Chengdu Ebyte Electronic Technology Co.,Ltd

# Wireless Modem

## User Manual



# EWD95M-400GLxx(xxx)

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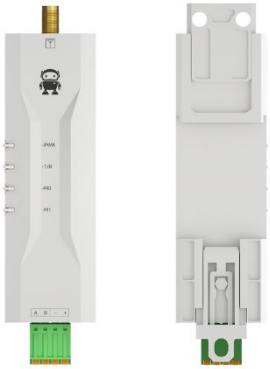
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# 1. Introduction

## 1.1 Brief Introduction



EWD95M-400GLxx(xxx) is a wireless data transmission radio based on E domestic LoRa transmission technology . It adopts ChirpIoT™ spread spectrum technology, has multiple transmission modes, operates in the 410.125~493.125MHz frequency band (default 433.125 MHz). It supports interoperability with our company's E290 series modules. The radio provides a transparent RS485/RS232 interface. It adopts a plastic shell and a guide rail installation structure, and supports 5~28V (DC) wide voltage input .

EWD95M-400GLxx(xxx) adopts the new generation of ChirpIoT™ spread spectrum technology, supports half-duplex wireless communication, and has the characteristics of high anti-interference and high sensitivity; supports air wake-up, wireless configuration, automatic relay, communication key, AT command, IAP upgrade and other functions, and supports packet length setting .

As a communication medium, wireless data transmission radio has a certain scope of application, just like optical fiber, microwave and open wire: it provides real-time and reliable data transmission of monitoring signals in private networks under certain special conditions. It has the characteristics of low cost, easy installation and maintenance, strong diffraction ability, flexible networking structure and long coverage. It is suitable for occasions with many dispersed points and complex geographical environment, and can be connected with data terminals such as PLC, RTU, rain gauge and liquid level meter.

## 1.2 Features

★ Support AT commands, which makes it more convenient to use;
★ The modulation method based on ChirpIoT™ brings a longer communication distance and stronger anti-interference ability . Under ideal conditions, the communication distance can reach 5km;
★ Supports automatic relay networking, multi-level relay is suitable for ultra-long-distance communication, and multiple networks can run simultaneously in the same area;
★ Supports users to set communication keys by themselves, which cannot be read, greatly improving the confidentiality of user data;
★ Support RSSI signal strength indication function, which is used to evaluate signal quality, improve communication network, and measure distance;
★ Support wireless parameter configuration, remotely configure or read parameters by sending command data packets wirelessly;
★ Support single-point air wake-up, i.e. ultra-low power consumption function;
★ Supports fixed-point transmission, broadcast transmission, and channel monitoring;
★ Supports the global license-free ISM 433MHz frequency band and the 470MHz frequency band;
★ Supports data transmission rates of 2.4k to 62.5kbps;
★ Support IAP upgrade, which makes firmware update more convenient;
★ Airspeed adaptation, if certain conditions are met, any airspeed gear can be configured and can communicate with

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each other;

★ Working temperature range: -40℃ ～ +85℃, adaptable to various harsh working environments, a true industrial-grade product;

★ Support Modbus protocol transmission;

★ Ultra-small size, 80*28*28.5mm, easy and quick to install;

★ Adopt flame-retardant plastic shell and guide rail installation structure, which is convenient and efficient to install;

★ Use hidden buttons to switch working modes to avoid false triggering, making the equipment more reliable.

★ Simple and efficient power supply design, supports power adapter or wire pressing, supports 5~28V (DC) power supply;

★ Multiple protection functions such as power reverse connection protection, over connection protection, antenna surge protection, etc. greatly increase the reliability of the radio;

★ The communication port and power interface adopt isolation and high protection;

★ Powerful software functions, all parameters can be set by programming: such as power, frequency, air rate, address ID, etc.;

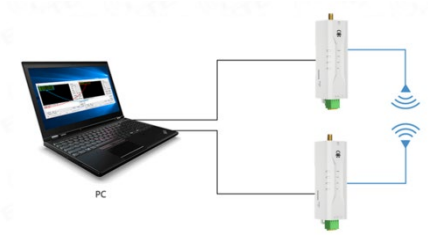
★ Built-in watchdog and precise time layout. Once an abnormality occurs, the radio will automatically restart and continue to work according to the previous parameter settings.

## 1.3 Quick Start

① You need to prepare two sets of DTU debugging components, including EWD95M-400GLxx(xxx) , antenna, DC 5V~28V power adapter, USB to RS232/RS485 (or other methods), and connecting cable (including 4PIN 3.81 Phoenix terminal male head) 2 pieces each.

② First, install the antenna for the digital radio . Then power on the DTU through the power adapter and connect the cables, TX A+ to A/T, RX B- to B/R.

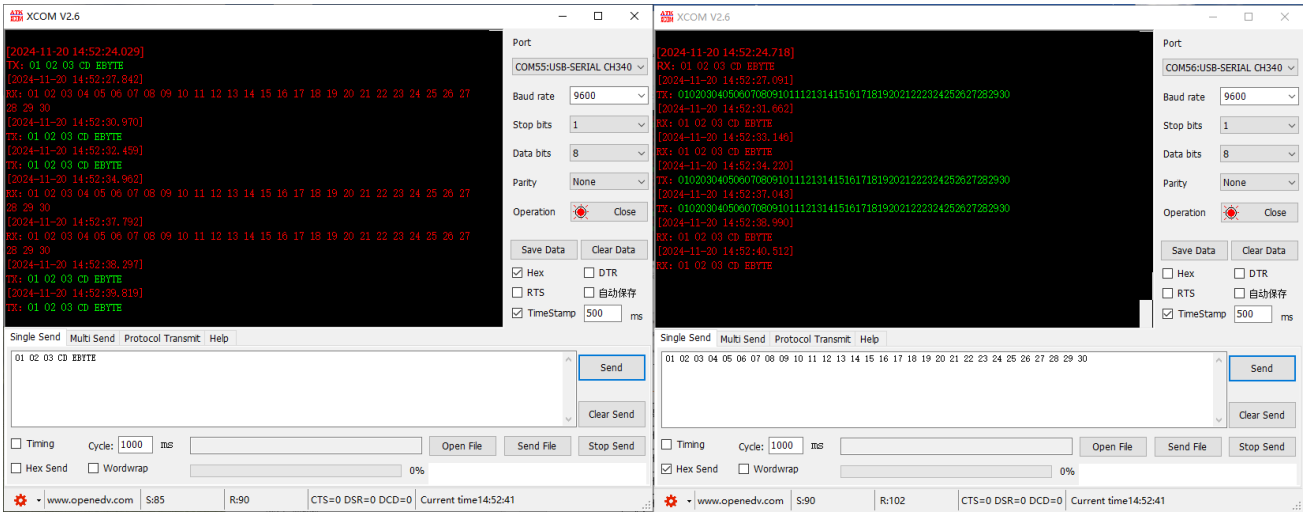



⑤ Enter data, check HEX SEND, send data, both directions can be sent and received. The operation is the same as in general mode.

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⑥ The working mode can be switched by pressing the Mode button. The M0 indicator light and the M1 indicator light are used to indicate different working modes. Press and hold the Mode button for 1 second. The indicator light changes to indicate a mode switch. The details of the mode switch are shown in the table below:

| Mode | Category | M1 | M0 | Notes |
|---|---|---|---|---|
| Mode 0 | Transmission Mode | Lights out | Lights out | Serial port is turned on, wireless is turned on, transparent transmission (factory default mode), and special command air configuration is supported. |
| Mode 1 | WOR Mode | Lights out | Lights on | Can be defined as WOR sender and WOR receiver, supporting single-point air wake-up |
| Mode 2 | Configuration Mode | Lights on | Lights out | The user can access the registers through the serial port to control the working state of the radio and put the radio into sleep mode. |
| Mode 3 | Deep Sleep | Lights on | Lights on | Enter sleep mode and wake up by switching modes |

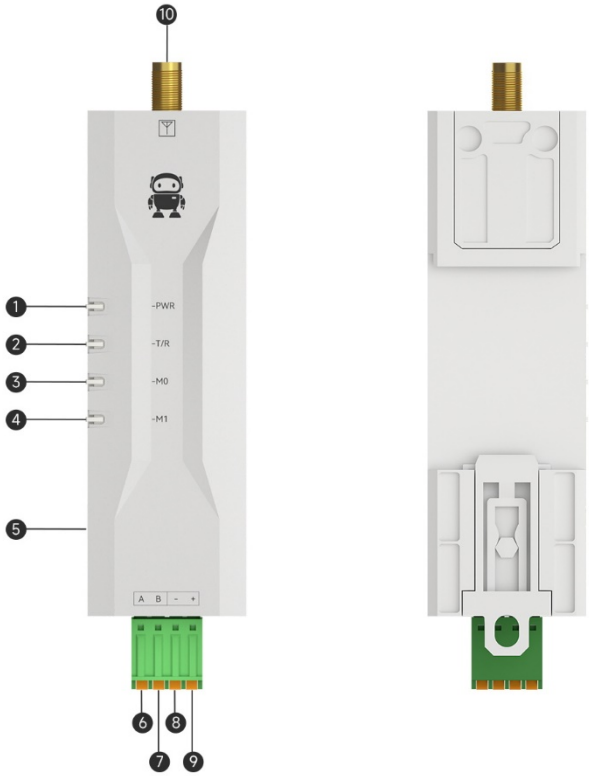
**Note: The radio has a power-off saving mode function. Users need to switch to the corresponding mode according to the M1 and M0 indicator lights (effective immediately).**

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## 1.4 Description of each part

### 1.4.1 RS485 interface




| No. | Name | Function | Illustrate |
|---|---|---|---|
| 1 | PWR | Power indicator | Lights up when the power is on. |
| 2 | T/R | Send/Receive Indicator | The flashing light is red when sending data and green when receiving data. |
| 3 | MO | Mode indicator | Working mode indicator light. |
| 4 | M1 | Mode indicator | Working mode indicator light. |
| 5 | Mode | Mode switch button | Working mode switching control. |
| 6 | A | RS485 Signal A | RS485 Signal A |
| 7 | B | RS485 Signal B | RS485 signal B |
| 8 | - | GND | Negative power supply |
| 9 | + | VCC | Power positive (DC 5~28V) |
| 10 | ANT | RF Interface | SMA-K, external threaded inner hole. |

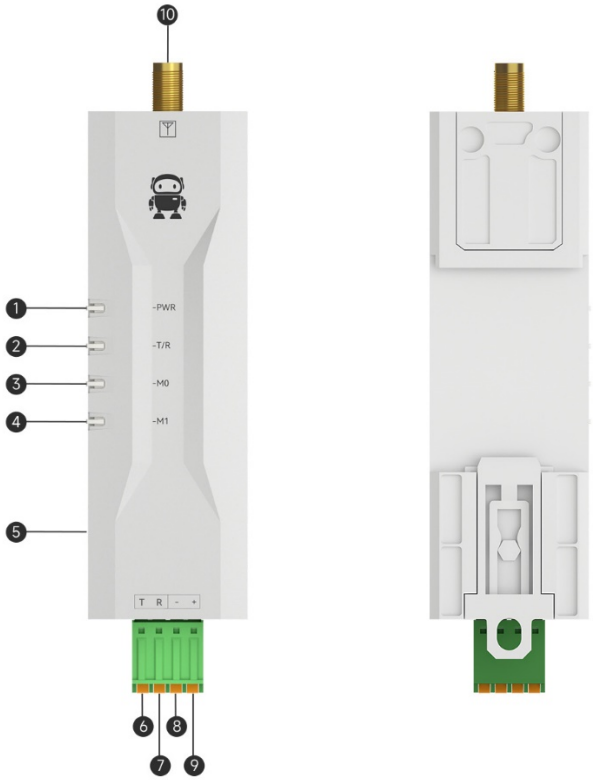
★ Note: If communication is not smooth when connecting the radio to multiple devices, but not when connecting to a single device, try connecting a 120Ω resistor in parallel between the 485_A terminal and the 485_B terminal.

