EWM32M-xxxT20S Product Specifications

AT Instructions 20dBm Small size LoRa Wireless Module



成都亿佰特电子科技有限公司
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Chapter 1: Product Overview

1.1 Product Overview

The EWM32M-xxxT20S Series (UART) is an ultra-compact, low-cost wireless serial port module (UART) that uses LoRa communication technology, which is fully compatible with the E32. It has a transmission power of 20 dBm, supports multiple transmission modes, operates in the 433 MHz and 900 MHz bands, provides TTL-level outputs, and is compatible with 3.3 V I/O voltages.

The EWM32M-xxxT20S offers the advantages of a longer communication range and strong interference resistance, while also providing exceptional security. The factory default air interface data rate is 2.4 kbps, and the transmission power is 20 dBm, which enhances communication stability and extends the communication range. The two modules shown in the figure below have the same transmission power but operate on different frequency bands.



Figure 1：EWM32M-433T20S



Figure 2：EWM32M-900T20S

1.2 Features and Functions

- It utilizes the latest generation of LoRa spread-spectrum modulation technology, delivering longer communication ranges and stronger interference resistance;
- Supports firmware updates via the serial port, making it more convenient to update the firmware;
- Supports AT commands for greater ease of use;
- Supports FEC (Forward Error Correction) to improve communication stability;
- Supports the global license-exempt ISM 433 MHz band or the 868/915 MHz EU common bands;
- Allows users to set their own communication keys, which cannot be read, greatly enhancing the confidentiality of user data;
- Supports LBT functionality, which monitors channel noise before transmission, significantly improving the module's communication success rate in harsh environments;
- Supports wireless parameter configuration; sends command packets wirelessly to remotely configure or read wireless module parameters;
- Supports "air wake," an ultra-low-power feature suitable for battery-powered applications;
- Supports point-to-point transmission, broadcast transmission, and channel monitoring;
- Supports deep sleep mode;in this mode, the device's total power consumption is approximately 3μA.
- Under ideal conditions, the communication range can reach 5 km;
- Parameters are retained during a power loss; after power is restored, the module will operate according to the configured parameters;
- High-efficiency watchdog design: In the event of an anomaly, the module will automatically reboot and

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resume operation using the previous parameter settings;

- Supports data transfer rates ranging from 2.4K to 19.2Kbps;
- Supports a supply voltage of 2.7 to 5.5 V; optimal performance is guaranteed at supply voltages greater than 5 V;
- Designed to industrial-grade standards, supporting long-term operation at temperatures ranging from -40 to +85°C;
- The module delivers a maximum power of 100 mW (20 dBm), enabling longer-range and more stable transmission.

1.3 Use Cases

- Home security alarms and remote keyless entry;
- Smart home devices and industrial sensors, etc.;
- Wireless alarm security system;
- Building automation solutions;
- Wireless industrial-grade remote control;
- Healthcare products;
- Advanced Metering Infrastructure (AMI).

Chapter 2: Specifications and Parameters

2.1 RF Parameters

RF Parameters	Unit	Performance			Notes
		Minimum Value	Typical values	Maximum value	
Maximum transmit power	dBm	-	20	-	-
Receiving Sensitivity	dBm	123	124	125	Air interface data rate: 2.4 kbps
Reference Distance	M	-	5K	-	Clear, unobstructed view; antenna gain of 5 dBi; antenna height of 2.5 meters; air data rate of 2.4 kbps.
Operating Frequency Band	MHz	410	433	441	Compatible with EWM32M-433T20S
	MHz	862	900	930	Applicable to the EWM32M-900T20S
Air Speed	bps	2.4K	2.4K	19.2K	User-Programmable Control
Blocking Power	dBm	-	-10	-	The probability of burning out is low when used at close range

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2.2 Electrical Specifications

Electrical Specifications		Unit	Model Number		Notes
			EWM32M-433T20S	EWM32M-900T20S	
Operating Voltage		V	2.7～5.5	2.7～5.5	An input voltage of ≥3.3V ensures output power; the typical value is 5V; voltages exceeding 5.5V will permanently damage the module.
Communication Levels		V	3.3V	3.3V	Using 5V TTL carries the risk of burning out the device.
Power Consumption	Emission Current	mA	110	120	Instantaneous Power Consumption @ 22 dBm
	Receive Current	mA	8	8	
	Standby Current	uA	3	3	Software Shutdown
Operating Temperature		℃	-40～+85		Industrial-Grade Design

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2.3 Hardware Specifications

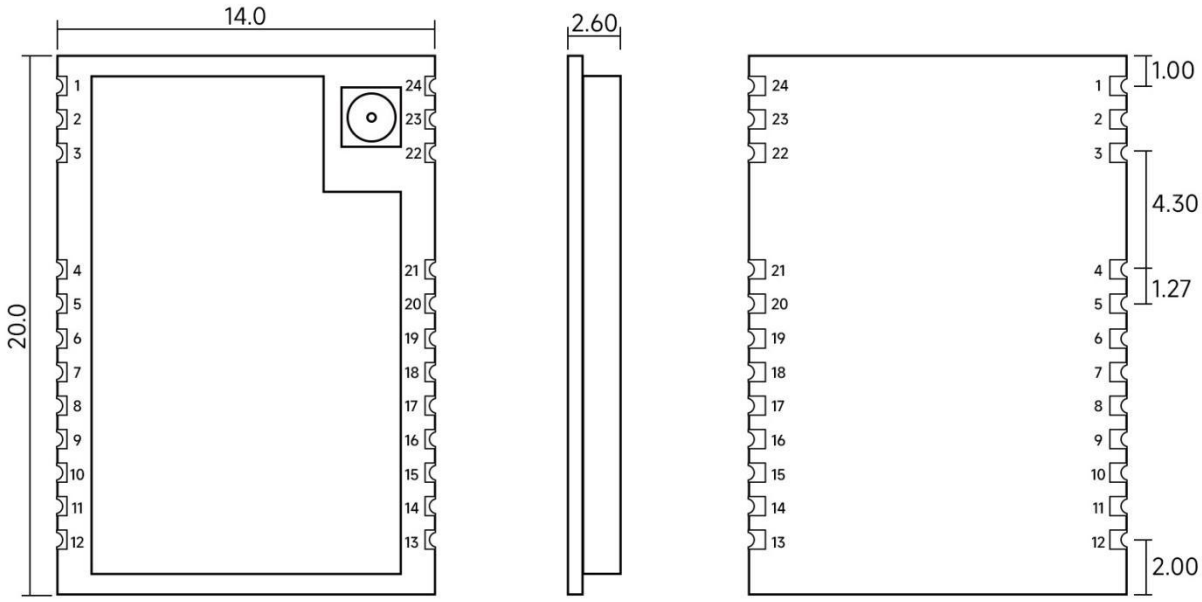
Hardware Specifications	Model Number		Notes
	EWM32M-433T20S	EWM32M-900T20S	
Modulation Scheme	LoRa		Next-Generation LoRa Modulation Technology
Interface Methods	1.27mm Stamp hole		
Communication Interfaces	UART Serial Port		TTL level
Launch Length	58 Btye		Maximum capacity per package; automatically splits into multiple packages when exceeded
Packaging Method	Surface-mount		-
Cache Capacity	512Btye		-
Antenna Connector	IPEX-1/Stamp hole		Equivalent impedance of approximately 50 Ω
Dimensions	14*20mm		±0.2mm
Net Weight of Product	2.0g		±0.1g

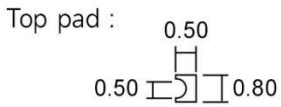
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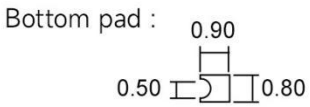
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Chapter 3:Mechanical Dimensions and Pin Definitions

3.1 EWM32M-433/900T20S Mechanical Dimensions and Pin Definitions







Unit : mm
Pad quantity : 24
Tolerance value : X.X±0.2mm
X.XX±0.05mm

Pin Numbers	Pin Names	Pin Orientation	Pin Functions
1	GND	-	Module Ground Wire
2	NC	-	Empty field (not yet available; users do not need to worry about this)
3	GND	-	Module Ground Wire
4	GND	-	Module Ground Wire
5	TX_EN	Output	Use in conjunction with RX_EN to control the external PA; leave floating when not in use
6	RX_EN	Output	Use in conjunction with RX_EN to control the external PA; leave floating when not in use
7	CLK	Input/Output	SWCLK: Clock pin used during program loading (left floating; no connection required by the user)
8	DIO	Input/Output	Data pins when the SWDIO program is loading (left floating; users do not

