Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual

E95M-DTU(400SLxx-xxx)

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Contents

Disclaimer 3
1 Introduction 4
1.1 Brief Introduction 4
1.2 Features 4
1.3 Quick start 5
1.4 Description of each department 7
1.5 Installation dimensions 10
2. Qualification 11
2.1 Model and specification 11
2.2 General specifications and parameters 12
2.3 Frequency range and channel number 12
2.4 Transmitting power level 12
2.5 Air rate rating 13
2.6 Current parameters 13
2.7 Length of receiving and receiving and the subcontracting method 13
3. Functional detailed explanation 14
3.1 Fixed point launch (162 m) 14
3.2 Broadcast transmission (16 approx.) 14
3.3 Broadcast address 14
3.4 Listen address 14
4. work pattern 15
4.1 Transmission mode (mode 0) 15
4.2 WOR Mode (Mode 1) 15
4.3 Configuration Mode (Mode 2) 16
5. Register read and write control 16
5.1 Instruction format 16
5.2 Register description 17
5.3 Factory default parameters 20
6. AT Directive 20
6.1 The AT instruction sheet 20
6.2 AT parameter resolution 22
6.3 Notes for serial port upgrade firmware 23
7. Use of the relay network mode 23
8. Description of the upper computer machine configuration 24
9. Program the radio stations 25
10. The connection diagram in the test and practical application 26
11. Related products 26
12. Practical applications 27
13. Notes for use 28
14. Important statement 29
Revise the history 29
About us 29

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1 Introduction

1.1 Brief Introduction

E95M-DTU (400 SLxx-xxx) is a wireless digital radio station using military grade LoRa modulation technology, with multiple transmission modes, working in (410.125MHz~493.125MHz) band (default 433.125MHz), the station provides transparent RS485 / RS232 / TTL interface, plastic case, rail installation structure, support 8~28V (DC) wide voltage, voltage input. LoRa spread frequency technology will bring further communication distance, and have the advantage of strong anti-interference ability.

Wireless digital radio as a kind of communication media, and optical fiber, microwave, open line, have certain scope of application: it provides some special conditions of private network monitoring signal of real-time and reliable data transmission, with low cost, convenient installation and maintenance, shooting ability, flexible network structure, far coverage characteristics, suitable for point and scattered, complex geographical environment, and PLC, RTU, rainfall gauge, liquid level meter data terminal.

1.2 Features

★ Using the latest LoRa technology, than the traditional LoRa digital radio distance is farther, more powerful performance;
★ Support serial port upgrade firmware, update firmware is more convenient;
★ Support AT instruction, it is more convenient to use;
★ Ultra-small volume, size of 80 * 28 * 27mm, easy and quick installation;
★ E95M-DTU (400SL22-xxx) is up to 5 Km under ideal conditions;
★ E95M-DTU (400SL30-xxx) is up to 10 Km under ideal conditions;
★ With data encryption, the subcontract length can be set;
★ Using flame retardant plastic shell, guide rail type installation structure, convenient and efficient installation;
★ Using hidden button to switch the working mode, to avoid false triggering, the equipment operation is more reliable;
★ Simple and efficient power supply design, support the power supply distribution device or voltage line mode, support 8~28V (DC) power supply;
★ The transmitting power is 22 / 30 dBm, and supports multi-stage adjustable, all technical indicators meet the industrial standards;
★ Support for 2.4K~62.5Kbps of data transmission rate;
★ Support for Modbus protocol transmission;
★ Support RSSI signal strength indication function for assessing signal quality, improving communication network and ranging;
★ Support LBT function, the station automatically sends according to the current ambient noise intensity. Greatly improve the communication success rate of radio stations in the harsh environment;
★ Support for wireless transmission of command data packet, remote configuration or reading of radio station parameters;
★ Support the communication key function, and effectively prevent the data from being intercepted;
★ It can realize the multi-stage relay networking, effectively expand the communication distance, and realize the

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ultra-long distance communication;

★ Working temperature range: -40℃ ~ + 85℃, adapt to a variety of harsh working environment, real industrial-grade products;

★ Power reverse connection protection, adoptive protection, antenna surge protection and other multiple protection functions, greatly increase the reliability of the station;

★ Communication ports and power supply interfaces shall be isolated with high protection;

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

★ Built-in watchdog, and precise time layout, in the event of abnormalities, the station will automatically restart, and can continue to work according to the previous parameter settings.