★ EWD95M-400GLxx(xxx) can be powered by 5~28V (DC) power supply, and the wiring port is connected by terminal block.

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## 1.4.2 RS232 interface



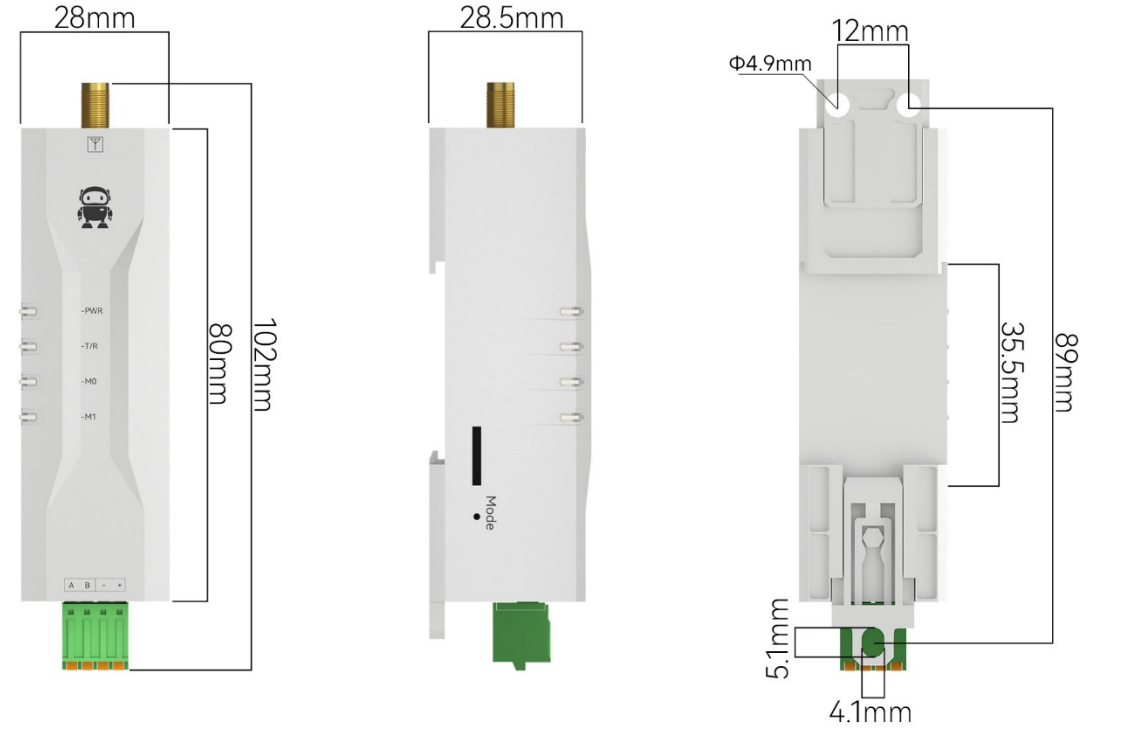

| No. | Name | Function | Illustrate |
|---|---|---|---|
| 1 | PWR | Power indicator | Lights up when the power is on. |
| 2 | T/R | Send/Receive Indicator | The flashing light is red when sending data and green when receiving data. |
| 3 | MO | Mode indicator | Working mode indicator light. |
| 4 | M1 | Mode indicator | Working mode indicator light. |
| 5 | Mode | Mode switch button | Working mode switching control. |
| 6 | T | RS232 bus TX interface | The RS232 interface TX interface is connected to the device RX interface |
| 7 | R | RS232 bus RX interface | The RS232 interface RX interface is connected to the device TX interface |
| 8 | - | VCC | Negative power supply |
| 9 | + | GND | Power positive (DC 5~28V) |
| 10 | ANT | RF Interface | SMA-K, external threaded inner hole. |

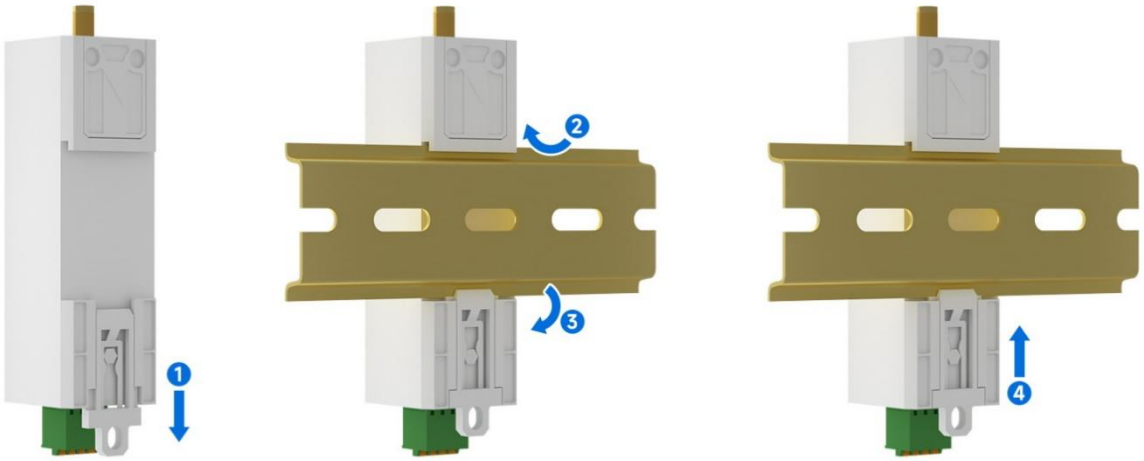
★ EWD95M-400GLxx(xxx) can be powered by 5~28V (DC) power supply, and the wiring port is connected by terminal block.

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## 1.5 Installation dimensions




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# 2. Technical indicators

## 2.1 Model Specifications

| Model Specifications | Operating frequency | Transmit power | Reference distance | Air speed | Technical characteristics |
|---|---|---|---|---|---|
| | Hz | dBm | km | bps | |
| EWD95M-400SL22(485) | 410.125～493.125 M | 22 | 5 | 2.4k~62.5k | New generation LoRa spread spectrum technology |
| EWD95M-400SL22(232) | | | | | |
| EWD95M-433GF20(485) | 410～450M | 20 | 3.5 | 2.4～500k | GFSK modulation technology |
| EWD95M-433GF20(232) | | | | | |
| EWD95M-433N20(485) | 425～450.5M | 20 | 2.5 | 1~25k | Wireless narrowband technology |
| EWD95M-433N20(232) | | | | | |
| EWD95M-400GL20(485) | 410.125～493.125M | 20 | 5 | 2.4 ~ 62.5k | ChirpIoT Spread Spectrum Technology |
| EWD95M-400GL20(232) | | | | | |
| EWD95M-433C20(485) | 410～441M | 20 | 6 | 0.5 ~ 470k | High-speed continuous transmission technology |
| EWD95M-433C20(232) | | | | | |
| EWD95M-2G4H20(485) | 2.4～2.518G | 20 | 2.5 | 250k～2M | Automatic frequency hopping technology |
| EWD95M-2G4H20(232) | | | | | |
| EWD95M-2G4H27(485) | 2.4～2.518G | 27 | 5 | 250k～2M | Automatic frequency hopping technology |
| EWD95M-2G4H27(232) | | | | | |
| EWD95M-400LN22 (485) | 410～510M | 22 | 5.6 | Adaptive | LORAWAN Protocol |
| EWD95M-400LN22 (232) | | | | | |
| EWD95M-900LN22 (485) | 850～930M | 22 | 5.6 | Adaptive | LORAWAN Protocol |
| EWD95M-900LN22 (232) | | | | | |
| EWD95M-400NW22(485) | 410.125～509.125M | 22 | 2.5 | 7～62.5k | LoRa Mesh Protocol |
| EWD95M-400NW22(232) | | | | | |
| EWD95M-900NW22(485) | 850.125～929.125M | 22 | 2.5 | 7～62.5k | LoRa Mesh Protocol |
| EWD95M-900NW22(232) | | | | | |

★ Note: Sunny weather, open environment without obstructions, 12V/1A power supply, 5dBi suction cup antenna, antenna height 2 meters from the ground, using factory default parameters.

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## 2.2 General Specifications

| No. | Project | Specification | Illustrate |
|---|---|---|---|
| 1 | Product size | 80*28*28.5 mm | See installation dimensions for details |
| 2 | Product Weight | 32 g | Weight tolerance 2g |
| 3 | Operating temperature | -40℃～+85℃ | Industrial Grade |
| 4 | Voltage range | 5～28V（DC） | The DC version is recommended to use 12V or 24V |
| 5 | Communication interface | RS485/RS232 | RS485 or RS232, choose one, please refer to the product label |
| 6 | Baud rate | Factory default 9600 | Baud rate range: 1200～115200 |
| 7 | Address code | Factory default 0 | A total of 65536 address codes can be set |

## 2.3 Frequency range and number of channels

| Model | Default frequency | Frequency range | Channel spacing | Number of channels |
|---|---|---|---|---|
| | Hz | Hz | Hz | |
| EWD95M-400GL20 (xxx) | 433.125M | 410.125～493.125M | 1M | 84 |

★ Note: When using multiple groups of data radios for one-to-one communication in the same area, it is recommended that the channel spacing of each group of data radios be set to more than 2MHz.

## 2.4 Transmit Power Level

| Model | 0 (factory default) | 1 | 2 | 3 |
|---|---|---|---|---|
| EWD95M-400GL20(xxx) | 20dBm | 18dBm | 14dBm | 10dBm |

★ Note: The lower the transmit power, the shorter the transmission distance, but the operating current does not decrease in the same proportion. It is recommended to use the maximum transmit power.

