MBL Series Test Kits User Manual

New generation of package compatible Sub-1G wireless module

E48-433MBL-01



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DISCLAIMER 2

1 OVERVIEW 3

1.1 INTRODUCTION 3
1.2 SIZE AND PIN DEFINITION 4
1.3 SUPPORT LIST 5

2 SOFTWARE INTRODUCTION 5

2.1 THE DIRECTORY STRUCTURE 5
2.2 IAR PROGRAMING 6
2.3 MAIN FUNCTION 7
2.4 TX AND RX TIME SEQUENCE 7
2.5 PROGRAMING 9

3 QUICK PRESENTATION 12

3.1 SIGNAL CABLE CONNECTION 12
3.2 SERIAL PORT ASSISTANT 12

4 FAQ 13

4.1 COMMUNICATION RANGE IS TOO SHORT 13
4.2 MODULE IS EASY TO DAMAGE 14
4.3 BER(BIT ERROR RATE) IS HIGH 14

REVISE THE HISTORY 15

ABOUT US 15

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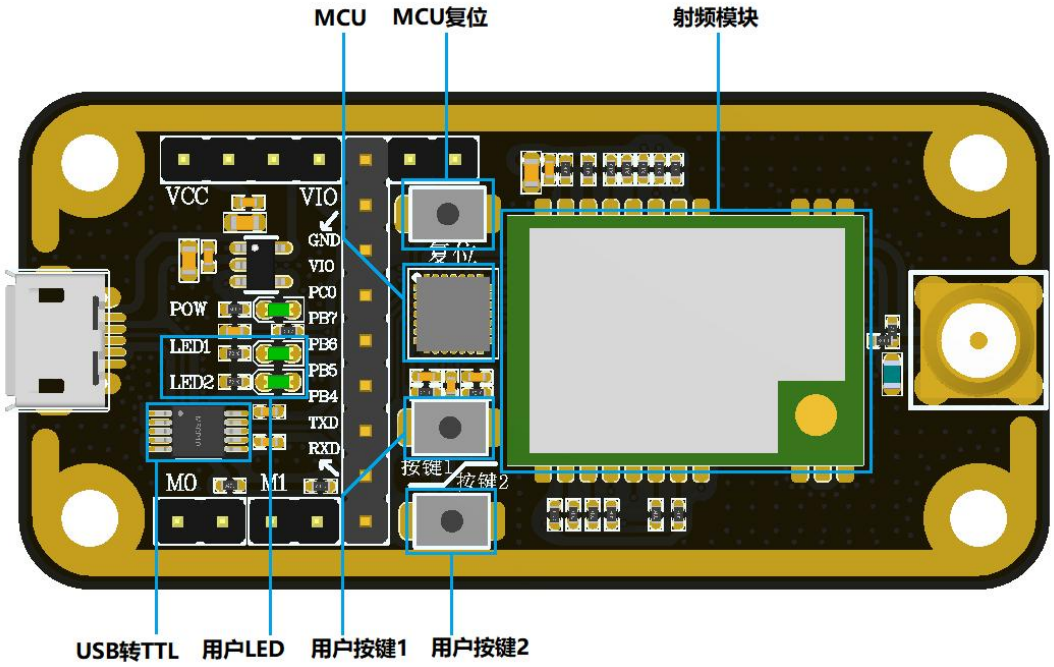
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1 Overview



