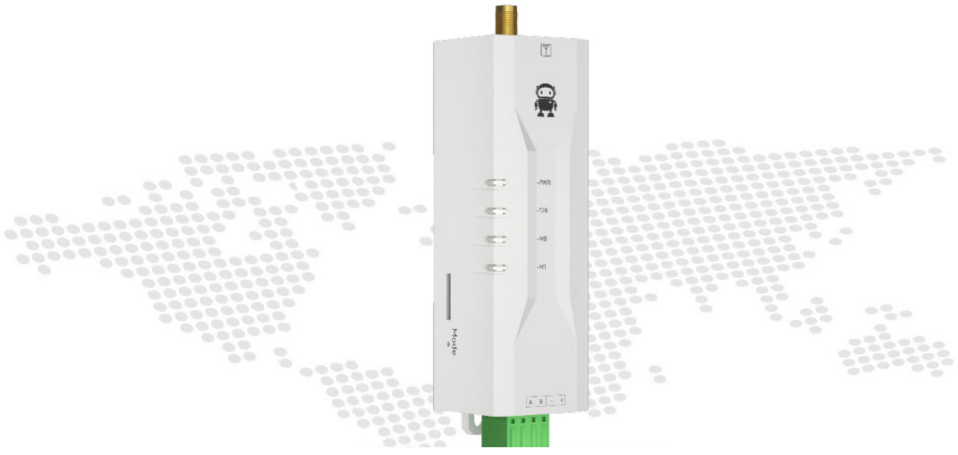
U.S. Converters LLC

Data Communication & Network Solutions

Wireless Modem

User Manual

EWD95M-2G4Hxx(xxx)



U.S. Converters LLC

EWD95M-2G4Hxx User Manual

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Contents

Disclaimer and Copyright Notice 2
1 Product Overview 3
1.1 Brief Introduction 3
1.2 Features 3
1.3 Quick Start 4
1.4 Description of components 6
1.4.1 RS485 interface 6
1.4.2 RS232 interface 7
1.5 Mounting Dimension 8
2 Technical indicators 9
2.1 Model Specification 9
2.2 General Specification Parameters 10
2.3 Frequency range and number of channels 10
2.4 Emission power level 10
2.5 Emission power level 10
2.6 Current parameter 11
2.7 Receiving and dispatching lengths and subcontracting methods. 11
3 Functions in detail 11
3.1 Targeted emission 11
4 Working mode 12
4.1 Fixed Frequency Mode (Mode 0) 12
4.2 Frequency hopping mode (mode 1) 13
4.3 Reserved mode (mode 2) 13
4.4 Configuration mode (mode 3) 13
5 Register read/write control 13
5.1 Factory Default Parameters 14
5.2 Reading of operating parameters 14
5.3 Version number reading 14
5.4 Reset command 15
5.5 Reset command 15
6 Configuration instructions for the host computer 17
7 Programming the radio 18
8 Connection diagrams for testing and practical applications 19
9 Related Products 19
10 Areas of practical application 20
11 Notes on use 21
12 Important statement 21
Revision history 22
About us 22

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1 Product Overview

1.1 Brief Introduction

The EWD95M-2G4Hxx(xxx) is a 2.4 GHz wireless data modem operating from 2.400 to 2.518 GHz (2.400 GHz default). It provides transparent RS485 or RS232 serial communication, a DIN-rail-mountable enclosure, and a wide 5-28 VDC input range.

Automatic frequency hopping improves resistance to interference and makes communications more difficult to intercept than fixed-frequency operation. If interference affects part of the band, communication can continue on other available frequencies.

The modem is designed for reliable wireless data transmission in industrial monitoring and control systems. It is suitable for point-to-point and multipoint installations, including PLCs, RTUs, rain gauges, level meters, and other serial data devices.

1.2 Features

- Support automatic frequency hopping, greatly improving the anti-interference ability of communication;
- Support fixed-frequency communication, fast transmission speed and small delay;
- Support for automatic retransmission of lost packets;
- Support fixed-point transmission, easy to group network communication;
- Ultra-small size, size 80*28*28.5mm, easy and fast installation;
- Built-in PA + LNA, transmit power up to 500mW, communication distance up to 5km;
- Support global licence-free ISM 2.4GHz band;
- Transmit power optional 20dBm/27dBm, and support multi-level adjustable, all technical indicators to industrial standards;
- Support data transmission rate of 250k~2Mbps;
- Support advanced GFSK modulation;
- Adopt flame retardant plastic shell, rail mounting structure, easy and efficient installation;
- Adopt hidden button to switch the working mode, to avoid false triggering, the equipment work operation is more reliable;
- Simple and efficient power supply design, support power adapter or voltage line mode, support 8 ~ 28V (DC) power supply;

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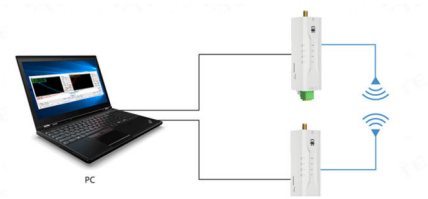
- Support Modbus protocol transmission;
- Operating temperature range: -40℃ ～+85℃, to adapt to a variety of harsh operating environments, true industrial-grade products;
- Power reverse connection protection, over connection protection, antenna surge protection and other multiple protection functions, greatly increasing the reliability of the radio;
- Communication ports, power supply interface with isolated 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 exception occurs, the radio will automatically restart, and can continue to work in accordance with the previous parameter settings.

