E220-xxxXBX-SC Series Test Kits
User Manual

A new generation of package-compatible Sub-1G wireless module kits



Chengdu Ebyte Electronic Technology Co.,Ltd.

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1 INTRODUCTION 2

1.1 BRIEF INTRODUCTION 2
1.2 PIN DEFINITION 3
1.3 FUNCTION INTRODUCTION 4
1.4 PARAMETER INTRODUCTION 4
1.5 CMPATIBILITY LIST 5
1.6 PROGRAM DOWNLOAD INTERFACE 5

2 SOFTWARE 7

2.1 DEVELOPMENT ENVIRONMENT 7
2.1.1 STM32CubeMX 7
2.1.2 MDK-ARM 7
2.2 DIRECTORY STRUCTURE 8

3 FUNCTION DEMONSTRATION 9

3.1 QUICK START 9
3.2 ACHIEVE TRANSPARENT TRANSMISSION FUNCTION VIA USB SERIAL PORT 12
3.3 ACHIEVE HOST COMPUTER CONFIGURATION FUNCTION VIA USB SERIAL PORT 13

4 FAQ 14

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

REVISION HISTORY 15

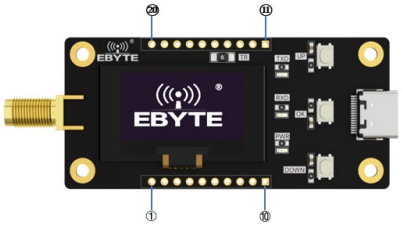
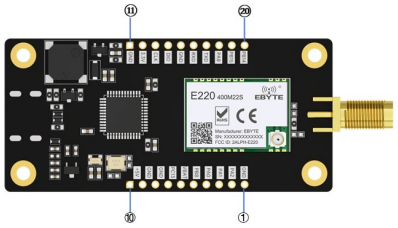
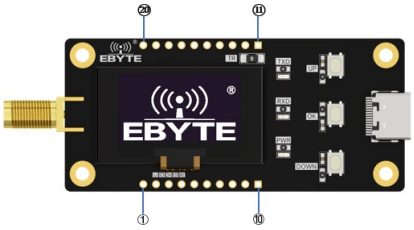
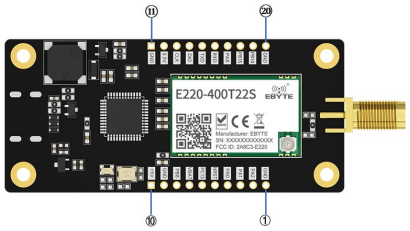
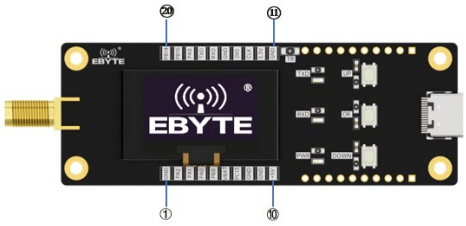
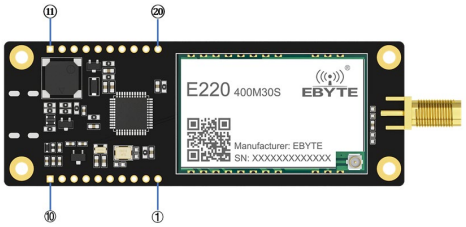
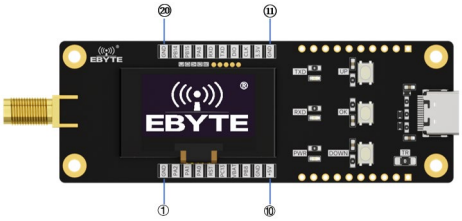
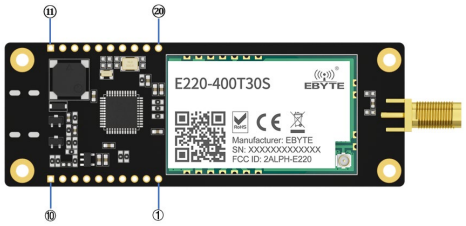
ABOUT US 15

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1 Introduction

1.1 Brief Introduction

	Model	Front	The back
Small power kit	**E220-xxxMBL-SC**		
	E220-xxxTBL-SC		
High power kit	**E220-xxxMBH-SC**		
	E220-xxxTBH-SC		

The SC series evaluation suite is designed to help users quickly evaluate the new generation package compatible wireless modules. MCU uses STM32F103C8T6, and the available pins have been drawn to both sides of the needle. Developers can easily connect a variety of peripheral devices through jumpers according to the actual needs, so as to facilitate developers to carry out secondary development.

