E22-xxxXBX-SC Series Evaluation Kit
User Manual

Next Generation Package Compatible Sub-1G Wireless Module Kit

Chengdu Ebyte Electronic Technology Co.,Ltd.

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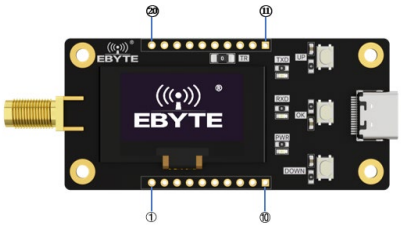
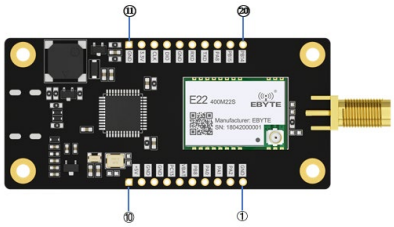
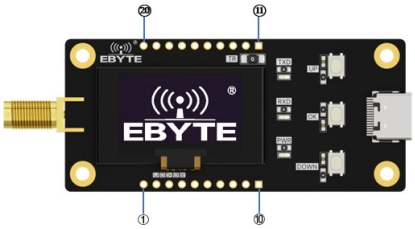
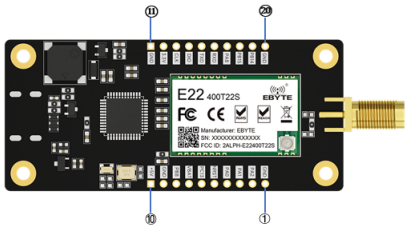
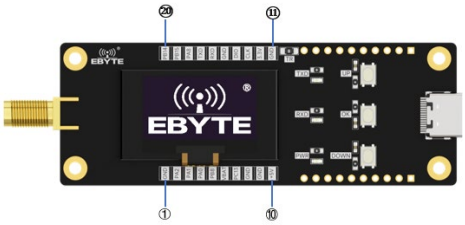
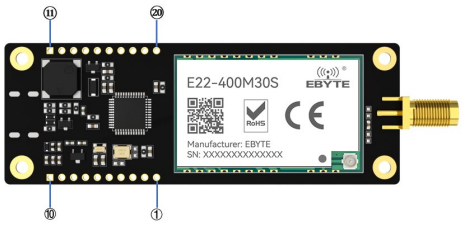
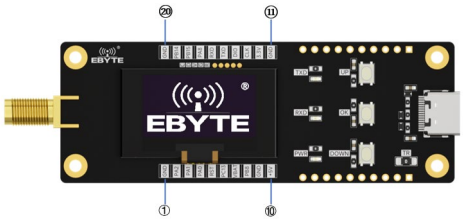
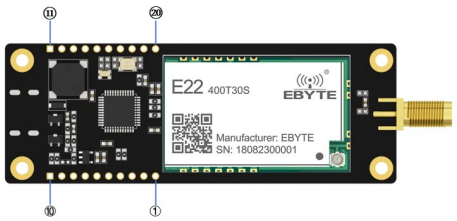
Contents

1 Introduction

1.1 Brief Introduction

	Model	Front side	Back side
Low Power Kit	E22-xxxMBL-SC		
	E22-xxxTBL-SC		
High Power Kit	E22-xxxMBH-SC		
	E22-xxxTBH-SC		

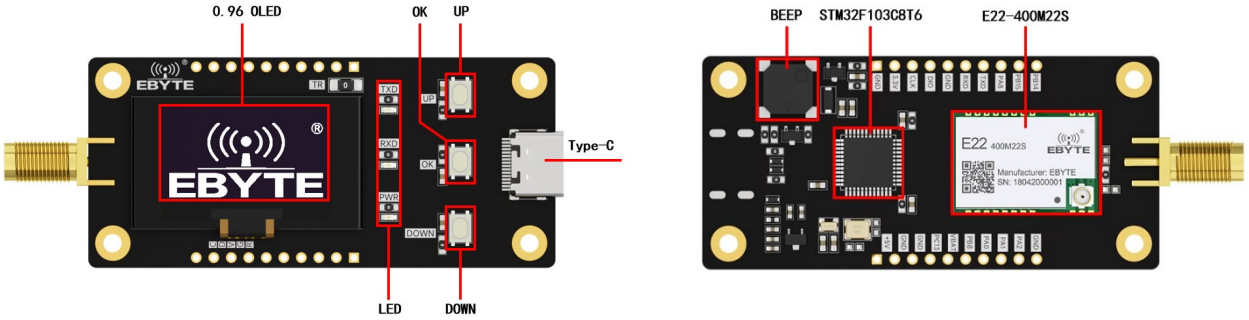
The SC series evaluation kits are designed to help users quickly evaluate Yeppert's new generation of package-compatible wireless modules, using STM32F103C8T6 MCUs with available pins pinned out to both sides of the pin header, which allows developers to easily connect a variety of peripheral devices 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. Supported modules are available in pin-compatible packages for quick replacement.