1.3 Quick Start

1. Prepare two complete modem sets. Each set should include an EWD95M-2G4Hxx(xxx), antenna, 5-28 VDC power supply, USB-to-RS232/RS485 adapter (or equivalent), and the required connection cables.
2. Install the antenna before applying power. Connect the modem to the power supply and serial interface. For RS485, connect A+ to A/T and B- to B/R.

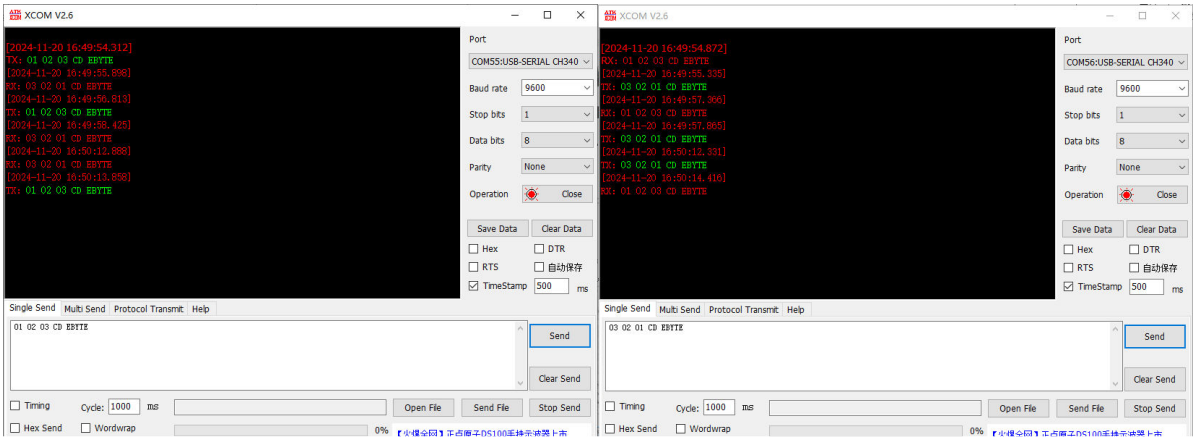


3. Connect both modems to the computer through the appropriate USB-to-RS232/RS485 adapters.



4. Open two serial-terminal windows. Set each serial port to 9600 bps, 8N1 (factory default), and select the required operating mode.
5. Enter data and transmit it in either direction. If using a HEX terminal, enable HEX Send as required.

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6. Use the MODE button to select the operating mode. The M0 and M1 indicators show the active mode. Press and hold MODE for approximately one second to advance to the next mode. The indicator states for each mode are shown below:

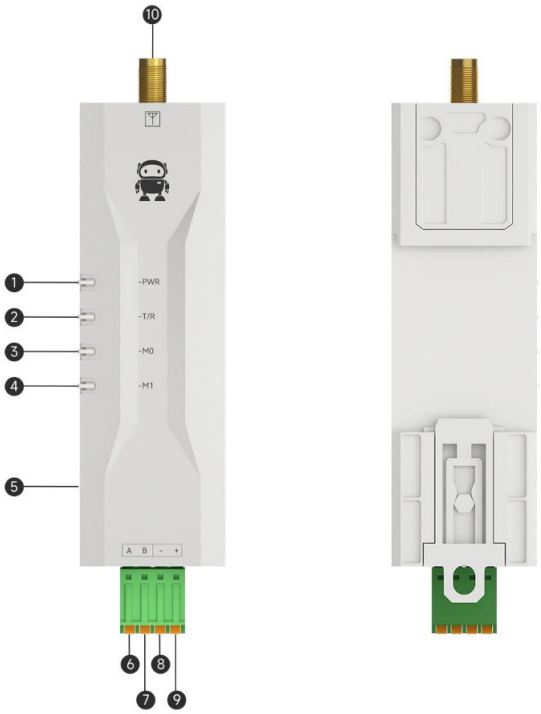
Serial number	Type	M1	M0	Note
Mode 0	Fixed Frequency Mode	Light out	Light out	Serial port open, wireless open, transparent transmission, receiver must be mode 0, 2
Mode 1	Frequency hopping mode	Light out	Light on	Difference with mode 0: the radio will be based on certain algorithmic rules, the sending and receiving process, the frequency will be changed, the change range is not limited to the basic frequency point set by the user, the radio has a specific spreading sequence. The receiver must be mode 1.
Mode 2	Reserve mode	Light on	Light out	Reserved mode. Same as mode 0 for now.
Mode 3	Configuration Mode	Light on	Light on	The radio enters the configuration and can receive parameter setting commands. See Working Parameters Detail.

Note: The selected operating mode is retained after power is removed. Select the required mode according to the M0 and M1 indicators; mode changes take effect immediately.