## 2.5 Air Speed Class

| Model | Default air rate | Number of levels | Air speed rating |
|---|---|---|---|
| | bps | | kbps |
| EWD95M-400GL20 (xxx) | 2.4k | 6 | 2.4, 4.8, 9.6 , 1 9.2 , 38.4 , 6 2.5 |

★ Note: The higher the airspeed setting, the faster the transmission rate and the shorter the transmission distance; therefore, if the rate meets the use requirements, it is recommended that the airspeed be as low as possible.

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## 2.6 Current parameters

| Model | Emission current mA | | | Receive current mA | | |
|---|---|---|---|---|---|---|
| | 5V | 12V | 28V | 5V | 12V | 28V |
| EWD95M-433GF20(xxx) | 132.6 | 68.2 | 20.3 | 13.5 | 8.5 | 3.6 |

★ Note: When the output power is set to the maximum, it is recommended to retain more than 50% current margin when selecting the power supply, which is conducive to the long-term and stable operation of the radio.

## 2.7 Sending and receiving length and subcontracting method

| Model | Cache size | Subcontracting |
|---|---|---|
| EWD95M-400SLxx(xxx) | 500 bytes | The command can be set to send packets of 32/64/128/240 bytes |

★ Notice:

1. If the data received by the radio at a single time is larger than the capacity of a single packet, the excess data will be automatically allocated to the second transmission until the transmission is completed;
2. The amount of data received by the radio at one time cannot be larger than the buffer capacity.

# 3. Detailed explanation of functions

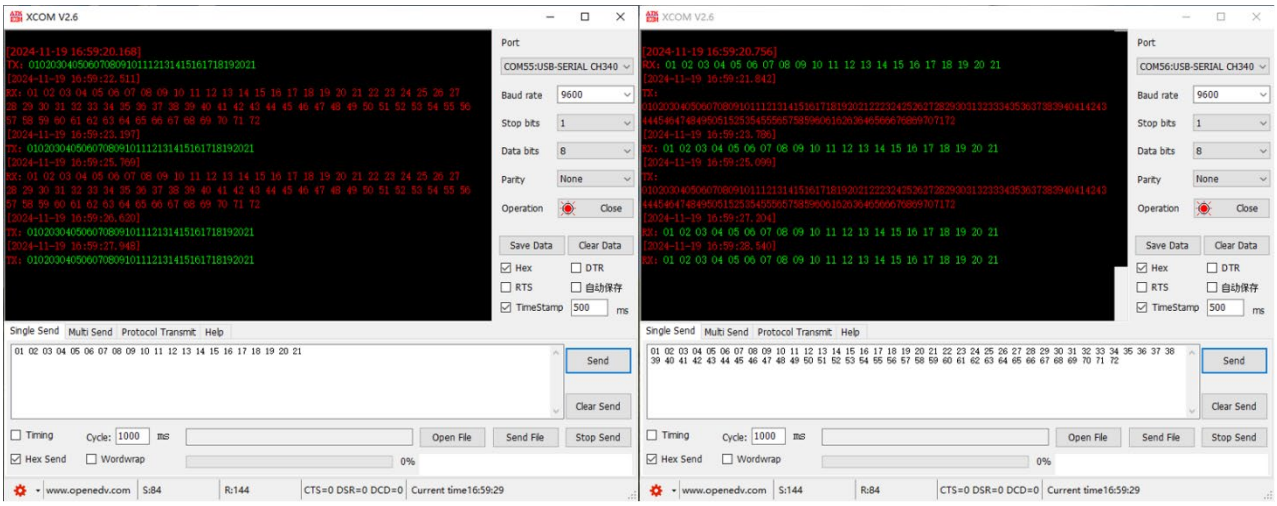
## 3.1 Working mode

### 3.1.1 Transfer mode use (M1, M0 pins set to 0,0)

- **Transparent transmission function** : What you send is what you get. Use the serial port assistant to communicate with each other (the factory default parameters are consistent, and the transmission method is transparent transmission). The example is as follows:

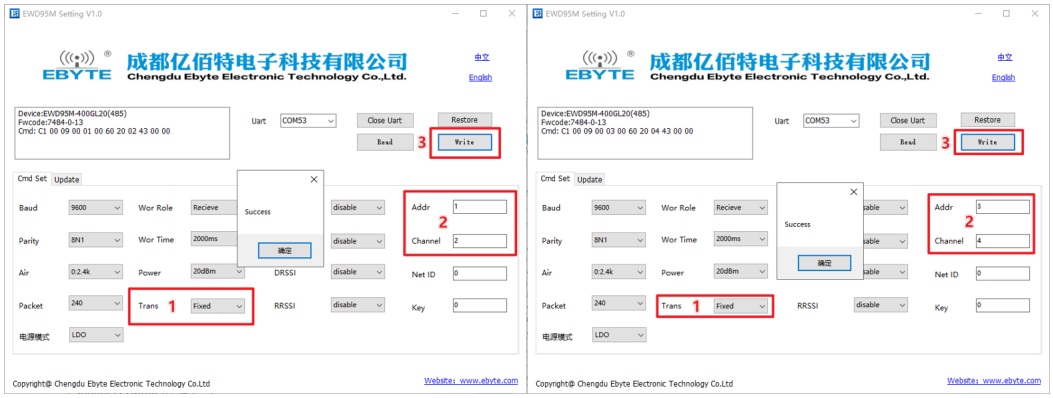
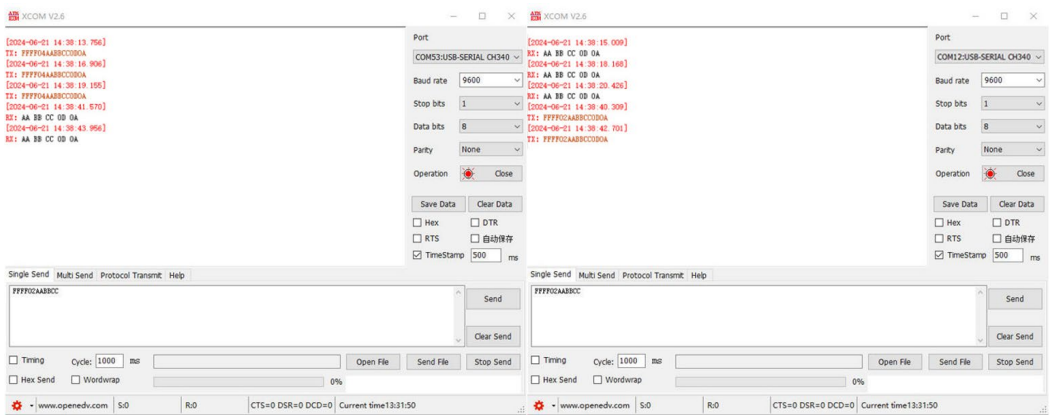
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Schematic diagram

- **Fixed-point transmission function:** Send and receive data in a fixed data format, the format is: target address + target channel + data, effectively avoiding partial interference.

| Serial number | Steps for using fixed-point launch |
|---|---|
| 1. Modify the parameters of the radio through the host computer: modify the radio address and channel under the configuration mode (M1, M0 pins are set to 1, 0), change the transparent transmission mode to fixed - point transmission, and finally write the parameters to complete the modification . |  |
| 2. Change the radio working mode to the general mode: edit the parameters of radio A to 000304AABBCC and send it to radio B. Similarly, the data sent by radio B is 000102AABBCC. (The transmission data format in fixed-point mode is: target address + target channel + data) |  |

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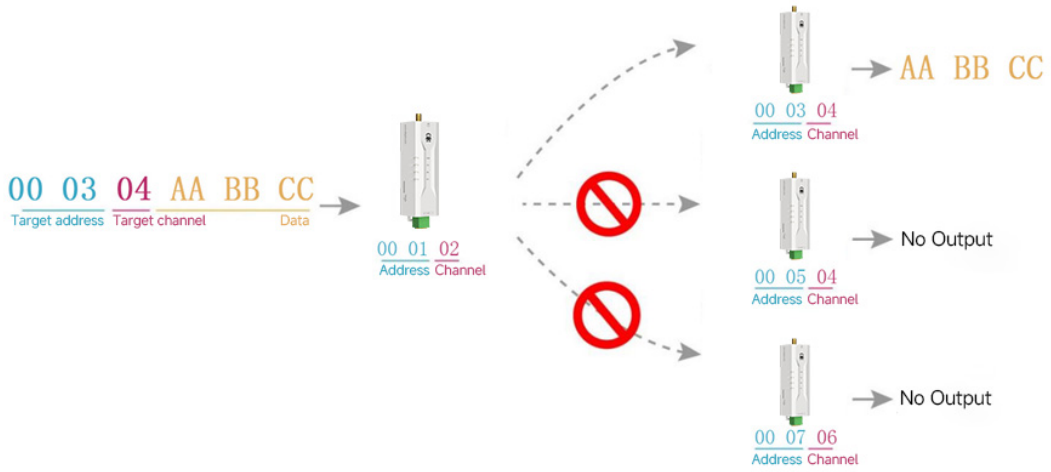



Figure 1Schematic diagram of fixed-point transmission

- **Broadcasting function:**

1) Set the address of radio station A to 0xFFFF and the channel to 0x04 . When radio station A is used as a transmitter (same mode, transparent transmission or fixed-point transmission ), all receiving stations under the 0x04 channel can receive data, achieving the purpose of broadcasting.

2) Set the address of radio A to 0xFFFF and the channel to 0x04. When radio A is used as a receiver, it can receive all the data under the 0x04 channel to achieve the purpose of monitoring.

| Serial number | Steps for using fixed-point broadcast transmission |
|---|---|
| 1. Modify the parameters of the radio through the host computer: modify the radio address and channel in the configuration mode (M1, M0 pins are set to 1, 0), change the transparent transmission mode to fixed - point transmission, and finally write the parameters to complete the modification . |  |



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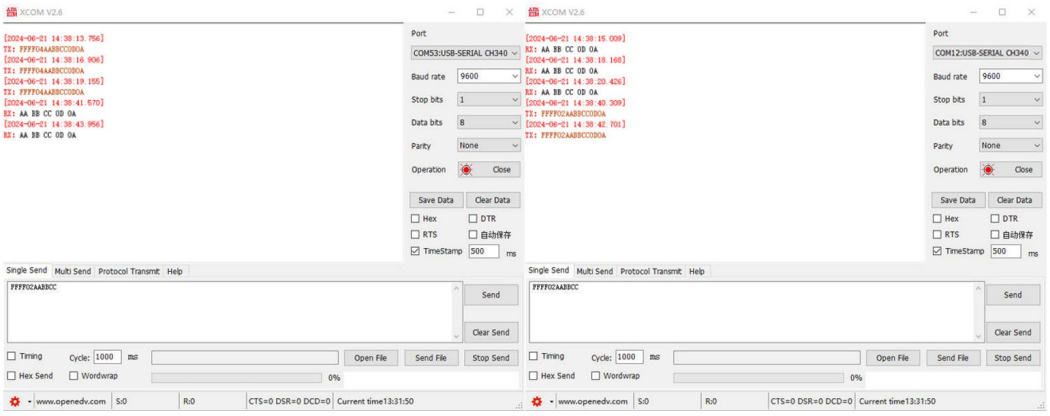
| | |
|---|---|
| 2. Change the radio working mode to the general mode: edit the parameters of radio A to FFFF04AABBCC and send it to radio B. Similarly, the data sent by radio B is FFFF02AABBCC. (The data transmission format in fixed-point broadcast mode is: broadcast address + target channel + data) |  |




Figure 2Schematic diagram of fixed-point broadcast transmission

- **Relay networking mode:** Relay networking forwards data between source nodes and target nodes through relay nodes, thereby expanding network coverage and improving communication reliability.

| Serial number | Relay Mode Description |
|---|---|
| 1 | After setting the relay mode through the configuration mode, switch to the general mode and the relay starts working. |
| 2 | In the relay mode, ADDH and ADDL are no longer used as radio addresses, but are forwarded and paired with NETID respectively. If a signal is received from one network, it is forwarded to the other network .<br>The repeater's own network ID is invalid. |
| 3 | In repeater mode, the repeater radio cannot send or receive data and cannot perform low-power operation. |
| 4 | When the user enters other modes from Mode 3 (Standby Mode) or during the reset process, the radio will reset the user parameters. |

Relay networking rules:

1、Forwarding rules, the relay can forward data bidirectionally between two NETIDs.