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

1.3 Function Introduction



Referring to the above figure of E22-400MBL-SC, all other models of SC series have the same hardware functions.

Display	0.96 OLED	Display current configuration, test parameters and version information, etc.
Buttons	UP	Up key, up to select or add, frequency and power settings to support continuous points
	OK	Confirm key, enter next page or exit last page.
	DOWN	Lower key, downward check or minus, frequency and power settings support continuous tap
Indicator light	TXD	Transmit indicator, blinks once when transmitting.
	RXD	Receive indicator, blinks once when receiving.
	PWR	Power indicator, always on when power on
Test Resistance	TR	Remove the test resistor and test the module current with an ammeter.
Buzzer	BEEP	Beep once when pressing key

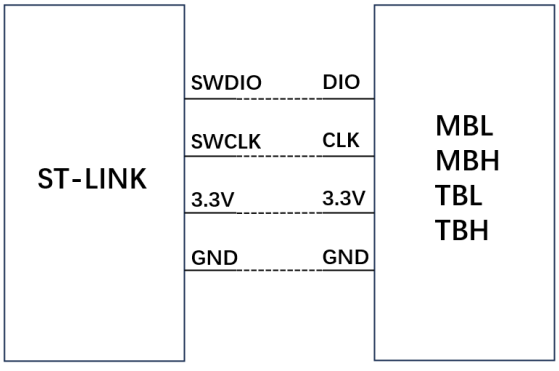
1.4 Parameter Introduction

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℃				-

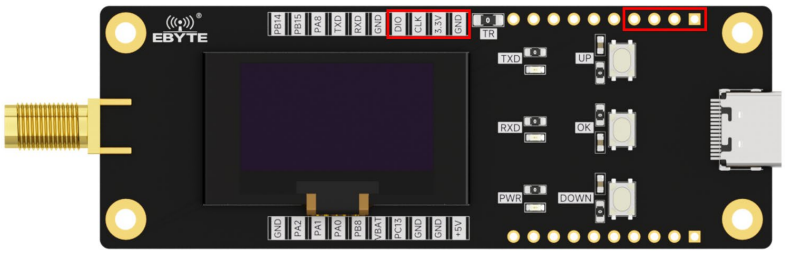
1.5 Compatibility list

Low Power Module	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
		18	E220-900M30S	
	UART	19	E22-400T30S	E22-400/900TBH-SC
		20	E22-900T30S	
		21	E32-433T30S	E32-433/900TBH-SC
		22	E32-900T30S	
		23	E220-400T30S	E220-400/900TBH-SC
		24	E220-900T30S	

