E290-xxxXBX-SC Series Evaluation Kit User's Manual

New Generation Package Compatible Sub-1G Wireless Module Kit



Chengdu Ebyte Electronic Technology Co.,Ltd.

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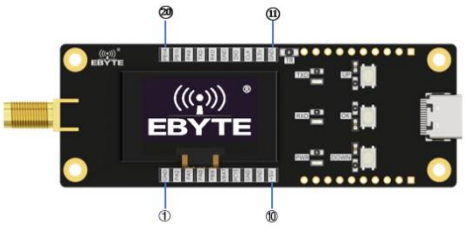
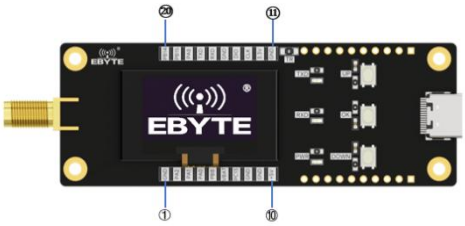
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1 Products Overview

1.1 Product Description

	Model	Front	Back
Low Power Kit	E290-xxxMBL-SC		
High Power Kit	E290-xxxMBH-SC		

The SC series evaluation kits are designed to help users quickly evaluate Yeppert's new generation of package-compatible wireless modules, using STM32F103C8T6 MCUs with available pins pinned out to both sides of the pin header, which allows developers to easily connect a variety of peripheral devices via jumper wires according to the actual needs, facilitating developers to carry out secondary development.

The kit provides complete software application examples to help customers quickly get started with wireless data communication development. Different types of Sub-1G wireless modules can be on-board according to customer requirements. The supported modules are available in pin-compatible packages for quick replacement.

1.2 Pin Definitions

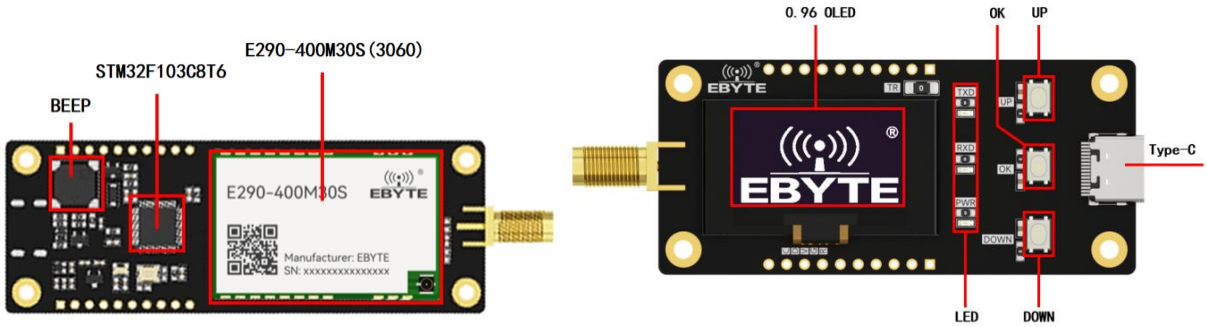
E290-xxxMBL/MBH-SC		
Pin No.	Definition	Functional Description
1	GND	baseboard ground
2	PA2	MCU_PA2 pin
3	PA1	MCU_PA1 pin
4	PA0	MCU_PA0 pin

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5	PB8	MCU_PB8 pin
6	VBAT	MCU_VBAT pin
7	PC13	MCU_PC13 pin
8	GND	baseboard ground
9	GND	baseboard ground
10	+5V	5V Power supply interface
11	GND	baseboard ground
12	3.3V	3.3V Power supply interface
13	CLK	SWCLK
14	DIO	SWDIO
15	GND	baseboard ground
16	RXD	MCU_RXD Data Input Pins
17	TXD	MCU_TXD Data Output Pins
18	PA8	MCU_PA8 pin
19	PB15	MCU_PB15 pin
20	PB14	MCU_PB14 pin

1.3 Function Introduction



Referring to the above figure of E290-400MBH-SC(3060), all other models of SC series have the same hardware functions.