1.1 Introduction

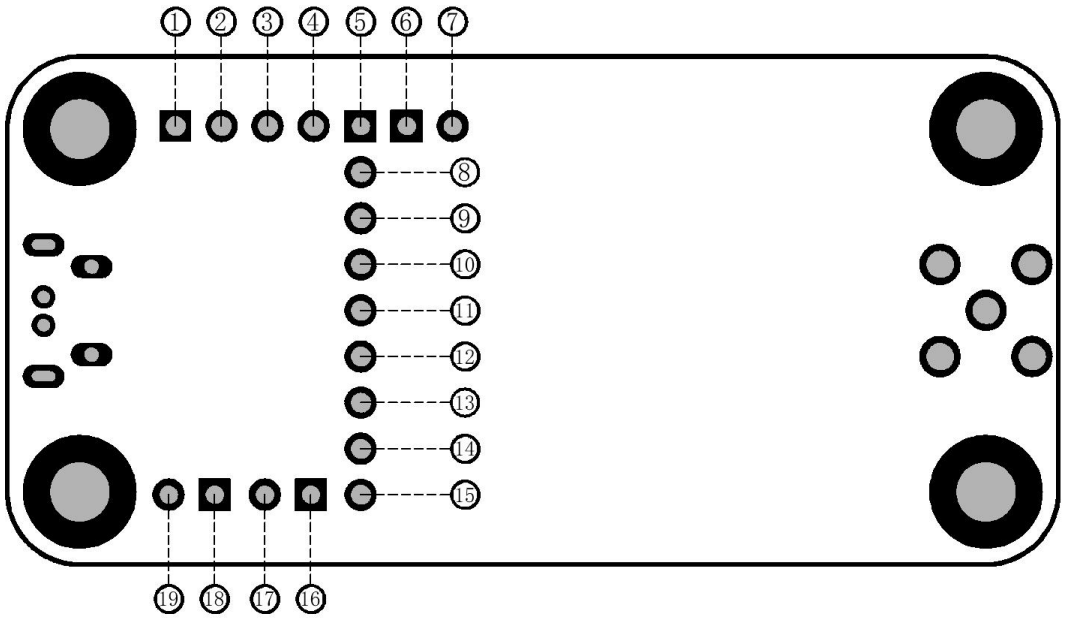
The MBL series evaluation suite is designed to help users quickly evaluate the new generation package compatible wireless modules. Most of the pins on the board have been drawn to both sides of the needle, and the developers can easily connect multiple peripheral devices through jumpers according to the actual needs.

The suite provides complete examples of software applications to help customers quickly develop wireless data communication. Different types of Sub-1G wireless modules can be loaded according to customer requirements. Supported modules all have pin-compatible packages for quick replacement.

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1.2 Size and pin definition



Pin No.	Item	Description
1	VCC	Module power supply pin is connected to the module with foot 2
2	3.3V	3.3V, electricity to lead out the foot
3	3.3V	3.3V, electricity to lead out the foot
4	VIO	MCU power supply pin, need to short connect with foot 3 to MCU power supply
5	G ND	Reference ground of bottom plate
6	R EST	The MCU external reset pin
7	S WIM	The SWIM pin of the MCU
8	VIO	The MCU power supply pin
9	PC0	Module reset pin
10	PB7	Module MISO pins
11	PB6	Module MOSI pin
12	PB5	Module SCLK pins
13	PB4	Module NSS pins
14	TXD	The MCU serial port TXD
15	RXD	The MCU serial port RXD
16	M 1	-
17	G ND	Reference ground of bottom plate
18	M 0	-
19	G ND	Reference ground of bottom plate

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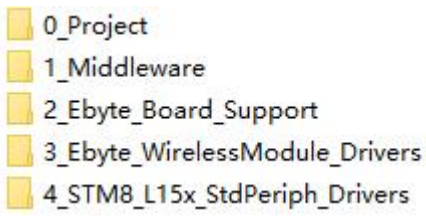
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1.3 Support list

