HR-2000 2.4G Ultra Low Power Zigbee Module

(Based on ZigBee protocol)

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Ⅰ、Features of HR-2000

HR-2000 is a ultra low power data radio module which based on ZigBee protocol. Its features are as follow:

1. Ultra low power transmission with 1mW（0dBm）, and receiving sensitivity is -92dBm.
2. ISM frequency band with no require of applying frequency

   The carrier frequency is 2.4GHz.

3. High anti-interference and Low BER (Bit error Rate)

   Based on the Quadrature Phase Shift Keying (QPSK) modulation, the high-efficiency forward error correction channel encoding technology is used to enhance data's resistance to both transient interference and random interference. Narrowband interference of the same frequency can be suppressed by Direct Sequence Spread Spectrum. The 16 CRC verify bits can be used to check mistake.

4. The transmitting speed in the air can reach up to 250kbps.

5. Transmission Distance

   Within the visible range, when the height of antenna is higher than 2m and The Bit Error Rate (BER) is 10^{-3}, the reliable transmission distance is 100m.

6. Multi-channels

   HR-2000 offers 16 channels. The communication channel can be adjusted automatically based on the user's environment.

7. UART interface

   HR-2000 provides a UART interface of TTL level. The interface baud rate is 38400bps, and the parity is no-parity (8N1).

8. Low power consumption

   The receive current is less than or equal to 33mA, and the transmit current is less than or equal to 33mA.

9. Small size and light weight

10. By using monolithic radio-frequency integrated circuit and single-chip MCU, the transceivers have less peripheral circuits, higher reliability, and lower failure rate.

11. HR-2000 (V1.2) provides PCB antenna, and HR-2000 (V1.3) provides external antenna.

12. It can meet for the protocol of IEEE 802.15.4 for 2.4GHz and the application of ZigBee， it can make network automatically.

II. Applications of HR-2000

HR-2000 ultra low power data radio module is suitable for:

* Home appliances intelligent control.
* Auto Meter Reading system.
* Industry telemetry and automatic data collection system.

* Security and alarm.
* Wireless monitor for hotel and equipment of computer room, door's security, personnel orientation.
* Traffic and the control for street lamp.
* Logistics, active RFID, POS system and wireless handheld terminal.

III. How to use HR-2000

1. Power supply

HR-2000 power supply is +3.3~6.0V DC. By using better ripple factor, HR-2000 can also share power supply with other equipment. If possible, a voltage-stabilizing chip with +3.3~6.0V DC voltage is recommended as the only power supply.

If lower power and lower power consumption are needed, we can specially design to lower the power as +3V or much lower.

2. Connection Definition with terminal

HR-2000 supply one 20-pin connector (JP1), their definitions and connection methods with terminals are shown in Table 1.

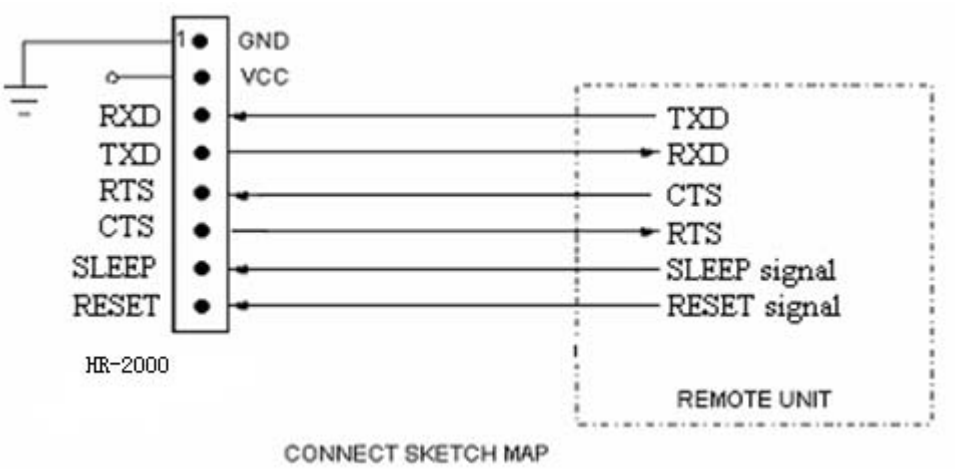
The range of interface level: the low level is 0-0.5V, the high level is 2.5-3.3V.

Pin	Definition	Instruction	Function	Connect with CC2430's pin
1	GND	Power ground		
3	VCC	Power supply DC	+3.3~6.0V	
5	RxD	Serial data receiver	Data input	4(P1_4)
7	TxD	Serial data transmitter	Data output	3(P1_5)
9	RTS	Request to send	Signal output	5(P1_3)
11	CTS	Clear to send	Signal input	6(P1_2)
13	SLEEP	Sleep signal	Signal input （ 1=sleep ， 0=communicate）	11(P0_0)
15	RESET	Reset signal	Signal input （ 1=communicate ， 0=reset）	10(RESET)
17	NC	I/O or ADC	Suspending	15(P0_4)
19	NC	I/O or ADC	Note 1*	16(P0_5)
2	NC	I/O	Suspending	45(P2_2)
4	NC	I/O	Suspending	46(P2_1)
6	3.0V	Power output	Maximum output current is 50mA	
8	NC	I/O	Suspending	1(P1_7)
10	NC	I/O	Suspending	2(P1_6)
12	NC	I/O	Suspending	8(P1_1)
14	NC	I/O	Suspending	9(P1_0)
16	NC	I/O or ADC	Suspending	18(P0_7)
18	NC	I/O or ADC	Suspending	13(P0_2)
20	NC	I/O or ADC	Note 1*	14(P0_3)

Table 1: JP1 Pin Definitions and connection methods

Note: When 19th and 20th pin are shorted by connector, the protocol for data transmitting is transparent protocol; when 19th and 20th pin are suspending, the protocol for data transmitting is formatted protocol. The details can be seen in the "HR-2000 data interface protocol".