Display screen	0.96 OLED	Displays the current configuration, test parameters, version information, etc.
Button	UP	Up key, up to check or add, frequency and power settings support connecting dots
	OK	Confirmation key to go to the next page or exit the last page
	DOWN	Down button, downward check or minus, frequency and power settings support continuous point
Indicator	TXD	Transmit indicator, blinks once for each transmission
	RXD	Receive indicator, blinking once for each reception
	PWR	Power indicator light, power on always on
Test Resistance	TR	Remove the test resistor and test the module current with an ammeter.
Buzzers	BEEP	Beeps once when key is pressed

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1.4 Parameter introduction

Serial No.	Parameter name	Parameter value		Note
		MBL-SC	MBH-SC	
1	Test board size	30*64mm	30*85mm	-
2	Production Process	Lead Free Process, Machine Attached		Machine labeling ensures batch consistency and reliability
3	Antenna Interface	SMA		-
3	Power supply interface	Type-C		USB to Type-C
4	Operating temperature	-40 ~ +85℃		-
5	Operating humidity	10% ~90%		-
6	Storage temperature	-40 ~ +125℃		-

1.5 Compatibility list

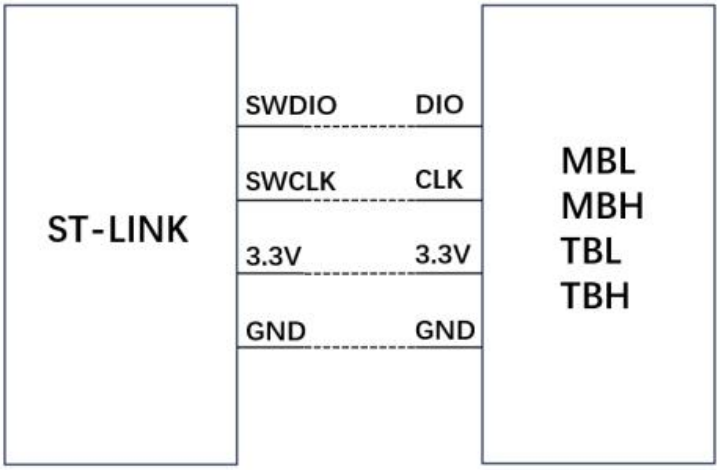
Low Power Modules	SPI	1	E22-400M22S	E22-400/900MBL-SC
		2	E22-900M22S	
		3	E32-400M20S	E32-400/900MBL-SC
		4	E32-900M20S	
		5	E220-400M22S	E220-400/900MBL-SC
		6	E220-900M22S	
	UART	7	E22-400T22S	E22-400/900TBL-SC
		8	E22-900T22S	
		9	E32-433T20S	E32-433/900TBL-SC
		10	E32-900T20S	
		11	E220-400T22S	E220-400/900TBL-SC
		12	E220-900T22S	
High Power Module	SPI	13	E22-400M30S	E22-400/900MBH-SC
		14	E22-900M30S	
		15	E32-400M30S	E32-400/900MBH-SC
		16	E32-900M30S	
		17	E220-400M30S	E220-400/900MBH-SC

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		18	E220-900M30S	
		19	E290-400M20S(3060)	E290-400MBL-SC(3060)
		20	E290-400M20S(3029)	E290-400MBL-SC(3029)
		21	E290-400M30S(3029)	E290-400MBH-SC(3029)
		22	E290-400M30S(3060)	E290-400MBH-SC(3060)
	UART	23	E22-400T30S	E22-400/900TBH-SC
		24	E22-900T30S	
		25	E32-433T30S	E32-433/900TBH-SC
		26	E32-900T30S	
		27	E220-400T30S	E220-400/900TBH-SC
		28	E220-900T30S	

1.6 Program Download Interface



Take the E290-400MBH-SC (3060) as an example.



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Programs can be burned to the MCU via ST-LINK. Please compile before burning.