2、In repeater mode, ADDH\ADDL is no longer used as the radio address, but as NETID for forwarding pairing.

As shown in the figure:

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①First -level relay

"Node 1" NETID is 08.

"Node 2" NETID is 33.

The ADDH\ADDL of relay 1 are 08 and 33 respectively.

So the signal sent by node 1 (08) can be forwarded to node 2 (33)

At the same time, the addresses of node 1 and node 2 are the same, so the data sent by node 1 can be received by node 2.

② Secondary relay

The ADDH\ADDL of relay 2 are 33, 05 respectively.

So relay 2 can forward the data of relay 1 to network NETID:05.

Therefore, nodes 3 and 4 can receive data from node 1. Node 4 outputs data normally, but node 3 does not output data because its address is different from that of node 1.

③Two -way relay

As shown in the configuration figure: the data sent by node 1 can be received by nodes 2 and 4, and the data sent by nodes 2 and 4 can also be received by node 1.

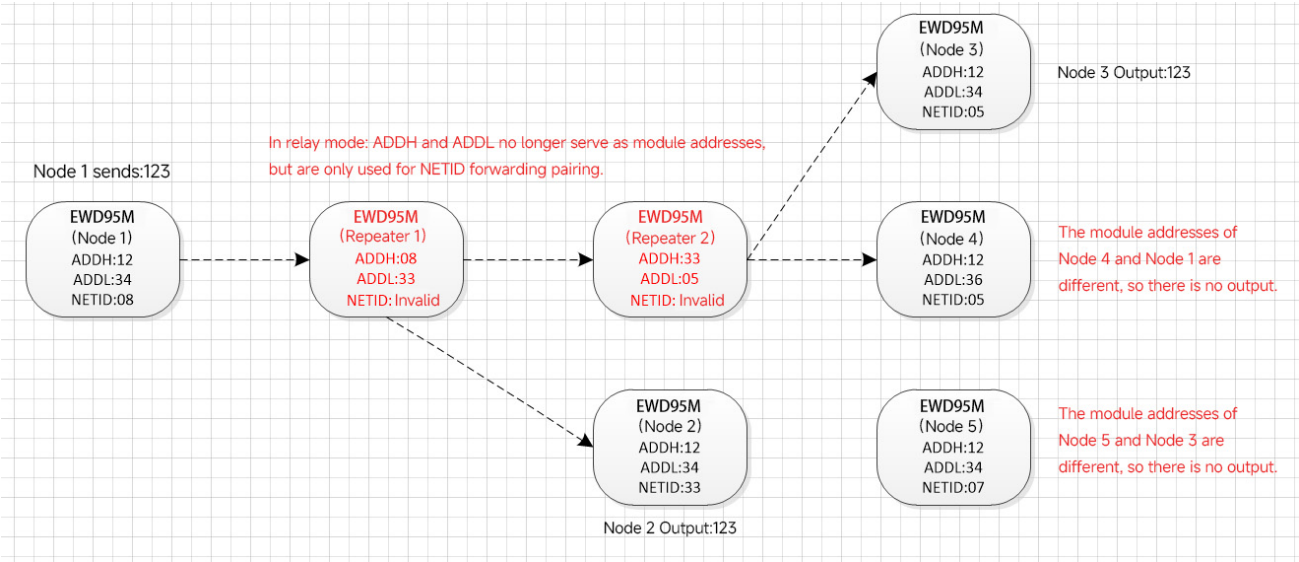
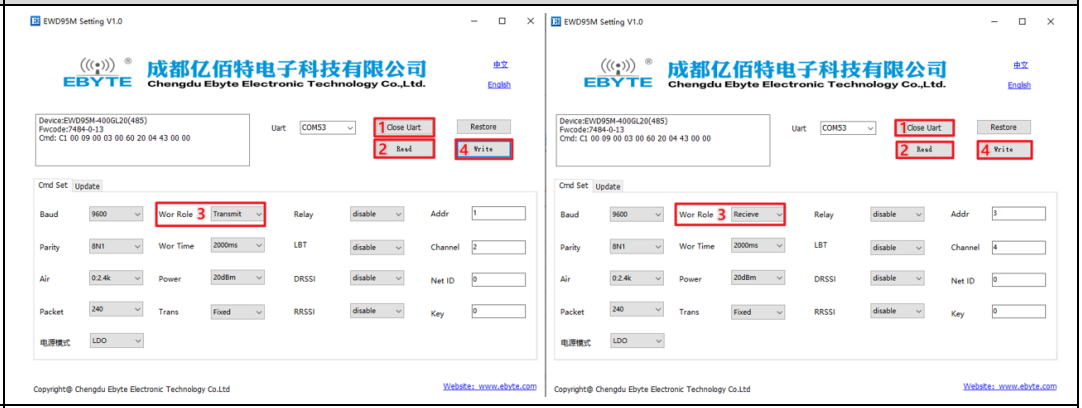
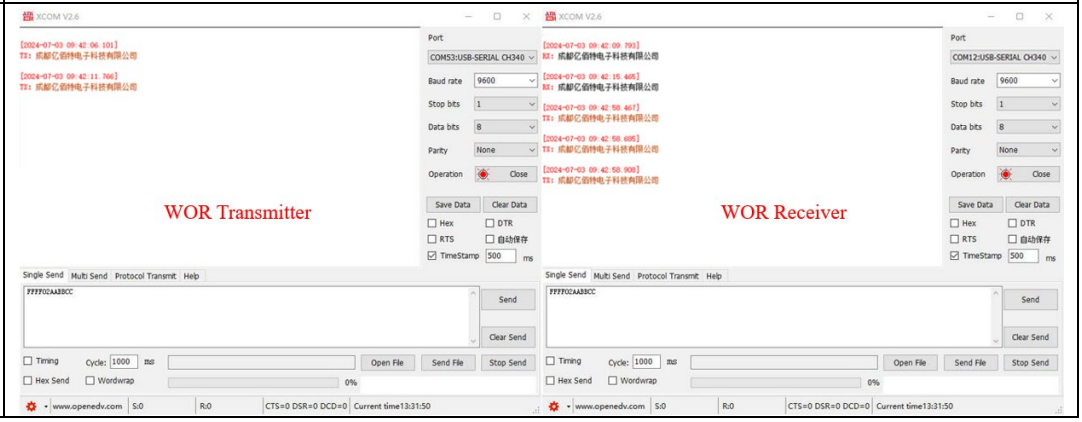



Figure 3Example of relay mode

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### 3.1.2 WOR mode use (M1, M0 pins set to 0,1)

| Serial number | Steps to use WOR mode |
|---|---|
| 1. Modify the parameters of the radio through the host computer: modify the radio WOR role in the configuration mode ( M1, M0 pins are set to 1, 0), and write the parameters to complete the modification . |  |
| 2. The radio working mode is changed to WOR mode (M1, M0 pins are set to 0, 1): The WOR Transmitter sends data to the WOR receiving radio, but the WOR receiving radio cannot send data to the Receiver. |  |

### 3.1.3 Configuration mode use (M1, M0 pins set to 1, 0)

1) The figure below shows the display interface of the host computer for radio configuration. Users can switch to command mode through M0 and M1 to quickly configure and read parameters on the host computer.






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2) In the configuration host computer, the radio address, frequency channel, network ID, and key are all displayed in decimal mode; the value range of each parameter is:

   Network address: 0-65535

   Frequency channel: 0～83

   Network ID: 0-255

   Key: 0-65535

3) When users use the host computer to configure the relay mode, they need to pay special attention to the fact that the parameters in the host computer are displayed in decimal mode, so the radio address and network ID need to be converted when filling in;

   If the network ID input by transmitter A is 02 and the network ID input by receiver B is 10, when repeater R sets the radio address, the hexadecimal value 0X020A is converted to the decimal value 522 as the radio address filled in by repeater R;

   That is, the radio address value that the relay end R needs to fill in is 522.

4) Remote configuration: Remotely read and modify radio parameters through the host computer: Radio A and Radio B must have the same parameters to perform remote configuration . For example: Radio A is in configuration mode, and Mode Group B is in general mode. Radio A can use the host computer to open remote configuration and read parameters.

### 3.1.3 Standby mode use (M1, M0 pins set to 1,1)

- For standby mode, just set the M1 and M0 pins to 1, 1.

## 3.2 Radio Reset

- After the radio is reset, it will perform a hardware self-check, set the working mode according to the user parameters, and start normal operation;

## 3.3 Single point wake-up

- The following measurement parameters are all default parameters, only the address and WOR role are changed
- The radio supports a single-point wake-up function, which can wake up a radio alone without waking up all radios. The current consumption diagram of the receiving device when it is the target device is shown in Figure 1 below, and the other non-target devices will re-enter the sleep state as shown in Figure 2.
- The radio can also partially sleep while receiving a wake-up code, further reducing power consumption.
- Note: When the airspeed is 62.5K, this single-point wake-up function is temporarily unavailable and only the traditional WOR mode can be used.

