Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual

EWD95M-433GFxx(xxx)

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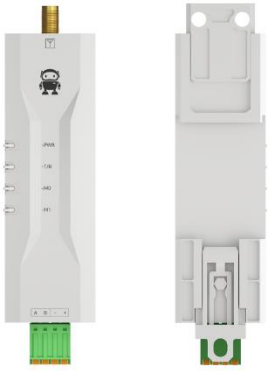
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1. Product Overview

1.1 Product Introduction



a wireless data transmission radio using GFSK modulation technology . It has multiple transmission modes and works in the frequency band (410 MHz to 450 MHz) (default 433 MHz). It supports interoperability with our company's E48 series modules.The radio provides a transparent RS485/RS232 interface, uses a plastic shell, a guide rail installation structure, and supports 8 to 28V (DC) wide voltage input . GFSK modulation technology can transmit more data within limited spectrum resources . The radio supports functions such as air wake-up, wireless configuration, relay networking , and communication keys. It also has data encryption functions. Through strict encryption and decryption algorithms, it ensures data security and improves communication reliability and transmission efficiency.

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 GFSK modulation ;
★ Support serial port firmware upgrade, which makes firmware update more convenient;
★ Support AT commands, which makes it more convenient to use;
★ Ultra-small size, 80*28*28.5mm, easy and quick to install;
★ The measured communication distance can reach 3.5km ;
★ With data encryption, the sub-packet length can be set;
★ 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;
★ The transmission power is 20dBm and supports multi-level adjustment. All technical indicators meet industrial standards.
★ Supports data transmission rates of 2.4K to 500Kbps;
★ Support Modbus protocol transmission;
★ Support RSSI signal strength indication function, which is used to evaluate signal quality, improve communication network, and measure distance;
★ Support frequency hopping transmission and reception, automatic retransmission function to ensure communication stability;

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★ Support LBT function, the radio automatically waits for transmission according to the current environmental noise intensity. Greatly improve the communication success rate of the radio in harsh environments;

★ Support wireless parameter configuration, remotely configure or read radio station parameters by sending command data packets wirelessly ;

★ Supports users to set communication keys by themselves, which cannot be read, greatly improving the confidentiality of user data;

★ It can realize multi-level relay networking , effectively extend the communication distance, and realize ultra-long-distance communication;

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

★ Supports wake-up on the air, an ultra-low power consumption feature suitable for battery-powered applications;

★ Supports fixed-point transmission, broadcast transmission, and channel monitoring;

★ 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.

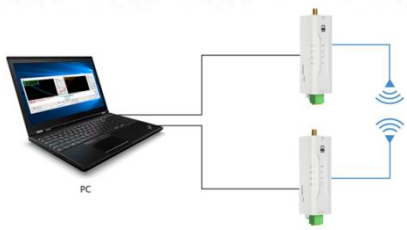
1.3 Quick Start

① You need to prepare two sets of DTU debugging components, including EWD95M-433GFXX(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.



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

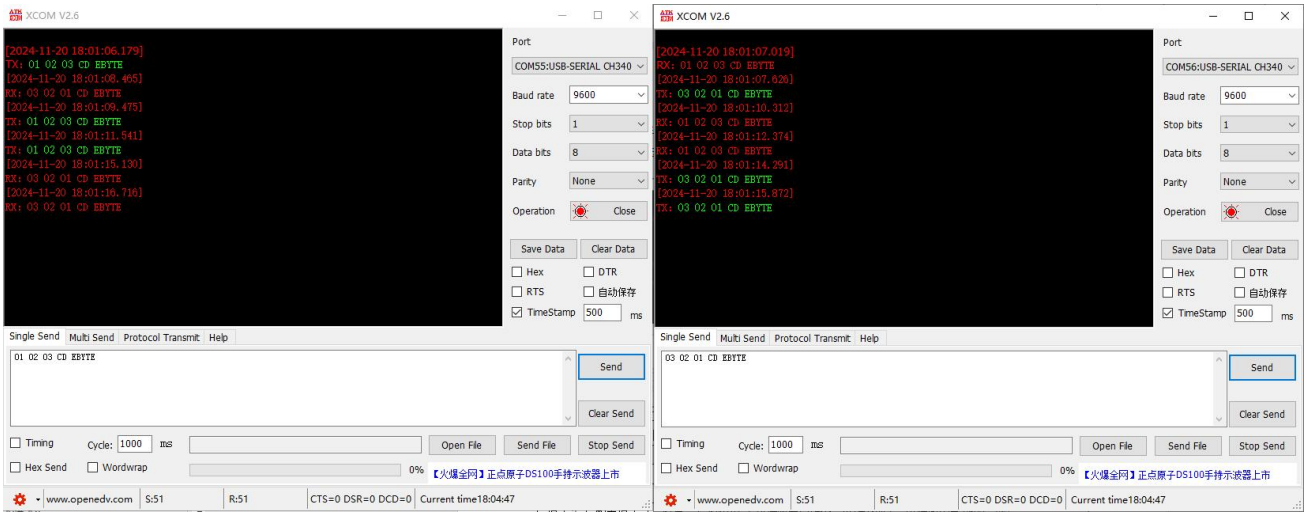


④ Start two serial port debugging assistants, select the serial port baud rate as 9600bps (default) and 8N1, and switch DTU to normal mode.