3. The connection sketch between HR-2000 and terminal equipment.



Picture 1: Connection sketch between HR-2000 and terminal equipment

4. Channels of HR-2000.

a. Channel frequency: Corresponding frequency points of 1~16 channels

Channel No.	Frequency	Channel No.	Frequency
1	2.405 GHz	9	2.445GHz
2	2.410 GHz	10	2.450GHz
3	2.415GHz	11	2.455GHz
4	2.420GHz	12	2.460GHz
5	2.425GHz	13	2.465GHz
6	2.430GHz	14	2.470GHz
7	2.435GHz	15	2.475GHz
8	2.440GHz	16	2.480GHz

Table2: channel and frequency

Note: The frequency points corresponding to each channel can be adjusted automatically based on the environment of user.

5. Interface format:

Data interface: Universal Asynchronous Receiver Transmitter (UART)

Level of interface: TTL level

Interface baud rate: 38400bps

Data format: 8N1 (eight data bits, no-parity and one stop bit)

6. LED function indicator

D1: networking indicator

D2: data input

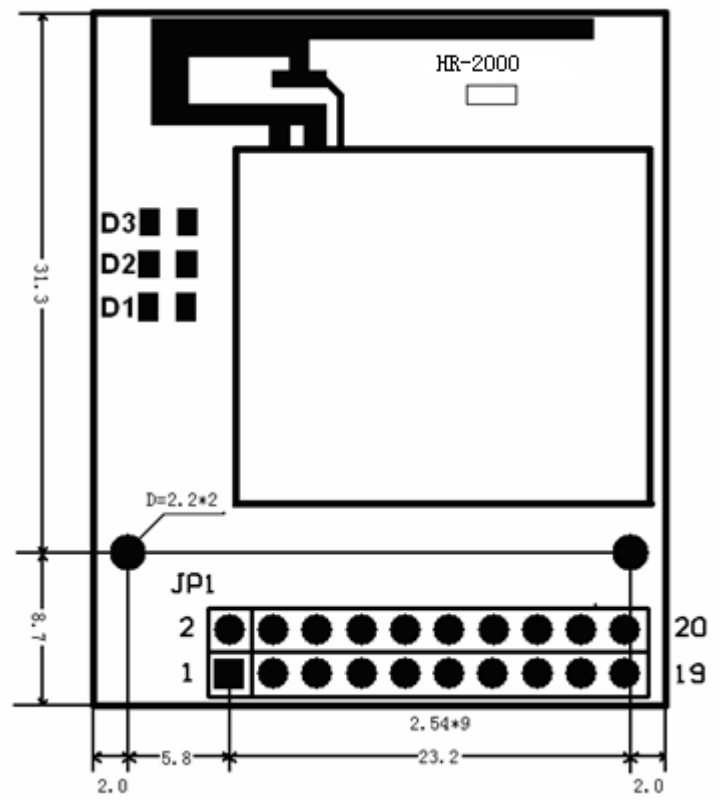
D3: data output

7. Antenna configuration:

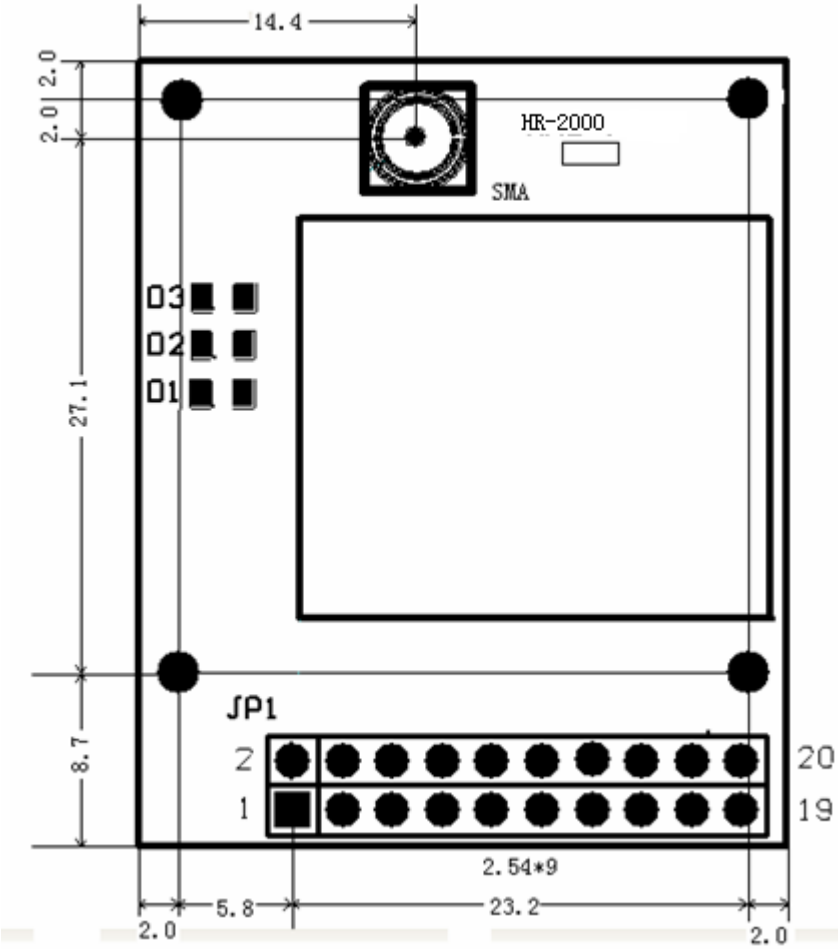
HR-2000 (V1.2) uses with PCB antenna, and HR-2000 (V1.3) uses with external antenna. When you use antenna, pay attention to the position of antenna, it doesn't allow metal shield layer nearby. There is more than 20mm all around the antenna. If you need a shell, you only can use plastic shell, you can't use metal shell, you'd better put the antenna near the edge of the shell. When you use external antenna, you need to use external antenna of 2.4GHz.