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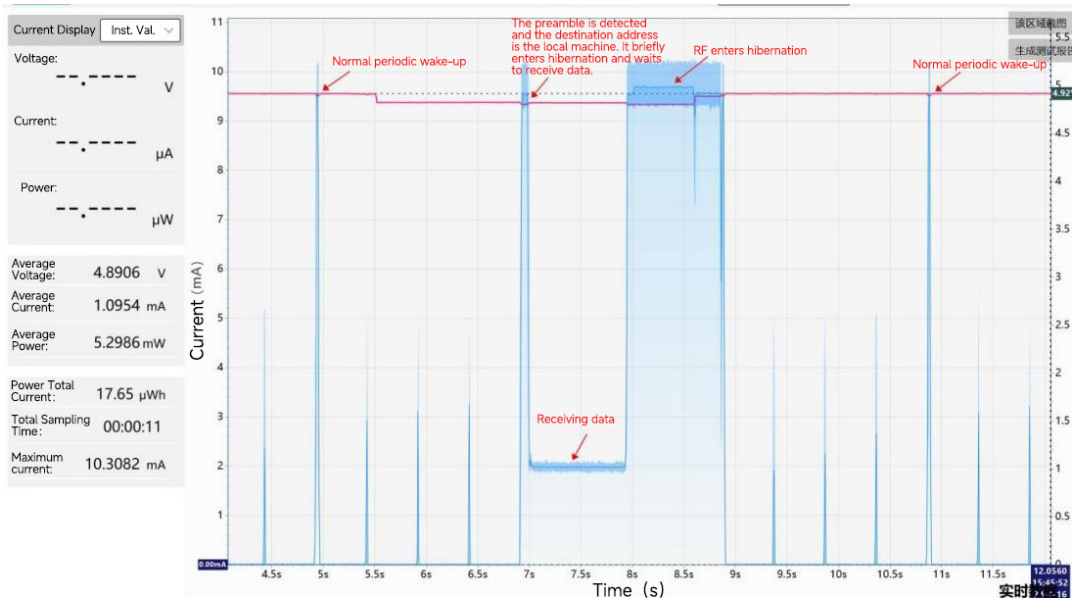



Figure 4Target device current consumption diagram

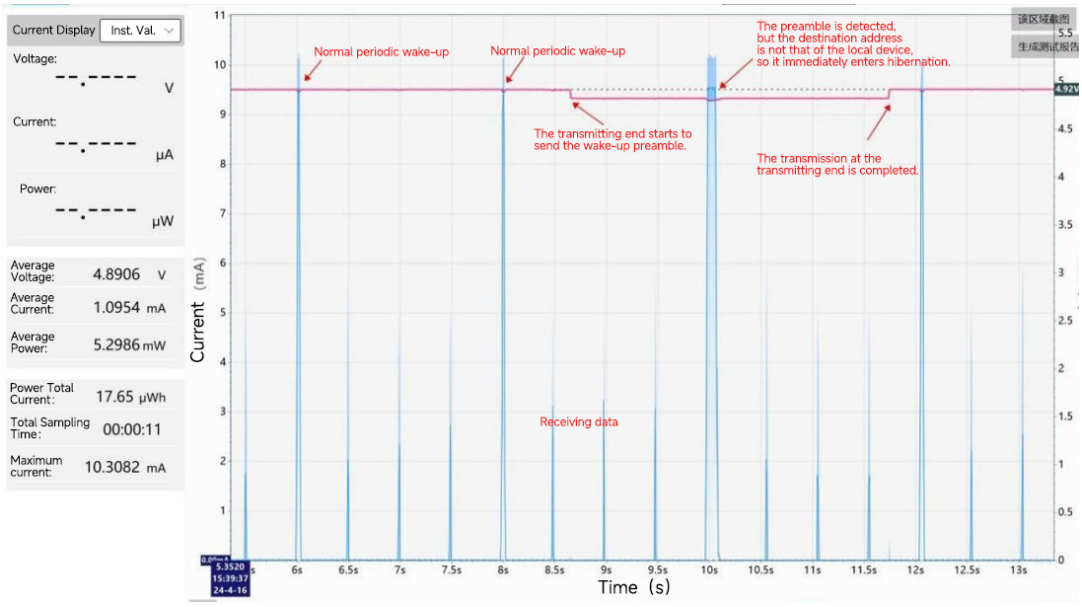



Figure 5Current consumption of non-target devices

- In addition, the radio cannot actively send data through RF by default in WOR receiving mode. In order to solve the problem that users repeatedly switch between WOR receiving mode and transparent transmission mode in the polling structure to achieve response, the radio can enable this function by setting C0 09 02 E8 03 or AT+DELAY=1000. After enabling this function, users can send wireless data through UART within 1000 ms after receiving data in WOR receiving mode.
- HEX instruction (C0 09 02 E8 03): C0 is the write command, 09 is the register start address, 02 is the length, 0x03E8 is the set delay, the maximum value 0xFFFF is 65535ms, and setting it to 0 will turn off the wake-up delay.

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# 4. Register read and write control

## 4.1 Instruction Format

Configuration mode (mode 2: M1=1, M0=0 ), the supported command list is as follows ( **when setting, only 9600, 8N1 format is supported** ):

| Serial number | Instruction Format | Detailed description |
|---|---|---|
| 1 | Setting Registers | Instruction: C0+starting address+length+parameter<br>Response: C1+starting address+length+parameters<br><br>Example 1: Restore factory default parameters<br>Instruction start address length parameter<br>Send: C0 0 0 0 9 00 00 00 60 20 17 03 00 00<br>Returns: C1 0 0 0 9 00 00 00 60 20 17 03 00 00<br>Example 2: Configure the radio address (0x1234), network address (0x00), serial port (9600 8N1), and airspeed ( 2.4 K) at the same time<br>Send: C0 00 04 12 34 00 6 0<br>Return: C1 00 04 12 34 00 6 0 |
| 2 | Read Register | Instruction: C1+starting address+length<br>Response: C1+starting address+length+parameters<br><br>Example 1: Read all setting parameters<br>Instruction start address length parameter<br>Send: C1 0 0 0 9<br>Returns: C1 0 0 0 9 00 00 00 60 20 17 03 00 00<br>Example 2: Read the radio address, network address, serial port, and airspeed simultaneously<br>Send: C1 00 04<br>Return: C1 00 04 12 34 00 6 0 |
| 3 | Setting up temporary registers | Instruction: C2 + starting address + length + parameter<br>Response: C1 + start address + length + parameter<br><br>Example 1: Configure the channel to 0x09<br>Instruction start address length parameter<br>Send: C2 05 01 09<br>Return: C1 05 01 09<br>Example 2: Configure the radio address (0x1234), network address (0x00), serial port (9600 8N1), and airspeed ( 2.4 K) at the same time<br>Send: C2 00 04 12 34 00 6 0<br>Return: C1 00 04 12 34 00 6 0 |
| 4 | Wireless Configuration | Instruction: CF CF + regular instruction<br>Response: CF CF + normal response<br><br>Example 1: The wireless configuration channel is 0x09<br>Wireless command header command start address length parameter<br>Send: CF CF C0 05 01 09<br>Return: CF CF C1 05 01 09<br>Example 2: Wireless configuration of radio address (0x1234), network address (0x00), serial port (9600 8N1), airspeed ( 2.4 K)<br>Send: CF CF C0 00 04 12 34 00 6 0<br>Return: CF CF C1 00 04 12 34 00 6 0 |
| 5 | Format Error | Format Error Response<br>FF FF FF / " =ERR " |

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## 4.2 Register Description

<table>
<tr><th>Serial number</th><th>Read and Write</th><th>name</th><th colspan="5">describe</th><th>Remark</th></tr>
<tr><td>00H</td><td>Read /Write</td><td>ADD H</td><td colspan="5">ADDH (default 0)</td><td rowspan="2">The high byte and low byte of the radio address . When the radio address is equal to FFFF, it can be used as a broadcast and monitoring address.</td></tr>
<tr><td>01H</td><td>Read /Write</td><td>ADD L</td><td colspan="5">ADDL (default 0)</td></tr>
<tr><td>02H</td><td>Read /Write</td><td>NETI D</td><td colspan="5">NETID (default 0)</td><td>Network address, used to distinguish networks ;<br>When communicating with each other, they should be set to the same.</td></tr>
<tr><td rowspan="20">0 3H</td><td rowspan="20">Read /Write</td><td rowspan="20">REG0</td><td>7</td><td>6</td><td>5</td><td>UART serial port rate (bps)</td><td rowspan="9">The two radio stations communicating with each other can have different serial port baud rates and verification methods ;<br><br>When transmitting large data packets continuously, users need to consider data blocking or even data loss caused by the same baud rate ;<br><br>It is generally recommended that both parties in communication have the same baud rate.</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>The serial port baud rate is 1200</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>The serial port baud rate is 2400</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>The serial port baud rate is 4800</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>The serial port baud rate is 9600 (default)</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>The serial port baud rate is 19200</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>The serial port baud rate is 38400</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>The serial port baud rate is 57600</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>The serial port baud rate is 115200</td></tr>
<tr><td>4</td><td>3</td><td colspan="2">Serial port check digit</td><td rowspan="5">The serial port modes of the two communicating parties can be different ;</td></tr>
<tr><td>0</td><td>0</td><td colspan="2">8 N1 (default)</td></tr>
<tr><td>0</td><td>1</td><td colspan="2">8 O1</td></tr>
<tr><td>1</td><td>0</td><td colspan="2">8 E1</td></tr>
<tr><td>1</td><td>1</td><td colspan="2">8 N1 (equivalent to 0 0 )</td></tr>
<tr><td>2</td><td>1</td><td>0</td><td>Wireless air rate (bps)</td><td rowspan="8">The air rate of both communicating parties must be the same ;<br><br>air rate, the smaller the delay and the shorter the transmission distance.<br>0~2: BW = 250K<br>3~7: BW = 500K</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>Air rate 2.4k (default)</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>Air speed 2.4k</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>Air speed 2.4k</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>Air speed 4.8 k</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>Air speed 9.6 k</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>Air speed 19.2 k</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>Air speed 38.4k</td></tr>
</table>

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1 | 1 | 1 | Air speed 62.5k | |
| 0 4H | Read/ Write | REG1 | 7 | 6 | Subcontracting settings | | The data sent by the user is smaller than the packet length, and the serial port output at the receiving end appears as uninterrupted continuous output ;<br>If the data sent by the user is larger than the packet length, the receiving serial port will output it in packets. |
| | | | 0 | 0 | 2 40 bytes (default) | | |
| | | | 0 | 1 | 1 28 bytes | | |
| | | | 1 | 0 | 6 4 bytes | | |
| | | | 1 | 1 | 3 2 bytes | | |
| | | | 5 | RF Power Mode | | | Users can change the RF power mode according to their needs:<br>1、DCDC mode reduces power consumption by sacrificing sensitivity<br>2、LDO mode improves sensitivity at the expense of power consumption<br>3. DCDC mode can be used for battery-powered devices |
| | | | 0 | DCDC mode | | | |
| | | | 1 | LDO mode (default) | | | |
| | | | 4 | RSSI environment noise enable | | | When enabled, you can send commands in transfer mode or WOR send mode.<br>Let C0 C1 C2 C3 instruction read register;<br>Register 0x00: Current ambient noise RSSI;<br>Register 0X01: RSSI when receiving data last time<br>(The current channel noise is: dBm = -(256 - RSSI));<br>Instruction format: C0 C1 C2 C3 + starting address + read length;<br>Return: C1 + address + read length + read valid value; such as:<br>Send C0 C1 C2 C3 00 01<br>Return C1 00 01 RSSI (address can only start from 00 |
| | | | 0 | Disabled (default) | | | |
| | | | 1 | Enable | | | |
| | | | 3 | 2 | reserve | | The relationship between power and current is nonlinear. When the power is at maximum, the power efficiency is the highest .<br>The current does not decrease in the same proportion as the power decreases. |
| | | | 1 | 0 | Transmit power | | |
| | | | 0 | 0 | 2 0d B m (default) | | |
| | | | 0 | 1 | 18d B m | | |
| | | | 1 | 0 | 1 4d B m | | |
| | | | 1 | 1 | 10d B m | | |
| 0 5H | Read/ Write | REG2 | Channel control (CH)<br>0-83 represent a total of 8 4 channels | | | | Actual frequency = 410.125 + CH * 1M |
| 0 6H | Read/ Write | REG3 | 7 | Enable RSSI Byte | | | When enabled, the radio receives wireless data and outputs it through the serial port TXD, followed by an RSSI strength byte. |
| | | | 0 | Disabled (default) | | | |
| | | | 1 | Enable | | | |
| | | | 6 | Transmission method | | | During fixed-point transmission, the radio will recognize the first three bytes of the serial port data as: address high + address low + channel, and use it as the wireless transmission target. |
| | | | 0 | Transparent transmission (default) | | | |
| | | | 1 | Fixed-point transmission | | | |