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 the mode switch are shown in the table below:

Serial number	category	M1	M0	Notes
Mode 0	General Mode	Lights out	Lights out	The serial port is turned on, the wireless is turned on, and special command air configuration is supported.
Mode 1	WOR Mode	Lights out	Lights on	Can be defined as WOR sender and WOR receiver, support air wake-up
Mode 2	Configuration Mode	Lights on	Lights out	Can receive serial port commands, see command list, baud rate is fixed at 9600, 8N1
Mode 3	Standby mode	Lights on	Lights on	Entering standby mode

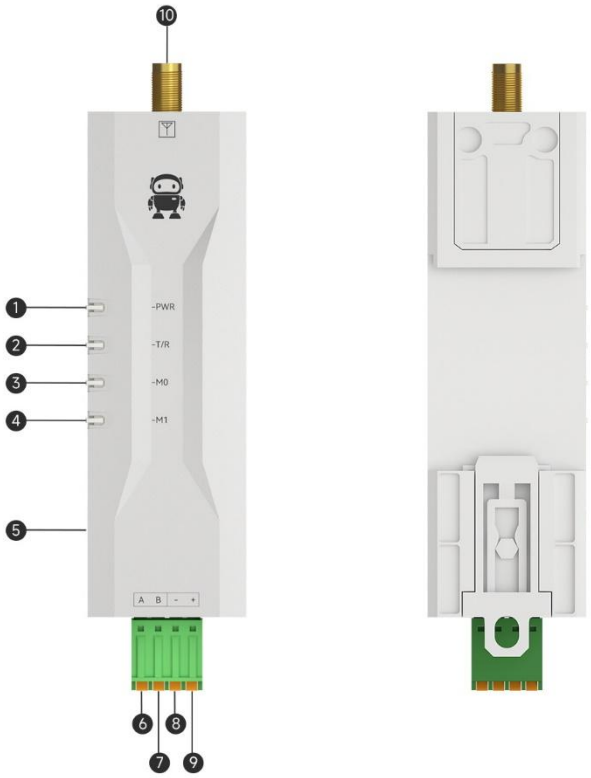
Note: The radio has a power-off saving mode function. Users need to switch to the corresponding mode according to the M1 and M0 indicator lights (effective immediately).

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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	M0	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 8～28V)
10	ANT	RF Interface	SMA-K, external threaded inner hole.

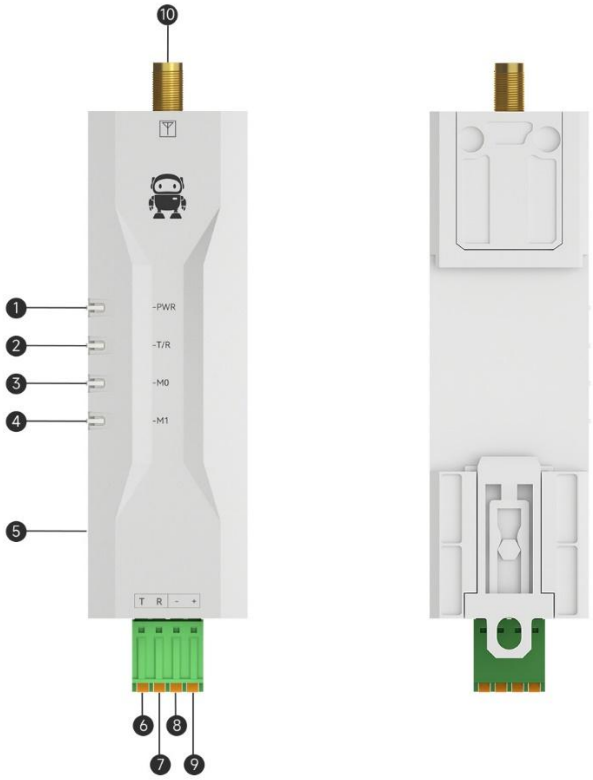
★ Note: If communication is not smooth when connecting the radio to multiple devices, but not when connecting to a single device, try connecting a 120Ω resistor in parallel between the 485_A terminal and the 485_B terminal.

★ EWD95M-433GFXX can be powered by a 8～28V (DC) power supply, and the wiring port is connected using a terminal block.

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1.4.2 RS232 interface



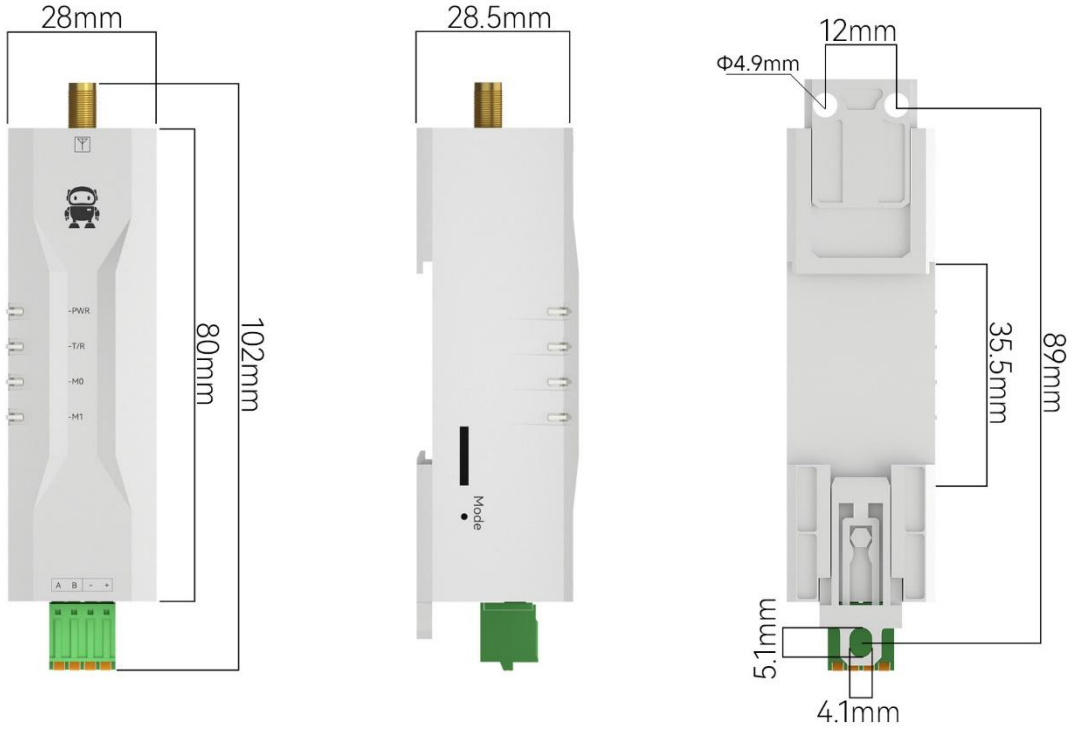
Serial number	name	Function	illustrate
1	PWR	Power indicator	Lights up when the power is on.
2	T/R	Send/Receive Indicator	The flashing light is red when sending data and green when receiving data.
3	M0	Mode indicator	Working mode indicator light.
4	M1	Mode indicator	Working mode indicator light.
5	Mode	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 8～28V)
10	ANT	RF Interface	SMA-K, external threaded inner hole.