1.3 Quick start

① You need to prepare two E95M-DTU (400 SLxx-xxx)

② First, install the antenna to the digital radio station, and then install the power supply. The user selects the power adapter according to the need.

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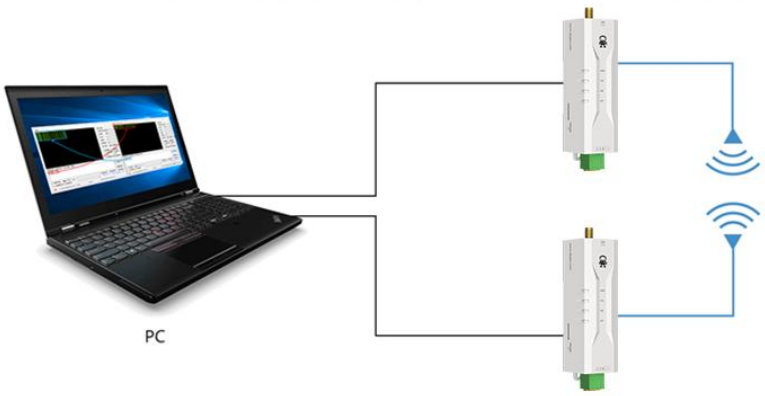
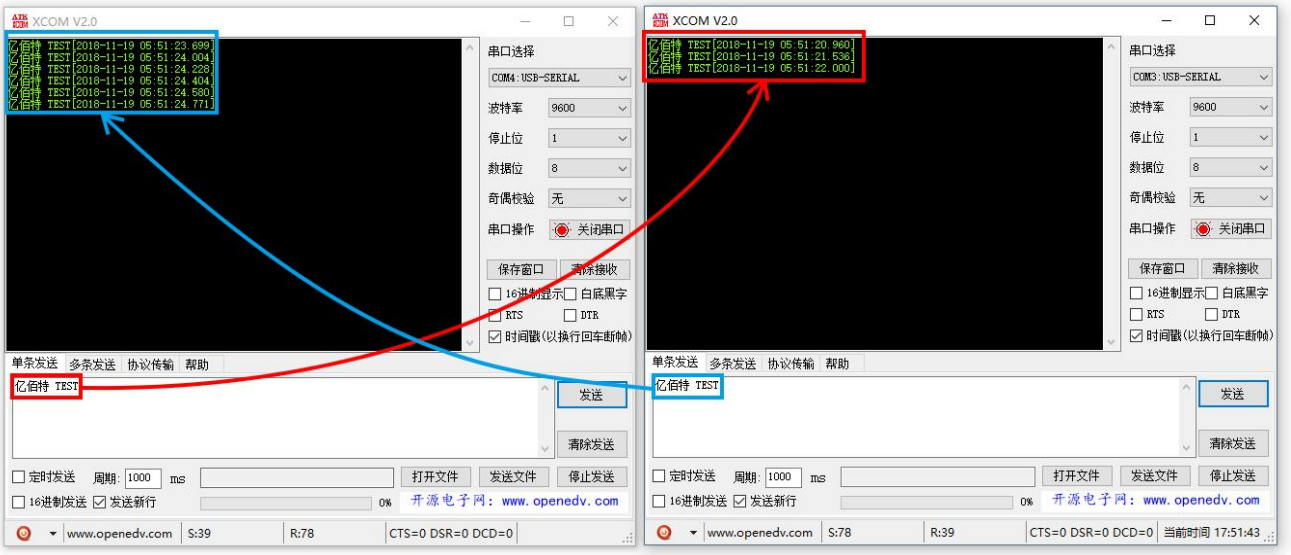
③ Using USB to RS 235 or other means;



④ Start two serial port debugging assistant, select serial port port rate of 9600bps (default), check mode of 8N1, can achieve serial port transmission;



⑤ If the customer needs to switch the working mode, it can switch the different working modes (M0 indicator light, M1 indicator light) through the Mode button control. Press the Mode button once for about 1ms to switch the mode once. Details of the mode switching are shown in the following table:

No.	**Class**	**M1**	**M0**	**Note**
pattern 0	Through transmission mode	light goes out	light goes out	Serial port open, wireless open, transparent transmission (factory default mode), support special command air configuration.
pattern 1	WOR pattern	light goes out	light on	Can be defined as WOR sender and WOR receiver, support aerial wake up
pattern 2	Configuration mode	light on	light goes out	The user accthe register through the serial port to control the working status of the station. The user can configure the station

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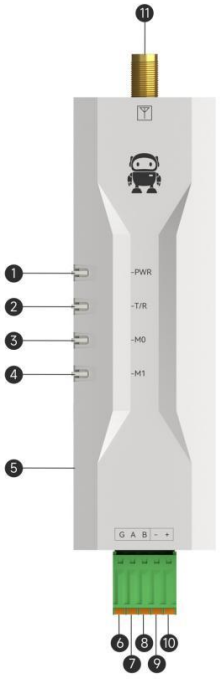
				through the upper computer configuration software.

Note: The radio station has the function of power loss saving mode (the default setting is to transmission mode). The user needs to switch the corresponding mode according to M1 and M0 indicators (effective immediately).

1.4 Description of each department

1.4.1 RS485 interface



No.	Name	Function	Description
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	+	VCC	DC power input port, voltage line port.
10	-	GND	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.

★ E95M-DTU (400 SLxx-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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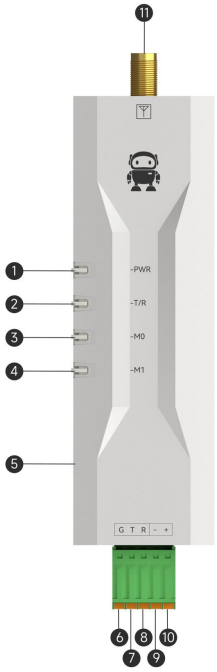
1.4.2 RS232 interface



No.	Name	Function	Description
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	+	VCC	DC power input port, voltage line port.
10	-	GND	DC power input port, voltage line port.
11	ANT	Radio frequency interface	SMA-K，External thread inner hole.

★ E95M-DTU (400 SLxx-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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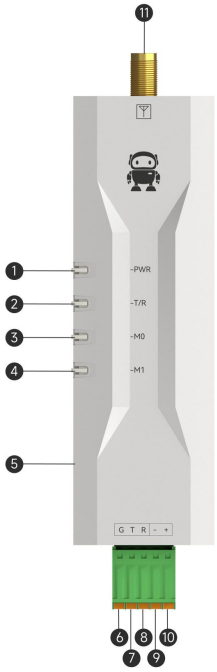
1.4.3 TTL interface



No.	Name	Function	Description
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 TTL bus TX interface	RS232 interface The TX interface is connected to the device RX interface.
8	R	The TTL bus RX interface	RS232 interface The RX interface is connected to the device TX interface.
9	+	VCC	DC power input port, voltage line port.
10	-	GND	DC power input port, voltage line port.
11	ANT	Radio frequency interface	SMA-K，External thread inner hole.