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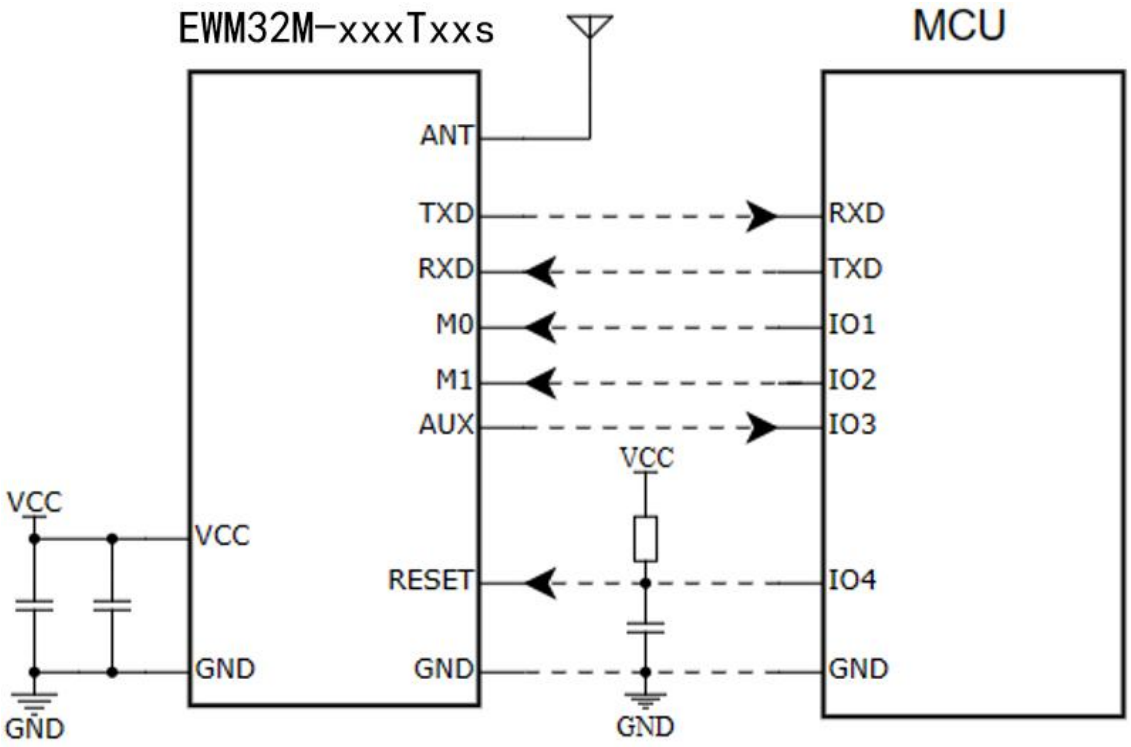
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			need to connect them)
9	NC	-	Empty field (not yet available; users do not need to worry about this)
10	NC	-	Empty field (not yet available; users do not need to worry about this)
11	NC	-	Empty field (not yet available; users do not need to worry about this)
12	NC	-	Empty field (not yet available; users do not need to worry about this)
13	GND	-	Module Ground Wire
14	VCC	-	Positive reference for modular power supplies; voltage range: 2.7 – 5.5 V DC
15	TXD	Output	TTL serial output, connected to the external RXD output pin;
16	RXD	Input	TTL serial input, connected to an external TXD output pin;
17	M1	Input	In conjunction with M0, this determines the module’s four operating modes (must not be left floating; if not in use, it may be grounded).
18	M0	Input	In conjunction with M1, this determines the module’s four operating modes (must not be left floating; if not in use, it may be grounded).
19	AUX	Output	Used to indicate the module's operating status; the user wakes up the external MCU, and the pin outputs a low level during power-on self-test and initialization; (may be left floating)
20	NC	-	Empty field (not yet available; users do not need to worry about this)
21	RESET	Input	Module reset pin; low-level reset.
22	GND	-	Module Ground Wire
23	ANT	-	Antenna Connector (High-Frequency Signal Output, 50-ohm Characteristic Impedance)
24	GND	-	Module Ground Wire

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Chapter 4: Recommended Connection Diagrams



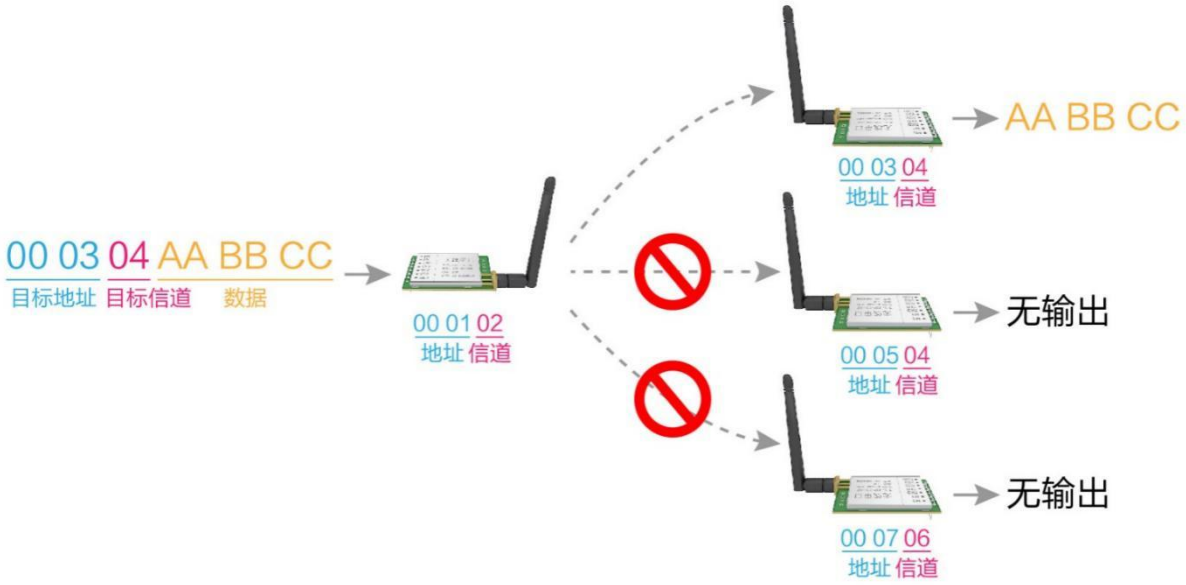
No.	Brief Instructions for Connecting Modules to Microcontrollers (The figure above uses an STM8L microcontroller as an example)
1	The wireless serial port module operates at TTL levels; please connect it to a TTL-level MCU.
2	For certain 5V microcontrollers, it may be necessary to add 4 – 10K pull-up resistors to the module’s TXD and AUX pins.
3	It is recommended to include a 1 MΩ pull-up resistor at the M0/M1 interface.