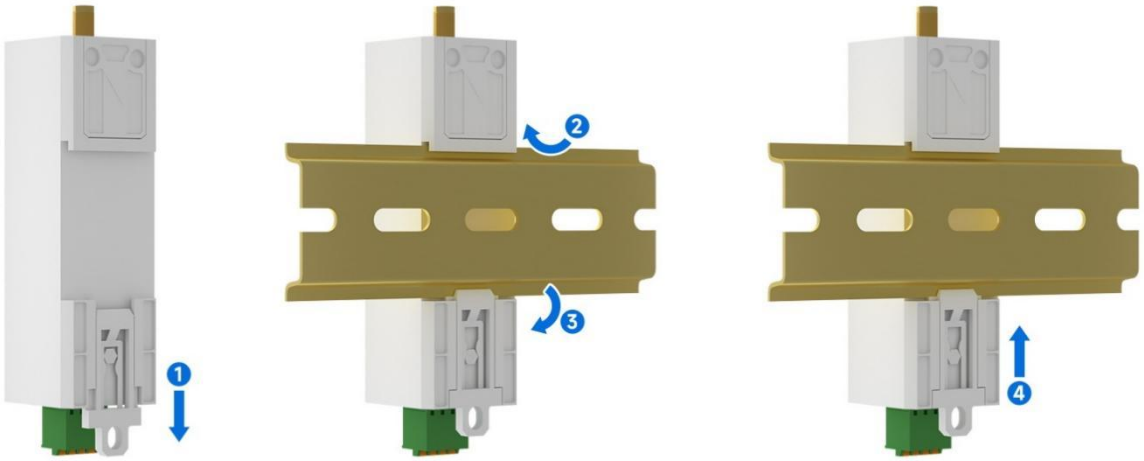
★ EWD95M-433GFXX can be powered by a 8～28V (DC) power supply, and the wiring port is connected using a terminal block.

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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	twenty two	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, use factory default parameters.

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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-433GFxx（xxx）	433M	410～450M	1M	41

★ 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 Specifications	0 (factory default)	1	2	3
EWD95M-433GF20 (xxx)	20dBm	17dB	14dBm	11dBm

★ 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.

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2.5 Air Speed Class

Model Specifications	Default air rate	Number of levels	Air speed rating
	bps		kbps
EWD95M-433GFxx (xxx)	2.4k	8	2.4, 4.8, 9.6, 20, 50, 100, 200, 500

★ 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		
	5V	12V	2 8V	5V	12V	28V
EWD95M-433GF 20(xxx)	87.1	43.3	21.9	15.4	9.6	4.1

★ 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 Specifications	Cache size	Subcontracting
EWD95M-433GFxx (xxx)	1000 bytes	The command can be set to send packets of 58/116 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.

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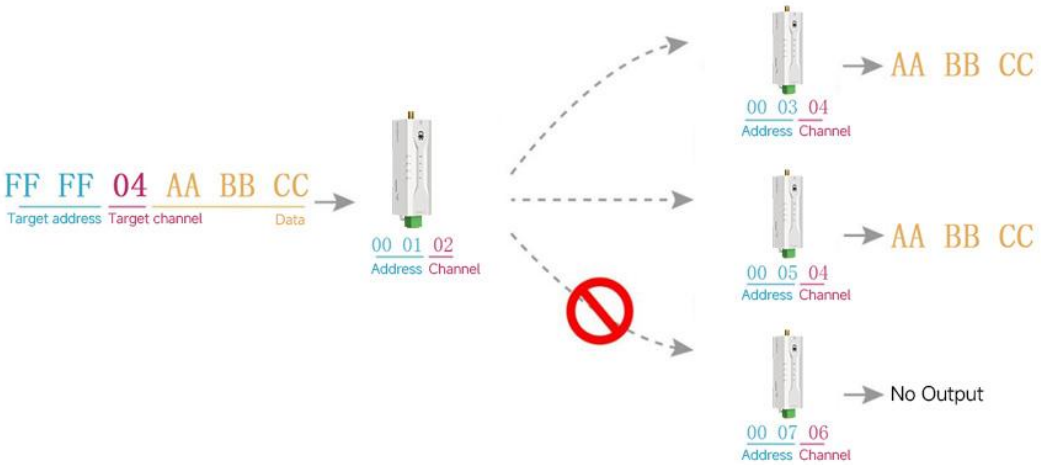
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3. Detailed explanation of functions

3.1 Fixed-point transmission (hexadecimal)



3.2 Broadcast transmission (hexadecimal)



3.3 Broadcast Address

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

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3.4 Listening Address

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

4. Working Mode

EWD95M-433GFxx has four working modes. When there is no demanding low power consumption requirement, it is recommended to configure the radio to the general mode (mode 0) if normal communication is required.

