Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual



EWD95M-xxxGLxx(xxx)

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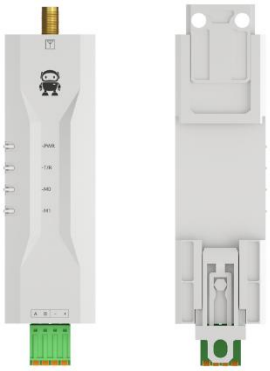
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1. Product Overview

1.1 Product Introduction



EWD95M-xxxGLxx(xxx) ① is a wireless data transmission radio based on domestic LoRa transmission technology . It has multiple transmission modes and operates in 410.125~493.125MHz and 850.125~930.125MHz frequency bands . It supports intercommunication with our E290 series modules. The radio provides a transparent RS485/RS232 interface, adopts a plastic shell, a guide rail installation structure, and supports 8~28V (DC) wide voltage input .

EWD95M-xxxGLxx(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 10 km;

★ 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, supports the 470MHz meter reading frequency band , and also supports the European and American 868/915MHz frequency bands ;

★ 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 each other;

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

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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 8~28V (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 Note: EWD95M-xxxGLxx(xxx) contains many models, please see Section 2.1 of this article for details.

1.3 Quick Start

① You need to prepare two sets of DTU debugging components, including EWD95M-xxxGLxx(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, A+/TX to A/T, B-/RX to B/R.



③ Finally, connect the computer to the two digital radios via USB to RS232/RS485 (or other methods);

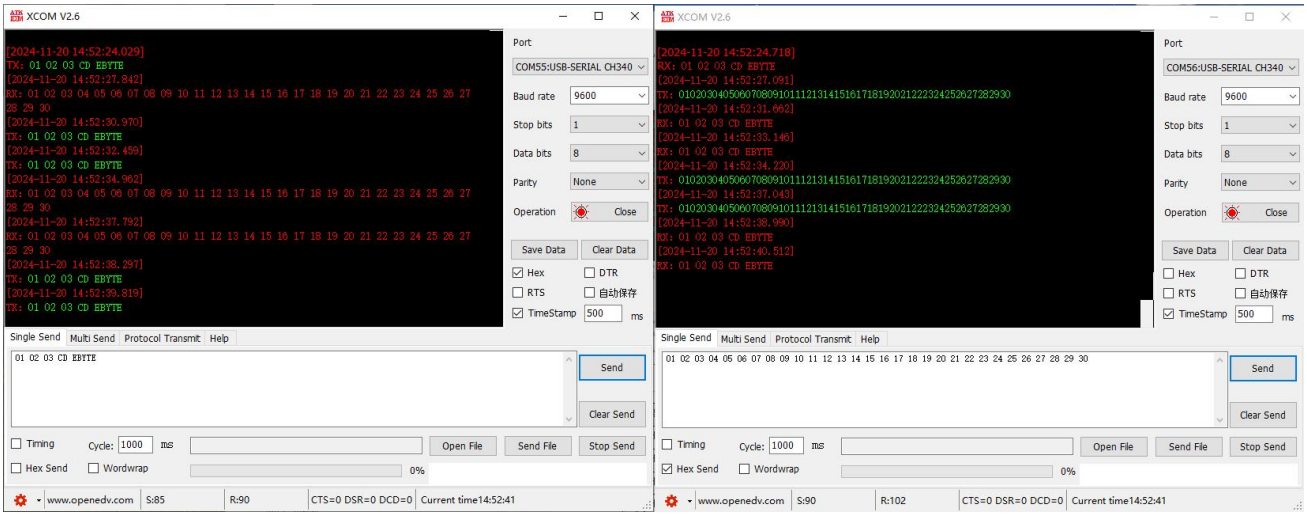


④ Start two serial port debugging assistants, select the serial port baud rate as 9600bps (default) and 8N1, and switch DTU to transmission mode.

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 mode switching are shown in the table below:

Serial number	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

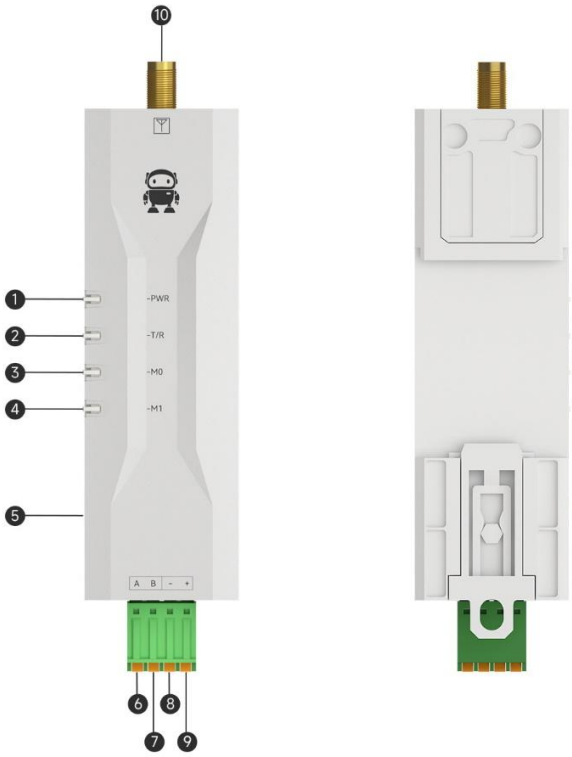
Note: The radio has a power-off saving mode function. Users need to switch to the corresponding mode according to the M1 and M0 indicator lights (effective immediately).

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1.4 Description of each part

1.4.1 RS485 interface



Serial number	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 supply positive (DC 8～28V)
10	ANT	RF Interface	SMA-K, external threaded inner hole.

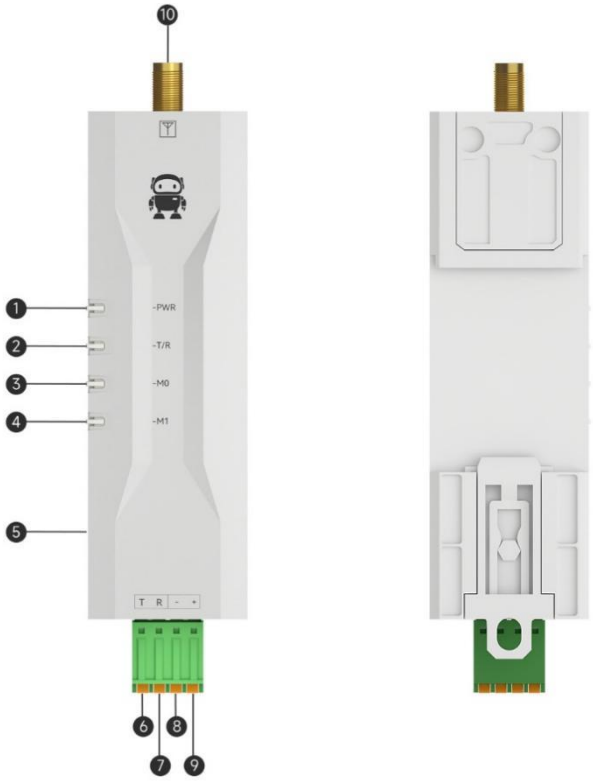
★ Note: If communication is not smooth when the radio is connected to multiple devices, but not when connected to a single device, try connecting a 120Ω resistor in parallel between the 485_A terminal and the 485_B terminal.