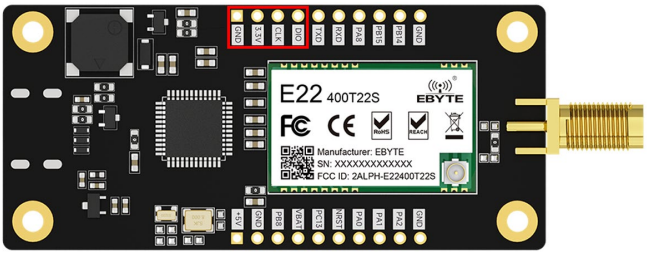
1.6 Program Download Interface



M series take E22-400MBH-SC as an example



T series take E22-400TBL-SC for example



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

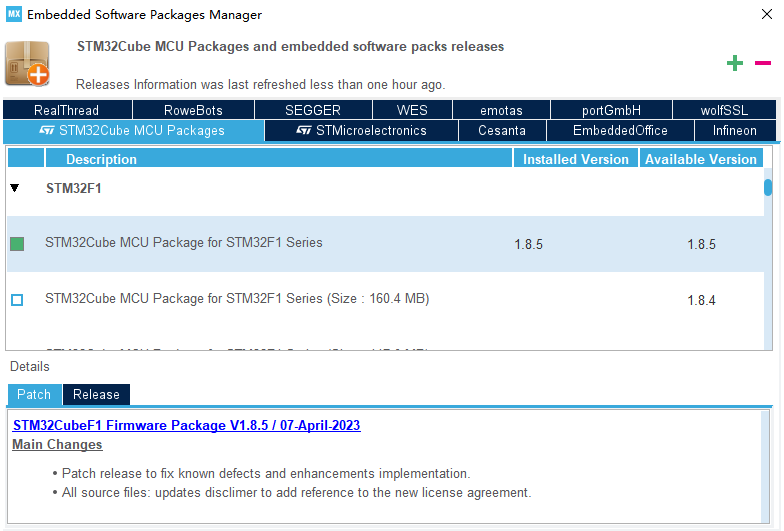
2 Introduction to the Software

2.1 Development environment

2.1.1 STM32CubeMX

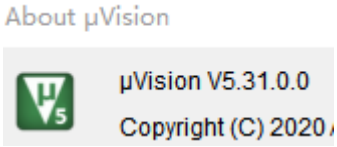
Tool recommended version ≥ v6.9.2

STM32 firmware package version ≥ v1.8.5

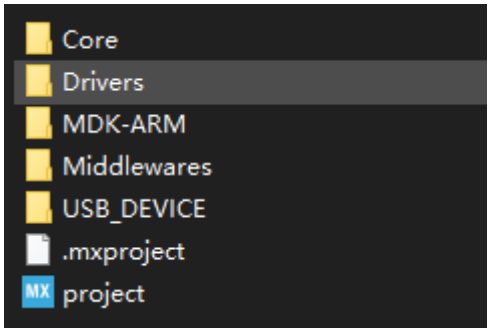
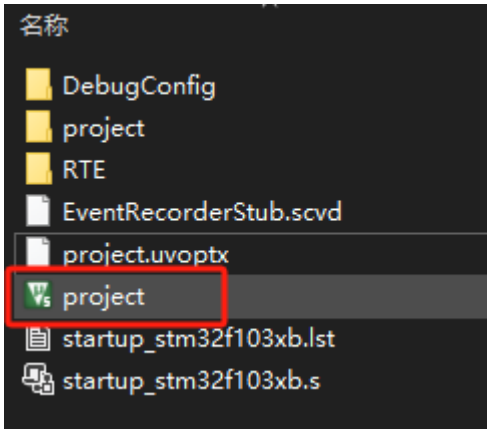
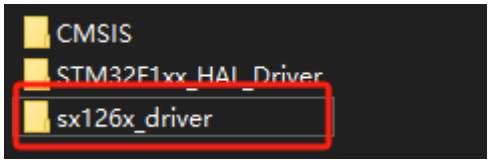
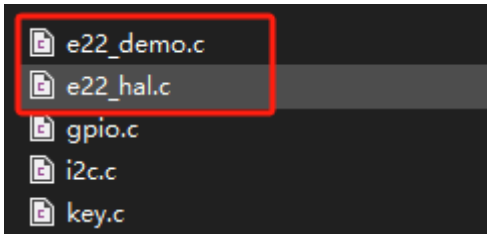


2.1.2 MDK-ARM

Keil version ≥ v5.31.0

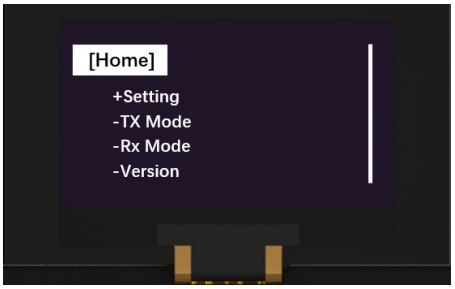
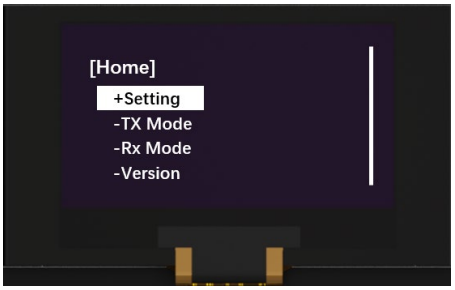
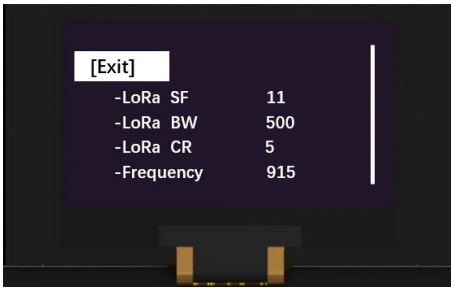
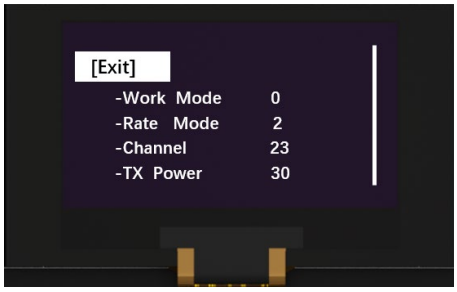