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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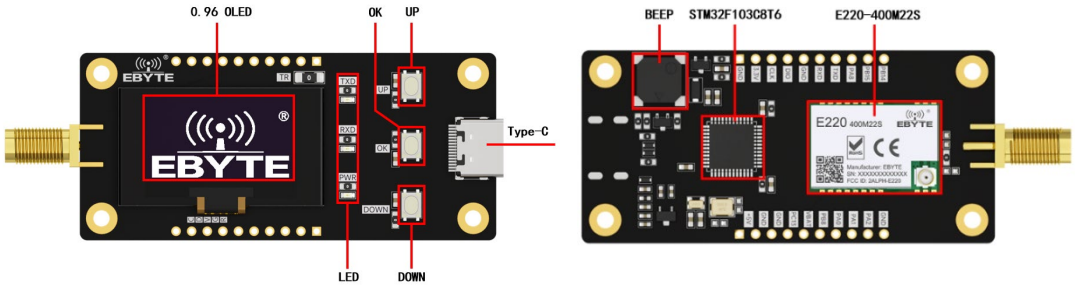
1.2 Pin Definition

Exx-xxxMBL/MBH-SC			Exx-xxxTBL/TBH-SC		
Pin No.	**Pin Name**	**Function**	**Pin No.**	**Pin Name**	**Function**
1	GND	Ground	1	GND	Ground
2	PA2	MCU_PA2 Pin	2	PA2	MCU_PA2 Pin
3	PA1	MCU_PA1 Pin	3	PA1	MCU_PA1 Pin
4	PA0	MCU_PA0 Pin	4	PA0	MCU_PA0 Pin
5	PB8	MCU_PB8 Pin	5	NRST	MCU Reset Pin
6	VBAT	MCU_VBAT Pin	6	PC13	MCU_PC13 Pin
7	PC13	MCU_PC13 Pin	7	VBAT	MCU_VBAT Pin
8	GND	Ground	8	PB8	MCU_PB8 Pin
9	GND	Ground	9	GND	Ground
10	+5V	Voltage: 5V DC	10	+5V	Voltage: 5V DC
11	GND	Ground	11	GND	Ground
12	3.3V	Voltage: 3.3V DC	12	3.3V	Voltage: 3.3V DC
13	CLK	SWCLK	13	CLK	SWCLK
14	DIO	SWDIO	14	DIO	SWDIO
15	GND	Ground	15	TXD	MCU_TXD Input Pin
16	RXD	MCU_RXD Input Pin	16	RXD	MCU_RXD Output Pin
17	TXD	MCU_TXD Output Pin	17	PA8	MCU_PA8 Pin
18	PA8	MCU_PA8 Pin	18	PB15	MCU_PB15 Pin
19	PB15	MCU_PB15 Pin	19	PB14	MCU_PB14 Pin
20	PB14	MCU_PB14 Pin	20	GND	Ground

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1.3 Function Introduction



Referring to E220-400 MBL-SC above, other hardware functions of SC series are consistent.

Display	0.96 OLED	Display the current configuration, test parameters, and version information
Buttons	UP	Up key, select up or add, frequency and power setting support connection point
	OK	Confirm key to the next page or exit the end page
	DOWN	Down key, select down or reduce, frequency and power setting support connection point
Pilot lamp	TXD	Transmit the indicator light, send once that is to flash once
	RXD	Receiving indicator light, receive once is flashing once
	PWR	Power supply indicator light, and the power supply is always on
Test resistance	TR	Remove the test resistance and string the current into the ammeter test module
Buzzer	BEEP	Button down and beep once

1.4 Parameter Introduction

No.	Parameter	Description				Note
		MBL-SC	TBL-SC	MBH-SC	TBH-SC	
1	Borad Size	30*64mm	30*68mm	30*85mm		-
2	Process	Lead free process, machine mount				Machine stickers can ensure batch consistency and reliability
3	Antenna port	SMA				-
3	Power supply	Type-C				USB to Type-C
4	Operating temperature [℃]	-40 ~ +85℃				-
5	Operation Humidity(%)	10% ~90%				-
6	Storage Temperature [℃]	-40 ~ +125℃				-