★ EWD95M-xxxGLxx(xxx) can be powered by 8~28V (DC) power supply, and the wiring port is connected by terminal block.

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1.4.2 RS232 interface



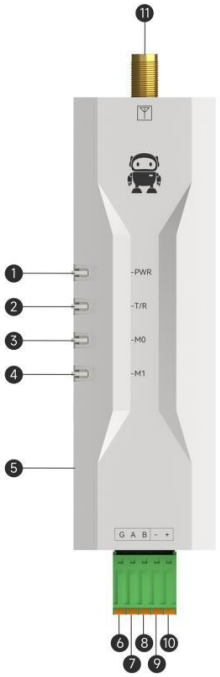
Serial number	name	Function	illustrate
1	PWR	Power indicator	Lights up when the power is on.
2	T/R	Send/Receive Indicator	The flashing light is red when sending data and green when receiving data.
3	MO	Mode indicator	Working mode indicator light.
4	M1	Mode indicator	Working mode indicator light.
5	Mode	Mode switch button	Working mode switching control.
6	T	RS232 bus TX interface	RS232-TX interface
7	R	RS232 bus RX interface	RS232-RX interface
8	-	VCC	Negative power supply
9	+	GND	Power supply positive (DC 8～28V)
10	ANT	RF Interface	SMA-K, external threaded inner hole.

★ EWD95M-xxxGLxx(xxx) can be powered by 8~28V (DC) power supply, and the wiring port is connected by terminal block.

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1.4.3 High protection isolated RS485 interface



Serial number	name	Function	illustrate
1	PWR	power light	Light ates when power is on.
2	T/R	Send / receive the indicator light	Flash light is red when sending data and green when receiving data.
3	MO	Mode indicator light	Operating mode indicator light.
4	M1	Mode indicator light	Operating mode indicator light.
5	Mode	Mode switch button	Working mode switching control.
6	G	GND	Ground.
7	A	The RS485 signal A	Standard RS485 interface.
8	B	The RS485 signal B	Standard RS485 interface.
9	-	GND	DC power input port, voltage line port.
10	+	VCC	DC power input port, voltage line port.
11	ANT	radio frequency interface	SMA-K，External thread inner hole.

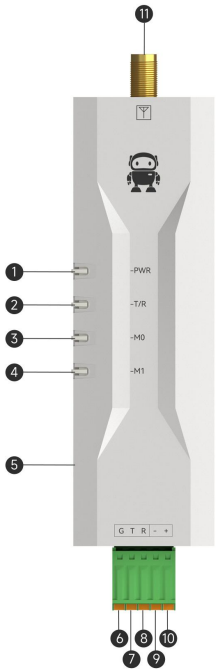
★ Note: When the radio station is connected to multiple devices, but not with a single device, try to parallel 120 Ω resistance between terminal 485_A and 485_B terminals.

★ EWD95M-xxxGLxxP(xxx) can be powered by 8~28V (DC) power supply, and the wiring port is connected by a terminal (2 Pin).

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1.4.4 High protection isolated RS232 interface



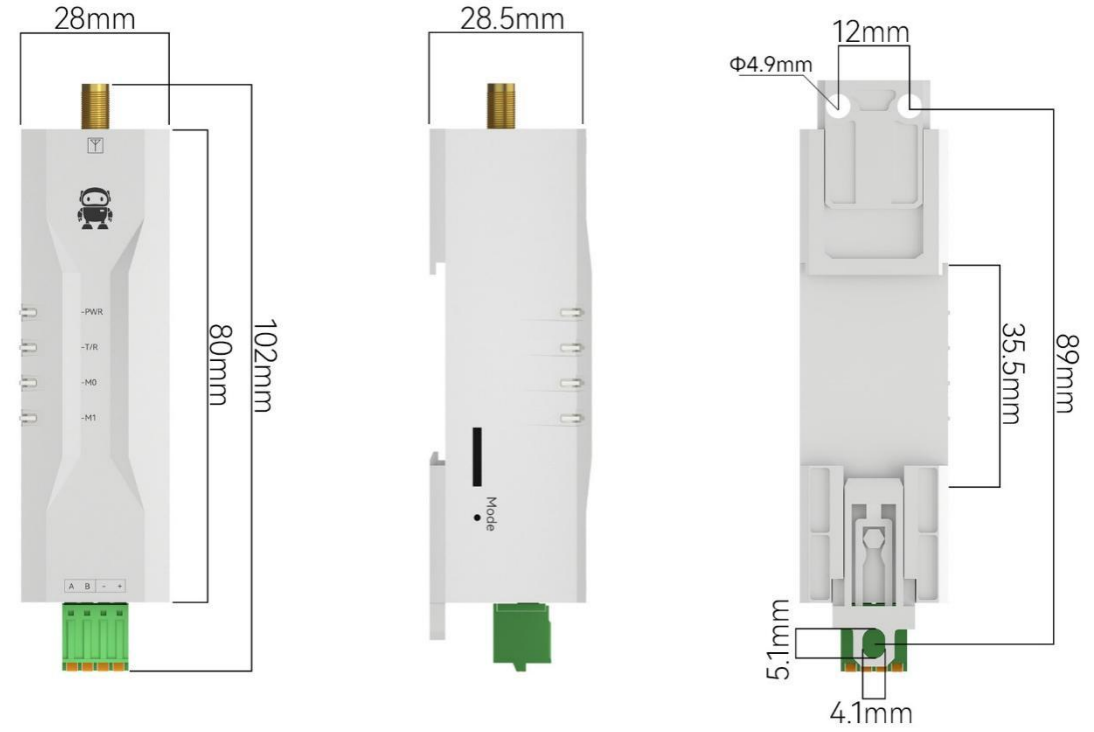
Serial number	name	Function	illustrate
1	PWR	Power light	Light ates when power is on.
2	T/R	Send / receive the indicator light	Flash light is red when sending data and green when receiving data.
3	MO	Mode indicator light	Operating mode indicator light.
4	M1	Mode indicator light	Operating mode indicator light.
5	Mode	Mode switch button	Working mode switching control.
6	G	Signal ground	Anti-interference, grounding.
7	T	The RS232 bus TX interface	RS232 interface The TX interface is connected to the device RX interface.
8	R	The RS232 bus RX interface	RS232 interface The RX interface is connected to the device TX interface.
9	-	GND	DC power input port, voltage line port.
10	+	VCC	DC power input port, voltage line port.
11	ANT	Radio frequency interface	SMA-K，External thread inner hole.