The radio is factory defaulted to normal mode (Mode 0).

Serial number	category	M1	M0	Notes
Mode 0	General 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, support air wake-up
Mode 2	Configuration Mode	Lights on	Lights out	The user accesses the registers through the serial port to control the working status of the radio. The user can configure the radio through the host computer configuration software.
Mode 3	Standby mode	Lights on	Lights on	The device enters standby mode

4.1 Normal Mode (Mode 0)

type	When the M0 indicator light is off , the M1 indicator light is off , and the radio operates in mode 0
Transmitting	The user can input data through the serial port, and the radio will start wireless transmission. There are 3 transmission modes available in general transmission mode, as described below: **Normal transmission:** no ACK mechanism and frequency hopping mechanism for transmission and reception **Automatic retransmission:** There is an ACK mechanism between the sender and the receiver. The sender will automatically retransmit within the retransmission times. The receiver will send an acknowledgment to the sender after receiving the data. When the sender receives the acknowledgment from the receiver, it will immediately end the retransmission. **Frequency hopping transmission: The sender and receiver will** perform frequency hopping transmission and reception according to the configured channel parameters. Note: In mode 0, the transmission mode of the sender and receiver must be consistent.
Receiving	The radio keeps the wireless receiving function on and can receive data packets sent from Mode 0. Note: In mode 0, the transmission mode of the sender and receiver must be consistent.

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4.2 WOR Mode (Mode 1)

type	When the M0 indicator light is on and the M1 indicator light is off , the radio operates in Mode 1.
Transmitting	When defined as a transmitter , a wake-up code will be automatically added for a certain period of time before transmission. When defined as a receiver, data cannot be transmitted.
Receiving	When defined as a transmitter, data from a sender can be received. When defined as a receiver, it can only receive data from the WOR sender.

4.3 Configuration Mode (Mode 2)

type	When the M0 indicator light is off and the M1 indicator light is on, the radio operates in Mode 2.
Transmitting	Wireless transmission is not possible.
Receiving	Wireless reception is not possible.
Configuration	Can be used for radio parameter setting, fixedly use serial port 9600, 8N1, set radio working parameters through specific command format

4.4 Standby mode (Mode 3)

type	When the M0 indicator light is on and the M1 indicator light is on , the radio operates in mode 3.
Transmitting	Unable to transmit wireless data
Receiving	Unable to transmit wireless data
other	In ultra-low power state, all other functions of the radio are turned off, and the sleep mode is exited by switching the M1 M0 state

5. Register read and write control

5.1 Instruction Format

In configuration mode (mode 2: M1 light off , M0 light on), the supported command list is as follows (**when setting, only 9600, 8N1 format is supported**):

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Serial number	Instruction Format	Detailed description
1	Setting Registers	Instruction: C0+starting address+length+parameter Response: C1+starting address+length+parameters Example 1: Configure the channel to 0x09 Instruction start address length parameter Send: C0 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: 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: Reading a channel Instruction start address length parameter Send: C1 05 01 Return: C1 05 01 09 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 + starting 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	Command: CF CF + General Instructions Response: CF CF + General 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

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5.2 Register Description

Serial number	Read and Write	name	describe	Remark
00H	Read/Write	ADDH	ADDH (default 0)	Radio address high byte and low byte ; Note: When the radio address is equal to FFFF, it can be used as a broadcast and monitoring address, that is, the radio will not perform address filtering at this time
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.
03H	Read/Write	REG0	7 6 5 UART serial port rate (bps) 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	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 both parties in communication have the same baud rate.
			4 3 Serial port check digit 0 0 8 N1 (default) 0 1 8 O1 1 0 8 E1 1 1 8 N1 (equivalent to 0 0)	The serial port modes of the two communicating parties can be different ;
			2 1 0 Wireless air rate (bps) 0 0 0 Air rate 2.4k (default) 0 0 1 Air speed 4.8k 0 1 0 Air speed 9.6k 0 1 1 Air speed 20 k 1 0 0 Air speed 50k 1 0 1 Air speed 100k 1 1 0 Air speed 200k	The air rate of both communicating parties must be the same ; air rate, the smaller the delay and the shorter the transmission distance.

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			1	1	1	Air speed 500k	
04H	Read/Write	REG1	7	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	58 bytes (default)			
			1	116 bytes			
			6	RSSI Ambient Noise Enable			Enable command (packet setting, transmission power are default parameters, configuration mode): C0 0401 40; After enabling, you can send command C0 C1C2 C3 command to read registers in transmission mode or WOR sending mode; Register 0x00: Current environment noise RSSI; Register 0X01: RSSI when receiving data last time (the return value of channel noise is the complement of 8-bit signed number, for example, if the value is 0x80, the actual value is -128); Instruction format: C0 C1C2 C3 + starting address + read length; Return: C1 + address + read length + read valid value; such as: Send C0 C1C2 C300 01 Return C100 01RSSI (address can only start from 00)
			0	Disabled (default)			
			1	Enable			
			5	FEC Function			Both parties in communication must enable or disable the FEC function at the same time
			0	Disabled (default)			
			1	Enable			
			4	3	Transmission method in general mode		It is only effective in general mode. The transmission mode of both communicating parties must be the same.
			0	0	Normal transmission (default)		
			0	1	Automatic resend		
			1	0	Frequency Hopping Transmission		
			1	1	Normal transmission, equivalent to (00)		
			2	Software mode switching			Specific commands can be used to switch the radio working mode, but after enabling, the baud rate is fixed at 9600bps in all working modes of the radio.
			0	Disabled (default)			
			1	Enable			
			1	0	Transmit power		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.
			0	0	20d B m (default)		
			0	1	17d B m		
			1	0	14d B m		
			1	1	11d B m		