8. Dimension diagram (Unit: mm):

Picture 2 is structure dimension of our standard HR-2000 V1.2 (with PCB antenna). Picture 3 is structure dimension of HR-2000 V1.3 (with external antenna). Other requests for smaller sizes or different shapes can also be provided to meet user's need.



Picture 2 Structure dimension of HR-2000 V1.2



Picture 3 Structure dimension of HR-2000 V1.3

IV. Technical specification of HR-2000

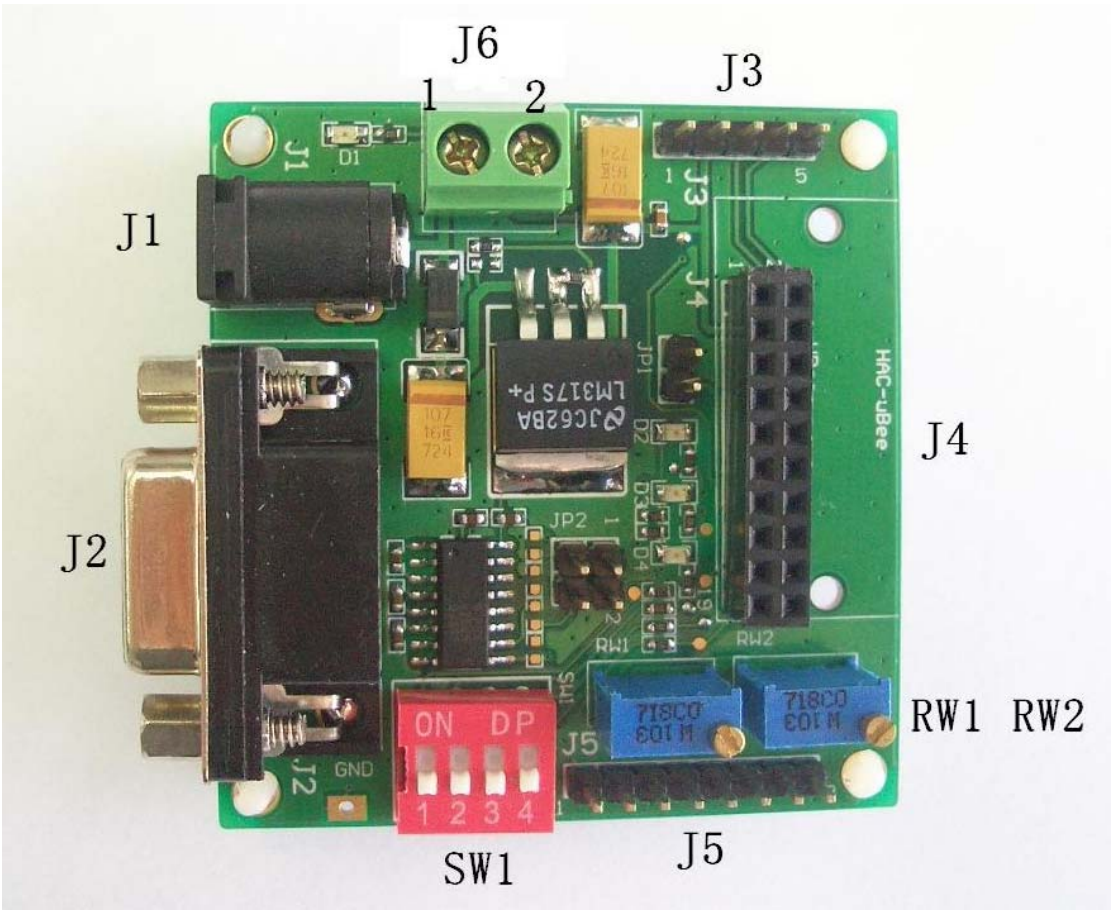
- Modulation mode: QPSK
- Method of spread spectrum: DSSS
- Working frequency: 2.4~2.5GHz
- Transmission power: 0dBm (1mW)
- Receiving sensitivity -92dBm
- Interface: UART, TTL, 38400bps, 8N1
- Working temperature: -40℃~80℃ (Industrial)
- Power supply: +3.3 ~ 6.0VDC
- Dimension: 40×33×3.5mm
- Transmit current: ≤33mA

- Receive current: ≤33mA
- Working humidity: 10%~90% relative humidity without condensation
- Transmission Distance: Within the visible range, when the height of antenna is higher than 2m , the reliable transmission distance is 100m.