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1.4 Description of components

1.4.1 RS485 interface



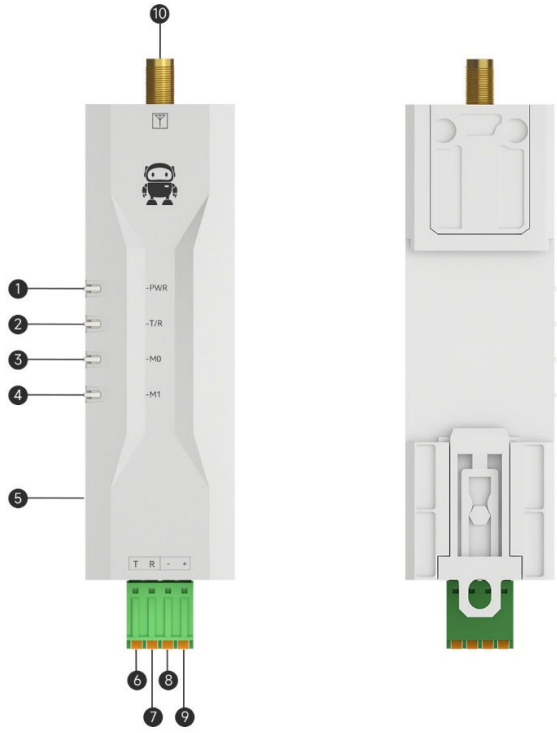
Serial Number	Name	Function	Instruction
1	PWR	Power indicator	Lights up when power is turned on.
2	T/R	Transmit/Receive Indicator	The blinking light is red when sending data and green when receiving data.
3	MO	Mode Indicator	Operating mode indicator.
4	M1	Mode Indicator	Operating mode indicator.
5	Mode	Mode switching button	Operating mode switching control.
6	A	RS485 signal A	RS485 signal A
7	B	RS485 signal B	RS485 signal B
8	-	GND	Power Negative
9	+	VCC	power positive（DC 5~28V）
10	ANT	RF interface	SMA-K, male threaded bore.

★ Note: Poor communication occurs 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.

★ The EWD95M-2G4Hxx(xxx) can be powered by an 5 to 28V (DC) power supply, and the wiring port is connected using terminal blocks.