★ E95M-DTU (400 SLxx-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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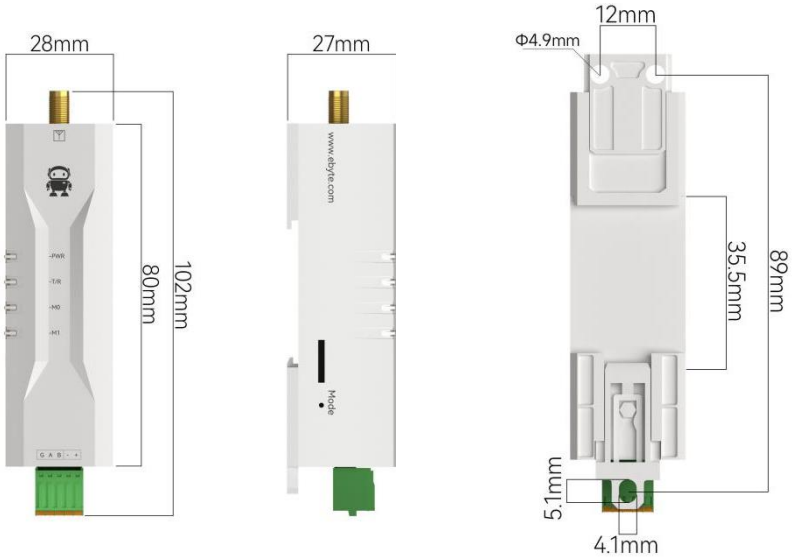
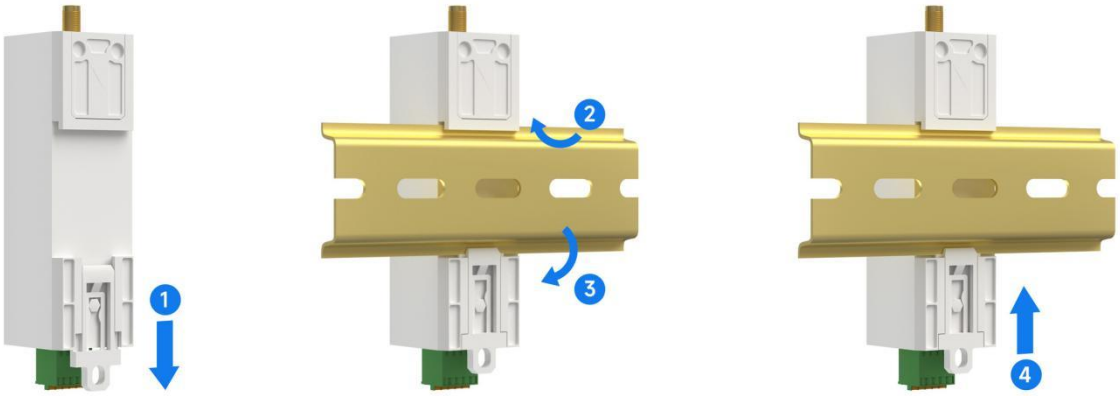
1.5 Installation dimensions





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2. Qualification

2.1 Model and specification

Model	Frequency	Transmitting power	Reference distance	Specification	Application
	MHz	dBm	km		
E95M -DTU(400SL22-485)	410.125 ～ 493.125	22	5	New generation of LoRa frequency expansion, DC power supply	Suitable for distant, vulnerable environments.
E95M -DTU(400SL 22-232)	410.125 ～ 493.125	22	5	New generation of LoRa frequency expansion, DC power supply	Suitable for distant, vulnerable environments.
E95M -DTU(400SL 30-485)	410.125 ～ 493.125	30	10	New generation of LoRa frequency expansion, DC power supply	Suitable for distant, vulnerable environments.
E95M -DTU(400SL 30-232)	410.125 ～ 493.125	30	10	New generation of LoRa frequency expansion, DC power supply	Suitable for distant, vulnerable environments.
E95-DTU(400SL22-TTL)	410.125 ～ 493.125	22	5	The new generation of LoRa frequency expansion, DC power supply, isolated version	Suitable for long distance, vulnerable to interference environment, high protection
E95-DTU(400SL 30-TTL)	410.125 ～ 493.125	30	10	The new generation of LoRa frequency expansion, DC power supply, isolated version	Suitable for long distance, vulnerable to interference environment, high protection

★ Note: In sunny weather, no shelter, 12V / 1A power supply, 5 dBi suction cup antenna, the antenna is 2 meters away from the ground height, using the factory default parameters.

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2.2 General specifications and parameters

No.	Item	Specifications	Description
1	product size	80*28*27 mm	See installation size for details
2	Product weight	32 g	Weight tolerance of 2g
3	working temperature	-40℃～+85℃	technical grade
4	voltage range	8～28V （DC ）	12V or 24V
5	communication interface	RS485/RS232/TTL	RS485, RS232, TTL three choose one, subject to the physical identification of the product
6	Baud rate	Factory default: 9600	The Baud rate range is from 1200 to 115200
7	address code	Factory default 0	A total of 65,536 address codes can be set

2.3 Frequency range and channel number

Model	Frequency	Transmitting power	Reference distance	Specification
	MHz	dBm	km	
E95M -DTU(400SLxx -xxx)	433.125M	410.125～493.125M	1M	84, Half duplex

★ Note: In the same area, use multiple sets of transmission stations to communicate one to one at the same time. It is suggested that the channel interval be set above 2 MHz.