V. Testing and development kit of HR-2000

1. HR-2000 TEST BOARD

HR-2000 TEST BOARD is testing and development kit of HR-2000. It can test data transmitting of HR-2000 V1.2 series and HR-2000 V1.3 series directly. It can connect with computer, and it can test the data transmitting of HR-2000 V1.2 series and HR-2000 V1.3 series through serial port testing software.



Picture 4 HR-2000 TEST BOARD

2. Interface instruction for HR-2000 TEST BOARD

J1 is a DC power jack, it is an access to power-input, its voltage range is from 7V to 24V.

J6 is a DC terminal. It is the same as J1, it is also an access to power-input, it is convenient for

users to choose power interface. Its voltage range is from 7V to 24V. The 1st pin of J6 is VCC, and the 2nd pin is GND.

J2 is a RS232 data interface. User can connect with computer through J2 to test and setting the HR-2000.

The definition of interface is as follow: 2（TXD） 3（RXD） 5（GND）

J3 is a debug interface. User can download the software for HR-2000 through it.

The definition of interface is as follow: 1 (GND） 2 (3.3V) 3 (DC) 4 (DD) 5 (RESET)

J4 is an HR-2000 jack. It can connect with any type of HR-2000's module. The connection direction must be corresponding to the number of interface.

We have retained some application interface for user, such as J5, RW1, RW2, SW1. User can develop application through the retained I/O of J5 according their need. Its definition is shown as follow.

Name		Instruction	Connect to the J4's pins	Connect to CC2430's pins
J5	J5-1（pin）	GND		
	J5-2（pin）	I/O interface	J4-12	8(P1_1)
	J5-3（pin）	I/O interface	J4-14	9(P1_0)
	J5-4（pin）	I/O interface or ADC	J4-16	18(P0_7)
	J5-5（pin）	I/O interface or ADC	J4-17	15(P0_4)
	J5-6（pin）	I/O interface or ADC	J4-18	13(P0_2)
	J5-7（pin）	NOTE 2*	J4-19	16(P0_5)
	J5-8（pin）	NOTE 2*	J4-20	14(P0_3)
RW1		10K adjustable precision resistor	J4-16	18(P0_7)
RW2		10K adjustable precision resistor	J4-20	14(P0_3)
SW1	SW1-1	1st bit of DIP switch	J4-16	18(P0_7)
	SW1-2	2nd bit of DIP switch	J4-19	16(P0_5)
	SW1-3	3rd bit of DIP switch	J4-18	13(P0_2)
	SW1-4	4th bit of DIP switch	J4-20	14(P0_3)

Table 3

Note: The J5-7 and J5-8 connect with the 19th pin and 20th pin of the module respectively.

So When the J5-7 and J5-8 are shorted by connector, the protocol for data transmitting is transparent protocol; when 19th and 20th pin are suspending, the protocol for data transmitting is formatted protocol. The details can be seen in the "HR-2000 data interface protocol".

VI. General knowledge for ZigBee

1. What is ZigBee?

The ZigBee Alliance based on an open global standard is an association of companies working together to enable reliable, cost-effective and low-power Wireless communications solutions. ZigBee launched by ZigBee Alliance is a short-distance, low-power and low-cost wireless communication technology. Some International well-known companies are members of ZigBee Alliance, such as TI, Motorola, Siemens, Philips.

2. The sort of ZigBee module

Our ZigBee module based on ZigBee protocol of TI company. According to different function in the network, module can be divided into two types, one is Coordinator (i.e. Coord), and the other is Router. The Coordinator's appearance and interface are the same as Router's, but you can distinguish them by label.

Picture 5 are labels which have adhered to the module, its ID is a 4-byte hexadecimal number.

3. ZigBee network

A ZigBee network only have a Coordinator, it uses for the establishment of the network. When Coordinator has been electrified for a few seconds, the network can be startup. Coordinator is the first node in the network. Then Router can connect with Coordinator and enter into the network. At the same time, Router in the network allows the other Router enter the network by connecting with it. Any two nodes in the network can do point to point communication. At the same time, any node can broadcast to the other nodes.

Whether a module can enter the network depends on whether it has node that has enter network in its communication distance. If the distance between the module and its nearest node in the network is more than its communication distance (seen in the module specification), and the node will not communicate with any nodes in the network.

The establishment of ZigBee network can finish automatically after the module has been electrified,

User doesn't need to operate. The order for the module's power doesn't seem particularly

important.

After Coordinator has been electrified, ZigBee network can be built. Once a Router has entered the network, even if the Coordinator's power is off, the network can also work normally.

The networking for Coordinator needs to search the right channel. And Router enter the network also need to search channel, search network and connect. It need some time to deal with these processes .

VII. Data interface protocol of HR-2000

1. Transparent protocol and formatted protocol

HR-2000 can support two data transmitting protocol, i.e. transparent protocol and formatted protocol.

2. Transparent protocol

2.1 What is transparent protocol?

When you use transparent protocol, you send data to any serial port of network node, the other network nodes can receive the data and send out it from the serial port.