2 Introduction to the software

2.1 Development Environment

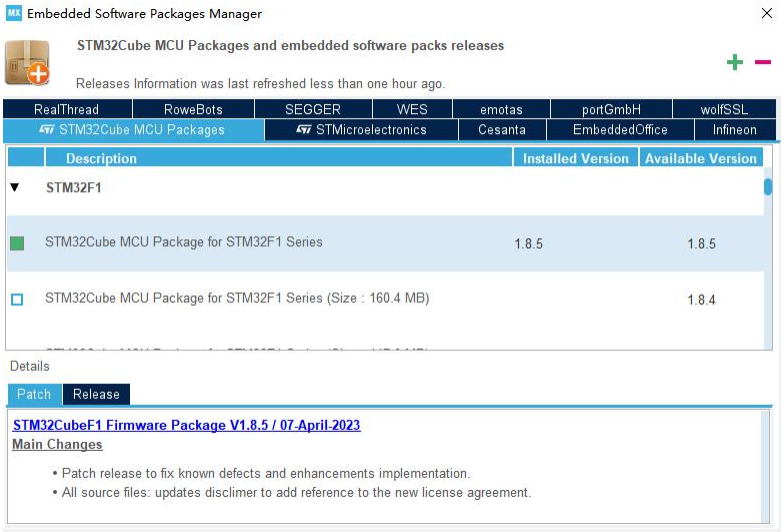
2.1.1 STM32CubeMX

Tool recommended version ≥ v6.9.2



STM32 firmware package version ≥ v1.8.5

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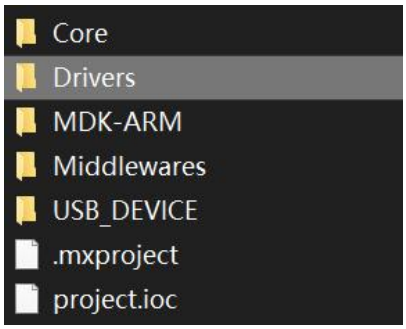


2.1.2 MDK-ARM

Keil version ⩾ v5.31.0

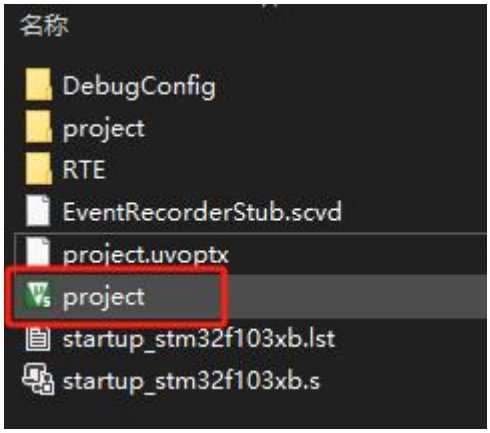
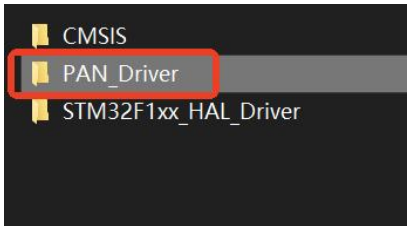
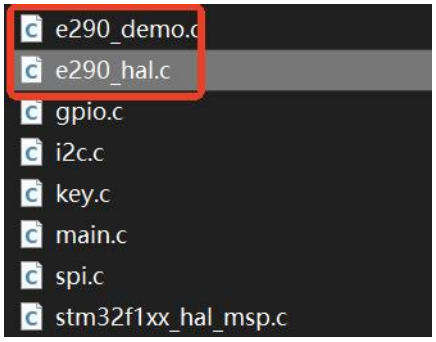


2.2 Catalog Structure

	Item	Instruction
1	File catalog	You can download the sample project from the official website and open the directory as shown below. 
2	Project initiation	There are startup files under MDK-ARM

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3	Module Driver	Drivers folder has the corresponding RF chip drivers. 
4	Module Applications	The corresponding exx_demo example is available in the Core/Src folder. 