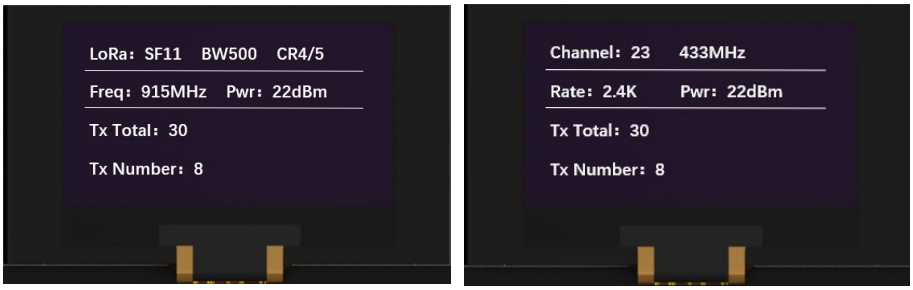
2.2 Catalog Structure

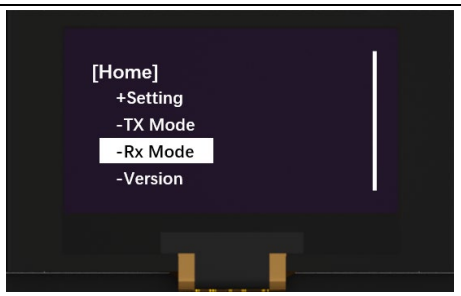
	item	clarification
1	file catalog	You can download the sample project from the official website and open the directory as shown below 
2	Project initiation	There are startup files under MDK-ARM 
3	Module Driver	Under the Drivers folder, there are corresponding RF chip drivers sx126x/sx127x/llcc68 and so on. 
4	Module Applications	The corresponding exx_demo example is available in the Core/Src folder. 

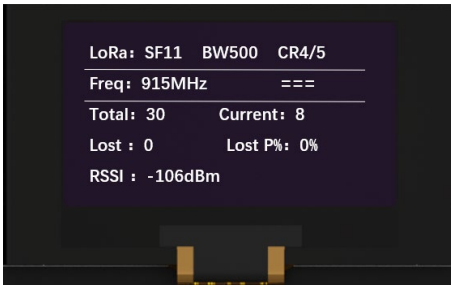
3 Function demonstration

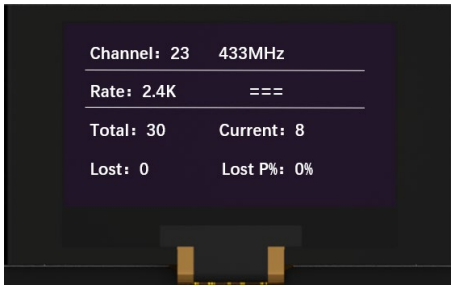
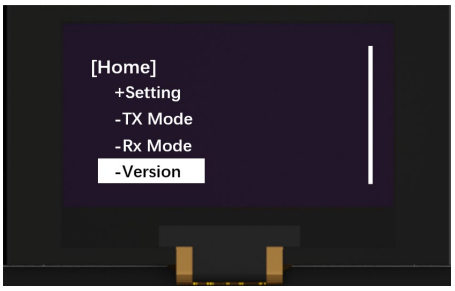
3.1 Quick start