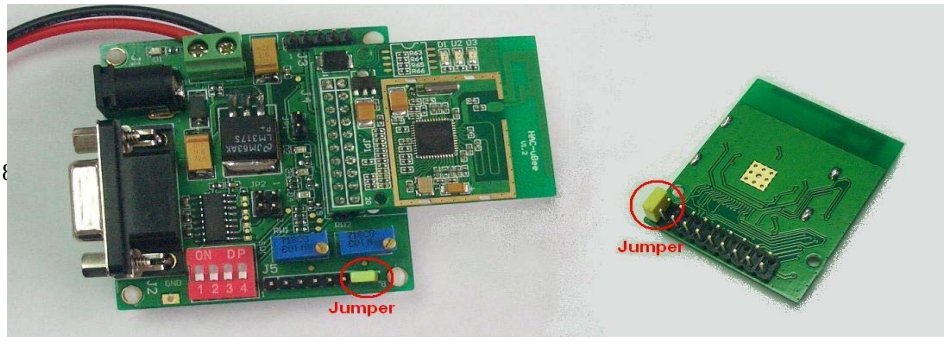
The advantage and disadvantage of transparent protocol.

The advantage of transparent protocol is simple, convenient and don't need to program. And the disadvantage is that it only has one communication mode called "broadcasting", i.e. when node A only need to communicate with node B, the other nodes can receive the data package which node A has sent to node B. Because transparent protocol can only adopt broadcasting mode, another disadvantage is that it will miss some data packages when the data flow is too large to exceed the network's load. The maximum load received by a standard ZigBee network is about three broadcasting every second.

How to make use of module with transparent protocol?

Let the 19th pin and 20th pin of HR-2000 V1.2's terminal or HR-2000 V1.3's terminal be shorted by short circuit, and the modules communicate with transparent protocol.

When HR-2000 module uses with HR-2000 TEST BOARD, and let 7th pin and 8th pin of HR-2000 TEST BOARD J5 be shorted by short circuit, they also communicate with transparent protocol. It is shown as Picture 6.



Picture 6

Note: When you change the working, it will work in the new working after the module has been electrified again.

How to know the module has entered the network?

When Coordinator has been electrified for a few seconds, it will establish network in the right channel, then it will send seven characters “Coord !” to serial port.

When Router has been electrified for a few seconds, it will enter the network in the channel which Coordinator has established, then it will send seven characters “Net OK !” to serial port.

3. Formatted protocol

3.1 What’s formatted protocol?

When you use formatted protocol, for the data from the serial port , HR-2000 only deal with the data that comply with the format, and the data receiving from network is sent to serial port according to a certain format, i.e. any module receive data from serial port, it will search the header of data and distinguish with the data whether it complies with the protocol, it only responds for the data that comply with the protocol. The data that doesn’t comply with the protocol will be discarded, and the module will shift forward to find the data that comply with the protocol. After the module receives data from network, it will package the data according to the request of protocol and send to the serial port.

3.2 The advantage and disadvantage of formatted protocol.

The formatted protocol can achieve broadcasting and point to point communication in the network, thereby it can avoid the situation that lots of data transmit in the network. Its disadvantage is that the data sent to serial port must comply with the request of the format, so it will increase the difficulties of development.

3.3 How to make use of module with formatted protocol?

Let the 19th pin and 20th pin of HR-2000 V1.2’s terminal or HAC-UBee V1.3’s terminal be hung in the air, and the modules communicate with formatted protocol.

When HR-2000 module uses with HR-2000 TEST BOARD, and let 7th pin and 8th pin of HR-2000 TEST BOARD’s J5 be hung in the air, they also communicate with transparent protocol.

Note: When you change the working, it will work in the new working after the module has been electrified again.

3.4 How to know the module has entered the network?

When Coordinator has been electrified for a few seconds, it will establish network in the right channel, then it will send its ID and attribute package to serial port.

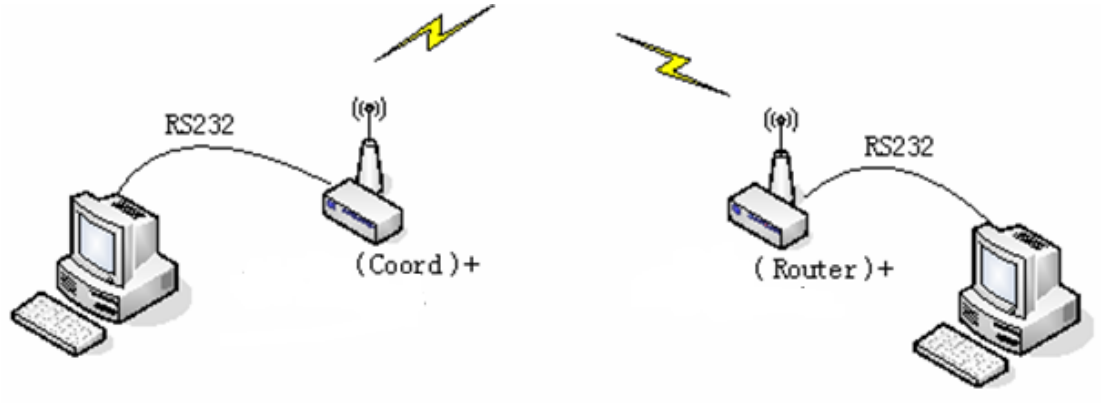
When Router has been electrified for a few seconds, it will enter the network in the channel which Coordinator has established, then it will send its ID and attribute package to serial port.