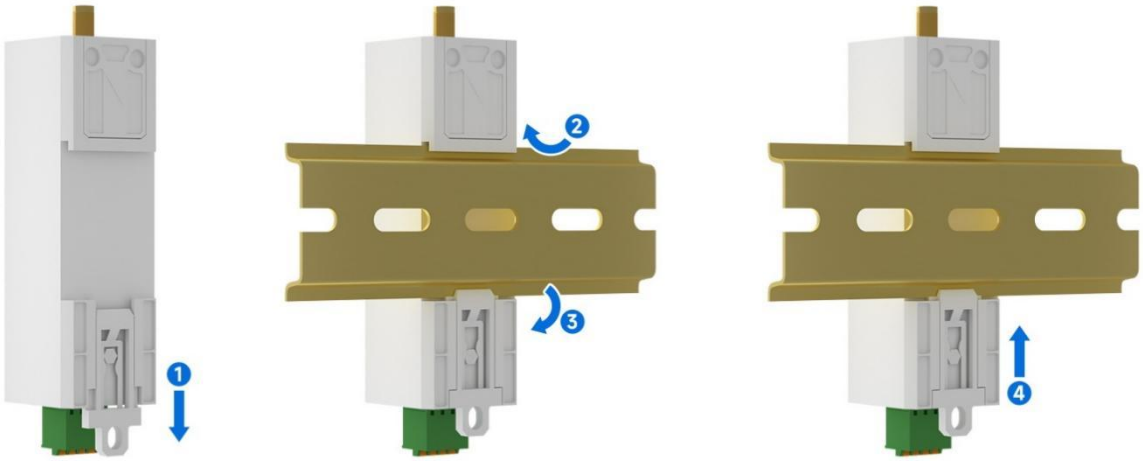
★ EWD95M-xxxGLxxP(xxx) can be powered by 8~28V (DC) power supply, and the wiring port is connected by a terminal (2 Pin).

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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-400GL20(485)	410.125～493.125M	20	5	2.4～62.5k	Domestic LoRa DTU
EWD95M-400GL20(232)					
EWD95M-400GL 3 0(485)	410.125～493.125M	30	10	2.4～62.5k	Domestic LoRa DTU
EWD95M-400GL20P(485)	410.125～493.125M	20	5	2.4～62.5k	High protection isolation domestic LoRa DTU
EWD95M-900GL20P(485)	850.125～930.125M	20	5	2.4～62.5k	High protection isolation domestic LoRa DTU

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

2.2 General Specifications

Serial number	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	8～28V (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 Specifications	Default frequency	Frequency range	Channel spacing	Number of channels
	Hz	Hz	Hz	
EWD95M-400GL xxx (xxx)	433.125M	410.125～493.125M	1M	84
EWD95M-900GL 20P (xxx)	868.125M	850.125～930.125 M	1M	81

★ 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.

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2.4 Transmit Power Level

Model Specifications	0 (factory default)	1	2	3
EWD95M-400GL 20 (xxx)	20dBm	18dBm	14dBm	10dBm
EWD95M-400GL 20 P (xxx)	20dBm	18dBm	14dBm	10dBm
EWD95M-400GL 3 0 (xxx)	30dBm	2 8dBm	2 4dBm	2 0dBm
EWD95M- 900GL 20P (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 Specifications	Default air rate	Number of levels	Air speed rating
	bps		kbps
EWD95M- xxx GL xx (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.

2.6 Current parameters

Model Specifications	Emission current mA			Receive current mA		
	8 V	12V	28V	8 V	12V	28V
EWD95M-433G L20(xxx)	96	6 5	30	10	8	2
EWD95M-400GL 20 P (xxx)	1 01	68	30	19	12	5
EWD95M-400GL 3 0 (xxx)	366	243	107	14	10	5
EWD95M- 900GL 20P (xxx)	104	70	30	19	12	5

★ 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.

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2.7 Sending and receiving length and subcontracting method

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

Notice:

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;

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

DTU has four working modes, which are set by the mode switch button . The details are shown in the following table:

Serial number	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 status 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 .

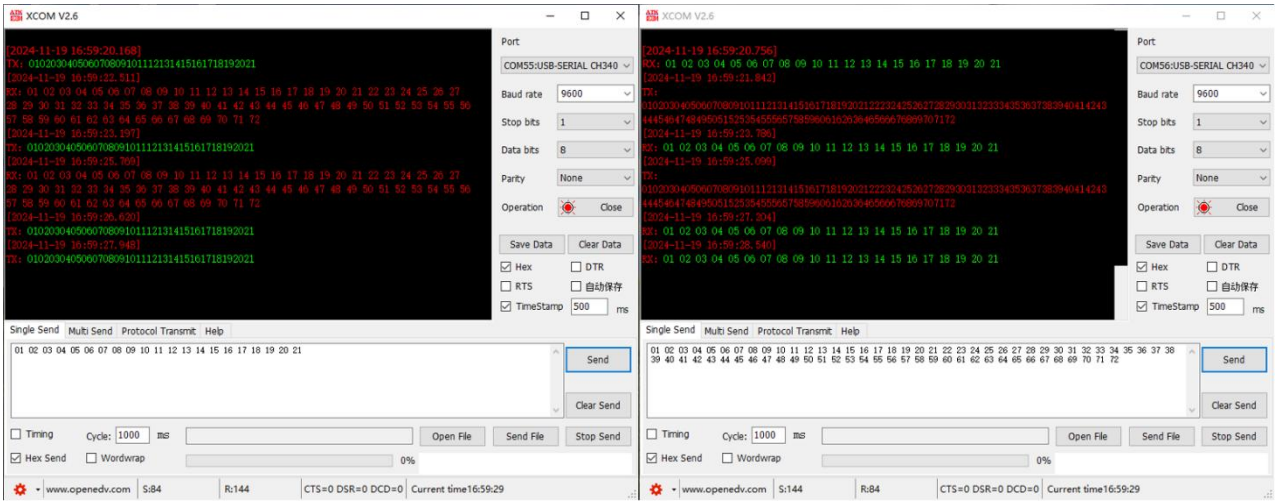
Note: In WOR mode, it is not recommended to use the two airspeeds of 62.5Kbps and 38.4Kbps.

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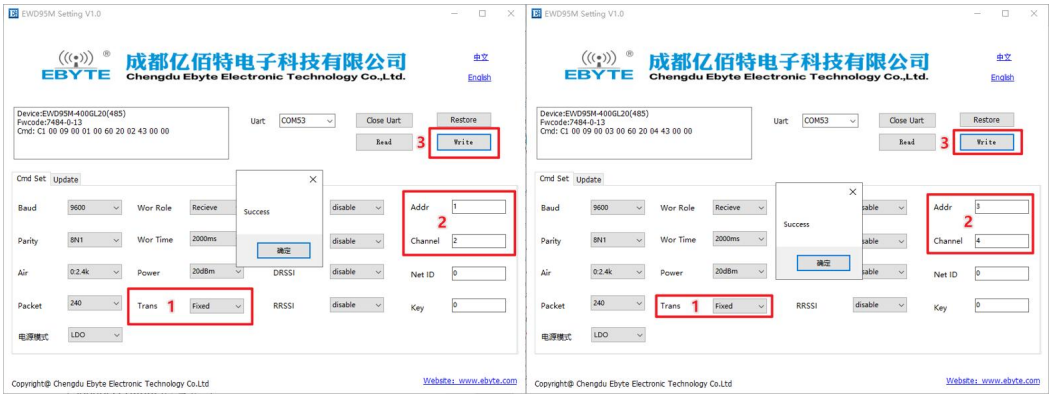
3.1.1 Transfer mode usage

Transparent transmission function : What you send is what you get. You can 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:



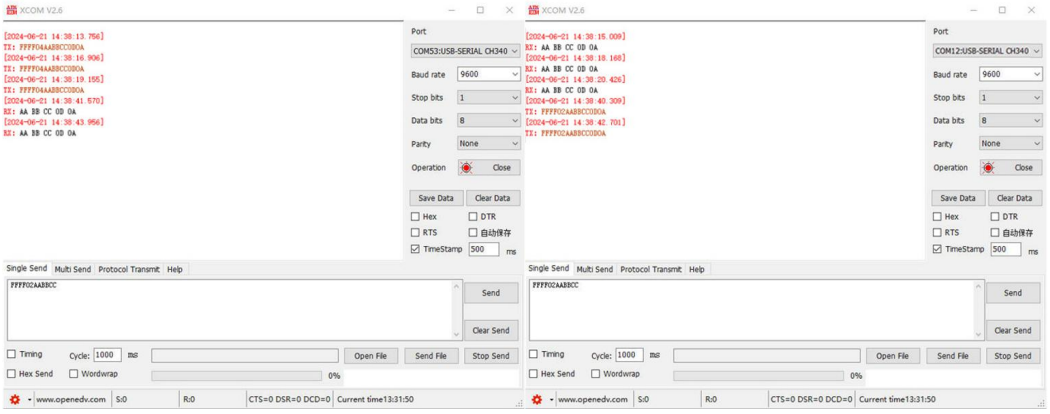
Schematic diagram

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 in the configuration mode , 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 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)	

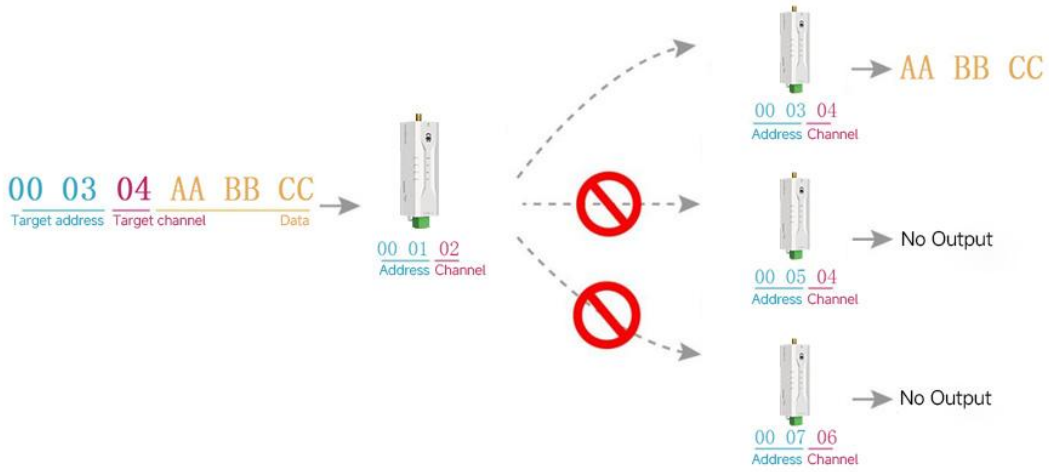


Figure 1 Schematic diagram of fixed-point transmission

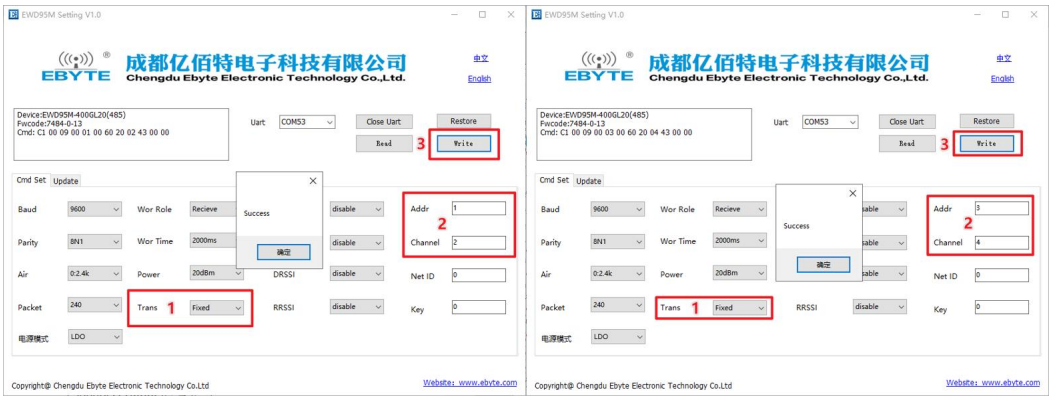
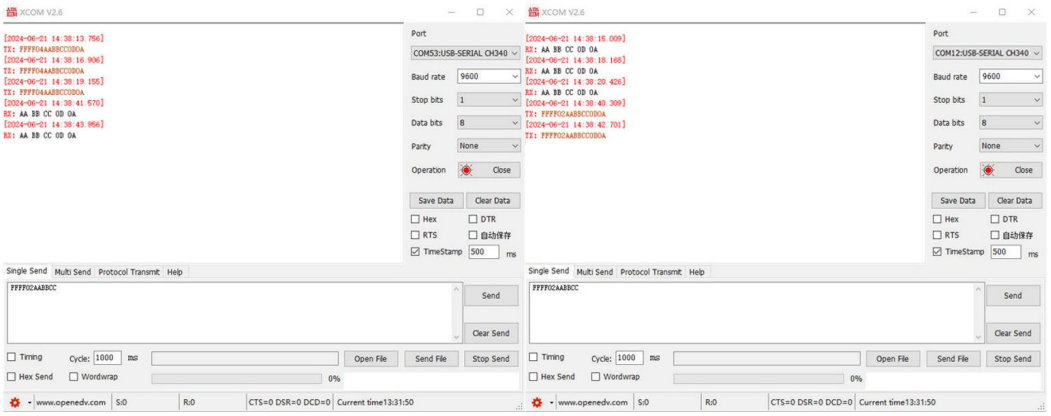
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- Broadcasting function:

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 , 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 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)	

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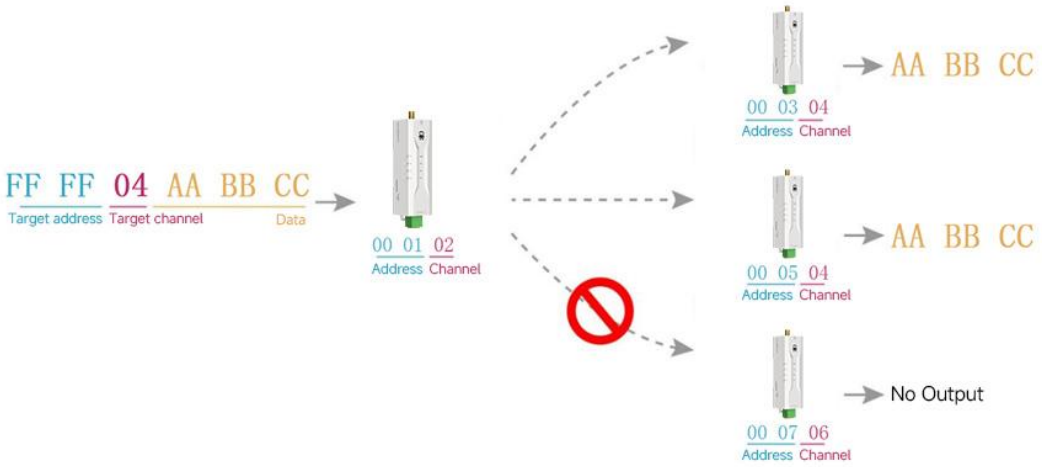


Figure 2 Schematic diagram of fixed-point broadcast transmission

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 of the networks, it is forwarded to the other network . The repeater's own network ID is invalid.
3	In the 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:

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

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.