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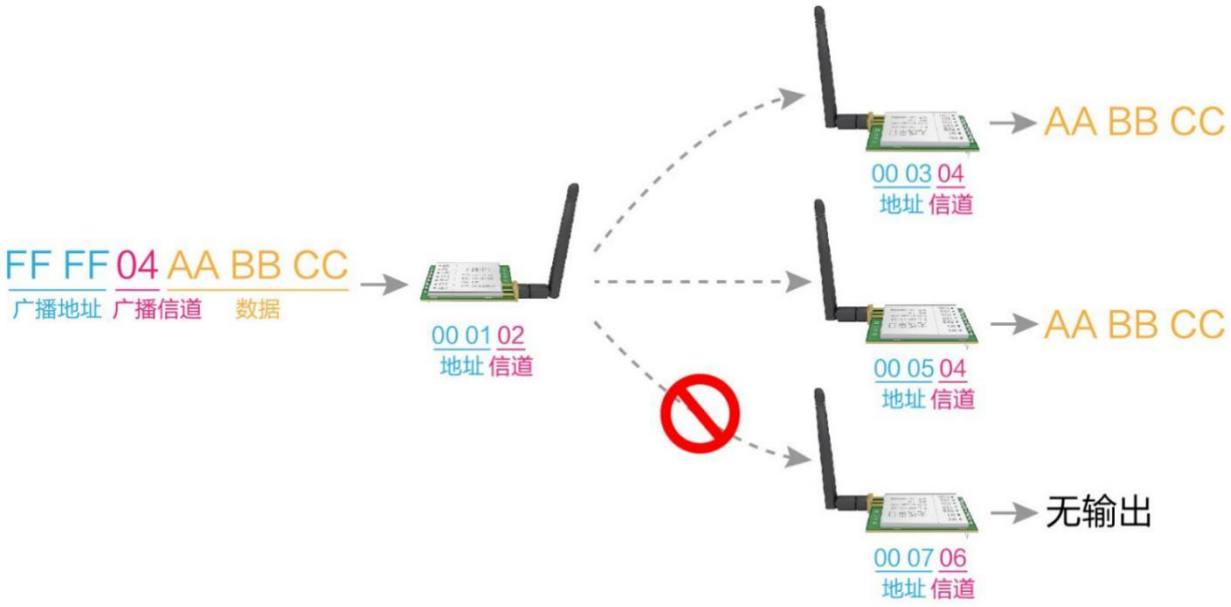
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Chapter 5: Detailed Explanation of Features

5.1 Fixed-Point Launch



5.2 Broadcast Transmission



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5.3 Broadcast Addresses

• Example: Set the address of Module A to 0xFFFF and the channel to 0x04.

• When Module A acts as the transmitter (same mode, transparent transmission), all receiving modules on channel 0x04 can receive the data, thereby achieving the purpose of a broadcast.

5.4 Listen Address

• Example: Set Module A’s address to 0xFFFF and its channel to 0x04.

• When Module A is in receive mode, it can receive all data on channel 0x04, thereby enabling monitoring.

5.5 Module Reset

• After the module is powered on, AUX immediately outputs a low level, performs a hardware self-test, and configures the operating mode according to user parameters;

During this process, AUX remains at a low level; once complete, AUX outputs a high level and begins normal operation in the mode determined by the combination of M1 and M0;

Therefore, the user must wait for the rising edge of AUX, which marks the start of normal module operation.

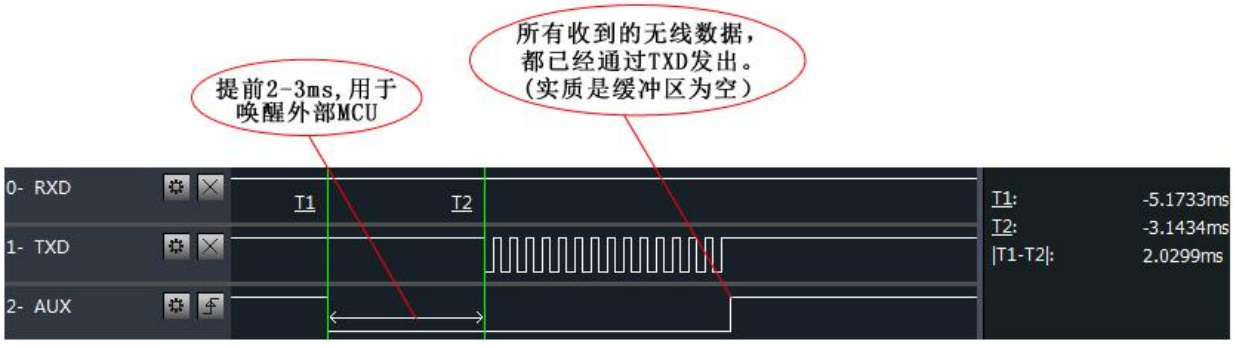
5.6 AUX Explained

• AUX is used to indicate wireless transmission/reception buffering and self-test status.

• It indicates whether the module has data that has not yet been transmitted wirelessly, whether received wireless data has not yet been fully transmitted via the serial port, or whether the module is currently performing a self-test during initialization.

5.6.1 Serial Port Data Output Indicator

• Used to wake up an external MCU from sleep mode;



模块串口外发数据时，AUX引脚时序图

5.6.2 Wireless Transmission Indicator

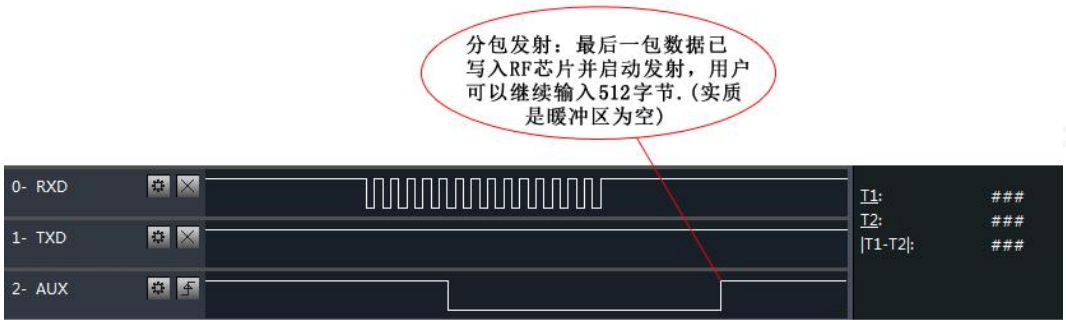
• Buffer empty: All data in the internal 512-byte buffer has been written to the wireless chip (automatic packet segmentation).

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• When AUX=1, if the user continuously sends data smaller than 512 bytes, no overflow will occur. When AUX=0 and the buffer is not empty—meaning the data in the internal 512-byte buffer has not yet been fully written to the wireless chip and transmission has not yet begun—the module may be waiting for the user data to finish (and has timed out) or may be in the process of transmitting the data in wireless packets.

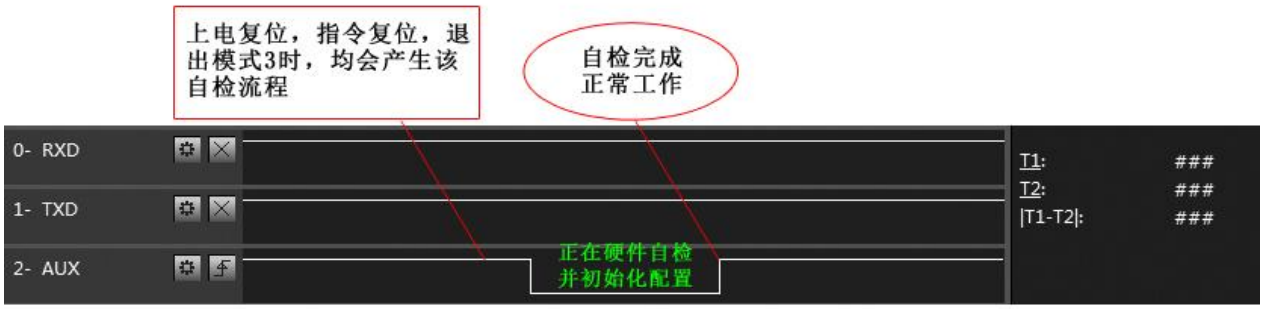
• [Note]: When AUX=1, this does not necessarily mean that all serial data from the module has been transmitted wirelessly; the last data packet may still be in the process of being transmitted.



模块接收串口数据时，AUX引脚时序图

5.6.3 The module is currently being configured

• Only when resetting or waking from sleep mode;



自检期间，AUX引脚时序图

5.6.4 Precautions

No.	AUX Precautions
1	For Functions 1 and 2 described above, the low-level output takes precedence; that is, if any one of the low-level output conditions is met, AUX outputs a low level; when none of the low-level conditions are met, AUX outputs a high level.
2	When the AUX output is at a low level, it indicates that the module is busy; in this case, the operating mode detection will not be performed. The mode switch will be completed within 1 ms after the module's AUX output goes high.
3	After the user switches to a new operating mode, the module will not actually enter that mode until at least 2 ms after the rising edge of AUX; if AUX remains at a high level, the mode switch will take effect immediately.
4	When the user switches from Mode 3 (Sleep Mode) to another mode or during a reset, the module resets the user parameters, and the AUX output remains at a low level during this process.
5	Due to the characteristics of the LoRa modulation scheme, data transmission latency is significantly longer than that of FSK. For example, at an airspeed of 2.4 kbps, the latency for transmitting 100 bytes is approximately 1.5 seconds. We recommend that customers avoid transmitting large amounts of data at low airspeeds to prevent communication anomalies caused by data loss resulting from data backlog.