The details can be seen in “formatted protocol text”.

VIII. The networking communication and testing for HR-2000

1. The communication testing of HR-2000

Using testing development kit HR-2000 and HR-2000 TEST BOARD which cooperate with computer, you can test, experience and evaluate the ZigBee network. The method is shown as Picture 7.



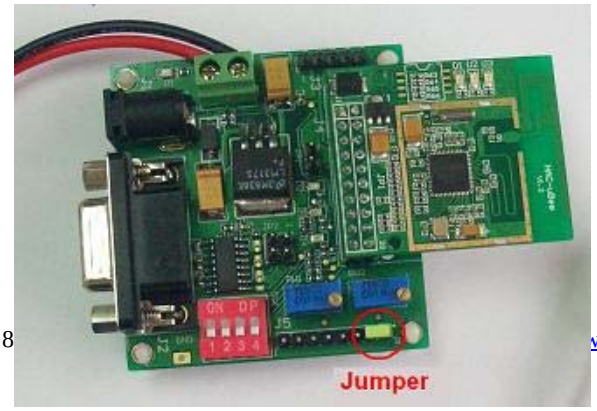
Picture 7

2. Choose module and kit for networking demo or testing

Choose one Coordinator and one or two Router, and plug them into HR-2000 TEST BOARD according to Picture 8.

Let all of 7th pin and 8th pin of HR-2000 TEST BOARD’s J5 be shorted by short circuits, let it work in transparent protocol mode.

Note: All of the modules must work in the same mode.



Picture 8

3. Get ready for communication

Let J2 of HR-2000 TEST BOARD connect with serial port of computer by RS232 serial wire, and use software that can communicate with serial port to check module's input and output in the serial port. When you connect module with TEST BOARD, please pay attention to the pin's definition of HR-2000 TEST BOARD's J2.

Serial port parameters of software are setting as follow:

Baud rate: 38400bps

No parity

Eight data bits

One stop bit

Note: Serial port setting of software must be the same as RS232 serial wire.

4. Electrify the modules

According to the pin definition of HR-2000 TEST BOARD's J1 or J6, you should offer appropriate power supply for each networking module.

When the network is made, the order of electrifying each module is not important, but based on the relevant protocol of ZigBee, the networking must be started up by a coordinator. So, even the router has electrified, the network wouldn't start except that coordinator has electrified for a few seconds. Coordinator is the first node of the network.

Now, electrify the modules.

5. Networking

When the distance between router and its nearest coordinator or router in the network is less than or equal to the maximum distance between modules' networking, the router will join into the network automatically to make a small network (ZigBee) after electrifying the Coordinator.

When Coordinator has electrified for a few seconds, you can see seven characters "Coord !" from screen of computer through serial port software. It indicates that Coordinator has finished establishment of network.

Then you can seen seven characters "Net OK !" from screen of computer through serial port software. It indicates Router has entered into the network.

6. Simulate and Test

When you transmit data to the serial port of any module in the network through software, you can get the same data from the serial port of the other module in the network. It indicates that ZigBee network works normally.

7. Notice

Based on the reason of ZigBee , the data length which transmit to the serial port is less than or equal to 70 bytes.

Transmit data too quickly to module through serial port may lose some data.

If you need to use formatted protocol, you need to remove all of short circuits in HR-2000 TEST BOARD's J5. The demonstration software for serial port communication can be downloaded on our website. The name of software is ZigBee_Demo.exe.

IX. Formatted protocol text

1. Summarization

The interface is a data interface protocol, it's suitable for HR-2000 V1.2 and HR-2000 V1.3.