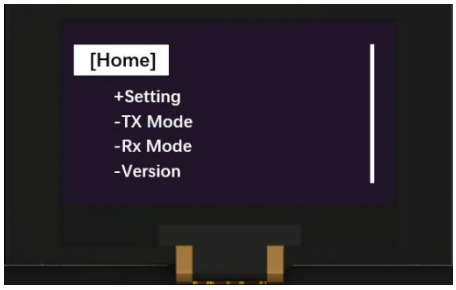
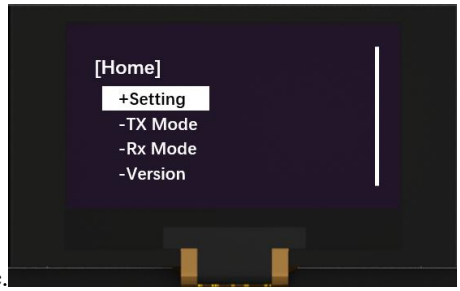
3 Function Demo

3.1 Quick Start

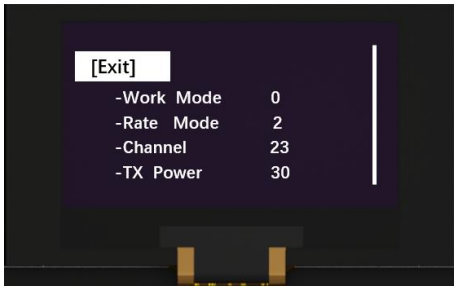
	Item	Instruction
1	Home page	Default to home page after power on, all configuration parameters restored to default state.

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<table>
<tr><td></td><td></td><td>
</td></tr>
<tr><td>2</td><td>Go to page</td><td>By clicking the physical confirmation button, you can access the corresponding option page.

</td></tr>
<tr><td>3</td><td>Basic Parameter Setting</td><td>M series Setting page has a variety of LoRa parameters, which can be adjusted according to the needs, and airspeed calculation is recommended to use PANCHIP official calculation tool:https://docs.panchip.com/pan3029dk-doc/latest/06_tools/index.html.
The difference between T series and M series is only the airspeed configuration.
After the configuration is completed, check [Exit] to return to the previous page.

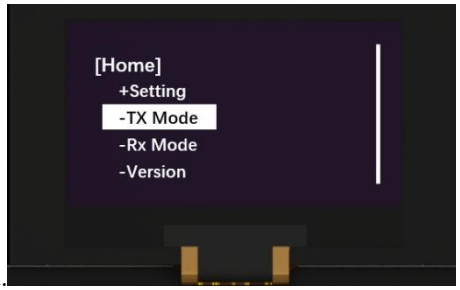
The M-Series configuration:

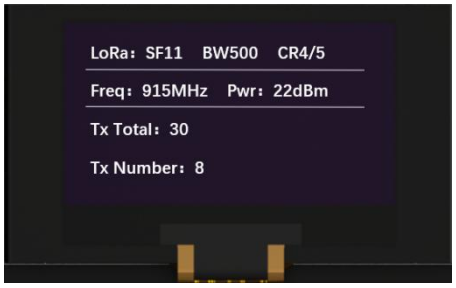

The T-Series configuration:


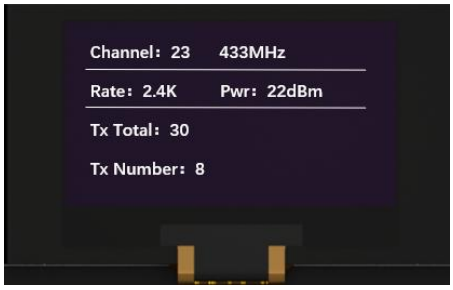
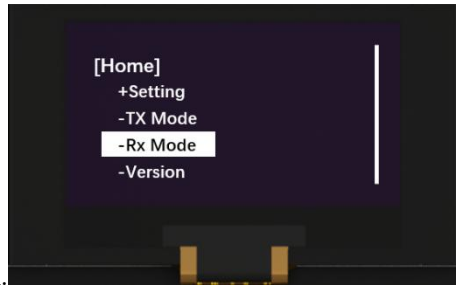
Functional interpretation:
<table>
<tr><td colspan="3">M Series</td><td colspan="3">T Series</td></tr>
<tr><td>LoRa SF</td><td>symbol rate</td><td rowspan="3">Airspeed needs to be calculated in conjunction with SF, BW, and CR.</td><td>Work Mode</td><td>operating mode</td><td>Select module operating mode</td></tr>
<tr><td>LoRa BW</td><td>channel bandwidth</td><td>Rate Mode</td><td>Rate Mode</td><td>Select Airspeed</td></tr>
<tr><td>LoRa CR</td><td>coding rate</td><td>Channel</td><td>operating</td><td>Select Channel</td></tr>
</table></td></tr>
</table>

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<table>
<tr><td></td><td></td><td>
<table>
<tr><td></td><td></td><td></td><td></td><td>channel</td><td></td></tr>
<tr><td>Frequency</td><td>operating frequency</td><td>Select Frequency</td><td>TX Power</td><td>firing power</td><td>Configuring Transmit Power</td></tr>
<tr><td>TX Power</td><td>firing power</td><td>Configuring Transmit Power</td><td>TX Count</td><td>Number of times sent</td><td>Configure the number of transmissions</td></tr>
<tr><td>TX Count</td><td>Number of times sent</td><td>Configure the number of transmissions</td><td>Back Color</td><td>background color</td><td>Reflects the background color of the screen</td></tr>
<tr><td>Back Color</td><td>background color</td><td>Reflects the background color of the screen</td><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>4</td><td>Sending Test</td><td>When Tx Mode is entered, it will automatically start to send packets according to the parameters set by the user (default 10 bytes per packet).
Press the “Confirm” button to exit and return to the upper page
After sending, press the “Down” button to


re-send.
The M-Series TX transmitter interface：

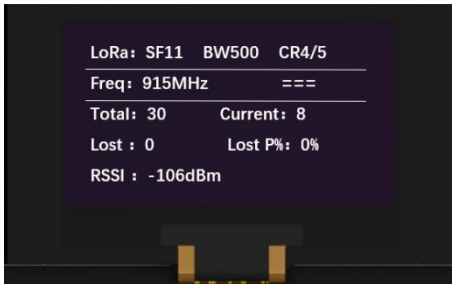
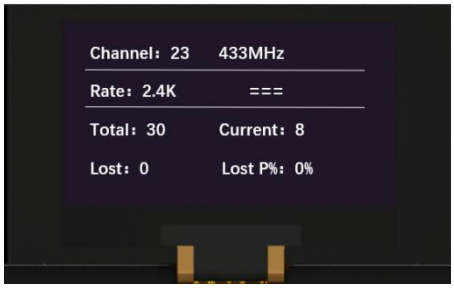
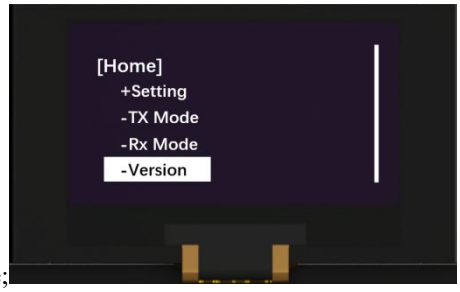
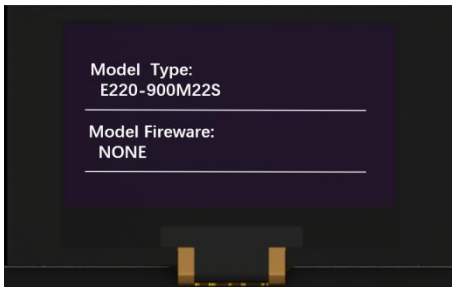
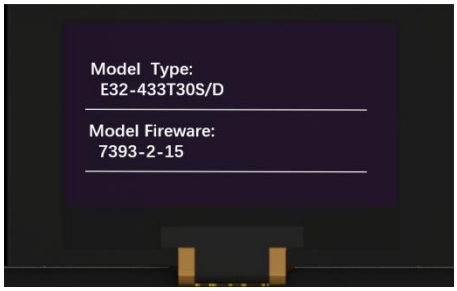
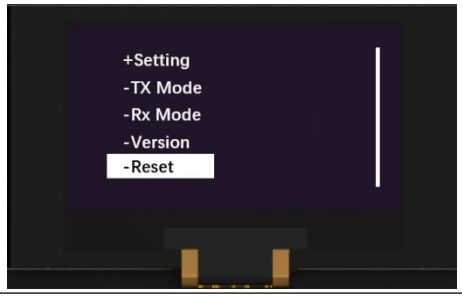
The T-Series TX transmitter interface：
</td></tr>
<tr><td>5</td><td>Reception test</td><td>After entering Rx Mode, it will automatically start to wait for receiving wireless data according to the parameters set by the user.
Pressing “Confirm” button in the page will exit and return to the superior page.
After sending, press “Down” button to start receiving