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1.4.2 RS232 interface

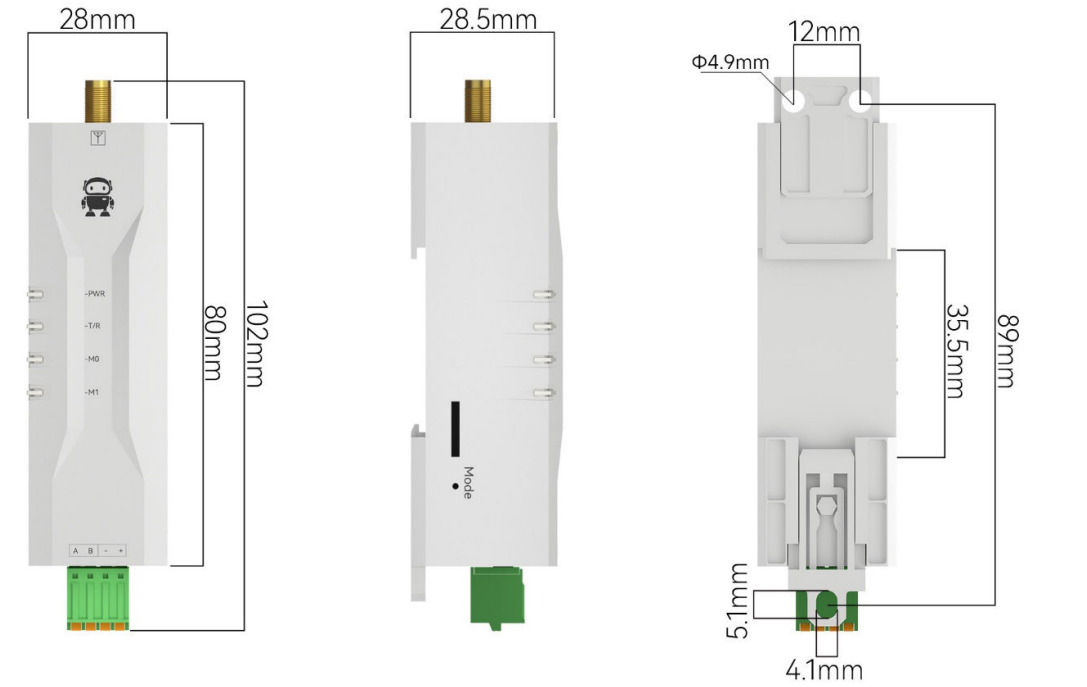


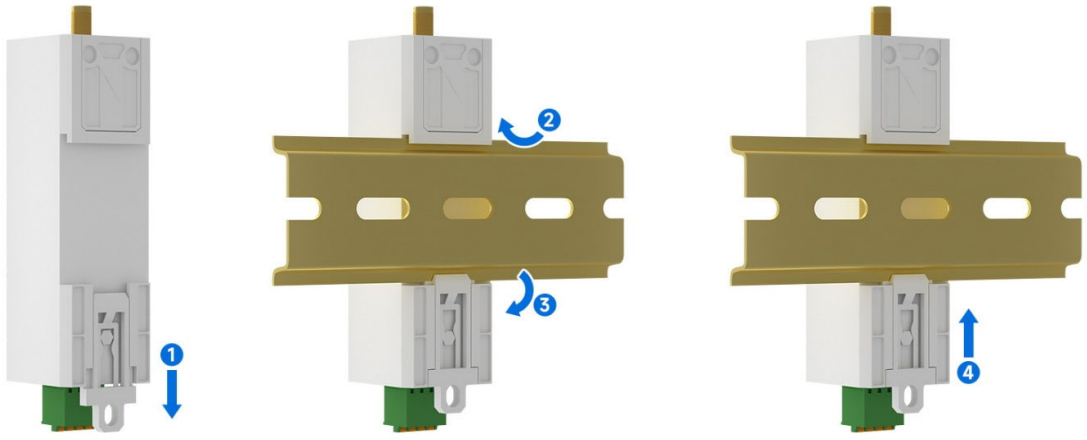
Serial Number	Name	Function	Instruction
1	PWR	Power indicator	Lights up when power is turned on.
2	T/R	Transmit/Receive Indicator	The blinking light is red when sending data and green when receiving data.
3	MO	Mode Indicator	Operating mode indicator.
4	M1	Mode Indicator	Operating mode indicator.
5	Mode	Mode switching button	Operating mode switching control.
6	T	RS232 bus TX interface	RS232 interface TX interface connected to device RX interface
7	R	RS232 bus RX interface	RS232 interface RX interface connected to device TX interface
8	-	VCC	Power Negative
9	+	GND	Power positive（DC 5~28V）
10	ANT	RF interface	SMA-K，External threaded bore.

★ The EWD95M-2G4Hxx(xxx) can be powered by an 5 to 28V (DC) power supply, and the wiring ports are connected using terminal blocks.

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1.5 Mounting Dimensions





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2 Technical Specifications

2.1 Model Specification

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

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

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2.2 General Specification Parameters

Serial Number	Item	Specification	Instruction
1	Product Size	80*28*28.5 mm	See mounting dimensions for details
2	Product weight	32 g	Weight tolerance 2g
3	Operating temperature	-40℃～+85℃	Industrial grade
4	Voltage range	5～28V（DC）	12V or 24V recommended for DC versions
5	Communication interface	RS485/RS232	RS485, RS232 two choose one, to the product physical identification shall prevail
6	Baud rate	Factory Default 9600	Baud rate range 1200 to 115200
7	Address code	Factory Default 0	Total 65536 address codes can be set

2.3 Frequency range and number of channels

Model	Default frequency	Frequency range	channel spacing	channel count
	Hz	Hz	Hz	
EWD95M-2G4Hxx (xxx)	2400M	2400～2518M	2M	12

★ Note: When using multiple sets of digital transmission radios in the same area to communicate one-to-one at the same time, it is recommended that each set of digital transmission radios set a channel interval of 2MHz or more.

2.4 Transmit Power Level

Model	0（Factory Default）	1	2	3
EWD95M-2G4H20(xxx)	20dBm	17dBm	14dBm	10dBm
EWD95M-2G4H27(xxx)	27dBm	21dBm	15dBm	9dBm

★ Note: The lower the transmit power, the closer the transmission distance, but the operating current will not be reduced in the same proportion, it is recommended to use the maximum transmit power.

2.5 Air Data Rate

Model	Default Air Rate	Level	Airspeed rating
	bps		kbps
EWD95M-2G4Hxx(xxx)	250k	3	250、1000、2000

★ Note: The higher the air rate setting is, the faster the transmission rate is and the closer the transmission distance is; therefore, if the rate meets the usage requirements, it is recommended that the lower the air rate is, the better.

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2.6 Current Consumption

Model	Response current mA			Receiving Current mA		
	5V	12V	24V	5V	12V	28V
EWD95M-2G4H20(xxx)	239.2	112.2	20.7	28.4	15.6	9.4
EWD95M-2G4H27(xxx)	935.5	319.8	163.5	28.2	15.0	8.8

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

2.7 Receive/Transmit Length and Packet Handling

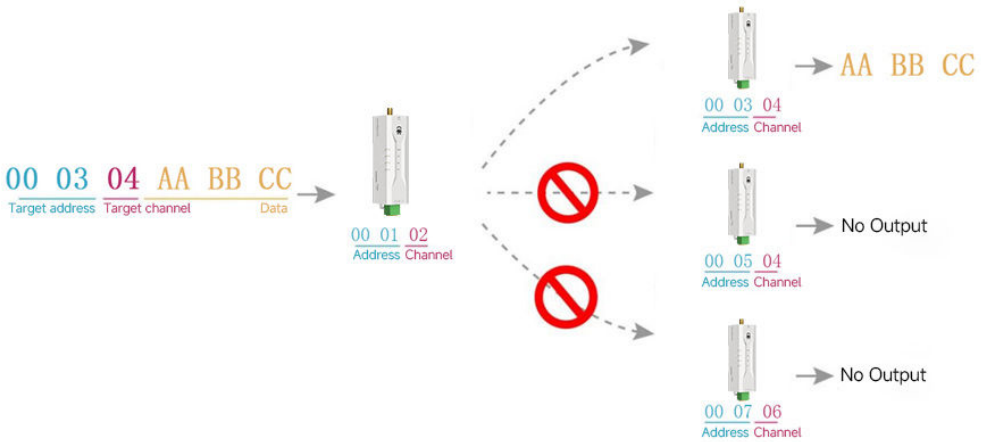
Model	Cache size	Subcontracting
EWD95M-2G4Hxx(xxx)	256 Bytes	Maximum length of a single transmission 27 bytes

★ Attention:

1. If the radio receives data more than the single packet capacity at a single time, the exceeding part of the data will be automatically assigned to the second transmission until the transmission is completed;
2. The radio single reception data cannot be larger than the cache capacity.