2. Value definition

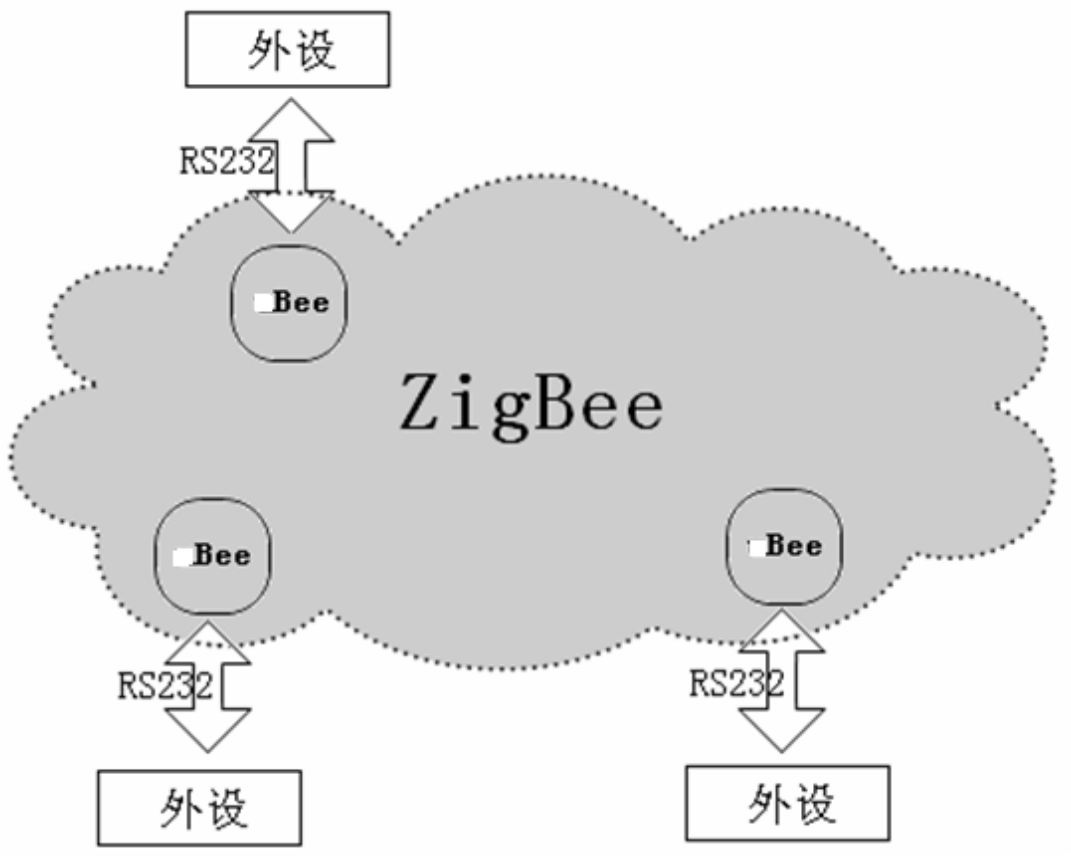
The data maximum length: MAX_DATALEN = 70（byte）

The length of ID address: ID_LEN = 4 bytes

3. Interface

The interface is a communication interface which is between ZigBee wireless communication module and its external equipment. The communication between external equipments can be achieved by ZigBee network. It is shown as Picture 9, the UBee in the picture is communication module.

The hardware interface is RS232.



Picture 9

Reading data from external equipment through RS232 interface is defined as input. Transmitting data to external equipment through RS232 interface is defined as output.

Serial number	Command	Command word(Hex)	Type	Remark
1	Data arrival	‘A’(0x41)	Output	
2	Send data	‘P’(0x50)	Input	
3	Read module’s ID	‘R’(0x52)	Input	

Table 4 Formatted protocol interface

3.1 Data arrival

Data arrival indicates that communication module receives other communication modules’ data from ZigBee.

When communication module receives data from ZigBee, the module will send the data to external equipment according to the format which is shown in table 5. After external equipment

receives data, the module will return response according to table 6.

Serial number	Data content	Length	Instruction
1	Header	3 bytes	0x4055AA
2	Command word	1 byte	0x41('A')
3	Source ID	ID_LEN	
4	Data length	1 byte	Efficient length of content in serial number 5
5	Data content	MAX_DATALEN byte	Fixed length MAX_DATALEN byte
6	Verify	2 bytes（high byte in the highest address）	Verify of content from serial number 1 to 5
7	End	3 bytes	0x2655AA

Table 5 Data format for transmitting to external equipment

Serial number	Data content	length	Instruction
1	Header	3 bytes	0x4055AA
2	Command word	1 byte	0x41('A')
3	Error code	1 byte	Details can be seen in definition of error code
4	End	3 bytes	0x2655AA

Table 6 Return format after having received data

3.2 Send data

Send data indicates that the communication module transmits data to other specific communication module.

When external equipment need to communicate with point to point mode, the data format sent to communication module must be according to table 7. when communication module has received data from external equipment, the data format response must be according to table 8.

When destination ID is 0xFF, data is broadcasting, i.e. it will transmit data to all nodes.

Note: Based on specialty of ZigBee, when each node maintain the information of in and out of the network for other node, it has a certain delay. Once a module enters network, then takes off network, the other module send data to it, it may also return the data package

that has send successfully. So source module receives the information about sending successfully, it doesn't mean that the destination module has received the data package successfully. When source module receives error package about that the destination module is out off network, we suggest that resend the data again.

Serial number	Data content	Length	Instruction
1	Header	3 bytes	0x4055AA
2	Command word	1 byte	0x50('P')
3	Destination ID	ID_LEN	
4	Data length	1 byte	Efficient length of content in serial number 5
5	Data content	MAX_DATALEN byte	Fixed length MAX_DATALEN byte
6	Verify	2 bytes（high byte in the highest address）	Verify of content from serial number 1 to 5
7	End	3 bytes	0x2655AA

Table 7 Data format for data transmitting

Serial number	Data content	Length	Instruction
1	Header	3 bytes	0x4055AA
2	Command word	1 byte	0x50
3	Error code	1 byte	Details can be seen in definition of error code
4	End	3 bytes	0x2655AA

Table 8 Response for data transmitting

3.3 Read module's ID

When external equipment need read module's ID address, it will send request for reading ID to communication module according to table 9. When communication module receives request for reading ID, it will read its ID and return its ID according to table 10.

Serial number	Data content	Length	Instruction
1	Header	3 bytes	0x4055AA

2	Command word	1 byte	0x52
3	End	3 btyes	0x2655AA

Table 9 Input data format for reading node's ID

When the module enters the network for the first time, it will send the data package to external equipment forwardly.

Based on specialty of ZigBee, once Router enters the network, its state is in the network, even if it has been out of network.