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05H	Read/Write	REG2	Channel (CH), actual frequency = 410MHz + CH*1MHz			Channel range: 0x00～0x28 , 41 channels
06H	Read/Write	REG3	7	Enable RSSI Byte		After enabling, the radio receives wireless data and outputs it through the serial port TXD, followed by an RSSI strength byte. The obtained value is the complement of an 8-bit signed number. For example, if the obtained value is 0x80, the actual value is -128
			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	L BT Enable		When enabled, wireless data will be monitored before transmission, which can avoid interference to a certain extent, but may cause data delays ; The maximum stay time of LBT is 2 seconds, and it will be forcibly issued after two seconds.
			0	Disabled (default)		
			1	Enable		
			3	WOR mode transceiver control		Only valid for mode 1;
			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; The longer the WOR monitoring interval is, the lower the average power consumption is , but the greater the data delay is; The sender and receiver must be consistent (very important); The cycle time is different at
			0	0	0	Level 0	
			0	0	1	Level 1	
			0	1	0	Level 2	
			0	1	1	Level 3	
			1	0	0	Level 4	
			1	0	1	Level 5	

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			1	1	0	Level 6		different airspeeds, as described below.
			1	1	1	Level 7		
07H	Read/Write	REG 4	7	6	5	4	reserve	
			3	2	1	0	Automatic resend times	Automatic retransmission is only effective in normal mode.
			Default 3					
08H	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.
09H	Write	CRYPT_L	Key low byte (default 0)					
80H ～86H	read	PID	Product information 7 bytes					Product information 7 bytes

5.3 Factory default parameters

model	Factory default parameter values						
Radio Model	frequency	address	Channel	Air speed	Baud rate	Serial port format	Transmit power
EWD95M-433GF 20(xxx)	433MHz	0x0000	0x17	2.4kbps	9600	8N1	20dBm

5.4 Specific time (ms) relationship between WOR cycle classification and airspeed (Kbps)

airspeed / cycle	2.4Kbps	4.8Kbps	9.6Kbps	20Kbps	50Kbps	100Kbps	200Kbps	500Kbps
Level 0	500ms	500ms	500ms	500ms	500ms	500ms	300ms	125ms
Level 1	1000ms	1000ms	1000ms	1000ms	1000ms	1000ms	600ms	250ms
Level 2	1500ms	1500ms	1500ms	1500ms	1500ms	1500ms	900ms	375ms
Level 3	2000ms	2000ms	2000ms	2000ms	2000ms	2000ms	1200ms	500ms
Level 4	2500ms	2500ms	2500ms	2500ms	2500ms	2500ms	1500ms	625ms
Level 5	3000ms	3000ms	3000ms	3000ms	3000ms	3000ms	1800ms	750ms
Level 6	3500ms	3500ms	3500ms	3500ms	3500ms	3500ms	2100ms	875ms
Level 7	4000ms	4000ms	4000ms	4000ms	4000ms	4000ms	2400ms	1000ms

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6. 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.

6.1 AT command table

Command Instructions	describe	Example	Example Description
AT+IAP (Use with caution, see Chapter 9 Firmware Upgrade Instructions for details)	Enter IAP upgrade mode	AT+IAP	Enter IAP upgrade mode
AT+RESET	Device restart	AT+RESET	Device restart
AT+DEFAULT	Configuration parameters restored to default And the device restarts	AT+DEFAULT	Configuration parameters restored to default And the device restarts

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 speed to 500 K
AT+PACKET=packet	Set packet length	AT+PACKET=0	Set the packet size to 58 bytes
AT+WOR=role	Setting WOR Roles	AT+WOR=0	Set the WOR role as the receiver
AT+WTIME=period	Setting the WOR cycle level	AT+WTIME=0	Set the WOR cycle level to 0
AT+POWER=power	Set the transmit power	AT+POWER=0	Set the transmit power to 20dBm
AT+TRANS= trans	Set the transmission mode for general mode	AT+TRANS=0	Set the transmission mode of general mode to normal transmission
AT+ROUTER=router	Set Repeater Mode	AT+ROUTER=1	Set to Repeater Mode
AT+LBT= lbt	Set the LBT function switch	AT+LBT=1	Set LBT function to on
AT+ERSSI= erssi	Setting the ambient noise RSSI switch	AT+ERSSI=1	Set the ambient noise RSSI function to on
AT+DRSSI= drssi	Set the RSSI switch for receiving data	AT+DRSSI=1	Set the receiving data RSSI function to be enabled

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AT+ADDR= addr	Set the station address	AT+ADDR=1234	Set the radio address to 1234
AT+CHANNEL= chan	Set the radio working channel	AT+CHANNEL=10	Set the radio working channel to 10
AT+FEC= fec	Set the FEC function switch	AT+FEC=1	Set FEC function to enable
AT+PTOP= ptop	Set the fixed-point transmission switch	AT+PTOP=1	Set the fixed-point sending function to be turned on
AT+RESEND=resend	Set the number of retransmissions for automatic retransmission	AT+RESEND=10	Set the number of retransmissions for automatic retransmission to 10
AT+NETID= netid	Set Network ID	AT+NETID=1234	Set the network ID to 1234
AT+KEY=key	Set the station key	AT+KEY= 2345	Set the radio key to 2345
AT+SWITCH=switch	Set software switching mode switch	AT+SWITCH=1	Set it up in configuration mode to allow software switching