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Chapter 6: Operating Modes

The module has four operating modes, which are configured via pins M1 and M0; details are shown in the table below:

Mode (0–3)	M1	M0	Mode Overview	Notes
0 Normal Mode	0	0	Serial port enabled, Wi-Fi enabled, transparent transmission	The recipient must be Mode 0 or 1.
1 Wake-up Mode	0	1	Serial port enabled, wireless enabled; The only difference from Mode 0: A wake-up code is automatically added before the packet is transmitted, which is necessary to wake up the receiver operating in Mode 2.	The recipient can be Mode 0 The recipient can be Mode 1 The recipient can be Mode 2
2 Power-Saving Mode	1	0	With the serial port reception disabled and the wireless module in air-wake mode, the system opens the serial port to transmit data upon receiving wireless data.	The sender must use Mode 1. Transmission is not permitted in this mode.
3 Sleep Mode	1	1	The module has entered sleep mode and can receive parameter configuration commands.	For details, see the Detailed Explanation of Operating Parameters

6.1 Precautions for Switching Modes

No.	Notes
1	• Users can combine high and low levels on M1 and M0 to determine the module's operating mode. The two GPIOs on the MCU can be used to control mode switching; • After changing M1 and M0: If the module is idle, it will begin operating in the new mode after 1 ms; • If the module has serial data that has not yet been fully transmitted via wireless, it will enter the new operating mode only after transmission is complete; • If the module receives wireless data and then transmits data via the serial port, it will enter the new operating mode only after transmission is complete; • Therefore, mode switching is only effective when AUX output is set to 1; otherwise, the switch will be delayed.
2	• For example: If a user enters a large amount of data continuously while switching modes, the mode-switching operation will be invalid at that time; the module will not check for a new mode until it has finished processing all user data. • Therefore, the general recommendation is to check the output state of the AUX pin and wait 2 ms after the output goes high before switching modes.
3	• When the module is switched from another mode to sleep mode, if there is data that has not yet been processed; • the module will process this data (including both received and transmitted data) before entering sleep mode. This feature enables rapid sleep mode entry, thereby saving power. For example: When the transmit module is operating in Mode 0, if the user initiates serial data "12345," the module does not need to wait for the AUX pin to become idle (high level); it can switch directly to sleep mode and immediately put the user's main MCU to sleep. The module will automatically transmit all user data wirelessly and enter sleep mode within 1 ms; • this saves MCU processing time and reduces power consumption.
4	• Similarly, this feature can be utilized for any mode switch. After a module processes the events for the current mode, it will automatically enter the new mode within 1 ms; this eliminates the need for the user to query AUX and enables rapid mode switching. • For example, switching from transmit mode to receive mode; the user's MCU can also enter sleep mode in advance of the mode switch and use the external interrupt function to detect changes in AUX, thereby triggering the mode switch.
5	• This approach is highly flexible and efficient; it is designed entirely with the user's MCU operability in mind, and it minimizes the overall system workload as much as possible, thereby improving system efficiency and reducing power consumption.

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6.2 General Mode (Mode 0)

Type	When M0 = 0 and M1 = 0, the module operates in Mode 0.
Launch	The module receives user data from the serial port and transmits wireless data packets with a length of 58 bytes. When the amount of user-input data reaches 58 bytes, the module initiates wireless transmission; at this point, the user may continue to enter data to be transmitted. If the number of bytes the user needs to transmit is less than 58, the module waits for 3 bytes; if no further user data is entered, the data is considered complete, and the module transmits all data via wireless. After the module receives the first piece of user data, the AUX pin goes low. Once the module has loaded all data into the RF chip and initiated transmission, the AUX pin goes high. This indicates that transmission of the final wireless data packet has begun, and the user may continue to enter data up to 512 bytes in length. Data packets transmitted in Mode 0 can only be received by receiver modules operating in Mode 0 or Mode 1.
Receive	The module keeps its wireless reception function enabled at all times and can receive data packets transmitted from Mode 0 and Mode 1; Upon receiving a data packet, the module sets the AUX pin to a low level, and after a 5 ms delay, begins transmitting the wireless data via the TXD pin of the serial port. Once all wireless data has been transmitted via the serial port, the module sets the AUX pin to a high level.

6.3 WOR Mode (Mode 1)

Type	When M0 = 1 and M1 = 0, the module operates in Mode 1.
Launch	The conditions for the module to transmit data packets and the AUX function are identical to those in Mode 0; the only difference is that the module automatically adds a wake-up code to the beginning of each packet, with the length of the wake-up code determined by the wake-up time set in the user parameters. The purpose of the wake-up code is to wake up receiver modules operating in Mode 2; therefore, data transmitted in Mode 1 can be received by modules in Modes 0, 1, and 2.
Receive	Equivalent to Mode 0.

6.4 Power-Saving Mode (Mode 2)

Type	When M0 = 0 and M1 = 1, the module operates in Mode 2.
Launch	The module is in sleep mode, and the serial port is disabled, so it cannot receive serial data from an external MCU; therefore, this mode does not support wireless transmission.
Receive	In Mode 2, the transmitter must operate in Mode 1; it periodically monitors for the wake-up code. Once a valid wake-up code is received, the module remains in a continuous receive state and waits for the entire valid data packet to be received; then, the AUX pin goes low, and after a 5 ms delay, the serial port is enabled to transmit the received wireless data via TXD. Upon completion, the AUX pin goes high; The wireless module then returns to the “sleep–listen” (polling) operating state. By setting different wake-up times, the module can achieve varying reception response delays (up to 2 s) and average power consumption (as low as 30 μA). Users must strike a balance between communication delay and average power consumption.

6.5 Deep Sleep Mode (Mode 3)

Type	When M0 = 1 and M1 = 1, the module operates in Mode 3.
Launch	Unable to transmit wireless data.
Receive	Unable to receive wireless data.

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Configuration	Sleep mode can be used to configure module parameters. Using a serial port set to 9600 baud and 8N1, you can set the module's operating parameters via a specific command format.
Note	When transitioning from sleep mode to another mode, the module reconfigures its parameters. During this process, the AUX pin remains at a low level; once the process is complete, it goes high. Therefore, users are advised to monitor the rising edge of the AUX signal.

Chapter 7: Register Read and Write Control

7.1 Introduction to Commands

In sleep mode (Mode 3: M0=1, M1=1), the list of supported commands is as follows (when configuring, only 9600 baud and 8N1 format are supported):

No.	Command Format	Detailed Description
1	C0+ Operating Parameters	Send the operating parameters in hexadecimal format as C0 followed by 5 bytes, for a total of 6 bytes. These must be sent consecutively (retained after power loss).
2	C1+C1+C1	Send three "C1" values in hexadecimal format; the module will return the saved parameters. The values must be sent consecutively.
3	C2+ Operating Parameters	Send the C2 command followed by 5 bytes of operating parameters in hexadecimal format, for a total of 6 bytes. These must be sent consecutively (they are not retained in the event of a power loss).
4	C3+C3+C3	Send three "C3" characters in hexadecimal format; the module will return version information. The characters must be sent consecutively.
5	C4+C4+C4	Send three "C4" characters in hexadecimal format; the module will reset once. These must be sent consecutively.

7.2 Reading Operating Parameters

Command Format	Detailed Description
C1+C1+C1	In sleep mode (M0=1, M1=1), send the following command (in HEX format) to the module's serial port: C1 C1 C1. The module will return its current configuration parameters, such as: C0 00 00 1A 06 44.

7.3 Reading Version Numbers

Command Format	Detailed Description
C3+C3+C3	In sleep mode (M0=1, M1=1), send the following command (in HEX format) to the module's serial port: C3 C3 C3. The module will return its current configuration parameters, such as: C3 32 XX YY; C3 is the command prefix, 32 represents the product model, XX represents the version number, and YY represents the interface format plus the module's maximum power rating (in hexadecimal). The TTL interface is 0x10, RS232 is 0x40, and RS485 is 0x80.