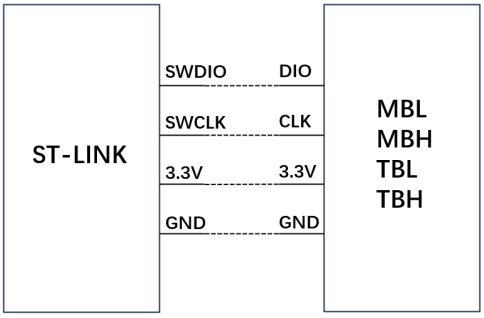
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1.5 Cmpatibility List

Small power module	SPI	1	E22-400M22S	E22-400/900 MBL-SC
		2	E22-900M22S	
		3	E32-400M20S	E32-400/900 MBL-SC
		4	E32-900M20S	
		5	E220-400M22S	E220-400/900 MBL-SC
		6	E220-900M22S	
	UART	7	E22-400T22S	E22-400/900 TBL-SC
		8	E22-900T22S	
		9	E32-433T20S	E32-433/900 TBL-SC
		10	E32-900T20S	
		11	E220-400T22S	E220-400/900 TBL-SC
		12	E220-900T22S	
High power module	SPI	13	E22-400M30S	E22-400/900 MBH-SC
		14	E22-900M30S	
		15	E32-400M30S	E32-400/900 MBH-SC
		16	E32-900M30S	
		17	E220-400M30S	E220-400/900 MBH-SC
		18	E220-900M30S	
	UART	19	E22-400T30S	E22-400/900 TBH-SC
		20	E22-900T30S	
		21	E32-433T30S	E32-433/900 TBH-SC
		22	E32-900T30S	
		23	E220-400T30S	E220-400/900 TBH-SC
		24	E220-900T30S	

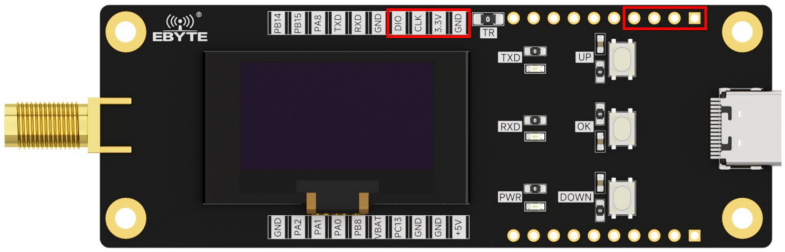
1.6 Program Download Interface



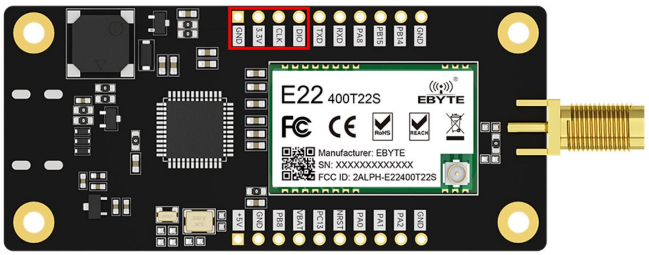
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M series with E22-400 MBH-SC



T series with E22-400 TBL-SC



MCU can be program via ST-LINK. Please compile it before firing it.