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<table>
<tr><td rowspan="15"></td><td rowspan="15"></td><td rowspan="15"></td><td>5</td><td colspan="3">Relay function</td><td rowspan="3">When the relay function is enabled, if the destination address is not the radio itself, the radio will initiate a forwarding ;<br>In order to prevent data from being transmitted back, it is recommended to use it in conjunction with the fixed-point mode ; that is, the target address and source address are different.</td></tr>
<tr><td>0</td><td colspan="3">Disable relay functionality (default)</td></tr>
<tr><td>1</td><td colspan="3">Enable relay function</td></tr>
<tr><td>4</td><td colspan="3">LBT (Listen Before Send)</td><td rowspan="3">After enabling, the wireless data will be intercepted before transmitting, which can avoid interference to a certain extent, but may cause data delay; the maximum dwell time of LBT is 2 seconds, and it will be forced to send after reaching the time limit.</td></tr>
<tr><td>0</td><td colspan="3">Disable LBT (default)</td></tr>
<tr><td>1</td><td colspan="3">Enable LBT</td></tr>
<tr><td>3</td><td colspan="3">WOR mode transceiver control</td><td rowspan="5">Only valid for mode 1;<br>1. In WOR receiving mode, the radio can modify the delay time after wake-up, the default time is 0;<br>2. The receiving end needs to send the command C0 09 02 E8 03 in the configuration mode (C0 is the write command, 09 is the register start address, 02 is the length, 0x03E8 is the set delay, the maximum FFFF is 65535ms, and setting it to 0 turns off the wake-up delay.)<br>3. Data can be sent within the delay</td></tr>
<tr><td>0</td><td colspan="3">W OR Receiver (Default)<br>Working in WOR monitoring mode, the monitoring cycle is shown below (WOR cycle), which can save a lot of power consumption.</td></tr>
<tr><td>1</td><td colspan="3">W OR transmitter<br>The radio is turned on for transmission and reception, and a wake-up code is added for a certain period of time when transmitting data.</td></tr>
<tr><td>2</td><td>1</td><td>0</td><td>WOR Cycle</td><td rowspan="9">Only valid for mode 1;<br><br>Period T = ( 1+WOR ) *500ms , maximum 4000ms , minimum 500ms ;<br><br>The longer the WOR monitoring interval is, the lower the average power consumption is, but the greater the data delay is;<br><br>The sender and receiver must be consistent (very important)</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>500 ms</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1000 ms</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1500 ms</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>2000 ms</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>2500 ms</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>3000 ms</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>3500 ms</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>4000 ms</td></tr>
<tr><td>0 7H</td><td>Write</td><td>CRYPT_H</td><td colspan="4">Key high byte (default 0)</td><td rowspan="2">Write only, read returns 0 ;<br>Used for encryption to prevent wireless data in the air from being intercepted by similar radio stations ;<br>The radio station will use these two bytes as calculation factors to transform and encrypt the wireless signal in the air.</td></tr>
<tr><td>0 8H</td><td>Write</td><td>CRYPT_L</td><td colspan="4">Key low byte (default 0)</td></tr>
</table>

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## 4.3 Heartbeat packet function configuration

Configuration mode (mode 2: M1=1, M0=0 ), the supported command list is as follows ( **when setting, only 9600, 8N1 format is supported** ):

| Serial number | Instruction Format | Detailed description |
|---|---|---|
| 1 | Configuration directives | Instruction: C 5 + starting address + length + parameter<br>Configuration command: C5+00+01+00<br><br>**Instruction structure meaning:**<br>● **C5** : Command header<br>● **00** : Register address (00: Heartbeat packet function selection register; 01: Heartbeat packet custom cycle time configuration register; 02: Heartbeat packet custom data configuration.)<br>● **01** : Register data length (the heartbeat packet function selection register data length is 1 byte, the heartbeat packet custom cycle time configuration register data length is 2 bytes, and the heartbeat packet custom data configuration length is up to 128 bytes.)<br>● **00** : Register data |
| 2 | Register Function Description | **00 register data meaning:**<br>● Configuration parameter 00: Disable the heartbeat packet function of the relay module.<br>● Configuration parameter 01: If the relay module serial port does not receive data within the specified period, the relay module will output the customized heartbeat packet data through the serial port.<br>● Configuration parameter is 02: If the relay module does not receive data within the wireless RF cycle, the relay module will send heartbeat packet data wirelessly (the sending address, channel, and network ID depend on the parameters configured by the relay module itself).<br>● Configuration parameter is 03: If the relay module does not receive data within the wireless RF cycle, the relay module will send heartbeat packet data through wireless fixed point (the network ID depends on the configuration parameters of the relay module itself, and the sending address and channel depend on the first three bytes of the custom heartbeat packet data: 2 bytes address + 1 byte channel, followed by the heartbeat wireless sending data). |
| 3 | Example | **01 Register:**<br>The register configuration parameter is two bytes, which configures the cycle time of the heartbeat packet.<br>For example: C5 01 02 00 05 configures the time to 5s<br><br>**02 Register:**<br>Customize heartbeat packet parameter configuration<br>For example: C5 02 05 11 22 33 44 55<br>Configure the heartbeat packet return data to be: 11 22 33 44 55<br><br>**Read instruction:**<br>C6 00 01<br>C6: Command Header<br>00: Register address<br>01: Length of the register data read |
| 4 | Format Error | Format Error Response<br>FF FF FF / " =ERR " |

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## 4.4 Factory default parameters

| Model | Factory default parameter values | | | | | | |
|---|---|---|---|---|---|---|---|
| Radio Model | Frequency | Address | Channel | Air speed | Baud rate | Serial port format | Transmit power |
| EWD95M-400GL20 ( xxx ) | 433.125M Hz | 0x0000 | 0x 17 | 2.4kbps | 9600 | 8N1 | 20dBm |

# 5. AT commands

- Parameter configuration or query using AT commands must be performed in configuration mode;
- AT commands are used in configuration mode. AT commands are divided into three categories: command commands, setting commands and query commands;
- Users can query the AT command set supported by the radio through "AT+HELP=?". The baud rate used by AT commands is 9600 8N1.

When the input parameters exceed the range, they will be restricted. Please do not let the parameters exceed the range to avoid unknown situations.

Note: AT commands do not require carriage return and line feed (\r\n).

## 5.1 AT command table

| Command Instructions | Describe | Example | Example Description |
|---|---|---|---|
| AT+IAP (use with caution) | Enter IAP upgrade mode | AT+IAP | Enter IAP upgrade mode |
| AT+RESET | Device restart | AT+RESET | Device restart |
| AT+DEFAULT | Restore Default Settings | AT+DEFAULT | Restore Default Settings |

| Setting Instructions | Describe | Example | Example Description |
|---|---|---|---|
| AT+UART=baud,parity | Set baud rate and parity | AT+UART=3,0 | Set the baud rate to 9600, 8N1 |
| AT+RATE=rate | Set air speed | AT+RATE=7 | Set the air rate to 62.5K |
| AT+PACKET=packet | Set packet length | AT+PACKET=0 | Set the packet size to 240 bytes |
| AT+WOR=role,period | Set WOR roles and cycles | AT+WOR=0,3 | Set to WOR reception, period is 2000ms |
| AT+POWER=power | Set the transmit power | AT+POWER=0 | Set the transmit power to 20dBm |
| AT+TRANS=mode | Set the sending mode | AT+TRANS=1 | Set to fixed point mode |
| AT+ROUTER=router | Set Repeater Mode | AT+ROUTER=1 | Set to Repeater Mode |
| AT+DRSSI=data_rssi | Setting data RSSI output function | AT+DRSSI=1 | Receive data RSSI function is enabled |
| AT+ERSSI=env_rssi | Setting the environment RSSI reading function | AT+ERSSI=1 | The ambient RSSI reading function is enabled |

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| | | | |
|---|---|---|---|
| AT+LBT=lbt | Setting the channel monitoring function | AT+LBT=1 | Channel monitoring function is enabled |
| AT+LDO=ldo | Set LDO power mode switch | AT+LDO=1 | Set the RF to LDO mode |
| AT+ADDR=addr | Set the station address | AT+ADDR=1234 | Set the radio address to 1234 |
| AT+CHANNEL=channel | Set the radio working channel | AT+CHANNEL=23 | Set the frequency to 433.125M |
| AT+NETID=netid | Set Network ID | AT+NETID=2 | Set the network ID to 2 |
| AT+KEY=key | Set the station key | AT+KEY=1234 | Set the radio key to 1234 |
| AT+DELAY=delay | Set the wake-up delay sleep time, and the single-point wake-up mode can restore data within the time. | AT+DELAY=1000 | Set the wake-up delay sleep time to 1000ms, and the single-point wake-up mode can restore data within the time. |
| AT+SEARCH=search | Setting the airspeed adaptation function (The airspeed of both parties cannot be 2.4K) | AT+SEARCH=search | Turn on the airspeed adaptive function. Communication is possible even if the airspeed is not 2.4K |

| Query command | describe | Return to example | Example Description |
|---|---|---|---|
| AT+HELP=? | Query AT command table | | Return to AT command table |
| AT+DEVTYPE=? | Check the radio model | DEVTYPE=EWD95M-400GL20(485) | Return to radio model |
| AT+FWCODE=? | Query firmware code | FWCODE=7484-1-10 | Returns the firmware version |
| AT+UART=? | Query baud rate and checksum | AT+UART=3,0 | The return baud rate is 9600, 8N1 |
| AT+RATE=? | Query air speed | AT+RATE=0 | The return air rate is 2.4K |
| AT+PACKET=? | Query packet length | AT+PACKET=0 | The return packet is 240 bytes |
| AT+WOR=? | Query WOR roles and cycles | AT+WOR=0,1 | The return is WOR reception, the cycle is 1000ms |
| AT+POWER=? | Query the transmit power | AT+POWER=0 | The return transmission power is 20dBm |
| AT+TRANS=? | Query sending mode | AT+TRANS=1 | Return to fixed-point mode |
| AT+ROUTER=? | Query relay mode | AT+ROUTER=1 | Return to relay mode |
| AT+DRSSI=? | Query RSSI data output enable | AT+DRSSI=1 | Data RSSI function enable |
| AT+ERSSI=? | Query and read RSSI function enable | AT+ERSSI=1 | RSSI reading function enabled |
| AT+LBT=? | Query whether the channel monitoring function is enabled | AT+LBT=1 | Channel monitoring function enabled |
| AT+LDO=? | Query the RF power mode status | AT+LDO=0 | RF works in DCDC mode |
| AT+ADDR=? | Query the radio station address | AT+ADDR=1234 | The returned radio address is 1234 |
| AT+CHANNEL=? | Query the radio working channel | AT+CHANNEL=23 | The returned frequency is 433.125M |
| AT+NETID=? | Query Network ID | AT+NETID=2 | The returned network ID is 2 |
| AT+KEY=? | Query the radio key | AT+KEY=0 (cannot read) | Returns the radio key as 0 |