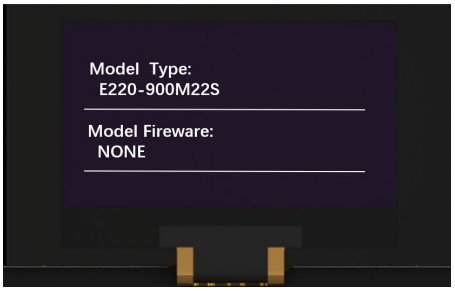
	item	clarification
1	Home page	Default to home page after power on, all configuration parameters restored to default state 
2	Go to page	By clicking the physical confirmation button, you can go to the corresponding option page 
3	Basic Parameter Setting	M series Setting page has a variety of LoRa parameters, which can be adjusted according to the needs, and airspeed calculation is recommended to use Semtech official LoRa calculation tool. The difference between T series and M series is only the airspeed configuration. After the configuration is completed, check [Exit] to return to the parent page.  The M-Series configuration is as follows: The T-Series configuration is as follows:  

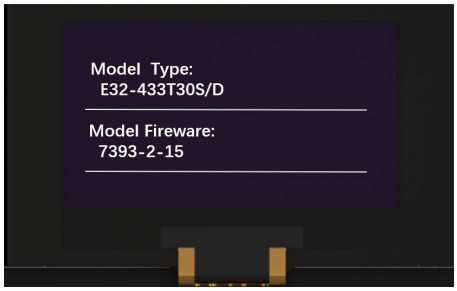
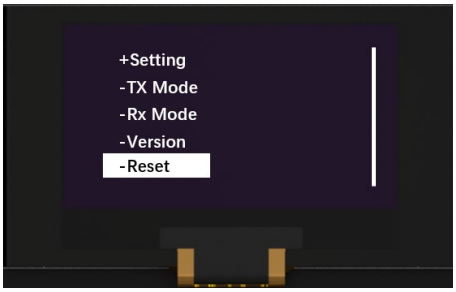
<table>
<tr><td></td><td></td><td>Functional interpretation:
<table>
<tr><th colspan="3">M Series</th><th colspan="3">T-Series</th></tr>
<tr><td>LoRa SF</td><td>Symbol Rate</td><td rowspan="3">Airspeed needs to be calculated in conjunction with SF, BW, and CR.</td><td>Work Mode</td><td>Operating Mode</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 Channel</td><td>Select channel</td></tr>
<tr><td>Frequency</td><td>Operating Frequency</td><td>Select frequency point</td><td>TX Power</td><td>Transmit power</td><td>Configure transmit power</td></tr>
<tr><td>TX Power</td><td>Transmit Power</td><td>Configure transmit power</td><td>TX Count</td><td>Number of transmissions</td><td>Configure the number of transmissions</td></tr>
<tr><td>TX Count</td><td>Number of transmissions</td><td>Configure the number of transmissions</td><td>Back Color</td><td>Background color</td><td>Reflect the background color of the screen</td></tr>
<tr><td>Back Color</td><td>Background color</td><td>Reflect the background color of the screen</td><td></td><td>Operating Mode</td><td></td></tr>
</table></td></tr>
<tr><td>4</td><td>Send 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).
Pressing “Confirm” in the page will exit and return to the higher page.
After sending, press “Down” key to re-send.
The M series TX transmitter interface is as follows: The T series TX transmitter interface is as follows:
 
</td></tr>
<tr><td>5</td><td>reception test</td><td>When Rx Mode is entered, it automatically starts to wait for receiving wireless data according to the parameters set by the user.
Press the “Confirm” button in the page to exit and return to the previous page.
After sending, press “Down” button to start receiving again.</td></tr>
</table>

<table>
<tr><td></td><td></td><td> 

The M series RX receive screen is as follows: The T series RX receive screen is as follows:


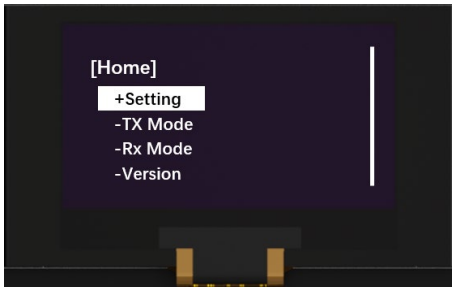
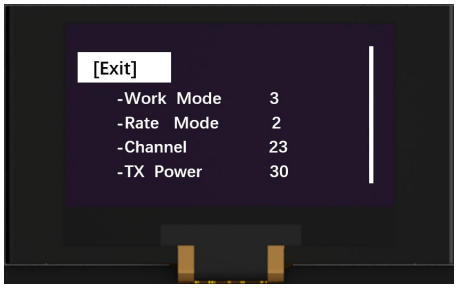
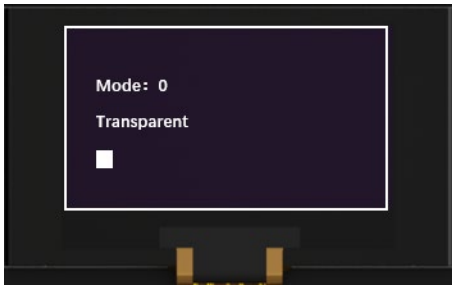
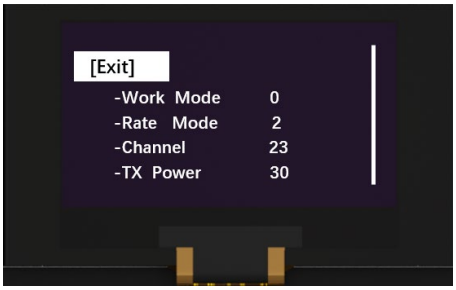

</td></tr>
<tr><td>6</td><td>version information</td><td>Displays basic information such as the module model number. NONE is displayed if there is no firmware inside the M series module;




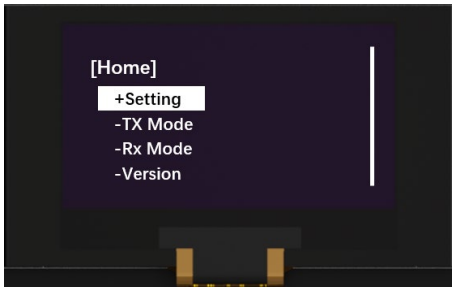
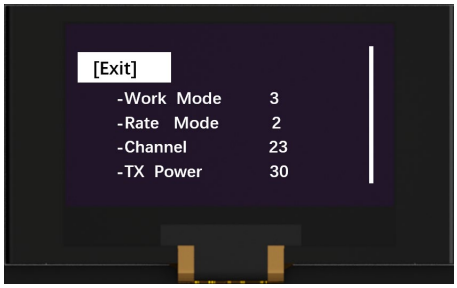
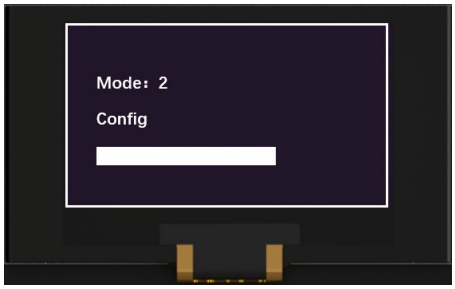

</td></tr>
<tr><td>7</td><td>reprovision</td><td>Select Reset, OK to confirm, reset the configuration and return to the home page.



</td></tr>
</table>

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

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	Config mode	Set the mode to sleep mode, i.e., "Mode: 2 Config" 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.

4 Common problems

4.1 Unsatisfactory transmission distance

- When there are linear communication barriers, the communication distance will decay accordingly;
- Temperature, humidity, and co-channel interference, which will lead to higher communication packet loss rate;
- The ground absorbs and reflects radio waves, and the test results are poorer near the ground;
- Seawater has a strong ability to absorb radio waves, so the effect of the seaside test is poor;
- Metal objects near the antenna, or placed in a metal shell, the signal attenuation will be very serious;
- Wrong power register setting, air rate setting is too high (the higher the air rate, the closer the distance);
- Low voltage of power supply at room temperature is lower than the recommended value, the lower the voltage the lower the hair power;
- The use of antenna and module matching degree is poor or the antenna itself quality problems.

4.2 Modules are fragile

- Please check the power supply to ensure that it is between the recommended supply voltages, if it exceeds the maximum value it will cause permanent damage to the module;
- Please check the power supply stability, the voltage can not be substantial frequent fluctuations;
- Please ensure that the installation and use process anti-static operation, high-frequency device electrostatic sensitivity;
- Please ensure that the installation and use of the process of humidity should not be too high, part of the components for humidity-sensitive devices;
- If there is no special demand is not recommended to be used at too high or too low a temperature.

4.3 BER is too high

- Near the same frequency signal interference, away from the source of interference or modify the frequency and channel to avoid interference;
- Poor power supply may also cause garbled code, be sure to ensure the reliability of the power supply;
- Extension cords, feeder cords of poor quality or too long, can also cause high BER.

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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