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2 Software

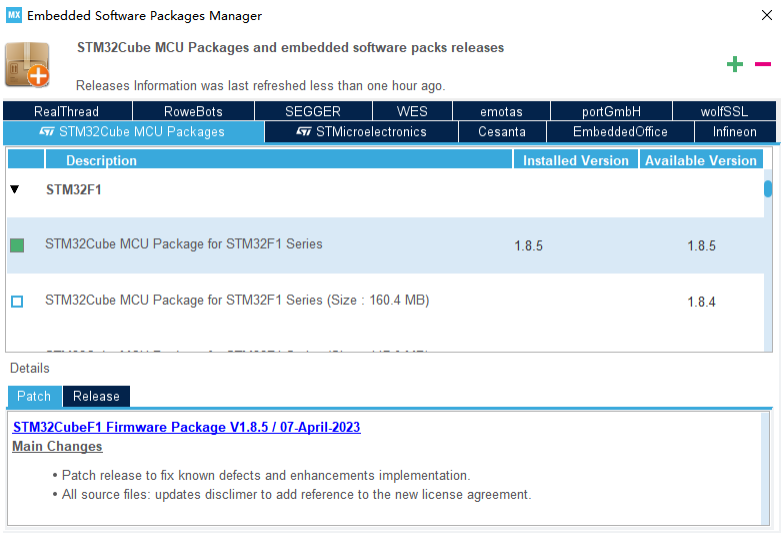
2.1 Development environment

2.1.1 STM32CubeMX

Tools recommended version≥v6.9.2

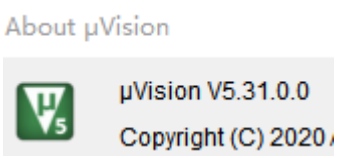


STM 32 Firmware Package version≥v1.8.5



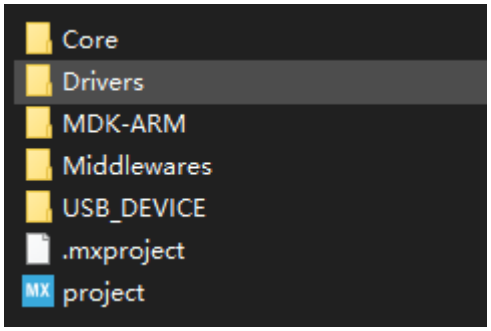
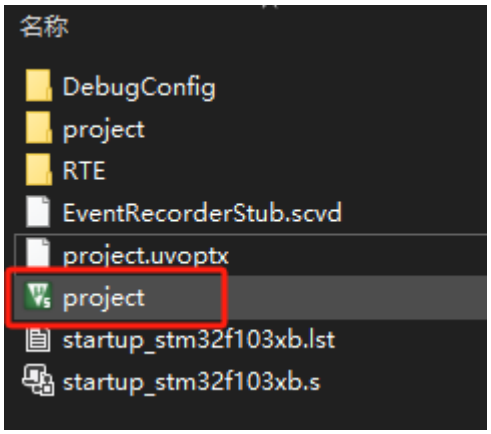
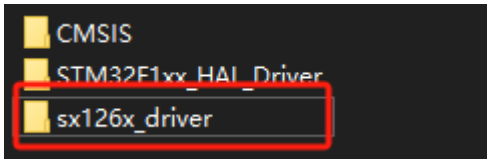
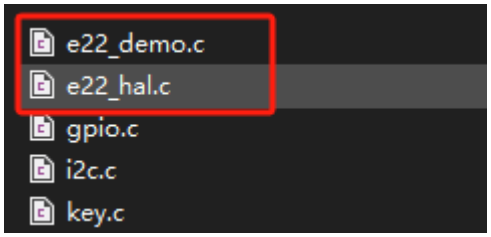
2.1.2 MDK-ARM

Keil version≥v5.31.0



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2.2 Directory Structure

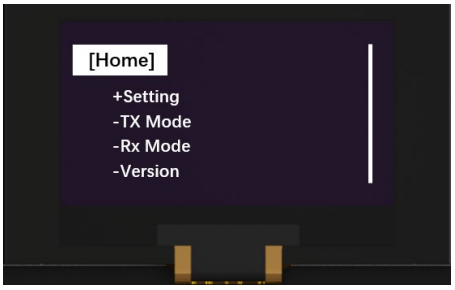
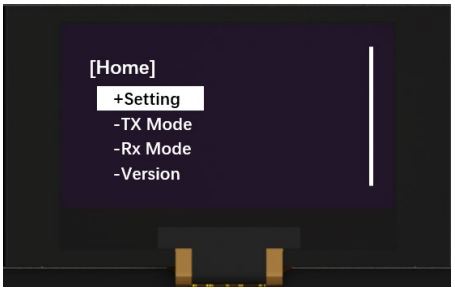
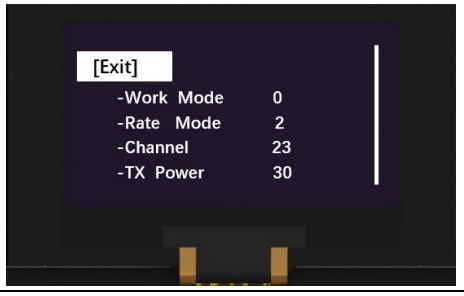
	Item	Explain
1	File catalog	It can be downloaded from the official website to the example project. Open the directory as shown in the figure below 
2	Project start	Launch files are available under the MDK-ARM 
3	Module drive	Drivers Under the folder is the corresponding RF chip driver sx126x / sx127x / llcc68, etc 
4	Module application	The corresponding exx _ demo example is shown in the Core / Src folder 