3 Detailed Functions

3.1 Fixed-Point Transmission



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4 Operating Modes

The EWD95M-2G4Hxx(xxx) has four modes of operation. It is recommended that the radio be configured in pass-through mode (Mode 0) if normal communication is required without demanding low-power requirements;
The radio is shipped from the factory with the default setting of pass-through mode (mode 0).

Serial Number	Type	M1	M0	Instruction
Mode 0	Fixed Frequency Mode	Lights out	Lights out	Serial port open, wireless open, transparent transmission, receiver must be mode 0, 2
Mode 1	Frequency hopping mode	Lights out	lights on	and mode 0 difference: The radio will send and receive according to certain algorithmic rules, the frequency will change, the change range is not limited to the basic frequency set by the user, the radio has a specific spread spectrum sequence. The receiver must be mode 1
Mode 2	Reserve mode	lights on	Lights out	Reserved mode. Same as mode 0 for now.
Mode 3	Configuration Mode	lights on	lights on	The radio enters configuration mode and can receive parameter setting commands. See Working Parameters Detail

Note: If there is no low power requirement, there is no need to care about WOR mode (mode 1).

4.1 Fixed Frequency Mode (Mode 0)

Type	When the M0 indicator is off and the M1 indicator is off, the radio is operating in mode 0
Emission	The radio receives user data from the serial port, the radio transmits wireless packet length of 27 bytes, when the amount of user input data reaches 27 bytes, the radio will start the wireless transmission, at this time, the user can continue to input the data that need to be transmitted; When the user needs to transmit bytes less than 27 bytes, the radio waits for 3 bytes of time, if no user data continues to be input, the data is considered to be terminated, and at this time the radio will send out all data packets through wireless; The data packet sent through mode 0 can only be received by the receiving radio in mode 0 and mode 2.
Reception	The radio keeps the wireless reception function turned on and can receive packets from Mode 0 and Mode 2;
Notice	When the radio transmits data, it cannot receive data. At the same time, data cannot be sent while the radio is receiving data.

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4.2 Frequency hopping mode (mode 1)

Type	When the M0 indicator is on and the M1 indicator is off, the radio is working in mode 1
Emission	The conditions under which the radio initiates packet transmission are the same as in mode 0, with the only difference being that the radio will send and receive according to certain algorithmic rules that will produce a change in frequency during the process. The range of variation is not limited to the base frequency set by the user. The radio has a specific spread spectrum sequence. The user does not need to care about this sequence. A packet sent through mode 1 can only be received by a receiver module that is in mode 1.
Reception	Equivalent to mode 0, only difference: the radio can only receive packets sent from mode 1.
Notice	When the radio transmits data, it cannot receive data. At the same time, data cannot be sent while the radio is receiving data.

4.3 Reserved mode (mode 2)

Type	When the M0 indicator is off and the M1 indicator is on, the radio is operating in mode 2
Emission	Equivalent to mode 0.
Reception	Equivalent to mode 0.
Notice	When the radio transmits data, it cannot receive data. At the same time, data cannot be sent while the radio is receiving data.

4.4 Configuration mode (mode 3)

Type	When the M0 indicator is on and the M1 indicator is on, the radio is operating in mode 3
Emission	Unable to transmit wireless data
Reception	Unable to transmit wireless data
Configuration	Configuration mode can be used for radio parameter setting, using the serial port 9600, 8N1, to set the radio operating parameters through a specific command format.
Notice	The radio reconfigures the parameters when going from configuration mode to other modes. configuration process.

5 Register read/write control

- The list of supported commands in setup mode (Mode 3: M0=1, M1=1) is as follows (only 9600, 8N1 format is supported during setup):

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Serial Number	Command format	Explain in detail
1	C0+Operating parameters	Sends C0 + 5 bytes of operating parameters in hexadecimal format for a total of 6 bytes, which must be sent continuously (power-down save)
2	C1 C1 C1	Three C1s are sent in hexadecimal format and the module returns the saved parameters, which must be sent consecutively.
3	C2+Operating parameters	Sends C2 + 5 bytes of operating parameters in hexadecimal format, for a total of 6 bytes, which must be sent continuously (power-down is not saved)
4	C3 C3 C3	Three C3 are sent in hexadecimal format and the module returns the version information, which must be sent consecutively.
5	C4 C4 C4	Sending three C4 in hexadecimal format will generate a reset in the module, which must be sent consecutively.