again.

The M-Series RX receiver interface： The T-Series RX receiver interface ：</td></tr>
</table>

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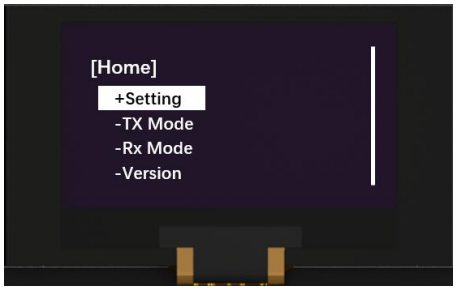
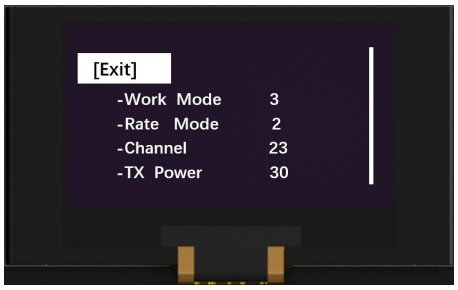
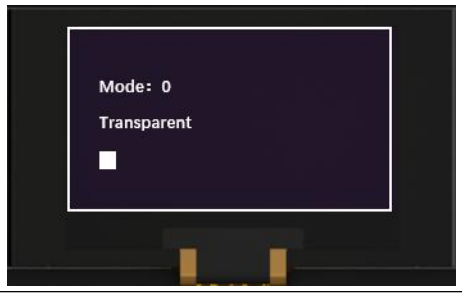
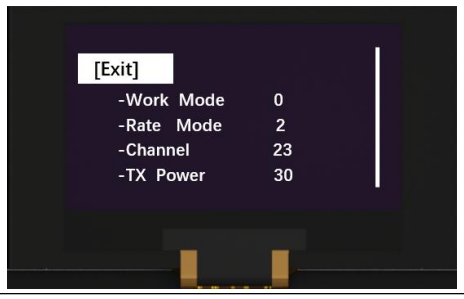
		 
6	Version Information	Displays basic information such as the module model number. NONE is displayed if there is no firmware inside the M series module;  The M-Series version information:  The T-Series version information: 
7	Reset	Select Reset, OK to confirm, reset the configuration and return to the home page.  