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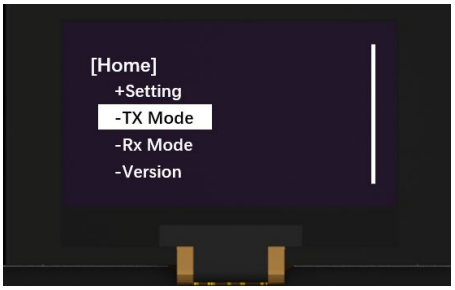
3 Function demonstration

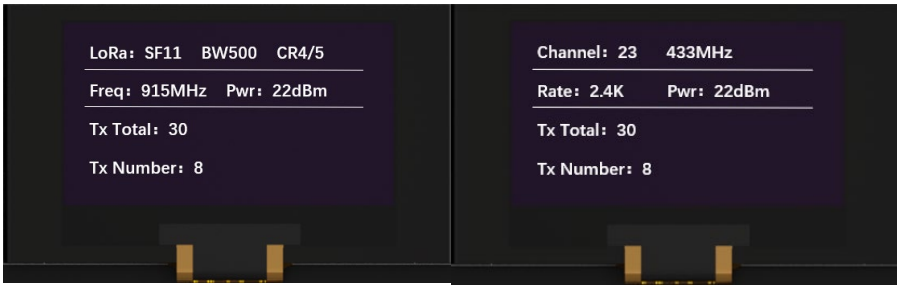
3.1 Quick start

	Item	Explain
1	Home page	Default to home page after power on, all configuration parameters restored to default state 
2	Enter the page	You can enter the corresponding options page by clicking the entity confirmation button 
3	Basic parameter setting	There are a variety of LoRa parameters in the M series Setting page, which can be adjusted according to the requirements. It is recommended to use the official Semtech LoRa calculation tool for empty speed calculation. The difference between T series and M series is only that the air speed configuration is different. When the configuration is complete, check [Exit] to confirm to return to the superior page  The M series configuration is as follows: The T series configuration is as follows:  