	RF solution	Manufacturer	Module model
1	CMT2310A	HOPERF	E48-433M20S

2 Software Introduction

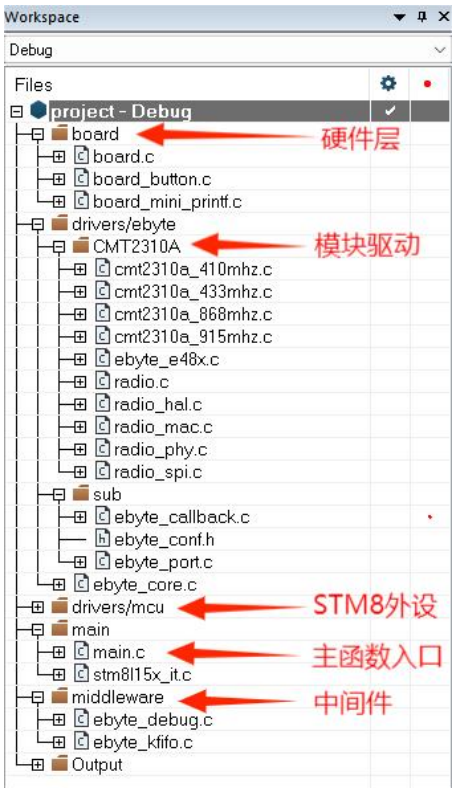
2.1 The directory structure

	Item	Explain
1	file catalog	It can be downloaded from the official website to the example project. Open the directory as shown in the figure below 
2	Directory instructions	You can use the I AR F or STM8 development environment to find the entry file for opening the project |-E15-EVB02-E48-DEMO //主文件夹 |
	-0_Project 		_IAR_for_Stm8 //工程文件夹，用IAR打开
|-1_Middleware | |—Kfifo //通用数组队列 | |_Produce //PC测试
	-2_Ebyte_Board_Support 		_E15-EVB02 //板载资源初始化
	-3_Ebyte_WirelessModule_Drivers 		_E48xMx //E48驱动
	-4_STM8_L15x_StdPeriph_Drivers

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2.2 IAR programing

	Item	Explain
1	engineering structure	Using the I AR F or STM8 development environment to open the engineering, you can see the basic structures 

2	Switch between the support models	In the ebyte _ conf. In the h file, the corresponding supporting models are selected by the macro-defined open and comment, as shown:
		`/*= !!!配置产品型号 单选 ==========*/`
		`#define EBYTE_E48_400M20S`
		`//#define EBYTE_E48_900M20S`
		In the radio _ hal. In the h file, the configuration macro defines the value of PRODUCT_FREQUENCY, and select the base frequency point. Note, you can only select the base frequency point under the corresponding frequency band, as shown:
		`//基础频点只能从以下选择`
		`#define CM2310A_410MHZ 0`
		`#define CM2310A_433MHZ 1`
		`#define CM2310A_868MHZ 2`
		`#define CM2310A_915MHZ 3`
		`#define PRODUCT_FREQUENCY CM2310A_410MHZ//选择基础频点`

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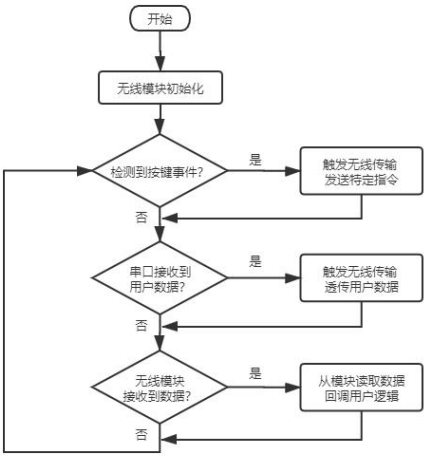
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2.3 Main function

main.c that is, the main function entrance. The presentation function process simplifies the following process:

	Item	Explain
1	Key function	If you press a button, you can send the command data wirelessly.essentially send a specific string "ping" and expects to receive a response "ping"
2	Serial port data transfer to wireless transmission	After receiving the data, the serial port automatically starts wireless transmission transmission data. Of course, it contains some special instruction responses, which are mainly used for special tests that users can ignore. After sending is completed, the user function is automatically called to process the sending logic itself.
3	Wireless receiving data	Generally, the internal state identification of the module is read to determine whether there is data. The underlying driver will copy the data and pass it to the user callback function, so as to process the receiving logic by itself

The software process simplification is shown in the following figure:



2.4 TX and RX time sequence

The wireless module has many operating states, and only specific functions can be completed in the corresponding state. From the simplest sending and receiving data, only consider the sending mode, receiving mode.