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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.

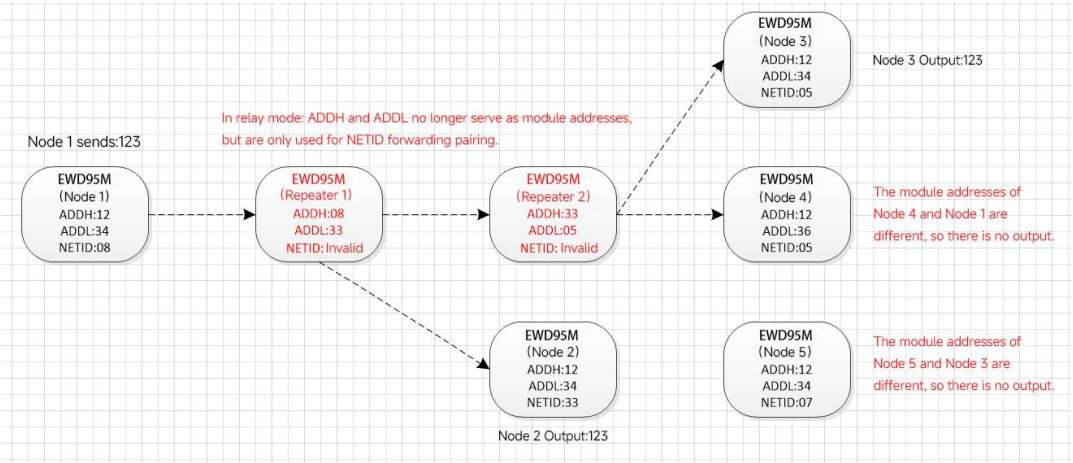
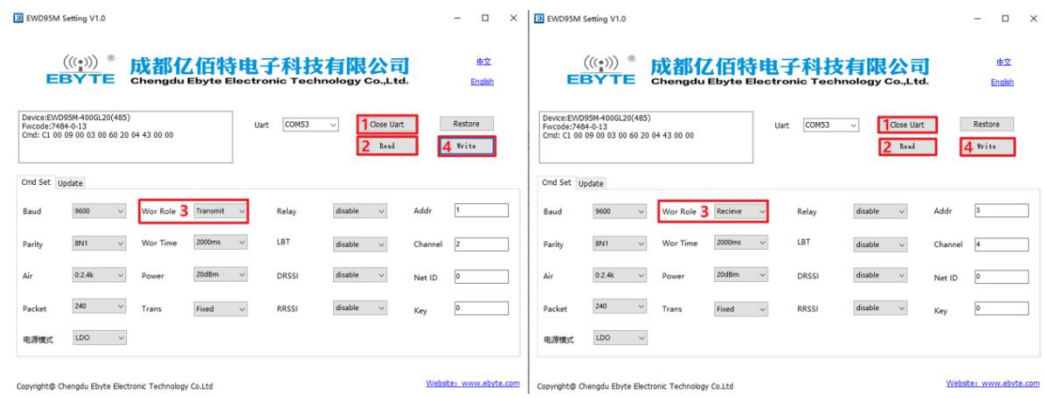
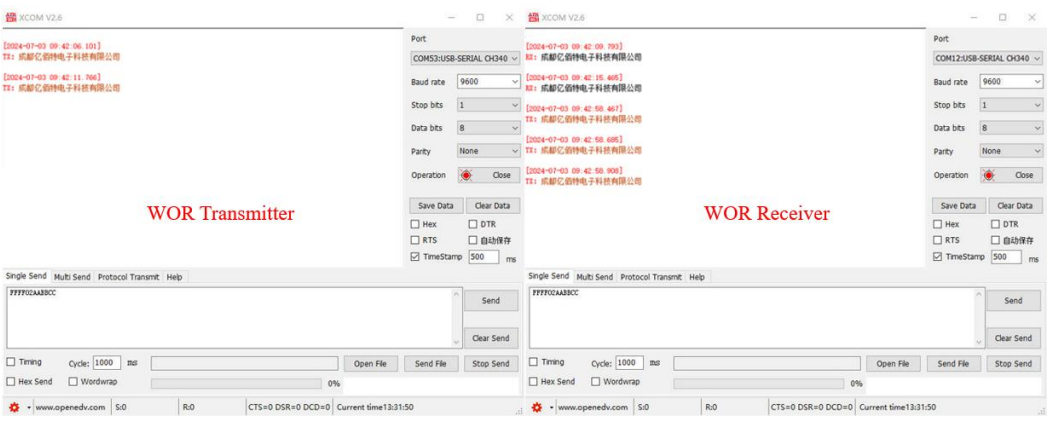


Figure 3 Example of relay mode

3.1.2 Use WOR mode

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 and write the parameters to complete the modification .	
2. The radio working mode is changed to WOR mode: the WOR transmitter radio sends data to the WOR receiver radio, but the WOR receiver radio cannot send data to the transmitter.	

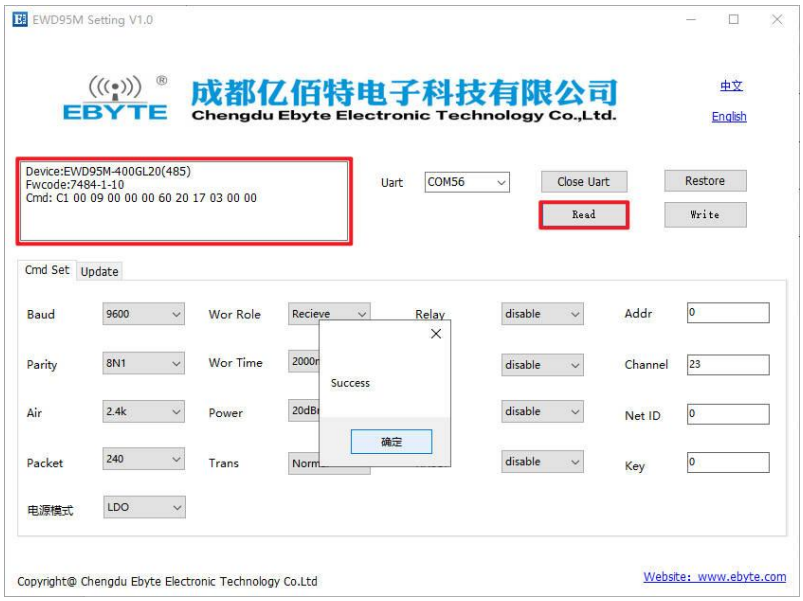
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Note: In WOR mode, the single-point wake-up function only supports 0-900 addresses at 38.4K airspeed and below, and 38.4K and 62.5K airspeed are not recommended.

3.1.3 Configuration mode usage

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



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 (Note: In WOR mode, the single-point wake-up function only supports 0-900 addresses at 38.4K airspeed and below.)

Frequency channel: 0~83 (Note: The channel range of 900MHz frequency band is 0~80.)

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: You need to send commands through the serial port assistant to remotely read and modify the radio parameters: 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.

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3.1.4 Standby mode use

In standby mode, just switch the mode so that the M1 light is on and the M0 light is off .

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 and 38.4K, this single-point wake-up function is temporarily unavailable and only the traditional WOR mode can be used.