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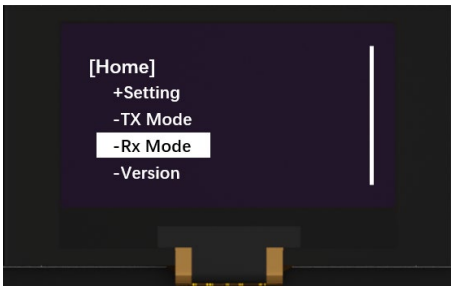
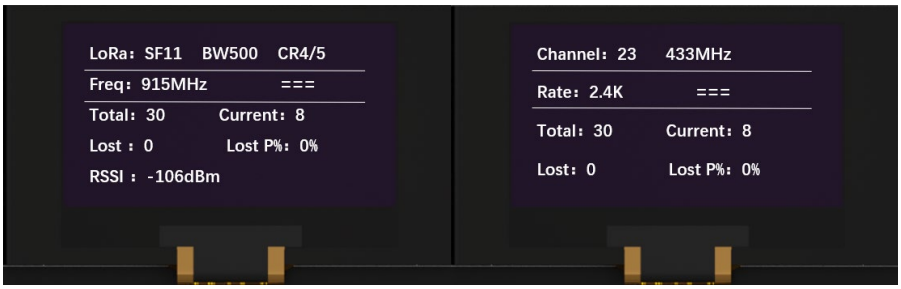
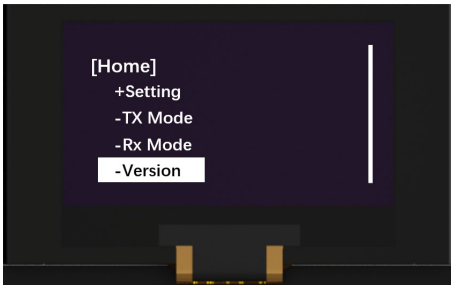
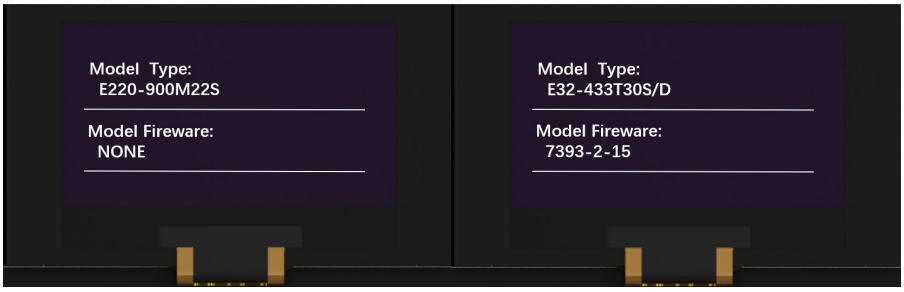
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<table>
<tr><td></td><td></td><td>Function definition:
<table>
<tr><th colspan="3">M series</th><th colspan="3">T series</th></tr>
<tr><td>LoRa SF</td><td>symbol rate</td><td rowspan="3">Air speed shall be calculated combined with SF, BW and CR.</td><td>Work Mode</td><td>work pattern</td><td>Select the module operating mode</td></tr>
<tr><td>LoRa BW</td><td>channel bandwidth</td><td>Rate Mode</td><td>Rate mode</td><td>Choose the air speed</td></tr>
<tr><td>LoRa CR</td><td>code rate</td><td>Channel</td><td>Work channel</td><td>Select the channel</td></tr>
<tr><td>Frequency</td><td>service frequency</td><td>Select the frequency point</td><td>TX Power</td><td>transmitting power</td><td>Configure the emission power</td></tr>
<tr><td>TX Power</td><td>transmitting power</td><td>Configure the emission power</td><td>TX Count</td><td>The number of send</td><td>Configure the number of senders</td></tr>
<tr><td>TX Count</td><td>The number of send</td><td>Configure the number of senders</td><td>Back Color</td><td>background color</td><td>Reverdisplay screen background color</td></tr>
<tr><td>Back Color</td><td>background color</td><td>Reverdisplay screen background color</td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>4</td><td>Send a test</td><td>Tx Mode After entering, it will automatically send packets according to the user set parameters (default single package 10 bytes).
Press the OK button in the page to exit and return to the superior page
After sending, press "Down" to rebuild the send.


The M-Series TX sending interface is as follows: The T-Series TX sending interface is as follows:

</td></tr>
<tr><td>5</td><td>Acceptance test</td><td>Rx Mode After entering, automatically start waiting to receive wireless data according to the user set parameters
Press the OK button in the page to exit and return to the superior page</td></tr>
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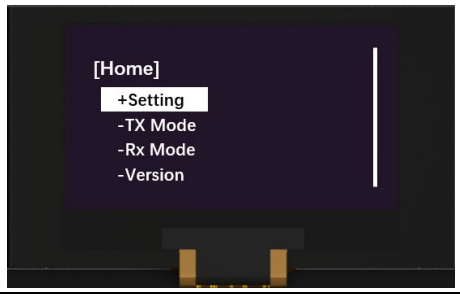
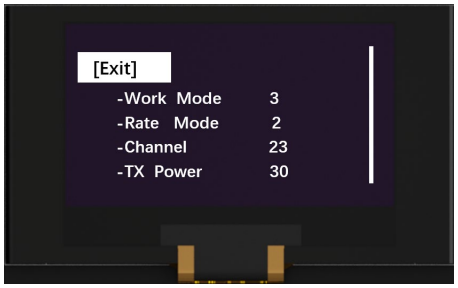
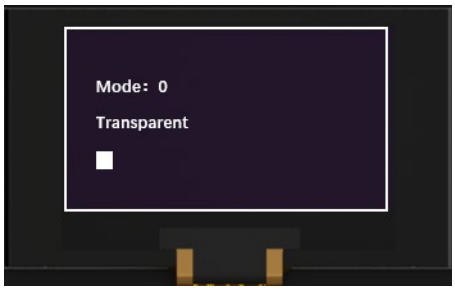
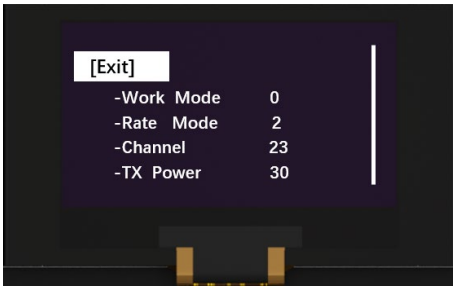
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		After sending completes, press Down to start receiving again  The M Series RX receiving interface is as follows: The T Series RX receiving interface is as follows: 
6	Version information	Display basic information such as module model, M series module has no firmware, display NONE;  
7	Resetting	Select Reset, OK to confirm, reset the configuration and return to the front page. 