7.4 Reset Command

Command Format	Detailed Description

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C4+C4+C4	In sleep mode (M0=1, M1=1), send the following command (in HEX format) to the module's serial port: C4 C4 C4. The module will perform a reset; During the reset process, the module performs a self-test, and the AUX output goes low. Once the reset is complete, the AUX output goes high, and the module begins normal operation; At this point, you can switch modes or issue the next command.

7.5 Register Descriptions

	Name	Description				Notes
0	HEAD	Set to 0xC0 or 0xC2 to indicate that the data in this frame is a control command.				Must be 0xC0 or C2. C0: The configured parameters are retained after a power loss. C2: The configured parameters are not retained after a power loss.
1	ADDH	Module Address High Byte (Default 00H)				00H-FFH
2	ADDL	Low byte of the module address (default 00H)				00H-FFH
3	SPED	7	6	Serial Port Parity Bit		The serial port modes of the two communicating parties may differ.
		0	0	8N1（Default）		
		0	1	8O1		
		1	0	8E1		
		1	1	8N1（Equivalent to 00）		
		5	4	3	TTL Serial Port Speed（bps）	The baud rates of the two communicating parties may differ The serial port baud rate is unrelated to wireless transmission parameters and does not affect wireless transmission and reception characteristics.
		0	0	0	The serial port baud rate is 1200	
		0	0	1	The serial port baud rate is 2400	
		0	1	0	The serial port baud rate is 4800	
		0	1	1	The serial port baud rate is 9600（Default）	
		1	0	0	The serial port baud rate is 19200	
		1	0	1	The serial port baud rate is 38400	
		1	1	0	The serial port baud rate is 57600	
		1	1	1	The serial port baud rate is 115200	
		2	1	0	General Wireless Air Rate（bps）	The lower the air data rate, the greater the distance, the stronger the interference resistance, and the longer the transmission time. The air data rates of both communication parties must be the same.
		0	0	0	Air Speed 2.4k	
		0	0	1	Air Speed 2.4k	
		0	1	0	Air Speed 2.4k（Default）	
		0	1	1	Air Speed 4.8k	
		1	0	0	Air Speed 9.6k	
		1	0	1	Air Speed 19.2k	
		1	1	0	Air Speed 19.2k	
		1	1	1	Air Speed 19.2k	
4	CHAN	General Model				
		7	6	5	Reserve for future use	Write 0
		Communication Channel				00H-1FH，Corresponding 410～441MHz 00H-45H，Corresponding 862～930MHz
		4–0, corresponding to (410 MHz + CHAN * 1 MHz); default 17H (433 MHz) (for the 400 band) 4–0, corresponding to (862 MHz + CHAN * 1 MHz); default 06H				

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		(868 MHz) (for the 900 band)				
5	OPTION	7	Point-to-Point Transmission Enable Bit (MODBUS-like)			When set to 1, the first three bytes of each user data frame represent the high address, low address, and channel. During transmission, the module changes its own address and channel; after transmission is complete, it reverts to the original settings.
		0	Transparent Transmission Mode			
		1	Point-to-Point Transmission Mode			
		6	IO Drive Mode (Default: 1)			This pin is used to enable the internal pull-up resistor of the module. The open-drain configuration offers greater level compatibility, but in some cases an external pull-up resistor may be required.
		1	TXD and AUX push-pull outputs; RXD pull-up input			
		0	TXD and AUX open-circuit outputs; RXD open-circuit input			
		5	4	3	Wireless Wake-Up Time	If both the transmitter and receiver modules are operating in Mode 0, this delay time is invalid and can be set to any value; If the transmitter is operating in Mode 1, it will continuously transmit the wake-up code for the specified duration; If the receiver is operating in Mode 2, this time refers to the receiver's listening interval (wireless wake-up), and it can only receive data from transmitters operating in Mode 1.
		0	0	0	250ms（Default）	
		0	0	1	500ms	
		0	1	0	750ms	
		0	1	1	1000ms	
		1	0	0	1250ms	
		1	0	1	1500ms	
		1	1	0	1750ms	
		1	1	1	2000ms	
		2	FEC Switch			Turning off FEC increases the actual data transmission rate but reduces interference resistance and slightly shortens the transmission distance; please select the appropriate setting based on your specific application. Both communication parties must either have FEC enabled or disabled.
		0	Turn off FEC error correction			
		1	Enable FEC error correction (default)			
		1	0	Transmit Power (Approximate Value)		The external power supply must be capable of delivering a current of at least 250 mA and ensure that the power supply ripple is less than 100 mV; Transmission at lower power levels is not recommended, as power utilization efficiency is low.
		0	0	20 dBm (default)		
		0	1	17dBm		
		1	0	14dBm		
		1	1	10dBm		

Illustrative Example (Meaning of the "SPED" byte at index 3):

The binary bits of this byte	7	6	5	4	3	2	1	0
Specific values (user-configurable)	0	0	0	1	1	0	1	0
Symbolic Significance	Serial Port Parity Bit: 8N1		The serial port baud rate is 9600			Air speed is 2.4k		
Corresponding hexadecimal value	1				A			

7.6 Factory Default Settings

Model Number	**Factory default parameter values for the 433 MHz band: C0 0000 1A 17 44 Factory default parameter values for the 900 MHz band: C0 0000 1A 06 44**						
Module Model	Frequency	Address	Channel	Air Speed	Baud rate	Serial Port Format	Transmit Power
EWM32M-433T20S	433.125MHz	0x0000	0x17	2.4kbps	9600	8N1	20dbm
EWM32M-900T20S	868.125MHz	0x0000	0x12	2.4kbps	9600	8N1	20dbm

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Chapter 8: AT Commands

• Parameter configuration or queries using AT commands must be performed in configuration mode (the serial port in configuration mode is fixed at 9600 baud, 8N1);
• If an AT command is not recognized or cannot be executed, the response will be "=ERR";
• If the input parameters exceed the specified range, they will be restricted. Please ensure that parameters do not exceed the range to avoid unexpected issues.

8.1 General Instructions

8.1.1 AT+RESET Soft Reset

Command Format	**AT+RESET**
Example of Execution	Send: AT+RESET Response: =OK
Feature Description	• Software versions (7512-0-10) and earlier will not respond with "OK" • The "OK" response was added starting with software version (7512-0-12) and later • The actual reset process begins only after the "OK" response is received. Please wait approximately 30 ms before proceeding to the next step.

8.1.2 AT+DEFAULT: Restore Factory Settings

Command Format	**AT+DEFAULT**
Example of Execution	Send: AT+DEFAULT Response: =OK
Feature Description	After the response (=OK), in addition to restoring the parameters, a restart process will be executed. Please wait approximately 30 ms before proceeding to the next step.

8.1.3 AT+DEVTYPE: Query the product model

Command Format	AT+DEVTYPE=?
Example of Execution	Send: AT+DEVTYPE=? Response: DEVTYPE=EWM32M-433T20S
Feature Description	• Product Series: EWM32M • Operating Frequency: 433 (433/900) • Maximum Power: 20

8.1.4 AT+FWCODE: Check the Software Version

Command Format	AT+FWCODE=?
Example of	Send: AT+FWCODE=?

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Execution	Response: FWCODE=7512-0-12
Feature Description	• Major version number: 7512 • Branch number: 0 • Minor version number: 10 (incremental starting from 10)

8.1.5 AT+SWITCH: Enable Software Mode Switching

Command Format	AT+SWITCH=**<on_off>**
Configuration Examples	Send: AT+SWITCH=0 Response: =OK
Query Examples	Command: AT+SWITCH=? Response: AT+SWITCH=0
Parameter Description	**<on_off>** ： on off 0 off (Default) 1 on
Feature Description	• Disabled by default; use the M0M1 pin to switch operating modes (hard switch) • When enabled, the M0M1 pin remains available; the last triggered action (hard or soft switch) takes precedence • A reboot is required for the setting to take effect • When enabled, you can use AT+MODE to specify the operating mode (soft switch), and the operating mode number is saved immediately after each soft switch • When enabled, for software versions 7512-0-10 and later, the initial operating mode after a power cycle will be the mode number saved during the last soft switch. When disabled, the initial operating mode after a power cycle will be the hardware mode set via the M0M1 pins.