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-433GFxx	Return to radio model
AT+FWCODE=?	Query firmware code	FWCODE=7482-0-10	Returns the firmware version
AT+UART=?	Query baud rate and checksum	AT+UART=3,0	return baud rate is 9600, 8N1
AT+RATE=?	Query air speed	AT+RATE=7	Return air rate is 500k
AT+PACKET=?	Query the length of sub-packets	AT+PACKET=0	return packet is 58 bytes
AT+WOR=?	Query WOR roles	AT+WOR=0	Returns the WOR role as the receiver
AT+WTIME=?	Query WOR cycle level	AT+WTIME=0	Returns WOR cycle level to 0
AT+POWER=?	Query the transmit power	AT+POWER=0	return transmission power is 20dBm
AT+TRANS=?	Query the transmission mode in general mode	AT+TRANS=0	The transmission mode of returning to normal mode is normal transmission
AT+ROUTER=?	Query relay mode	AT+ROUTER=1	Return to relay mode
AT+LBT=?	Query the LBT function switch	AT+LBT=1	Returns the LBT switch status
AT+ERSSI=?	Query the ambient noise RSSI switch	AT+ERSSI=1	Returns the ambient noise on/off status
AT+DRSSI=?	Query RSSI output	AT+DRSSI=1	Return channel RSSI function is enabled
AT+ADDR=?	Query the radio station address	AT+ADDR=1234	returned radio address is 1234

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AT+CHANNEL=?	Query the radio working channel	AT+CHANNEL=23	returned frequency is 433.125M
AT+FEC=?	Check whether the FEC function is enabled	AT+FEC=1	Return FEC function is enabled
AT+PTOP=?	Query the fixed-point sending function switch	AT+PTOP=1	Return to fixed point sending function is turned on
AT+RESEND=?	Query the number of automatic resends	AT+RESEND=10	Returns the number of retransmissions for automatic retransmission to 10
AT+NETID=?	Query Network ID	AT+NETID=1234	returned network ID is 1234
AT+KEY=?	Query the radio key	AT+KEY=2345	The return radio key is 2345
AT+SWITCH=?	Query software switching mode switch	AT+SWITCH=0	Software switch mode off

6.2 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	0:2.4Kbps 1:4.8kbps 2:9.6kbps 3:20kbps 4:50 kbps 5:100kbps 6:200kbps 7:500kbps
Packet (packet length)	0:58bytes 1:116bytes
Role	0: Receiver 1: Sender
Period	0:Level 0 1:Level 1 2:Level 2 3:Level 3 4:Level 4 5:Level 5 6:Level 6 7:Level 7
Power (transmit power)	0: 20 dBm 1:1 7 dBm 2:1 4 dBm 3: 11 dBm
T rans (transmission mode in general mode)	0: Normal transmission 1: Automatic retransmission 2: Frequency hopping transmission 3: Normal transmission
Router (Relay Mode)	0: Off 1: Enable
LBT (listen before talk)	0: Off 1: Enable
Erssi (Environmental RSSI)	0: Off 1: Enable
Drssi (Data RSSI)	0: Off 1: Enable
Addr (station address)	Radio address 0~65535 (decimal)
C han (radio working channel)	setting value varies according to the frequency band
F ec (FEC function switch)	0: Off 1: Enable
P top (fixed-point send switch)	0: Off 1: Enable
Resend (number of automatic resends in general mode)	Set to 0~15
Netid (Network ID)	Radio network 0~255 (decimal)
Key	Radio key 0~65535 (decimal)
switch (software switching mode function switch)	0: Disable 1: Enable

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7. Use of relay networking mode

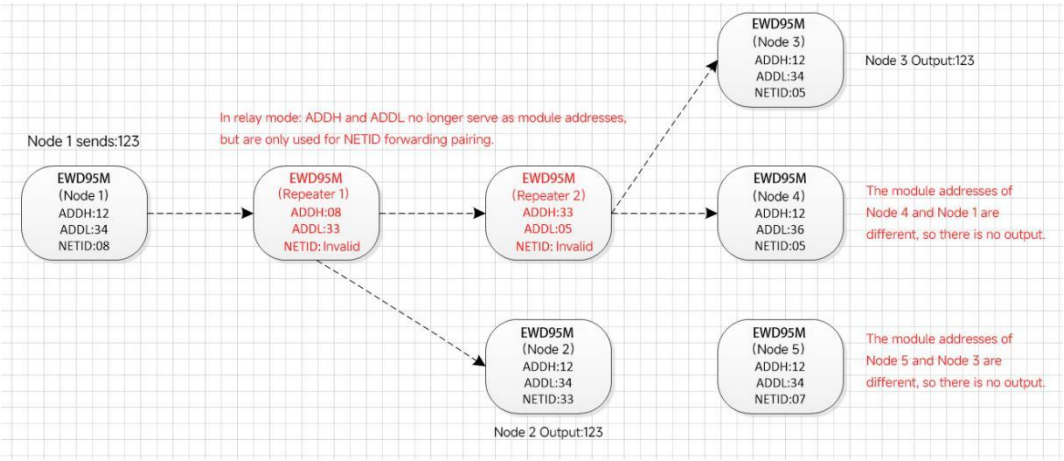
Serial number	Relay Mode Description
1	After setting the relay mode through the configuration mode, switch to the general mode and the relay starts to work. The WOR mode does not support the use of relays.
2	In repeater mode, ADDH and ADDL are no longer used as radio addresses, but are forwarded and paired with NETID. If a signal is received from one network, it is forwarded to the other network. 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	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:



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

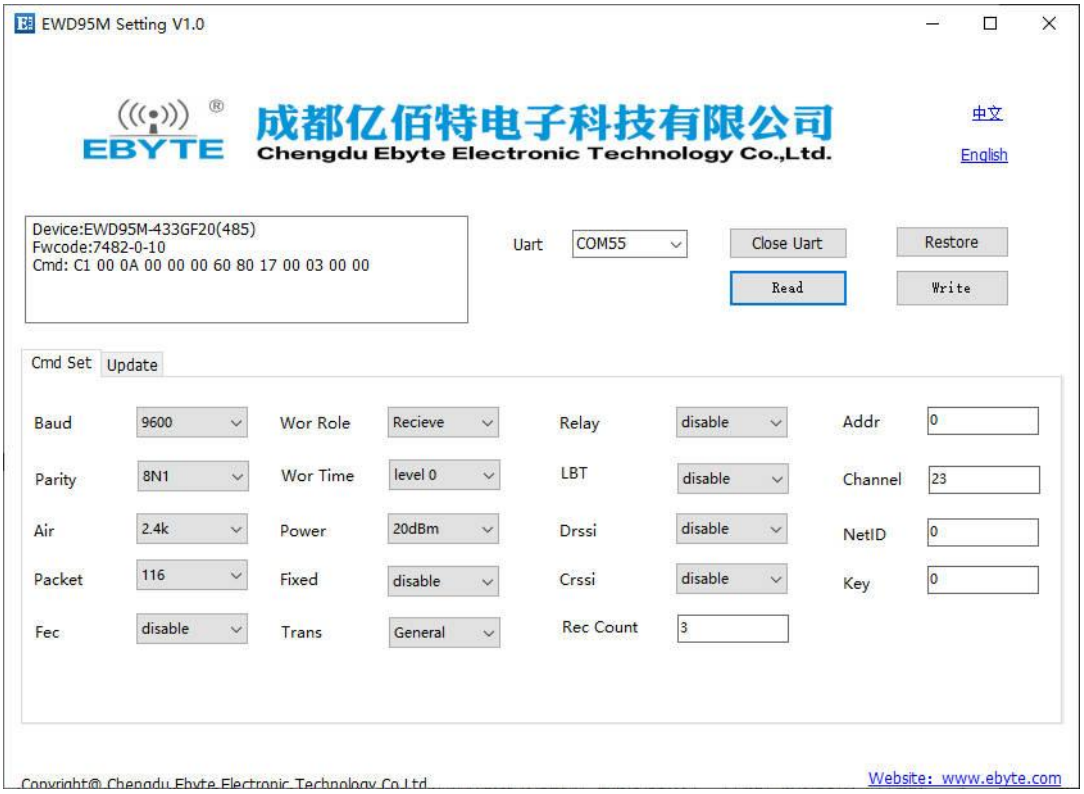
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nodes 2 and 4 can also be received by node 1.

8. Host computer configuration instructions

- The figure below shows the configuration interface of the host computer for EWD95M-433GFxx (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: 0～40
  Network ID: 0-255
  Key: 0-65535
- When the user uses the host computer to configure the relay mode, special attention should be paid. Since the parameters in the host computer are in decimal display mode, the radio address and network ID need to be converted when filling in. For example, if the network ID input by the transmitter A is 02 and the network ID input by the receiver B is 10, when the relay R sets the radio address, the hexadecimal value 0X020A is converted to the decimal value 522 as the radio address filled in by the relay R. That is, the radio address value that the relay R needs to fill in is 522.

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9. Firmware Upgrade Instructions

EWD95M series DTU supports serial port firmware upgrade. When special after-sales support is required, you can contact us to obtain the corresponding firmware for upgrade.

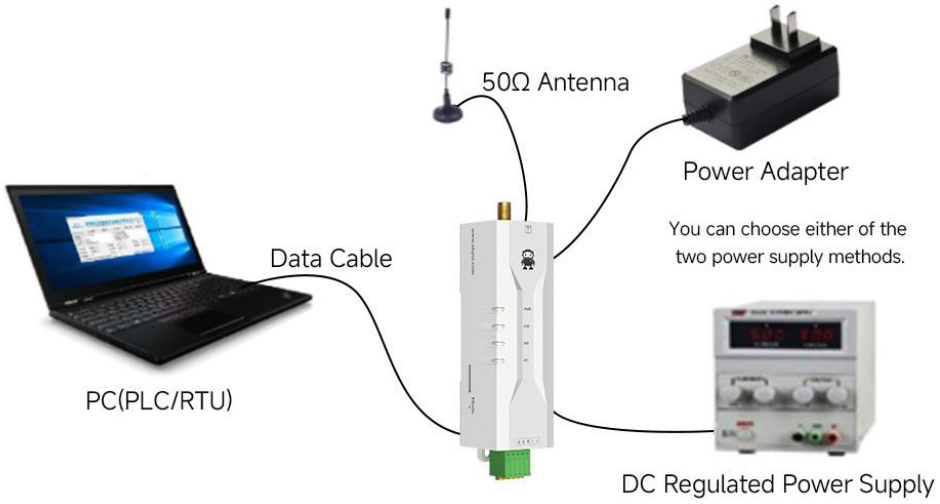
Upgrade method: Use USB to RS232/RS485 tool to connect DTU , and control M0/M1 level to enter configuration mode. Connect DTU through the host configuration tool provided by our official website , select IAP upgrade, click the "Open File" button to select the corresponding firmware, and then click to start downloading. When the Please Wait prompt box appears, click Confirm, wait for 5 seconds, confirm to enter the upgrade mode and start downloading. At this time, wait for the progress bar to reach 100% to complete the download . After completion, please manually close and open the serial port again to re-read the parameters.