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| | | | |
|---|---|---|---|
| AT+DELAY=? | Query WOR delayed sleep time | AT+DELAY=1000 | Return WOR delay sleep time is 1000ms |
| AT+SEARCH=? | Query airspeed adaptation | AT+SEARCH=1 | Return airspeed adaptation is on |
| AT+UID=? | Query unique serial number | AT+UID=xx | Returns the unique serial number xx |

## 5.2 AT parameter analysis

When the serial port receives the correct command, the serial port will return "Command = OK", otherwise it will return "=ERR"

| Command parameters | Parameter meaning |
|---|---|
| Baud (serial port baud rate) | 0:1200 1:2400 2:4800 3:9600<br>4:19200 5:38400 6:57600 7:115200 |
| Parity (serial port check bit) | 0:8N1 1:8O1 2:8E1 3:8N1 |
| Rate | 0:2.4K 1:2.4K 2:2.4K 3:4.8K<br>4:9.8K 5:19.2K 6:38.4K 7:62.5K |
| Packet (packet length) | 0:240 1:128 2:64 3:32 |
| Role | 0: Receive 1: Send |
| Period | 0: 500 ms 1:10 00 ms 2:1 500 ms 3: 20 00 ms<br>4:2 500 ms 5: 30 00 ms 6:3 500 ms 7: 4000ms |
| Power (transmit power) | 0:20dBm 1:18dBm 2:14dBm 3:10dBm |
| Mode (Transmission Mode) | 0: Transparent 1: Fixed point |
| Router (Relay Mode) | 0: Disable 1: Enable |
| Data_rssi (Data RSSI) | 0: Disable 1: Enable |
| Env_rssi (Environmental RSSI) | 0: Disable 1: Enable |
| Lbt (channel listening) | 0: Disable 1: Enable |
| Ldo (LDO mode switch) | 0:DCDC 1:LDO |
| Addr (radio station address) | Radio address 0~65535 (decimal) |
| Channel (Radio Channel) | Radio channel 0~83 (decimal) |
| Netid (Network ID) | Radio network 0~255 (decimal) |
| Key | Radio key 0~65535 (decimal) |
| Delay (WOR delay sleep) | Delay sleep 0~65535 (decimal) |
| Search (airspeed adaptation) | 0: Disable 1: Enable |
| Baud (serial port baud rate) | 0:1200 1:2400 2:4800 3:9600<br>4:19200 5:38400 6:57600 7:115200 |

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# 6. Use of relay networking mode

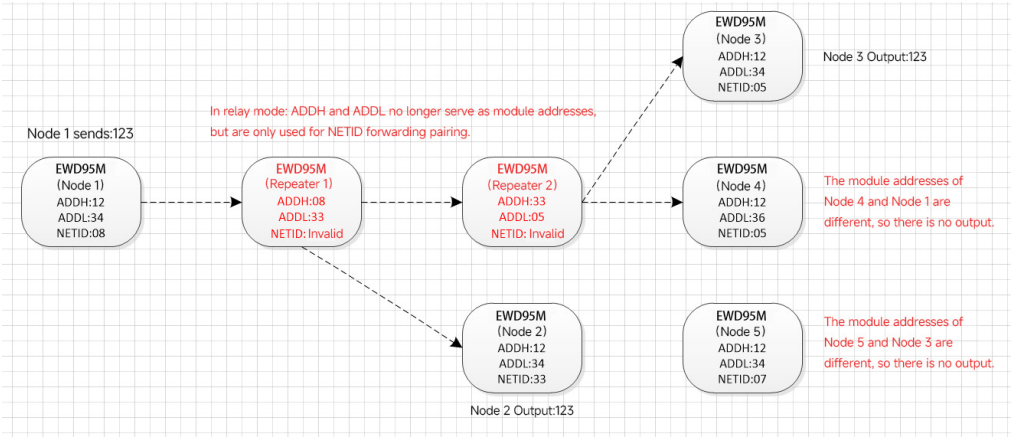
| Serial number | Relay Mode Description |
|---|---|
| 1 | After setting the relay mode through the configuration mode, switch to the general mode and the relay starts working. |
| 2 | In the relay mode, ADDH and ADDL are no longer used as radio addresses, but are forwarded and paired with NETID respectively. If a signal is received from one network, it is forwarded to the other network .<br>The repeater's own network ID is invalid. |
| 3 | In repeater mode, the radio cannot send or receive data and cannot perform low-power operation. |
| 4 | When the user enters other modes from Mode 3 (Standby Mode) or during the reset process, the radio will reset the user parameters. |

Relay networking rules:

3、Forwarding rules, the relay can forward data bidirectionally between two NETIDs.

4、In repeater mode, ADDH\ADDL is no longer used as the radio address, but as NETID for forwarding pairing.

As shown in the Figure:




①First-level relay

"Node 1" NETID is 08.

"Node 2" NETID is 33.

The ADDH\ADDL of relay 1 are 08 and 33 respectively.

So the signal sent by node 1 (08) can be forwarded to node 2 (33)

At the same time, the addresses of node 1 and node 2 are the same, so the data sent by node 1 can be received by node 2.

② Secondary relay

The ADDH\ADDL of relay 2 are 33, 05 respectively.

So relay 2 can forward the data of relay 1 to network NETID:05.

Therefore, nodes 3 and 4 can receive data from node 1. Node 4 outputs data normally, but node 3 does not output data because its address is different from that of node 1.

③Two-way relay

As shown in the configuration figure: the data sent by node 1 can be received by nodes 2 and 4, and the data sent by nodes 2 and 4 can also be received by node 1.

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# 7. Host computer configuration instructions

- The figure below shows the configuration interface of the host computer for EWD95M-400GLxx(xxx) . Users can switch to configuration mode by pressing the MODE button to quickly configure and read parameters on the host computer.




- In the configuration host computer, the radio address, frequency channel, network ID, and key are all displayed in decimal mode, and the value range of each parameter is:
  Network address: 0-65535
  Frequency channel: 0～83
  Network ID: 0-255
  Key: 0-65535
- When users use the host computer to configure the relay mode, they need to pay special attention to the fact that the parameters in the host computer are displayed in decimal mode, so the radio address and network ID need to be converted when filling in the decimal system.
  If the network ID input by transmitter A is 02 and the network ID input by receiver B is 10, when repeater R sets the radio address, the hexadecimal value 0X020A is converted to the decimal value 522 as the radio address filled in by repeater R. That is, the radio address value that repeater R needs to fill in is 522.

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# 8. Firmware Upgrade Instructions

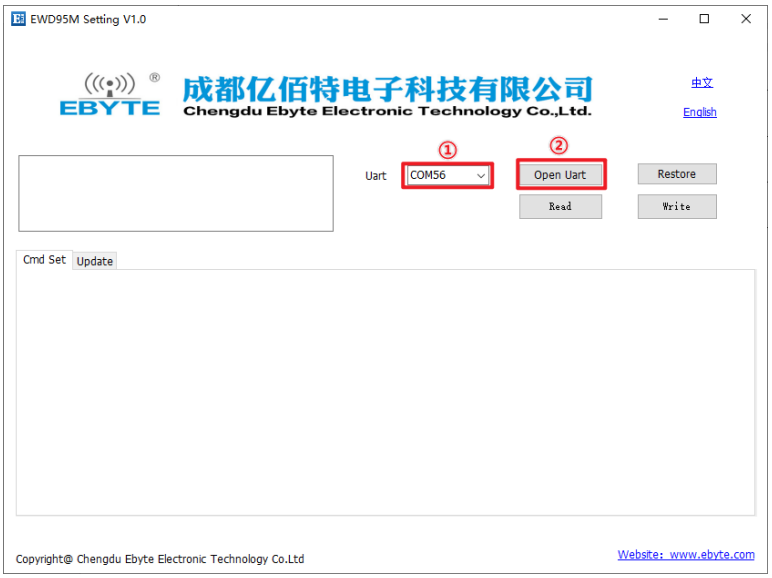
If the customer needs to upgrade the firmware, he needs to find the corresponding BIN file provided by the official, and then use the official host computer to upgrade the firmware. Under normal circumstances, users do not need to upgrade the firmware, and please do not use the "AT+IAP" command.

First connect RS485/RS232/TTL, then send the "AT+IAP" command in configuration mode to enter the upgrade mode. If you need to exit the IAP upgrade mode, you need to keep the power on and wait for 60 seconds, the program will automatically exit, otherwise it will enter the upgrade mode infinitely even if it is restarted.

After entering the upgrade mode, the baud rate will automatically switch to 115200 until it automatically exits, during which time there will be log output.