5.1 Factory Default Parameters

Model	Factory Default Parameter Values：C0 00 00 18 00 40						
Model	Frequency	Address	Channel	Air speed	Baud rate	Serial Port Format	Emission power
EWD95M-2G4H20SX	2.4GHz	0x0000	0x00	250kbps	9600	8N1	20dBm
EWD95M-2G4H27SX	2.4GHz	0x0000	0x00	250kbps	9600	8N1	27dBm

5.2 Reading Operating Parameters

Command format	Explanation
C1 C1 C1	In configuration mode (M0=1, M1=1), issue the command (in HEX format): C1 C1 C1, to the module serial port. The module will return the current configuration parameters, e.g. C0 00 00 18 00 40.

5.3 Reading the Version Number

Command format	Explanation
C3 C3 C3	In setup mode (M0=1, M1=1), send a command (in HEX format) to the module serial port: C3 C3 C3. The module will return the current configuration parameters, e.g.: C3 39 xx yy; Here 39 stands for the module model (E39 series), xx is the version number, and yy refers to other features of the module.

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5.4 Reset command

Command format	Explanation
C4 C4 C4	In setup mode (M0=1, M1=1), send a command (HEX format) to the module serial port: C4 C4 C4, the The module will generate a reset; During the reset, the module performs a self-test and then begins normal operation. At this point, you can switch modes or initiate the next command.

5.5 Parameter setting command

	Name	Description				Note
0	HEAD	Fixed 0xC0 or 0xC2, indicating that this frame data is a control command				Must be 0xC0 or C2 C0: The set parameters are saved by power down. C2: The set parameters will not be saved by power down.
1	ADDH	7, 6, 5, 4 Number of lost packet retransmissions (valid only for modes 0, 2)				Default 15 times (default F); when there are multiple receivers with the same address, it may cause conflicts, please set to 0
		3, 2, 1, 0 module address high 4 bits (default F0H)				default 0
2	ADDL	Module address low byte (default 00H)				00H-0FFH
3	SPED	7	6	serial port parity bit		Serial port modes can be different on both sides of the communication
		0	0	8N1（default）		
		0	1	8O1		
		1	0	8E1		
		1	1	8N1（Equivalent to 00）		
		5	4	3	TTL serial port rate (bps)	Baud rates can be different for each side of the communication The serial port baud rate is independent of the wireless transmission parameters and does not affect the wireless transceiver characteristics.
		0	0	0	Serial port baud rate of 1200	
		0	0	1	Serial port baud rate of 2400	
		0	1	0	Serial port baud rate of 4800	
		0	1	1	Serial port baud rate of 9600 (default)	
		1	0	0	Serial port baud rate of 19200	
		1	0	1	Serial port baud rate of 38400	
		1	1	0	Serial port baud rate of 57600	
		1	1	1	Serial port baud rate of 115200	
		2	Retention of unused			Recommended to write 0
		1	0	Wireless air rate (bps)		The airborne wireless transmission rate must be the same for both sides of the communication; The lower the air rate, the longer the distance, the greater the anti-interference performance and the longer the transmission time.
		0	0	Air rate 250k (default)		
		0	1	Air rate 1M		
		1	0	Air rate 2M		
		1	1	Air rate 2M (equivalent to 10)		
4	CHAN	7、6、5、4 Retention of unused				Recommended to write 0
		3、2、1、0 communications channel				00H to 0BH, for a total of 12 channels;
		Fixed frequency mode (mode 0)				

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<table>
<tr><td></td><td></td><td colspan="3">0-5 channel corresponding frequency: 2400M + CHAN * 2M
6-11 channel corresponding frequency: 2508M + (CHAN-6)* 2M
Frequency Hopping Mode (Mode 1)
Corresponding frequency for channels 0-11: 2412M + CHAN * 2M</td><td></td></tr>
<tr><td rowspan="11">5</td><td rowspan="11">OPTION</td><td>7</td><td colspan="2">Fixed-point transmit enable bit (MODBUS-like)</td><td rowspan="3">When it is 1, the first 3 bytes of each user data frame are used as high and low address and channel. When transmitting, the module changes its own address and channel, and when finished, restores the original settings.</td></tr>
<tr><td>0</td><td colspan="2">Transparent transmission (default)</td></tr>
<tr><td>1</td><td colspan="2">fixed-point transmission</td></tr>
<tr><td>6</td><td colspan="2">IO drive mode (default 1)</td><td rowspan="3">This bit is used to enable the module's internal pull-up resistor;
The open drain method level adaptation is more robust and may require an external pull-up resistor in some cases.</td></tr>
<tr><td>1</td><td colspan="2">TXD push-pull output, RXD pull-up input</td></tr>
<tr><td>0</td><td colspan="2">TXD open output, RXD open input</td></tr>
<tr><td colspan="3">5、4、3、2 Retention of unused</td><td>Recommended to write 0</td></tr>
<tr><td>1</td><td>0</td><td>Transmit power (approximate)</td><td rowspan="5">The external power supply must provide more than 800mA current output capability and ensure that the power supply ripple is less than 100mV;

It is not recommended to use lower power transmission, the power utilisation efficiency is not high.</td></tr>
<tr><td>0</td><td>0</td><td>20/27dBm（default）</td></tr>
<tr><td>0</td><td>1</td><td>17/21dBm</td></tr>
<tr><td>1</td><td>0</td><td>14/15dBm</td></tr>
<tr><td>1</td><td>1</td><td>10/9dBm</td></tr>
</table>