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10. Program the Radio Station

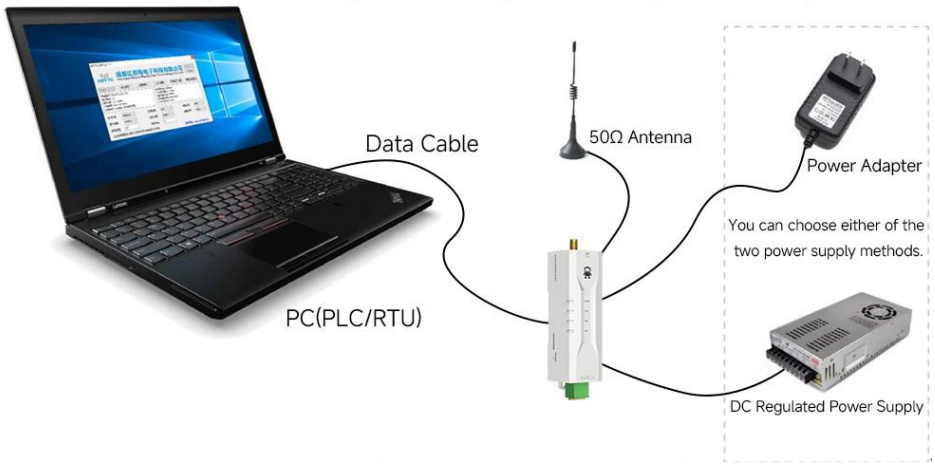


Working Mode	M1	M0	Notes
Configuration Mode	Indicator light on	Light off	The radio can only be programmed using the configuration software in the current mode

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-433GFxx (xxx) configuration software and modify the relevant parameters.

11. Connection diagram in testing and actual application



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12. Related Products

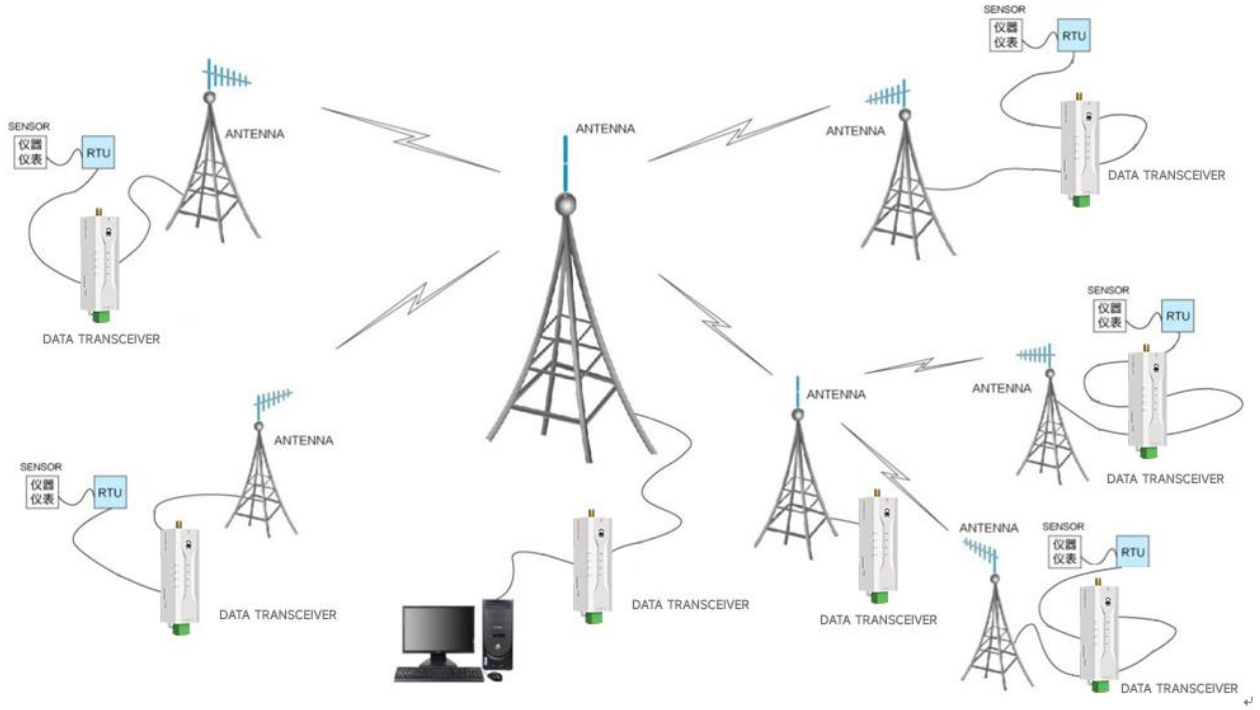
Product Model	Interface Type	Operating frequency MHz	Transmit power dBm	Communication distance km	Features
E90- DTU(900L20)-V8	RS232 RS485	862～930	20	3	LoRa spread spectrum, long-distance anti-interference
E90- DTU(433L37)-V8	RS232 RS485	410～441	37	20	LoRa spread spectrum, long-distance anti-interference
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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13. 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:



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14. 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 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.

15. 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. Add a description of module interoperability.	Lei
1.2	2025-01-22	Correct the errors in the accompanying illustrations	Lei
1.3	2025-10-17	Adjust voltage range	Hao

About us

Technical support: support@cdebyte.com
Documents and RF Setting download link: www.ebyte.com
Thank you for using Ebyte products! Please contact us with any questions or suggestions: info@cdebyte.com
---
Web: www.ebyte.com
Address: B5 Mould Park, 199# Xiqu Ave, High-tech District, Sichuan, China

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