- **Host computer command upgrade guide**

1. Make the radio enter configuration mode by changing M0 and M1 (note: the baud rate in configuration mode is 9600);
2. Open the official website to configure the host computer "EWD95M Setting V1.0", select Serial Port > Open Serial Port;




3. Click Read Parameters to view the radio station information in the left window of the host computer;



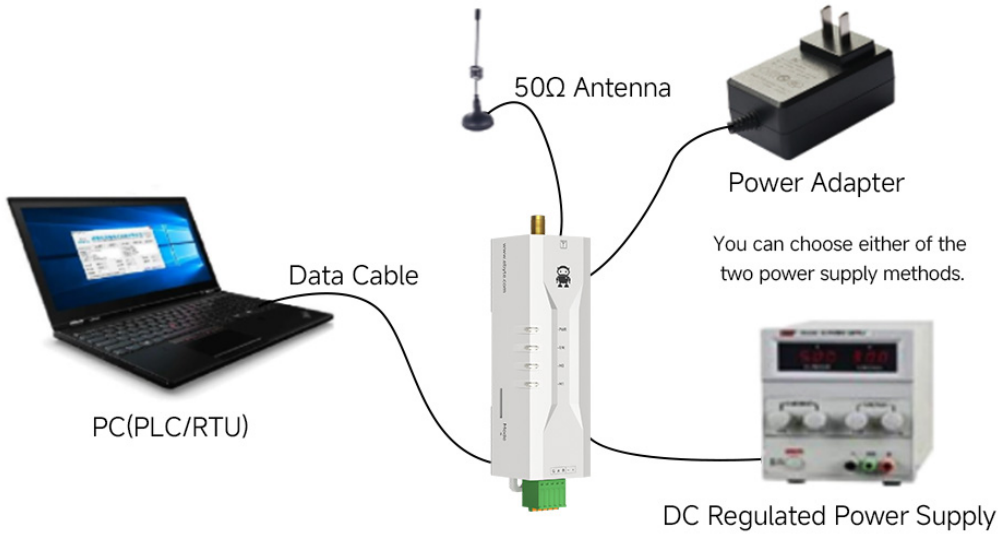

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4. Click Firmware Upgrade > Click Open File (select the firmware .bin file) > Click Start Downloading;




# 9. Program the Radio Station




| Working Mode | M1 | M0 | Notes |
|---|---|---|---|
| Configuration Mode | Indicator light on | Light off | The radio can only be programmed using the configuration software in the current mode |

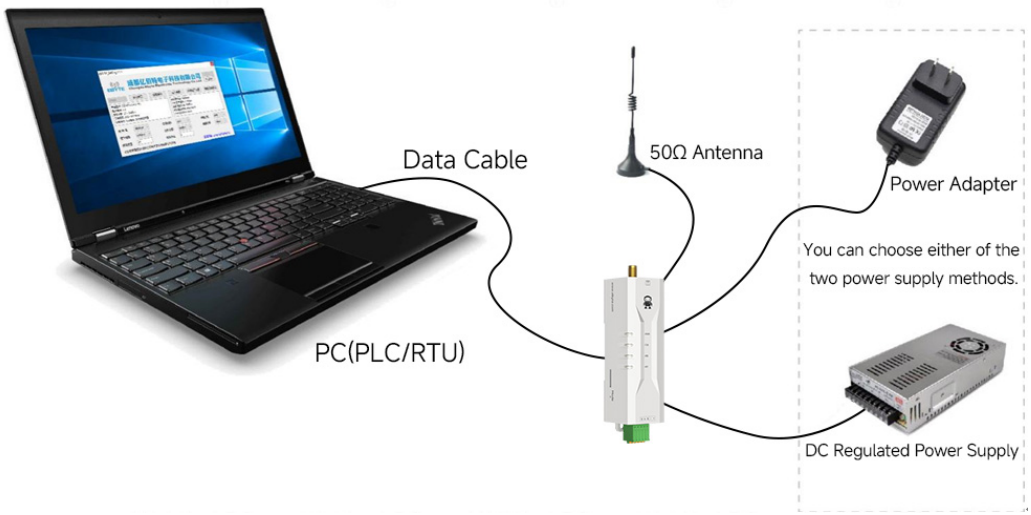
1、 Programming can only be performed in specific working modes (see the table above). If programming fails, please confirm whether the radio working mode is correct.

2、 If no complex programming is required, just open the EWD95M-400GLxx(xxx) configuration software and modify the relevant parameters.

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# 10. Connection diagram in testing and actual application




# 11. Related Products

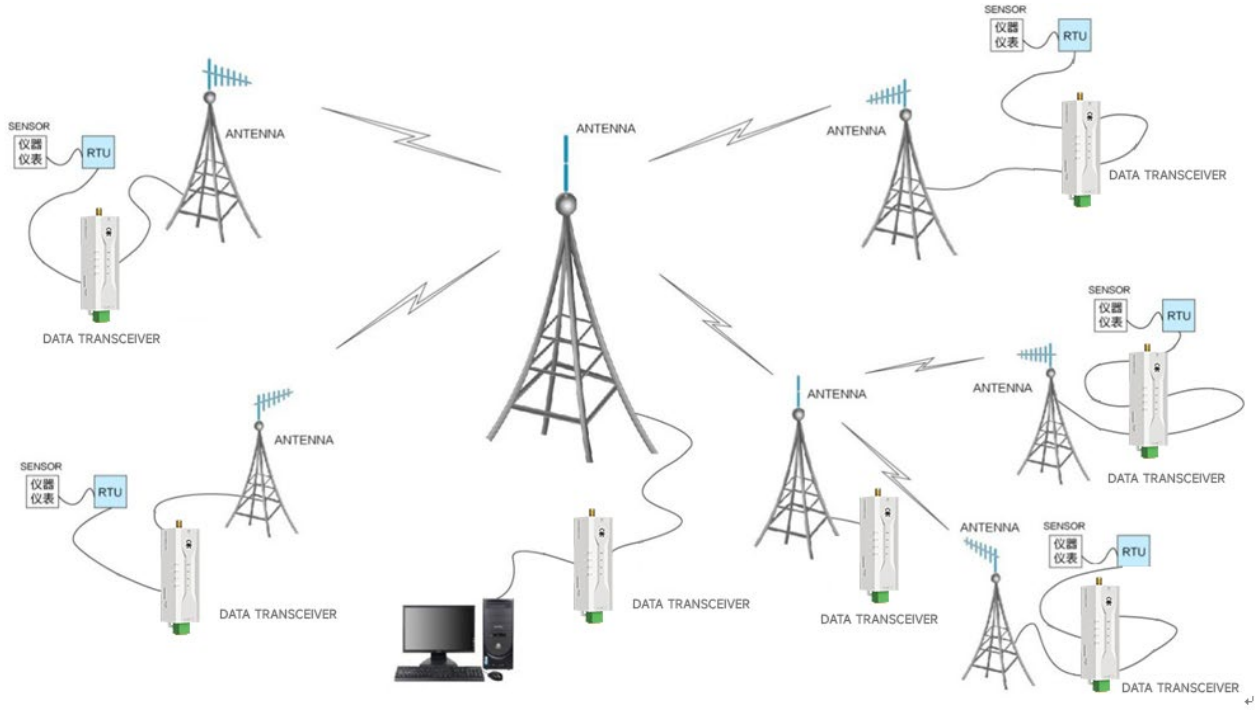
| Product Model | Interface Type | Operating frequency MHz | Transmit power dBm | Communication distance km | Features |
|---|---|---|---|---|---|
| E90-DTU(900L20)-V8 | RS232 RS485 | 862～930 | 20 | 3 | LoRa spread spectrum, long-distance anti-interference |
| E90-DTU(433L37)-V8 | RS232 RS485 | 410～441 | 37 | 20 | LoRa spread spectrum, long-distance anti-interference |
| E90-DTU(433L20)-V8 | RS232 RS485 | 410～441 | 20 | 3 | LoRa spread spectrum, long-distance anti-interference |
| E90-DTU(433L30)-V8 | RS232 RS485 | 410～441 | 30 | 8 | LoRa spread spectrum, long-distance anti-interference |
| E95-DTU(433L20-485)-V8 | RS485 | 410～441 | 20 | 3 | LoRa spread spectrum, long-distance anti-interference |
| E95-DTU(433L30-485)-V8 | RS485 | 410～441 | 30 | 8 | LoRa spread spectrum, long-distance anti-interference |
| E96-DTU(433L20-485)-V8 | RS485 | 410～441 | 20 | 3 | LoRa spread spectrum, long-distance anti-interference |
| E96-DTU(433L30-485)-V8 | RS485 | 410～441 | 30 | 8 | LoRa spread spectrum, long-distance anti-interference |
| E800-DTU(400SL20-485)-V8 | RS485 | 410～441 | 20 | 3 | LoRa spread spectrum, long-distance anti-interference |
| E800-DTU(400SL30-485)-V8 | RS485 | 410～441 | 30 | 8 | LoRa spread spectrum, long-distance anti-interference |

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# 12. Practical Application Fields

Ebyte digital radio is suitable for all kinds of point-to-point and point-to-multipoint wireless data transmission systems, such as smart home, Internet of Things transformation, power load monitoring, distribution network automation, hydrological and water conditions monitoring, tap water network monitoring, urban street light monitoring, air defense alarm control, railway signal monitoring, railway water supply centralized control, oil and gas supply network monitoring, GPS positioning system, remote meter reading, electronic crane scale, automatic target reporting, earthquake monitoring, fire prevention and theft prevention, environmental monitoring and other industrial automation systems, as shown in the following figure:




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# 13. Precautions for use

1. Do not operate this radio in flammable places (such as coal mines) or near explosive and dangerous objects (such as detonators).
2. A suitable DC regulated power supply should be selected, which is required to have strong resistance to high-frequency interference, small ripple, and sufficient load capacity; it is best if it also has overcurrent, overvoltage protection and lightning protection functions to ensure the normal operation of the digital radio station.
3. Do not use the device in an environment that exceeds the environmental characteristics of the digital radio, such as high temperature, humidity, low temperature, strong electromagnetic field, or dusty environment.
4. Do not allow the digital radio to continuously operate at full load, otherwise the transmitter may burn out.
5. The ground wire of the digital radio should be well connected with the ground wire of the external device (such as PC, PLC, etc.) and the ground wire of the power supply, otherwise it is easy to burn out the communication interface, etc.; never plug or unplug the serial port when it is powered on.
6. When testing a digital radio station, a matching antenna or a 50 Ω dummy load must be connected, otherwise the transmitter may be easily damaged. If an antenna is connected, the distance between the human body and the antenna should be more than 2 meters to avoid injury. Do not touch the antenna during transmission.
7. Wireless data transmission stations often have different communication distances in different environments. The communication distance is often affected by temperature, humidity, obstacle density, obstacle volume, and electromagnetic environment. In order to ensure stable communication, it is recommended to reserve more than 50% of the communication distance margin.
8. If the measured communication distance is not ideal, it is recommended to analyze and improve the communication distance based on the antenna quality and antenna installation method. You can also contact support@cdebyte.com for help.
9. When selecting a power supply, in addition to retaining a 50% current margin as recommended, you should also pay attention to the ripple not exceeding 100mV.

# 14. Important Statement

1. Ebyte reserves the final right of interpretation and modification of all contents in this manual.
2. Due to the continuous improvement of the product hardware and software, this manual may be changed without prior notice. The latest version of the manual shall prevail.

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# Revision History

| Version | Revision Date | Revision Notes | Maintainer |
|---|---|---|---|
| 1.0 | 2024-11-26 | Initial release | Lei |
| 1.1 | 2024-12-24 | Modify the size description.<br>Add a description of module interoperability. | Lei |
| 1.2 | 2025-01-22 | Correct the errors in the accompanying illustrations | Lei |

# About Us

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