3.2 Transmission via USB serial port.

	Item	Instruction
1	Home page	Default to home page after power on, all configuration parameters restored to default state

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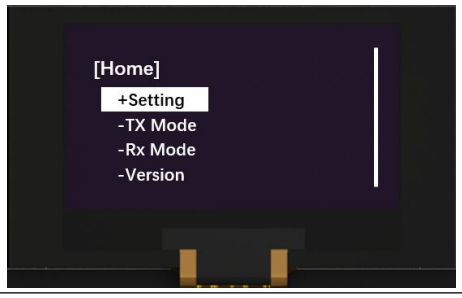
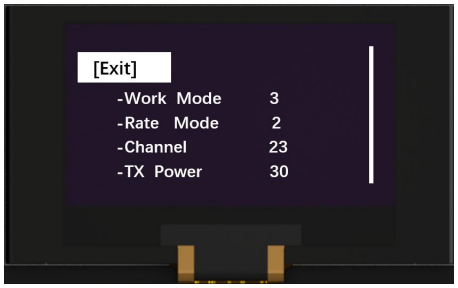
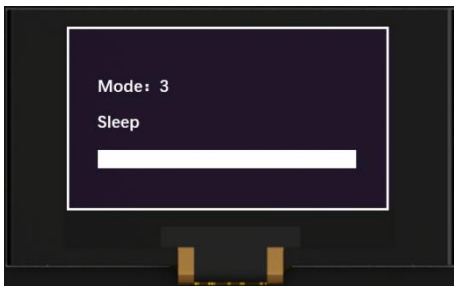
		
2	Menu	Press any key to enter the menu page, then press “DOWN” key to select ‘Setting’, then press “OK” key to enter the setting mode. 
3	Mode Setting	In the setting mode, press the “DOWN” button to select “Work Mode”, and then press the “OK” button to enter the mode setting. 
4	Transparent transfer mode	Set the mode as “Mode: 0 Transparent”, press “OK” to save and return. (For the first time use, please switch the mode by up and down buttons once, and then select “Mode: 0”)  
5	Transparent transmission function via USB serial port.	Open the serial port tool to realize the transparent transmission function with the module of the same model. Note: The configuration parameters of the kit are the default parameters at this time.

3.3 Upper computer configuration function via USB serial port.

	Item	Instruction
1	Home page	After powering up, you will enter the home page by default, and all configuration

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		parameters will be restored to the default state.
2	Menu	Press any key to enter the menu, select “Setting” by ‘DOWN’ key, then press “OK” key to enter the setting mode.
3	Mode Setting	In the menu, press the “DOWN” button to select “Work Mode”, and then press the “OK” button to enter the mode setting.
4	Set to sleep mode	Set the mode to sleep mode, i.e. “Mode: 3 Sleep”, press “OK” to save and exit.
5	Upper computer configuration function via USB serial port.	You can read the module parameters and configuration parameters by opening the corresponding official web console.

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4 FAQ

4.1 Communication range is too short

- The communication distance will be affected when obstacle exists;
- Data lose rate will be affected by temperature, humidity and co-channel interference;
- The ground will absorb and reflect wireless radio wave, so the performance will be poor when testing near ground;
- Sea water has great ability in absorbing wireless radio wave, so performance will be poor when testing near the sea;
- The signal will be affected when the antenna is near metal object or put in a metal case;
- Power register was set incorrectly, air data rate is set as too high (the higher the air data rate, the shorter the distance);
- The low voltage of the power supply at room temperature is lower than the recommended value, and the lower the voltage, the lower the power generated;
- Due to antenna quality or poor matching between antenna and module.

4.2 Module is easy to damage

- Please check the power supply to ensure that it is between the recommended supply voltages, exceeding the maximum value can cause permanent damage to the module;
- Please check the stability of power source, the voltage cannot fluctuate too much;
- Please ensure that the installation and use of the process of anti-static operation, high-frequency devices electrostatic sensitivity;
- Please ensure the humidity is within limited range, some parts are sensitive to humidity;
- Please avoid using modules under too high or too low temperature.

4.3 BER(Bit Error Rate) is high

- There are co-channel signal interference nearby, please be away from interference sources or modify frequency and channel to avoid interference;
- Poor power supply may cause messy code. Make sure that the power supply is reliable;
- The extension line and feeder quality are poor or too long, so the bit error rate is high.

Revision history

Version	Date	Description	Issued by
1.0	2025-7-10	Initial version	Hao
1.1	2026-1-9	Edit content	Hao
1.2	2026-4-2	Edit content	Hao

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