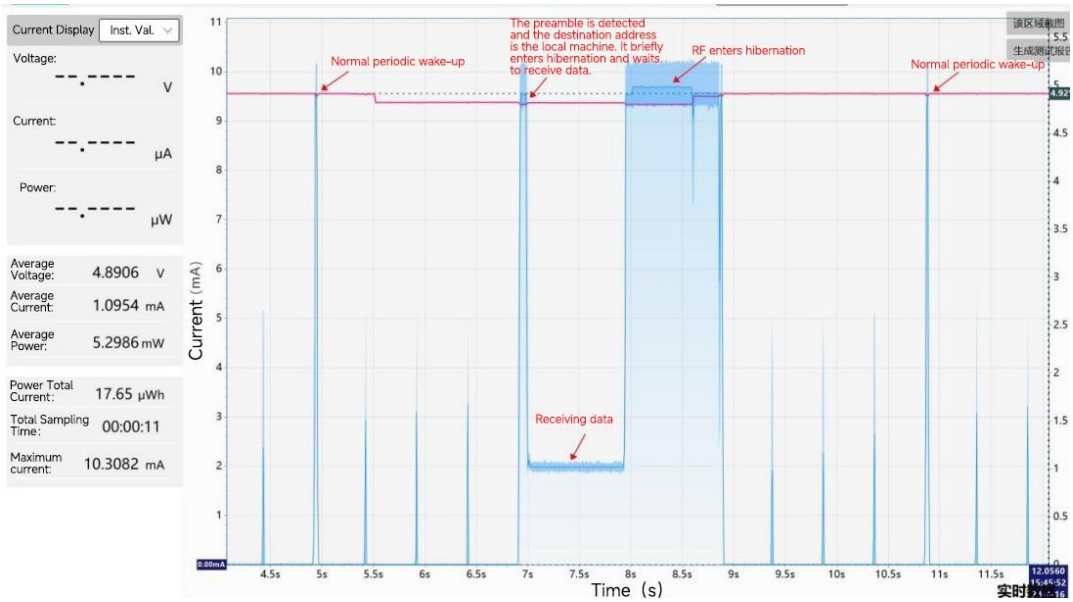


Figure 1 Target device current consumption diagram

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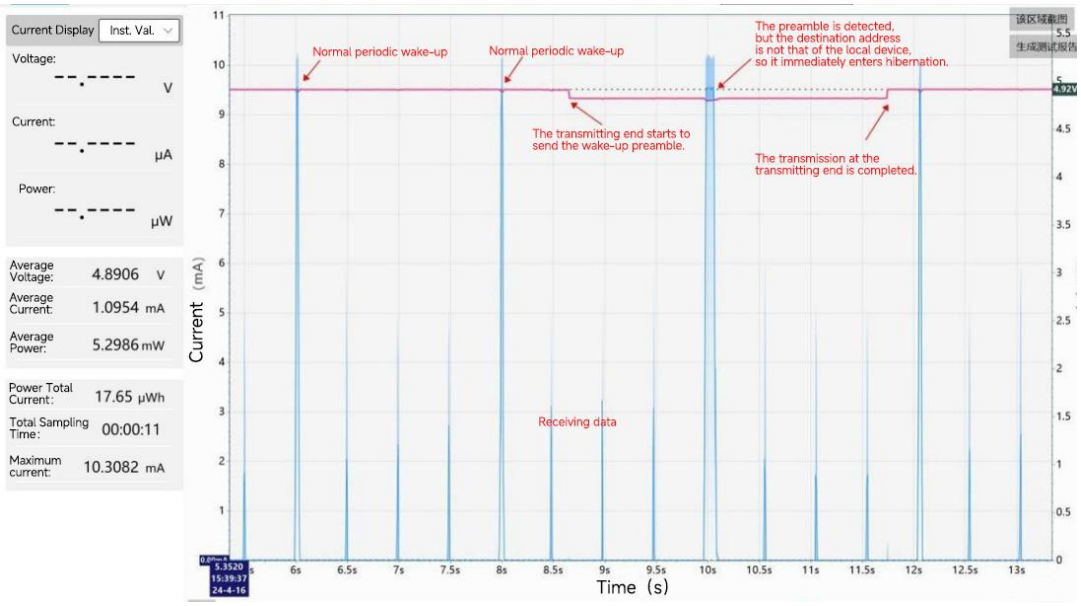


Figure 2 Current consumption of non-target devices

- 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.

4. Register read and write control

4.1 Instruction Format

In configuration mode (mode 2: M1 light is on , M0 light is off), 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 Response: C1+starting address+length+parameters Example 1: Restore factory default parameters Instruction start address length parameter Send: C0 0 0 0 9 00 00 00 60 20 17 03 00 00 Returns: C1 0 0 0 9 00 00 00 60 20 17 03 00 00 Example 2: Configure the radio address (0x1234), network address (0x00), serial port (9600 8N1), and airspeed (2.4 K) at the same time

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

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4.2 Register Description

Serial number	Read and Write	name	describe				Remark
00H	Read/ Write	ADDH	ADDH (default 0)				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.
01H	Read/ Write	ADDL	ADDL (default 0)				
02H	Read/ Write	NETID	NETID (default 0)				Network address, used to distinguish networks ; When communicating with each other, they should be set to the same.
0 3H	Read/ Write	REG0	7	6	5	UART serial port rate (bps)	The two radio stations communicating with each other can have different serial port baud rates and verification methods ; When transmitting large data packets continuously, users need to consider data blocking or even data loss caused by the same baud rate ; It is generally recommended that the baud rate of both communicating parties be the same.
			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	
			4	3	Serial port check digit		The serial port modes of the two communicating parties can be different ;
			0	0	8 N1 (default)		
			0	1	8 O1		
			1	0	8 E1		
			1	1	8 N1 (equivalent to 0 0)		
			2	1	0	Wireless air rate (bps)	The air rate of both communicating parties must be the same ; air rate, the smaller the delay and the shorter the transmission distance. 0~2: BW = 250K 3~7: BW = 500K
			0	0	0	Air rate 2.4k (default)	
			0	0	1	Air speed 2.4k	
			0	1	0	Air speed 2.4k	
			0	1	1	Air speed 4.8 k	
			1	0	0	Air speed 9.6 k	
			1	0	1	Air speed 19.2 k	

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			1	1	0	Air speed 38.4k	
			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 ; 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: DCDC mode reduces power consumption by sacrificing sensitivity LDO mode improves sensitivity at the expense of power consumption 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. Let C0 C1 C2 C3 instruction read register; Register 0x00: Current ambient noise RSSI; Register 0X01: RSSI when receiving data last time (The current channel noise is: dBm = -(256 - RSSI)); Instruction format: C0 C1 C2 C3 + starting address + read length; Return: C1 + address + read length + read valid value; such as: Send C0 C1 C2 C3 00 01 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 . The current does not decrease in the same proportion as the power decreases.
			1	0	Transmit power		
			0	0	20dBm / 30dBm (default)		
			0	1	18dBm / 28dBm		
			1	0	14dBm / 24dBm		
			1	1	10dBm / 20dBm		
0 5H	Read/ Write	REG2	Channel control (CH) 0-83 represent a total of 8 4 channels (corresponding to the 410.125 ~ 493.125MHz				Actual frequency = 410.125 + CH * 1M Actual frequency = 850.125 + CH* 1M