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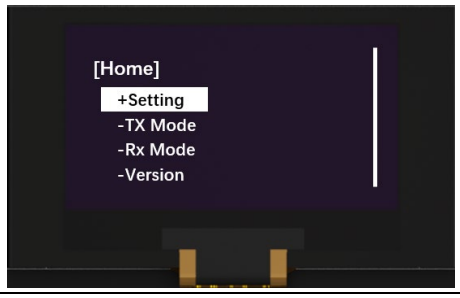
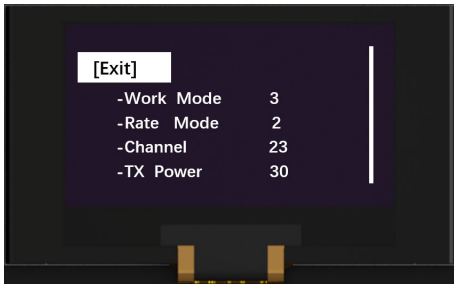
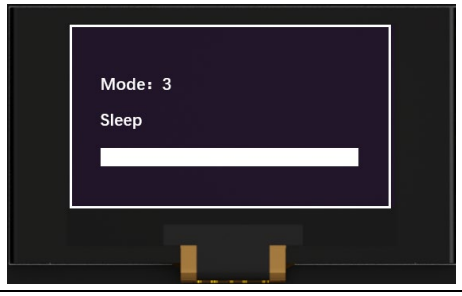
3.2 Achieve transparent transmission function via USB serial port

	Item	Instruction
1	Home page	Default to home page after power on, all configuration parameters restored to default state 
2	Menu	Press any key to enter the menu page, then press the "DOWN" key to select "Setting," and press the "OK" key to enter the settings mode 
3	Mode settings	In settings mode, press the "DOWN" key to select "Work Mode," then press the "OK" key to enter mode settings 
4	Transparent transmission mode	Set the mode to transparent transmission mode, i.e., "Mode: 0 Transparent," and press "OK" to save and return  
5	Achieve transparent transmission function via USB serial port	Open the serial port tool to achieve transparent transmission function with modules of the same model. Note: At this time, the configuration parameters of the kit are default parameters

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3.3 Achieve host computer configuration function via USB serial port

	Item	Instruction
1	Home page	Default to home page after power on, all configuration parameters restored to default state 
2	Menu	Press any key to enter the menu page, then press the "DOWN" key to select "Setting," and press the "OK" key to enter the settings mode 
3	Mode settings	In settings mode, press the "DOWN" key to select "Work Mode," then press the "OK" key to enter mode settings 
4	Sleep mode	Set the mode to sleep mode, i.e., "Mode: 3 Sleep," and press the "OK" key to save and exit 
5	Achieve host computer configuration function via USB serial port	Open the corresponding official website host computer to read module parameters and configuration parameters.

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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 power supply low voltage under room temperature is lower than 2.5V, the lower the voltage, the lower the transmitting power;
● Due to antenna quality or poor matching between antenna and module.

4.2 Module is easy to damage

 Please check the power supply source, ensure it is 2.0V~3.6V, voltage higher than 3.6V will damage the module;
 Please check the stability of power source, the voltage cannot fluctuate too much;
 Please make sure antistatic measure are taken when installing and using, high frequency devices have electrostatic susceptibility;
 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.

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Revision History

Version	Date	Description	Issued by
1.0	2024-09-02	The initial version	Lei
1.1	2024-10-24	Updated voltage description	Lei
1.2	2025-02-18	Added USB serial port to achieve transparent transmission and host computer configuration functions.	Lei

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