8.1.6 AT+MODE: Switching the Operating Mode via Software

Command Format	AT+MODE=**<mode>**
Configuration Examples	Send: AT+MODE=0 Response: AT+MODE=0
Query Examples	Send: AT+MODE=? Response: AT+MODE=0
Parameter Description	**<mode>: Operating mode number** **0 Transmission mode** **1 Wake-on-Radio transmission mode (WOR Tx)** **2 Wake-on-Radio reception mode (WOR Rx/Power-saving mode)** **3 Sleep and configuration mode**
Feature Description	• Must be enabled via AT+SWITCH before use • Can be used in any operating mode • The actual mode switch begins only after a response is received (=OK); please wait approximately 15 ms before performing the next operation • Please read the AT+SWITCH feature description

8.1.7 AT+UAUX Enable wireless AUX transmission

Command Format	AT+UAUX=**<on_off>**
Configuration Example	Send: AT+UAUX=0 Response: =OK
Query Examples	Send: AT+UAUX=? Response: AT+UAUX=0

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Parameter Description	**<on_off> ：** on off 0 off (Default) 1 on
Feature Description	• This feature is disabled by default in software version (7512-0-10) and later. When enabled, the AUX pin will go low during wireless transmission.

8.1.8 AT+ADDR Communication Address (Match Filtering)

Command Format	AT+ADDR=<address>
Configuration Example	Send: AT+ADDR=0 Response: =OK
Query Examples	Send: AT+ADDR=? Response: AT+ADDR=0
Parameter Description	<address> ： Mailing Address 0 - 65535
Feature Description	• Default address: 0 • An address is not an RF characteristic; it is merely an identifier carried within a data packet to help the receiving software determine whether to apply matching filters. • Broadcast address: 65535. When acting as a receiver, it can receive data sent from any address on the same channel (without filtering). When acting as a transmitter, the data packets it sends carry the broadcast address, so the other party will not filter them (broadcast data).

8.1.9 AT+CHANNEL Communication Channel (Carrier Frequency)

Command Format	AT+CHANNEL=**<ch>**	
Configuration Example	Send: AT+CHANNEL=0 Response: =OK	
Query Examples	Send: AT+CHANNEL=? Response: AT+CHANNEL=0	
Parameter Description	**<ch> ：** Communication Channel 0 - 31 **EWM32M-433T20S**	**<ch> ：** Communication Channel 0 - 69 **EWM32M-900T20S**
Feature Description	• The channel ranges vary by frequency band; please be sure to distinguish between them. • For the 433 MHz band, the actual carrier frequency corresponds to: 410 MHz + ch * 1 MHz • For the 933 MHz band, the actual carrier frequency corresponds to: 862 MHz + ch * 1 MHz	

8.1.10 AT+UART Serial Port Baud Rate and Parity

Command Format	AT+UART=**<baud>**,**<parity>**
Configuration Example	Send: AT+UART=3,0 Response: =OK
Query Examples	Send: AT+UART=? Response: AT+UART=3,0
Parameter Description	**<baud>: Serial port baud rate** **0 1200 bps** **1 2400 bps** **2 4800 bps** 3 9600bps (Default) 4 19200bps

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	5 38400bps 6 57600bps 7 115200bps **<parity>** ： Serial Port Parity Types 0 No Checksum None (default) 1 Odd Parity Odd 2 Even parity Even
Feature Description	• In configuration mode (M0M1 Mode 3), the settings are fixed at 9600 8N1. • This takes effect after switching to the operating mode.

8.1.11 AT+URXT Serial Port Frame Interruption Conditions

Command Format	AT+URXT=**<byte>**
Configuration Example	Send: AT+URXT=3 Response: =OK
Query Examples	Send: AT+URXT=? Response: AT+URXT=3
Parameter Description	**<byte>: Byte time 1–255**
Feature Description	• By default, serial port timeout and frame truncation are handled based on a 3-byte time window. • The time varies (byte time) depending on the baud rate. At 9,600 baud, it is approximately 1 millisecond per byte; at 115,200 baud, it is approximately 100 microseconds per byte. • For some customers, data transmitted from an external microcontroller's serial port to the module is not continuous (e.g., due to RTOS task interrupts). When this data exceeds the module's configured byte time window, it is treated as a frame break and appears as fragmented data packets at the receiving end.

8.1.12 AT+RATE Wireless Transmission Rate

Command Format	AT+RATE=**<rate>**
Configuration Example	Send: AT+RATE=2 Response: =OK
Query Examples	Send: AT+RATE=? Response: AT+RATE=2
Parameter Description	**<rate>** ： Air Speed 0 2.4Kbps 1 2.4Kbps 2 2.4Kbps (Default) 3 4.8Kbps 4 9.6Kbps 5 19.2Kbps 6 19.2Kbps 7 19.2Kbps
Feature Description	• The higher the data rate, the lower the communication latency (shorter transmission time), but the lower the reception sensitivity (shorter communication range).

8.1.13 AT+TRANS Wireless Transmission Modes (Pass-Through/Fixed-Point)

Command Format	AT+TRANS=**<mode>**
Configuration	Send: AT+TRANS=0

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Example	Response: =OK
Query Examples	Command: AT+TRANS=? Response: AT+TRANS=0
Parameter Description	**<mode>** ： Transmission Method 0 Transparent Transmission (Default) 1 Point-to-Point Transmission
Feature Description	• Fixed-point transmission applies special processing to the first 3 bytes of user-input data. The first and second bytes are identified as the destination communication address, and the third byte is identified as the destination communication channel (automatic channel switching). • After fixed-point transmission completes data transmission, it automatically switches back to the original channel.

8.1.14 AT+WTIME Over-the-Air Wake-Up Interval

Command Format	AT+WTIME=**<timeout>**
Configuration Example	Send: AT+WTIME=0 Response: =OK
Query Examples	Send: AT+WTIME=? Response: AT+WTIME=0
Parameter Description	**<timeout>** ： Sleep Time 0 250ms (Default) 1 500ms 2 750ms 3 1000ms 4 1250ms 5 1500ms 6 1750ms 7 2000ms
Feature Description	• The longer the recipient remains in sleep mode during an air wake-up, the lower the average power consumption, but the greater the communication delay.

8.1.15 AT+FEC Forward Error Correction

Command Format	AT+FEC=**<on_off>**
Configuration Example	Send: AT+FEC=0 Response: =OK
Query Examples	Send: AT+FEC=? Response: =OK
Parameter Description	**<on_off>** ： on off 0 off 1 on (Default)
Feature Description	• When FEC is disabled, the actual data transmission rate increases, but interference resistance decreases and the communication range may be reduced; please select the appropriate setting based on your specific application; • Both communication parties must either have FEC enabled or disabled.

8.1.16 AT+POWER Power Levels

Command Format	AT+POWER=**<Power>**
Configuration Example	Send: AT+POWER=0 Response: AT+POWER=0

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Query Examples	Send: AT+POWER=? Response: AT+POWER=0
Parameter Description	**<Power>** ： Power **EWM32M-433T20S、EWM32-900T20S** 0 20dBm （Default） 1 17dBm 2 14dBm 3 10dBm
Feature Description	-

8.2 Signaling Testing (Authentication)

8.2.1 Test Instruction Declaration

The section on testing AT commands is intended solely to assist users in obtaining product certifications (e.g., CE, FCC, etc.); please do not use it for any other purposes.

EBYTE assumes no liability for any damages resulting from failure to comply with relevant operating or design specifications. EBYTE makes every effort to ensure the completeness, accuracy, and timeliness of the features under development, but does not exclude the possibility of errors or omissions in the aforementioned features. Unless otherwise specified in an agreement, no implied or statutory warranties are provided regarding the use of the features under development. To the fullest extent permitted by applicable law, EBYTE shall not be liable for any damages incurred as a result of using the features under development, regardless of whether such damages were foreseeable.

8.2.2 List of Test Commands

- For detailed documentation on command operations, please contact the EBYTE sales team.

AT Commands	Feature Overview
AT+FPOWER	Fine-Tuning of Transmit Power
AT+XCAP	Crystal Oscillator Calibration
AT+ULORAM	Modifying LoRa Modulation Parameters (SF Spreading Factor, BW Transmission Bandwidth, CR Coding Rate)
AT+OPTIMIZE	Low-Rate Optimization Options
AT+UFREQ	Carrier Frequency Adjustment (Start Frequency, Channel Spacing)
AT+SWAVE	Fixed-Frequency Continuous Single-Carrier Transmission
AT+MWAVE	Fixed-Frequency Continuous Modulation Transmission
AT+TFHSS	Frequency-Hopping Modulated Wave Transmission
AT+DUTYTX	Fixed-frequency continuous single-carrier/modulated-wave duty-cycle transmission

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Chapter 9: Host Computer Configuration Instructions

9.1 Host Computer Interface

• The figure below shows the host computer display interface for the EWM32M-900T20S as an example. Users can switch to command mode using M0 or M1 to quickly configure and read parameters on the host computer.