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			frequency band) 0-8 0 represents a total of 8 1 channels (corresponding to the 850.125 ~ 930.125MHz frequency band)				
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			
			5	Relay function			When the relay function is enabled, if the destination address is not the radio itself, the radio will initiate a forwarding ; 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.
			0	Disable relay functionality (default)			
			1	Enable relay function			
			4	LBT (Listen Before Send)			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.
			0	Disable LBT (default)			
			1	Enable LBT			
			3	WOR mode transceiver control			Only valid for mode 1; 1. In WOR receiving mode, the radio can modify the delay time after wake-up, the default time is 0; 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.) 3. Data can be sent within the delay
			0	W OR Receiver (Default) Working in WOR monitoring mode, the monitoring cycle is shown below (WOR cycle), which can save a lot of power consumption.			
			1	W OR transmitter 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.			
			2	1	0	W OR Cycle	Only valid for mode 1; Period T = (1+WOR) *500ms , maximum 4000ms , minimum 500ms ; The longer the WOR monitoring interval is,
			0	0	0	500 ms	
			0	0	1	1000 ms	
			0	1	0	1500 ms	
			0	1	1	2000 ms	
			1	0	0	2500 ms	

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			1	0	1	3000 ms	the lower the average power consumption is, but the greater the data delay is; The sender and receiver must be consistent (very important)
			1	1	0	3500 ms	
			1	1	1	4000 ms	
0 7H	Write	CRYPT_H	Key high byte (default 0)				Write only, read returns 0 ; Used for encryption to prevent wireless data in the air from being intercepted by similar radio stations ; The radio station will use these two bytes as calculation factors to transform and encrypt the wireless signal in the air.
0 8H	Write	CRYPT_L	Key low byte (default 0)				

4.3 Heartbeat packet function configuration

In configuration mode (mode 2: M1 light is on , M0 light is off), 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 Configuration command: C5+00+01+00 Instruction structure meaning: C5 : Command header 00 : Register address (00: Heartbeat packet function selection register; 01: Heartbeat packet custom cycle time configuration register; 02: Heartbeat packet custom data configuration.) 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.) 00 : Register data
2	Register Function Description	00 register data meaning: The configuration parameter is 00: disable the heartbeat packet function of the relay module. 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. Configuration parameter 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). 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

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		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: The register configuration parameter is two bytes, which configures the cycle time of the heartbeat packet. For example: C5 01 02 00 05 configures the time to 5s 02 Register: Customize heartbeat packet parameter configuration For example: C5 02 05 11 22 33 44 55 Configure the heartbeat packet return data to be: 11 22 33 44 55 Read instruction: C6 00 01 C6: Command Header 00: Register address 01: Length of the register data read
4	Format Error	Format Error Response FF FF FF / " =ERR "

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-400GL 20 x (xxx)	433.125MHz	0x0000	0x 17	2.4kbps	9600	8N1	20dBm
EWD95M-400GL 3 0 (xxx)	433.125MHz	0x0000	0x17	2.4kbps	9600	8N1	30dBm
EWD95M - 900GL20P (xxx)	868 .125MHz	0x0000	0x1 2	2.4kbps	9600	8N1	20dbm

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5. AT commands

Parameter configuration or query using AT commands needs to 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 WOR reception with a period of 2000ms
AT+POWER=power	Set the transmit power	AT+POWER=0	Set the transmit power to 20dBm /30 dBm
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
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 /868.125M
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.

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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	Return WOR reception, the cycle is 1000ms
AT+POWER=?	Query the transmit power	AT+POWER=0	Return transmit power is 20dBm /30dBm
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 return frequency is 433.125M /868.125M
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
AT+DELAY=?	Query WOR delay sleep time	AT+DELAY=1000	The 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

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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 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 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 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 0: 3 0dBm 1: 2 8dBm 2: 2 4dBm 3: 20 dBm
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 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 4:19200 5:38400 6:57600 7:115200

6. 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

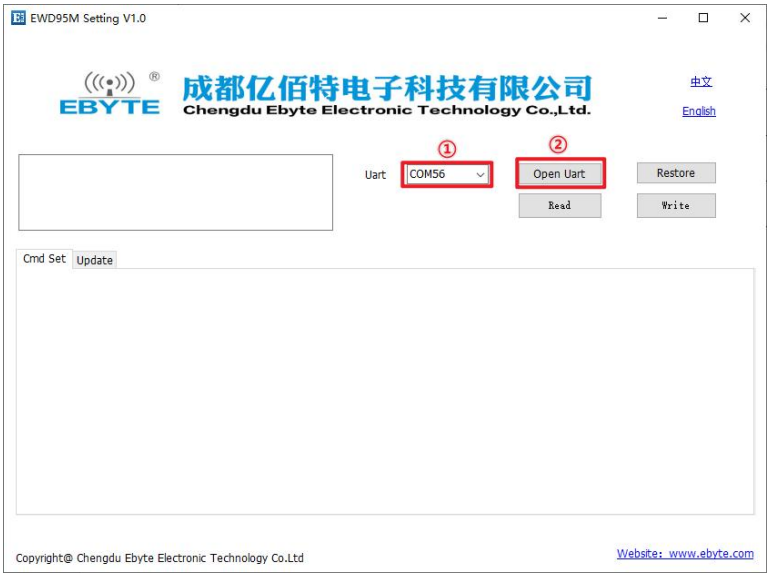
1. Make the radio enter configuration mode by changing M0 and M1 (note: the baud rate in configuration mode is 9600);

2. Open the official website to configure the host computer "EWD95M Setting V1.0", select Serial Port > Open

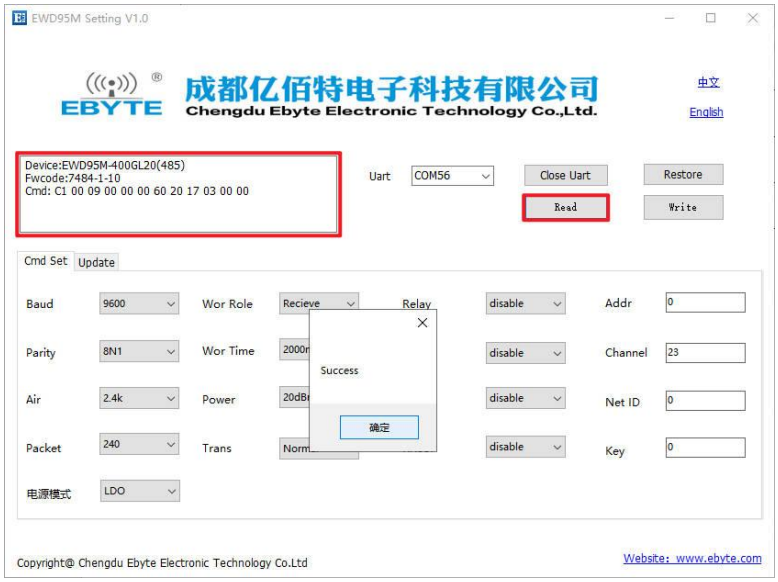
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Serial Port;