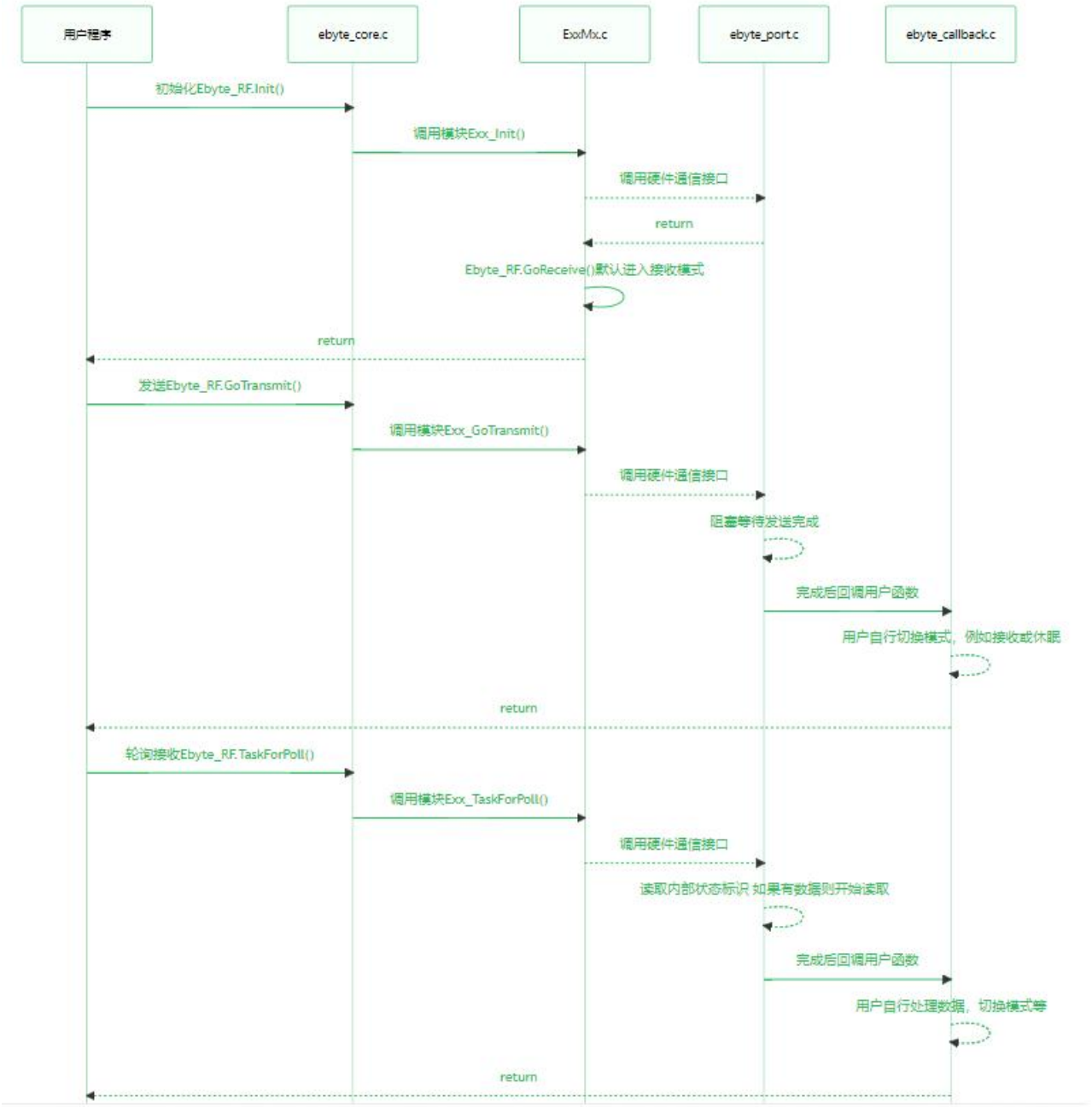
	Item	Explain
1	Receive mode	Receiving mode automatically after default initialization. In essence, the receiving function is called in the initialization and thus enters the receiving mode. If you need to consider other modes after initialization, such as dormancy, just replace them with the same type function Go _ xxxxx().
2	Send mode	When the sending function is called, the underlying driver actually switches the module into the standby mode, usually in which the modulation parameter configuration, such as frequency, power, frequency bias, etc. After the parameter configuration is correct, gradually enter some intermediate modes, open the internal

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		FIFO, PA, external XTAL, etc., and the current consumption will also gradually climb. Eventually, they switch into the sending mode, triggering the wireless data transmission. After completion, the module enters the standby mode, which cannot continue to send and receive, and the user needs to process the next mode in the callback function. When the function is complex, you need to receive or send continuously, please further switch other modes according to the chip characteristics.