• In the host computer configuration, the module address, frequency channel, network ID, and key are all displayed in decimal format; the valid ranges for each parameter are as follows:

Network address: 0–65535

Frequency Channels: 0–45

9.2 Online Firmware Upgrade

• If a customer needs to upgrade the firmware, they must locate the corresponding BIN file provided by the manufacturer and then use the manufacturer-provided PC software to perform the firmware upgrade. Generally, users do not need to upgrade the firmware; please do not use the “AT+IAP” command.

• The pins required for the upgrade must be brought out (M1, M0, AUX, TXD, RXD, VCC, GND). Then, send the “AT+IAP” command in configuration mode to enter upgrade mode，to exit IAP upgrade mode, leave the device powered on and wait 60 seconds; the program will exit automatically. Otherwise, even if you restart the device, it will remain in upgrade mode indefinitely.

• Once upgrade mode is entered, the baud rate will automatically switch to 115200 and remain there until the system exits automatically; log messages will be output during this period.

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9.3 Quick Start Guide for Host Computer Upgrades

• Put the module into configuration mode by adjusting M0 and M1 (Note: The baud rate is 9600 in configuration mode); open the configuration software and select the Firmware Upgrade tab

• Open the official website to configure the host computer, select the serial port → open the serial port → read the parameters → select "Firmware Upgrade" → click "Open File" and select the firmware you want to upgrade → click "Download" to proceed;



Chapter 10: Hardware Design

• It is recommended to power this module using a regulated DC power supply with as low a ripple factor as possible; the module must be reliably grounded;

• Please ensure that the positive and negative terminals of the power supply are connected correctly; reverse connection may cause permanent damage to the module;

• Please check the power supply to ensure it falls within the recommended voltage range; exceeding the maximum value may cause permanent damage to the module;

• Please check the stability of the power supply; the voltage should not fluctuate significantly or frequently;

• When designing power supply circuits for modules, it is often recommended to allow for a margin of at least 30% to ensure the long-term, stable operation of the entire system;

• Modules should be placed as far as possible from power supplies, transformers, high-frequency traces, and other sources of significant electromagnetic interference;

• High-frequency digital traces, high-frequency analog traces, and power traces must be routed away from the bottom of the module. If it is absolutely necessary to route them beneath the module—assuming the module is mounted on the top layer—a ground plane must be laid on the top layer at the module's contact points (covering the entire area and properly grounded), and the traces must be routed close to the module's digital section on the bottom layer;

• Assuming the module is soldered or placed on the top layer, routing traces arbitrarily on the bottom layer or other layers is also incorrect and will affect the module's spurious emissions and reception sensitivity to varying degrees;

• If there are components near the module that generate significant electromagnetic interference, this can greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep such components at a suitable distance from the module; if possible, appropriate isolation and shielding should be implemented;

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• If there are traces around the module that generate significant electromagnetic interference (high-frequency digital, high-frequency analog, or power traces), this can also greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to place these traces at a suitable distance from the module; if circumstances permit, appropriate isolation and shielding should be implemented;
• If the communication line uses a 5V voltage level, a 1k–5.1k resistor must be connected in series (not recommended; there is still a risk of damage);
• Avoid, as much as possible, TTL protocols that also operate on the 2.4 GHz physical layer, such as USB 3.0;
• The antenna mounting configuration has a significant impact on module performance; be sure to ensure that the antenna is exposed and, ideally, pointing straight up;
• When the module is installed inside the enclosure, you can use a high-quality antenna extension cable to extend the antenna outside the enclosure;
• The antenna must not be installed inside a metal enclosure, as this will significantly reduce the transmission range.

Chapter 11: Frequently Asked Questions

11.1 Transmission distance is not ideal

• When there are obstacles in the line of sight, the communication range decreases accordingly;
• Temperature, humidity, and co-channel interference can lead to an increase in the packet loss rate;
• The ground absorbs and reflects radio waves, so testing results are less accurate when conducted close to the ground;
• Seawater strongly absorbs radio waves, so testing near the coast yields poor results;
• If there are metal objects near the antenna, or if it is placed inside a metal casing, signal attenuation will be very severe;
• Incorrect power register settings, air rate set too high (the higher the air rate, the shorter the distance);
• At room temperature, if the power supply voltage is lower than the recommended value, the lower the voltage, the lower the power output;
• Poor matching between the antenna and the module, or a quality issue with the antenna itself.

11.2 Modules are prone to damage

• Please check the power supply to ensure it falls within the recommended voltage range; exceeding the maximum value may cause permanent damage to the module;
• Please check the stability of the power supply; the voltage should not fluctuate significantly or frequently;
• Please ensure that anti-static procedures are followed during installation and use, as high-frequency components are sensitive to static electricity;
• Please ensure that humidity levels are not too high during installation and use, as some components are humidity-sensitive;
• Unless there are special requirements, we do not recommend using the product at extremely high or low temperatures.

11.3 The bit error rate is too high

• If there is interference from signals on the same frequency nearby, move away from the source of interference or change the frequency or channel to avoid the interference;

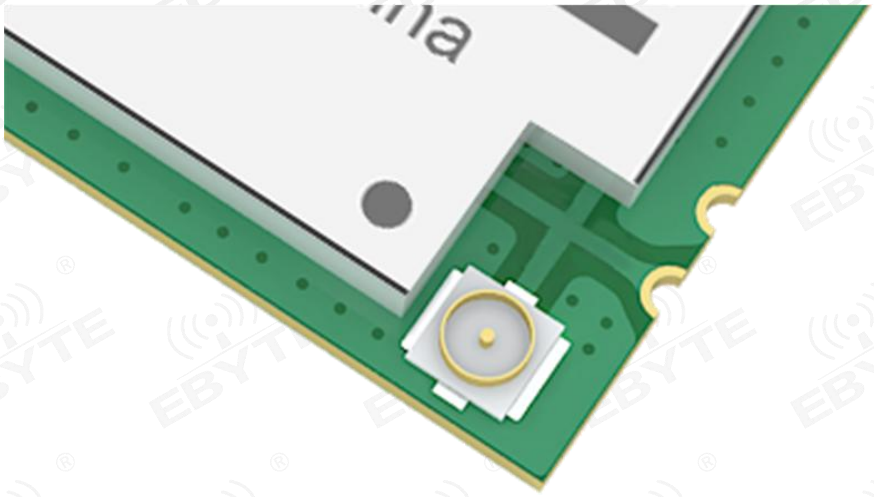
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• A poor power supply can also cause garbled text; be sure to ensure a reliable power supply;

• Poor-quality or excessively long extension cables and feeder cables can also result in a high bit error rate.

11.4 Antenna Selection



Enable both the IPEX-1 interface and the stamp-hole interface; either the IPEX-1 interface or the stamp-hole interface may be selected.