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



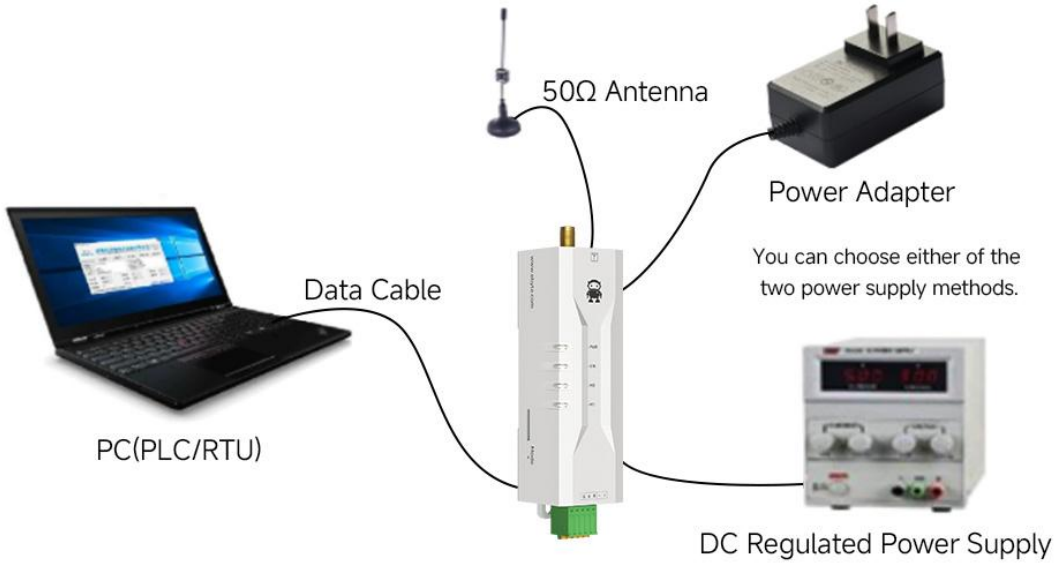
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4. Click Firmware Upgrade > Click Open File (select the firmware .bin file) > Click Start Downloading;



7. 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

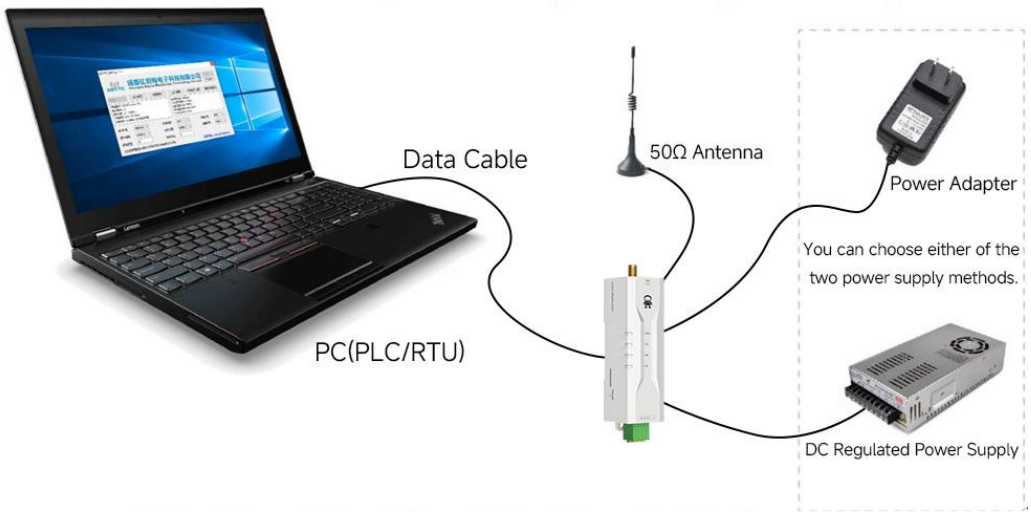
1、 Programming can only be performed in specific working modes (see the table above). If programming fails, please confirm whether the radio working mode is correct.

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

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8. Connection diagram in test and actual application



9. Related Products

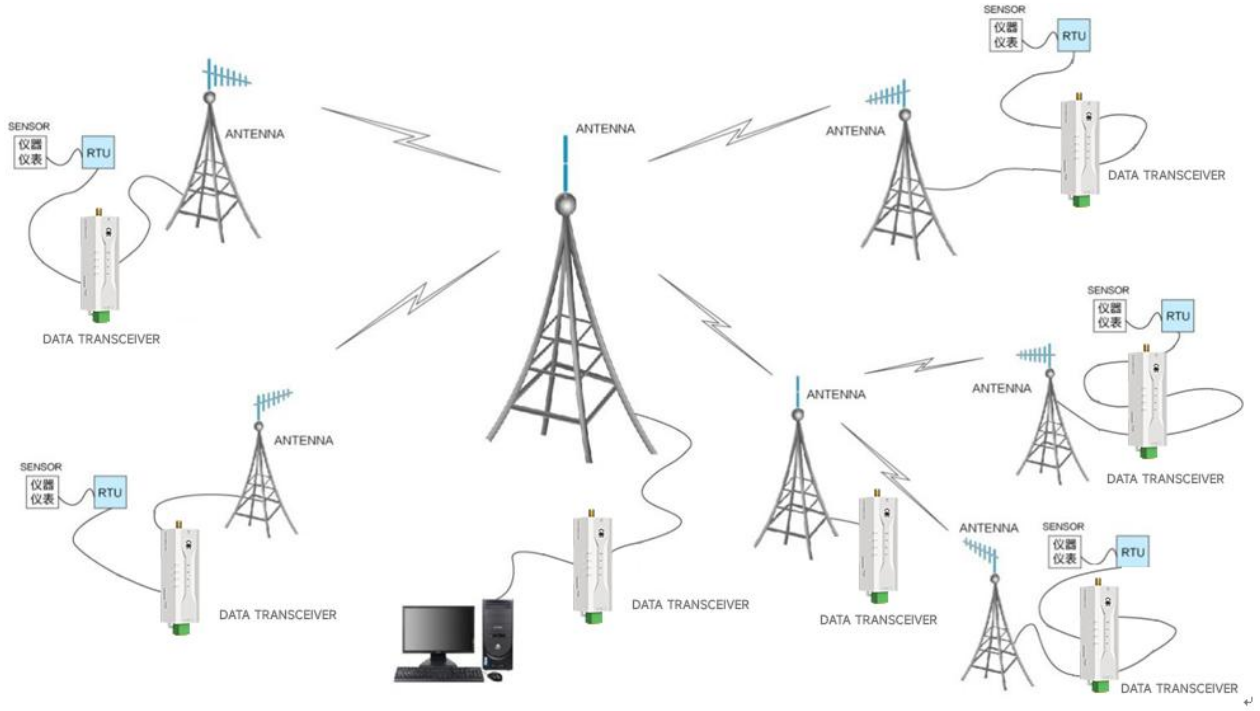
Product Model	Interface Type	Operating frequency MHz	Transmit power dBm	Communication distancekm	Features
E90-DTU(900L20)-V8	RS232 RS485	862～930	20	3	LoRa spread spectrum, long-distance anti-interference
E90-DTU(433L37)-V8	RS232 RS485	410～441	37	20	LoRa spread spectrum, long-distance anti-interference
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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10. 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, water pipe network monitoring, urban street light monitoring, air defense alarm control, railway signal monitoring, railway water supply centralized control, oil and gas supply pipe 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:



11. 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.

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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.

12.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.

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 Add module interoperability description	Lei
1.2	2025-1-22	Correct the image error	Lei
1.3	2025-2-17	New Models	Hao

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