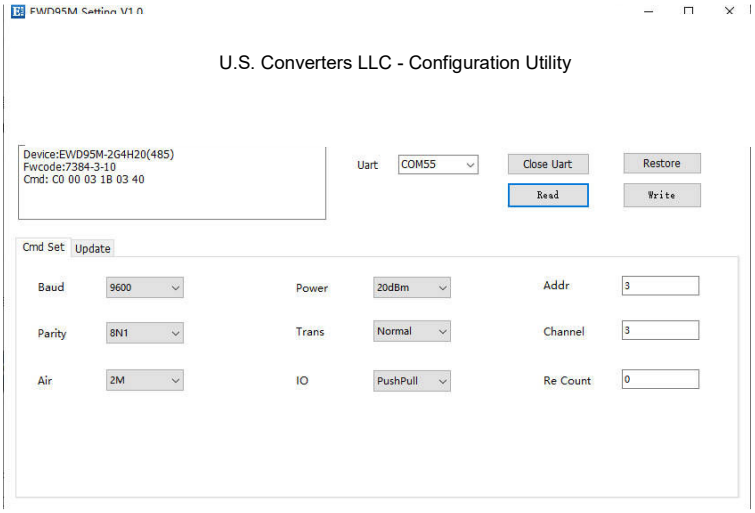
Example (meaning of the byte 'SPED' in serial number 3):

Binary bits of this byte	7	6	5	4	3	2	1	0
Specific values (user-configurable)	0	0	0	1	1	0	0	0
Representativeness	Serial port parity bit 8N1		Serial port baud rate of 9600			Air rate 250kbps		
Corresponding hexadecimal	1			8				

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6 Configuration Software Instructions

The configuration utility shown below is used to read and modify EWD95M-2G4Hxx(xxx) parameters. Press the MODE button to place the modem in Configuration Mode, then use the software to read or write the required settings.

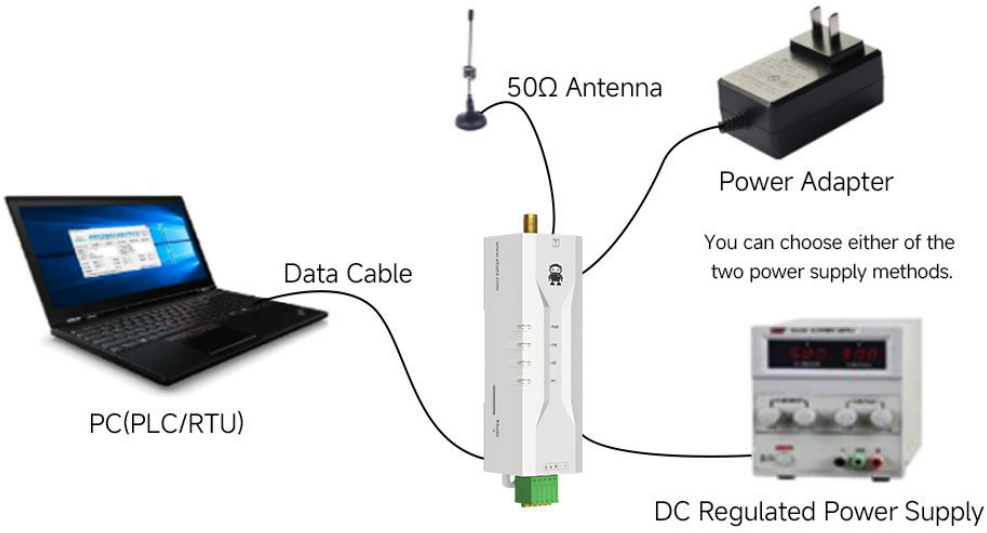


The configuration utility displays the radio address, frequency channel, network ID, and key as decimal values. Valid ranges are:
Network address: 0-65535
Frequency channel: 0-83
Network ID: 0-255
Key: 0-65535

When configuring relay-related values, convert hexadecimal values to decimal before entering them. For example, hexadecimal 0x020A equals decimal 522.

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7 Programming the radio

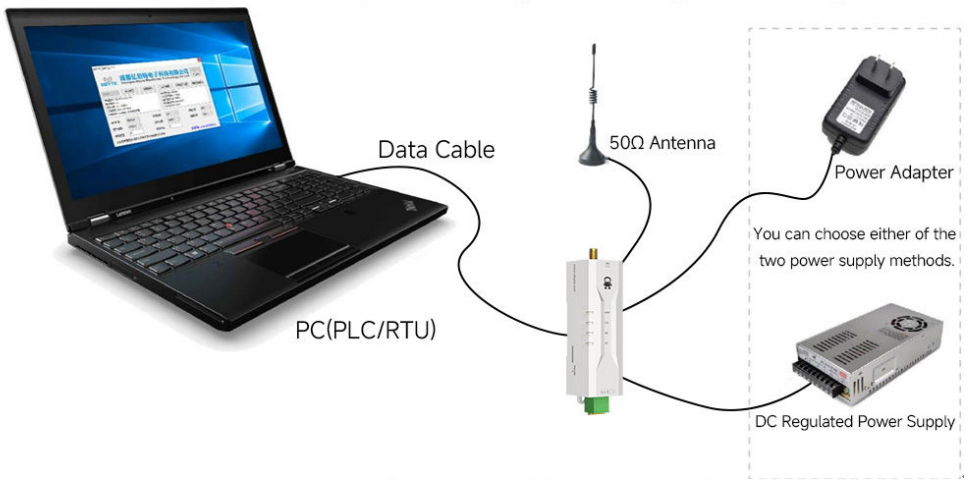


Working mode	M1	M0	Note
Configuration Mode	Indicator light	Indicator light off	The radio can only be programmed in the current mode using the configuration software