Serial number	Data content	Length	Instruction
1	Header	3 bytes	0x4055AA
2	Command word	1 byte	0x52
3	ID	ID_LEN	
4	Information of module (information about edition)	8 bytes	The first byte: 0x00-Coordinator，0x01－Router，0x02-Termianl other：unknown/out of network The second byte: edition of software (the high four bits is mai edition, and the low four bits is secondary edition) The third byte：state，0x00 in the network，0x01 out of th network. The fourth and fifth byte：short address（only effective when it is i the network） From the sixth to eighth byte: reservation
5	Verify	2 bytes	Verify of content from serial number 1 to 4（high byte in th highest address）
6	End	3 bytes	0x2655AA

Table 10 Output data format for reading ID

4. Definition of error code

Error code is just one byte long. In order to making error code to reflect results of operation more accurately, error code is divided into the high four-bit and the low four-bit to explain. For example, 0x22 indicates that the module has received input data from interface rightly, but it isn't in the network. The blank of table is undefined error, it retains for user.

Serial number	Content	The high four-bit	The low four-bit

1	0x0	Success	Success
2	0x1	Make a mistake	Make a mistake
3	0x2	Input rightly	It isn't in the network.
4	0x3		Destination ID isn't in the network.
5	0x4		Destination ID is lawless
6	0x5		Verify wrongly
7	0x6		The data length is beyond.
8	0x7		Wrong. format
9	0x8		
…	…		
16	0xF	Unknown mistake	Unknown mistake

5. Verify arithmetic

The protocol uses CRC arithmetic. Its source code(C language) is as follow:

```
#define CRC16_POLY 0X1021
//=====================================================
// Function: Cyclic Redundancy Check -16
// Description: Calculating for 16 bits verify code
// CRC-CCITT: X^16+X^12+X^5+1    (0X1021)
// CRC-16;       X^16+X^15+X^2+1    (0X8005)
//=====================================================
unsigned int CRC16(unsigned char *str,unsigned int len)
{
      unsigned char i;
      unsigned int crc = 0X0000;

      while (len-- != 0)
      {
            for (i = 0X80; i != 0; i/=2)       // i/=2 denote 'shift right', i*=2 denote 'shift left'.
            {
                  if ((crc & 0X8000) != 0)
                  {
                        crc *= 2;                    // the surplus of CRC multiply two, and calculate CRC.
                        crc ^= CRC16_POLY;
                  }
                  else
                     crc *= 2;
                  if ((*str & i) != 0)      crc ^= CRC16_POLY;      // superadd natural CRC
            }
            str++;
```

```
    }
    return crc;
}
// Example for verifying arithmetic
void main(void)
{
    unsigned char i;
    unsigned char a[22];
    unsigned int sum;

    for (i = 0; i < 20; i++)            a[i] = 0x11;
    sum = CRC16(a,20);
    a[21] = (unsigned char)(sum >> 8);
    a[20] = (unsigned char)(sum);
}
```

6. Example for interface data

6.1 Example of note

The data of example are all hexadecimal number, not characters.

The example is only suitable for external equipment, it is divided into two kinds, one is command package which external equipment sends to module through serial port, the other is data package which external equipment receives from module through serial port.

6.2 Send command for reading attribute to module

4055AA522655AA

6.3 Send 70 bytes data command to node AB612001

4055AA50AB6120014610111213141516171819111213141516171819201112131415161718192

0111213141516171819201112131415161718192011121314151617181920111213141516171819

204F332655AA

You can find out the destination ID AB612001 from the command.

6.4 Send 10 bytes data command to all of the nodes

4055AA50FFFFFFFF0A10111213141516171819111213141516171819201112131415161718192

0111213141516171819201112131415161718192011121314151617181920111213141516171819

20DCAE2655AA

You can find out the destination ID FFFFFFFF from the command. Although you only send 10 bytes, but you need to fill in the MAX_DATALEN.

6.5 Returned data package that has received command of reading attribute

40 55 AA 52 AB 61 20 00 00 10 00 00 00 15 87 00 04 65 26 55 AA

You can find out the destination ID AB612000 from the returned data package, it's a Coordinator, it is in the network.

6.6 Returned data package that has received command of sending data

Send successfully： 40 55 AA 50 00 26 55 AA

Destination module is not in the network(send failure)：40 55 AA 50 23 26 55 AA

X. Configuration of HR-2000

1、Development kit of ZigBee

- One Coordinator HR-2000 with external antenna
- Two Routers HR-2000 with PCB antenna
- One Router HR-2000 with external antenna
- Pin header is plug in the back side and welded in the face side, assort with testing board.
- Two SMA antennas with 2.4GHz
- Four sets testing board (including AC100V~240V/DC9V adaptor)
- Three standard serial wires
- One USB-to-RS232 serial wire
- One CD（USB driver，ZIGBEE-DEMO demo software，Specification）

2、HR-2000

Pin header does not be welded (customize plugged in the back side and welded in the face side)

- Sample with CD

3、HR-2000

- Do not need pin header (customize plugged in the back side and welded in the face side)
- Weld lengthen straight SMA antenna（customize other right-angle or straight antenna）
- Two SMA antennas with 2.4GHz （customize other antennas）
- Sample with CD

4、Choose and buy

- Testing board（including AC100V~240V/DC9V adaptor）
- Standard serial wire
- USB-to-RS232 serial wire
- Helical antenna