The timing diagram is shown below:



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2.5 Programing

	Document	Key instructions
1	ebyte_core.h	A modular structure is defined that abstracts the basic functions, and the functions of the underlying module will be bound to that structure. When used for simple transceiver applications, there is no need to understand the underlying work details of each module, and then directly call the abstract function to start sending and receiving data. If you need to customize some functions, you can also consider integrating them into the structure. If you know enough of the functional functions of the underlying module, you can also directly remove the ebyte _ core. Document c / h, there is no strong coupling between the layers. 
2	ebyte_exx.c	Is a specific module driver file, is generally encapsulated, do not need the user to change, only need to consider how to input the data from this "box".
3	ebyte_port.c	Specifically used to bind SPI and GPIO under different hardware platforms, abstracted as a "box" input. Users need to fill the communication interface in their hardware platform to a fixed position according to the annotation. In general, it provides the level control of the SPI transceiver function and pin. Some modules are slightly special. For example, E49 uses half-duplex SPI. If you are too lazy to write communication drive, directly bind IO to a fixed position, and leave the rest to the module to simulate IO to achieve communication. As shown in the figure below, it is required to provide the SPI interface position to fill in the specific receiving function, and returned to SPI by result.

```
typedef struct
{
    uint8_t  ( *Init )( void );  //初始化
    uint8_t  ( *GoTransmit )( uint8_t *buffer, uint8_t size ); //切换发送模式 开始传输数据
    uint8_t  ( *GoSleep )( void );     //切换到休眠模式 低功耗用到
    uint8_t  ( *GoReceive )( void );  //切换到接收模式 开始监听数据
    uint8_t  ( *TaskForPoll)( void ); //轮询函数 可以主循环周期调用 也可以视情况放入中断
    void     ( *TaskForIRQ )( void ); //暂时保留，不必使用。用于将来扩展中断收/发
    uint8_t  ( *GetStatus )( void );  //获取模块状态(软件状态机)
    uint8_t * ( *GetName ) (void );  //获取模块识别码 为字符串 例如 "E22-400M22S"
    uint8_t  ( *GetDriver ) (void );  //获取软件版本号
}Ebyte_RF_t;
```

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		``
		/*!
		 * @brief 配置目标硬件平台SPI接口收发函数
		 * @param send EBYTE驱动库上层调用需要传输的数据 1 Byte
		 * @return SPI 接收的数据 1 Byte
		 */
		uint8_t Ebyte_Port_SpiTransmitAndReceivce(uint8_t send)
		{
		  uint8_t result = 0;
		
		  /* !必须提供: SPI接口 */
		  result = Ebyte_BSP_SpiTransAndRecv(send); //用户填充函数
		
		  return result;
		}
		``

4	ebyte_callback.c	Specifically used to bind the user's own sending and receiving logic, abstracted as a "box" output. In essence, a module drive is a direct call to the user's callback function after the send or receive is complete. As shown in the figure below, just fill in the user's logical function at the To-do prompt position.state It is driven by the module and actually processed by the Exx _ GoTransmit() function. When the function is complex, it can be considered and modified to support more cases.
		``
		/*!
		 * @brief 发送完成回调接口 由客户实现自己的发送完成逻辑
		 * @param state 上层回调提供的状态码 客户请根据示例注释找到对应区域
		 */
		void Ebyte_Port_TransmitCallback(uint16_t state)
		{
		  /* 发送: 正常完成 */
		  if(state &= 0x0001)
		  {
		  //To-do 实现自己的逻辑
		  UserTransmitDoneCallback();
		  }
		  /* 发送: 其他情况 */
		  else
		  {
		  //To-do 实现自己的逻辑
		  }
		}
		``

5	board.c	STM 8 peripheral initialization, involving SPI, TIMER, GPIO, etc., strongly coupled with the used hardware used.
6	board_button.c	The key event queue is a FIFO in terms of data structure. When the timer detects the key, put the corresponding event in the queue and wait for the main loop response.
7	board_mini_printf.c	The simplified printf, which is shrunk but occupies a small volume. The DEBUG macro in the project relies mainly on the mprintf provided by this file.
8	ebyte_kfifo.c	Optimoptimized general FIFO queue suitable for cache.