Chapter 12: Welding Work Instructions

12.1 Reflow Soldering Temperature

Reflow Soldering Curve Characteristics		Lead-Based Assembly Process	Lead-Free Assembly Process
Preheating/Keeping Warm	Lowest Temperature（Tsmin）	100℃	150℃
	Highest Temperature（Tsmax）	150℃	200℃
	Time（Tsmin~Tsmin）	60-120 seconds	60-120 seconds
Rate of increase in temperature（TL~Tp）		3℃/second, maximum value	3℃/second, maximum value
Liquid-phase temperature（TL）		183℃	217℃
TL Duration of the above		60~90 seconds	60~90 seconds
Peak Temperature of the Package Tp		Users must not exceed the temperature specified on the product's "moisture sensitivity" label.	Users must not exceed the temperature specified on the product's "moisture sensitivity" label.
At the specified grading temperature（Tc）5℃within that time frame（Tp）,See the figure below		20 seconds	30 seconds
Rate of Decrease in Temperature（Tp~TL）		6℃/second, maximum value	6℃/second, maximum value

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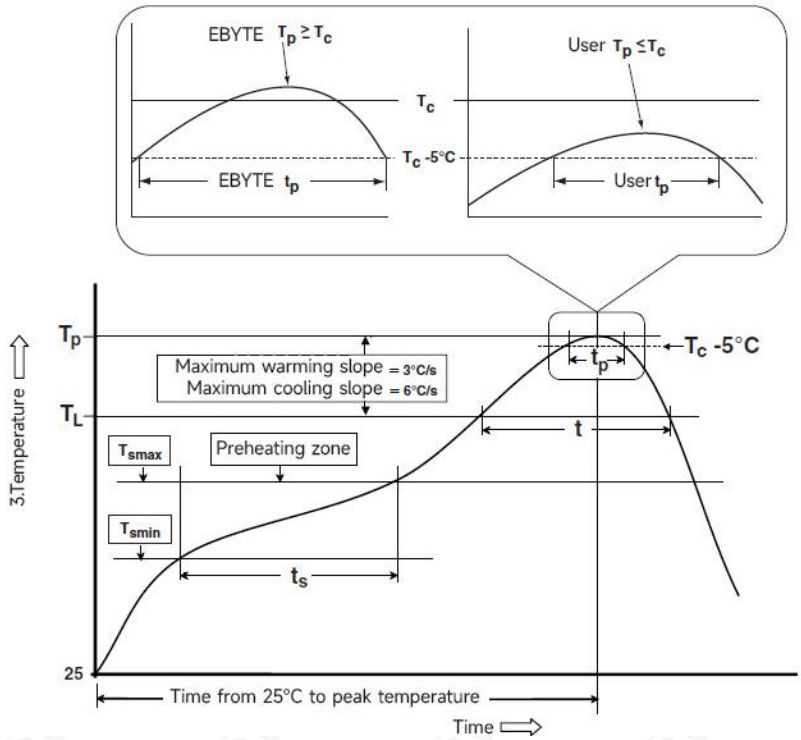
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Time from room temperature to peak temperature	6 minutes, maximum	8 minutes, maximum
※ The tolerance for the peak temperature (Tp) on the temperature curve is defined as the user's upper limit.		

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12.2 Reflow Soldering Curve Chart



Chapter 13: Antenna Guide

13.1 Recommended Antennas

Antennas play a crucial role in communication; poor-quality antennas can often have a significant impact on communication systems. Therefore, our company recommends a selection of antennas that are compatible with our wireless modules and offer excellent performance at a reasonable price.

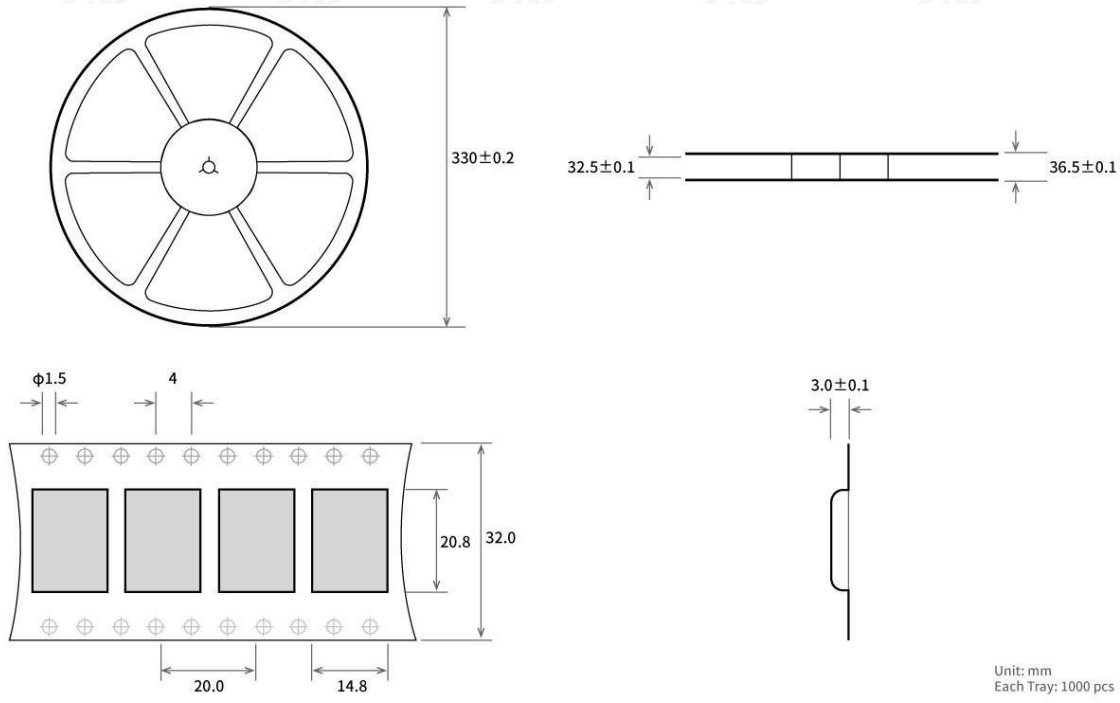
Product Model	Type	Frequency Band (Hz)	Interface	Gain (dBi)	Height (mm)	Feeder (cm)	Features and Benefits
TX433-JZG-6	Glue Stick Antenna	433M	SMA-J	2.5	62	-	Ultra-short, straight-type, omnidirectional antenna
TX433-JW-5	Glue Stick Antenna	433M	SMA-J	2.0	50	-	Bendable Rubber Rod, Omnidirectional Antenna
TX433-JWG-7	Glue Stick Antenna	433M	SMA-J	2.5	75	-	Bendable Rubber Rod, Omnidirectional Antenna
TX433-JK-11	Glue Stick Antenna	433M	SMA-J	2.5	110	-	Bendable Rubber Rod, Omnidirectional Antenna
TX433-XPL-100	Suction Cup Antenna	433M	SMA-J	3.5	185	100	Compact Suction Cup Antenna, Great Value for the Price
TX433-XP-200	Suction Cup Antenna	433M	SMA-J	4.0	190	200	Neutral-polarization suction cup antenna, low loss
TX433-XPH-300	Suction Cup	433M	SMA-J	6.0	965	300	Large Suction Cup Antenna, High Gain

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Product Model	Type	Frequency Band (Hz)	Interface	Gain (dBi)	Height (mm)	Feeder (cm)	Features and Benefits
	Antenna						
TX490-JZ-5	Glue Stick Antenna	470/490M	SMA-J	2.0	50	-	Ultra-short, straight-type, omnidirectional antenna
TX490-XPL-100	Suction Cup Antenna	470/490M	SMA-J	3.5	120	100	Compact Suction Cup Antenna, Great Value for the Price
TX868-JKS-IPX20	Glue Stick Antenna	868M	IPEX-1	3.0	197	200	Bendable Rubber Rod, Omnidirectional Antenna
TX868-JZLW-15	Glue Stick Antenna	868M	IPEX-1	3.0	165	150	Bendable Rubber Rod, Omnidirectional Antenna
TX868-XPL-100	Suction Cup Antenna	868M	SMA-J	3.5	290	100	Compact Suction Cup Antenna, Great Value for the Price
TX868-JKD-20	Glue Stick Antenna	868M	SMA-J	3.0	170	-	Bendable Rubber Rod, Omnidirectional Antenna
TX915-JKS-IPX20	Glue Stick Antenna	915M	IPEX-1	3.0	197	200	Bendable Rubber Rod, Omnidirectional Antenna
TX915-JZLW-15	Glue Stick Antenna	915M	IPEX-1	3.0	155	150	Bendable Rubber Rod, Omnidirectional Antenna
TX915-JKD-20	Glue Stick Antenna	915M	SMA-J	3.5	200	-	Bendable Rubber Rod, Omnidirectional Antenna
TX915-XPL-100	Glue Stick Antenna	915M	SMA-J	3.5	260	100	Compact Suction Cup Antenna, Great Value for the Price

Chapter 14: Bulk Packaging Methods



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Revision History

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1.0	2025-02-07	Initial Version	Lei
1.1	2025-04-17	Remove descriptions related to RSSI	Lei
1.2	2026-5-29	Content Correction	Hao
1.2	2026-7-28	Corrections to the Manual Instructions	Hao

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