1. Programming is available only in the specified operating mode shown above. If programming fails, verify that the modem is in the correct mode.
2. For normal configuration, open the EWD95M-2G4Hxx(xxx) configuration software and modify the required parameters.

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8 Connection diagrams for testing and practical applications



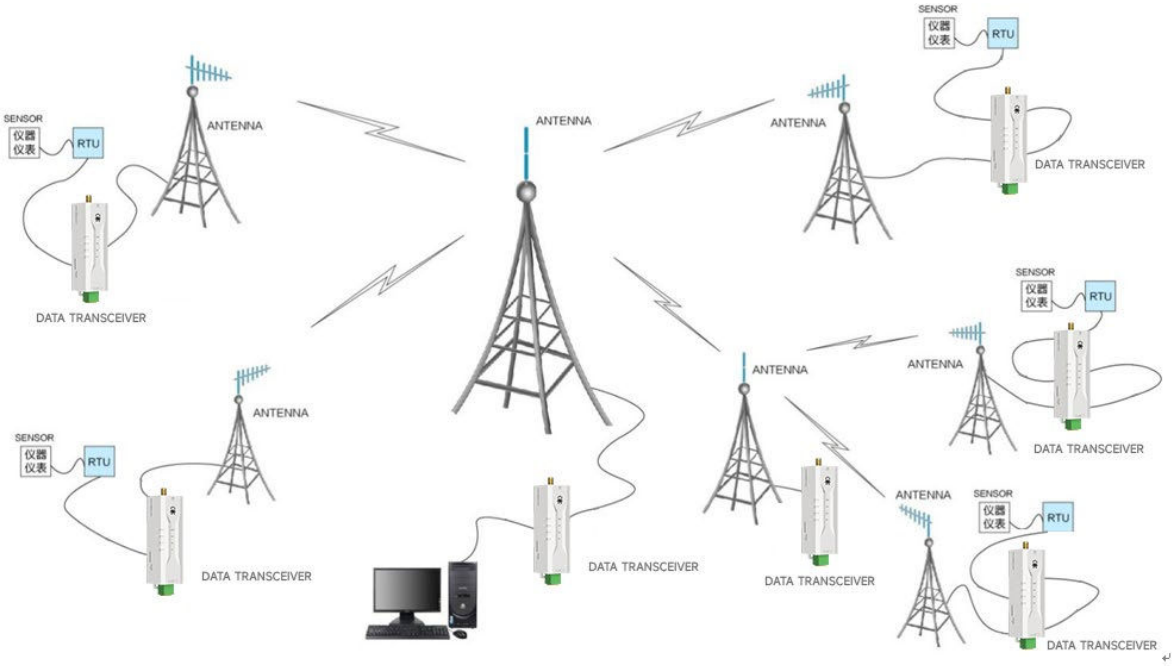
9 Related Products

Model	Interface Type	Operating frequency MHz	Emission 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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10 Typical Applications

EWD95M wireless modems are suitable for point-to-point and point-to-multipoint wireless data systems. Typical applications include industrial automation, smart-home and IoT systems, power-load monitoring, distribution automation, hydrological monitoring, water-network monitoring, street-light control, railway signaling, oil and gas pipeline monitoring, GPS systems, remote meter reading, alarm systems, environmental monitoring, and other remote telemetry and control applications.



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1. Do not operate the modem in flammable or explosive environments.
2. Use a suitable regulated DC power supply with low ripple, adequate current capacity, and appropriate over-current, over-voltage, and surge protection.
3. Do not operate the modem outside its specified environmental limits, including temperature, humidity, electromagnetic-field, and dust limits.
4. Avoid continuous full-load transmission for extended periods unless the installation is designed for that duty cycle.
5. Ensure that the modem, connected equipment, and power supply share a proper ground. Do not connect or disconnect the serial interface while power is applied.
6. During testing, always connect a suitable antenna or 50-ohm dummy load before transmitting. Keep personnel a safe distance from the antenna and do not touch the antenna while transmitting.
7. Wireless range varies with temperature, humidity, terrain, obstacles, antenna placement, and the RF environment. Allow sufficient link margin for reliable operation.
8. If communication range is insufficient, check antenna type, antenna placement, cable losses, power supply quality, and local interference.
9. When selecting a power supply, allow at least 50% current margin and keep supply ripple below 100 mV.

12 Important Statement

1. U.S. Converters LLC reserves the right to revise this manual as required.
2. Product hardware and software may be updated without prior notice. Always refer to the latest available manual for the applicable product revision.

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