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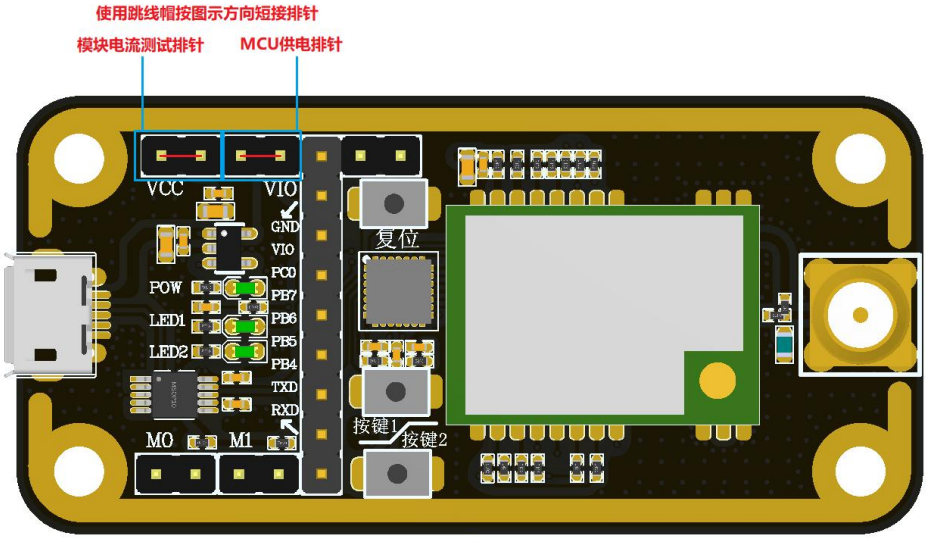
9	ebyte_debug.c	Used to connect to the PC for some tests, generally not use.
10	stm8l15x_it.c	All interrupt function entries are concentrated for serial port, timer, key IO, etc

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3 Quick presentation

3.1 Signal cable connection

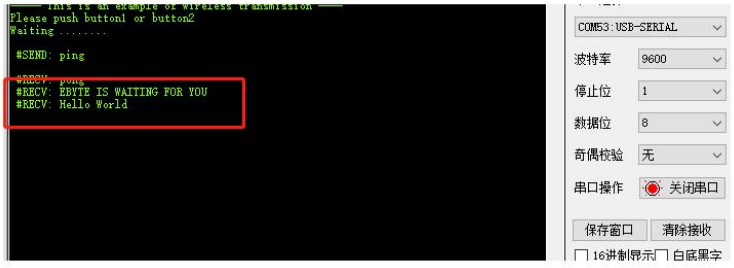
	Item	Explain
1	Power jumper cap	
2	Assist	USB cables, antenna, PC, etc

3.2 Serial port assistant

	Item	Explain
1	Device Manager View serial port numbers	

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2	Serial port software	
4	String data transmission	The serial port data transmission transmits the required content directly through XCOM 

3	Example button communication	# The RECV identifier, used only for prompting, represents the data received by the wireless module. # SEND identifier, used for prompt only, indicates the data sent by the wireless module 

4 FAQ

4.1 Communication range is too short

- When there is a linear communication obstacle, the communication distance will decay accordingly;
- Temperature, humidity, the same frequency interference, will lead to the communication packet loss rate increased;

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- Ground absorption, reflection of radio waves, close to the ground test effect is poor;
- Seawater has a strong ability to absorb radio waves, so the seaside test effect is poor;
- There are metal objects near the antenna, or placed in the metal shell, the signal attenuation will be very serious;
- Power register setting is wrong, the air rate setting is too high (the higher the air rate, the closer the distance);
- At room temperature, the low voltage of the power supply is lower than the recommended value, and the lower the voltage, the lower the power generation;
- The antenna is poor to match the module or the quality of the antenna itself.

4.2 Module is easy to damage

- Please check the power supply to ensure that between the recommended supply voltage, exceeding the maximum value will cause permanent damage to the module;
- Please check the stability of the power supply, and the voltage cannot fluctuate substantially and frequently;
- Please ensure anti-static operation during installation and use process and static sensitivity of high frequency devices;
- Please ensure that the humidity should not be too high, and some components are humidity sensitive devices;
- If there is no special demand, it is not recommended to use it at too high or too low temperature.

4.3 BER(Bit Error Rate) is high

- There is the same frequency signal interference nearby, stay away from the interference source or modify the frequency, channel to avoid interference;
- The power supply is not ideal may also cause disorderly code, be sure to ensure the reliability of the power supply;
- Extension line, feeder quality is poor or too long, will also cause high error rate.

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