2.4 Transmitting power level

Model	22dBm / 30dBm	17dBm / 27dBm	13dBm / 24dBm	10dBm / 21dBm
E95M -DTU(400SLxx -xxx)	Factory default	√	√	√

★ Note: The lower the transmission power is, the closer the transmission distance is, but the working current will not decrease in the same proportion, so it is recommended to use the maximum transmission power.

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2.5 Air rate rating

Model	Default air rate	Equal series	Air rate grade
	bps		k bps
E95M -DTU(400SLxx-xxx)	2.4k	6	2.4、4.8、9.6、19.2、38.4、62.5

★ Note: The higher the air speed setting, the faster the transmission rate, and the closer the transmission distance; so if the rate meets the usage requirements, the lower the air speed, the better.

2. 6 Current parameters

Model	Emission current mA		Waiting current mA	
	12V	24V	12V	24V
E95M -DTU(400SL 22-xxx)	45	26	10	7
E95M -DTU(400SL 30-xxx)	250	125	9	5

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

2. 7 Length of receiving and receiving and the subcontracting method

ts	Cache size	Subcontracting method
E95M -DTU(400SLxx -xxx)	1000 Bytes	Can be sent by instruction subcontracting 32 / 64 / 128 / 240 bytes

★ pay attention to:

1. If the single received data of the radio station is greater than the single package capacity, the excess data will be automatically allocated to the second transmission until the transmission is completed;
2. Single single received data cannot be greater than the cache capacity.

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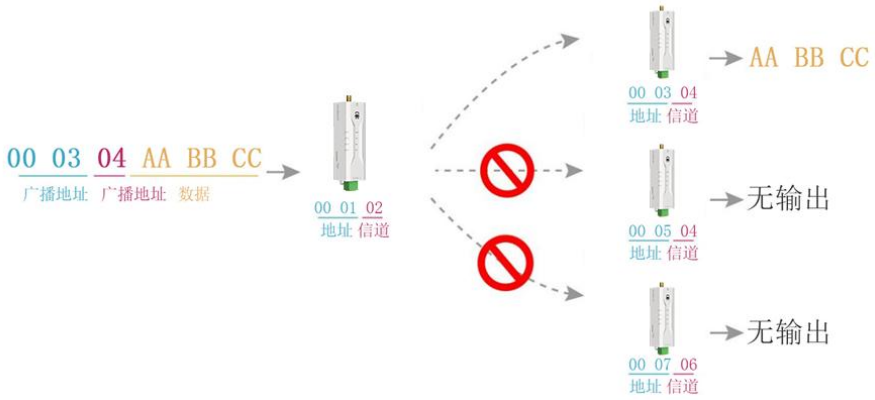
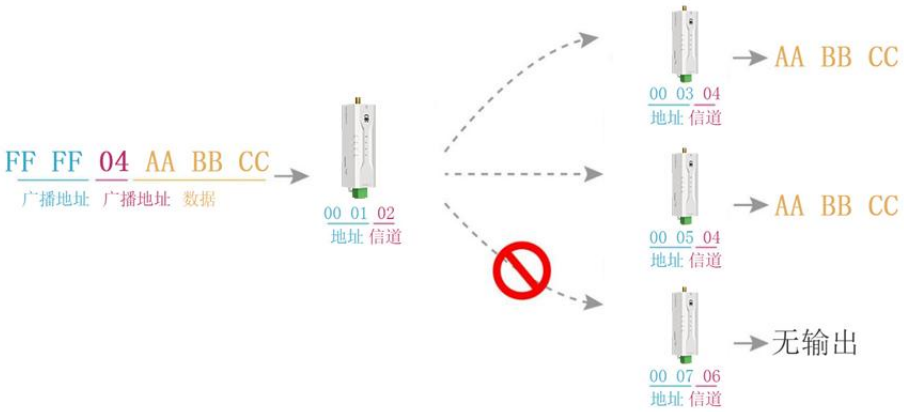
3. Functional detailed explanation

3.1 Fixed point launch (162 m)



3.2 Broadcast transmission (16 approx.)



3.3 Broadcast address

- Example: Set the station A address to 0xFFFF and the channel to 0x04.
- When station A is used as transmission (the same mode, transparent transmission mode), all receiving stations under the 0x04 channel can receive data to achieve the purpose of broadcasting.

3.4 Listen address

- Example: Set the station A address to 0xFFFF and the channel to 0x04.

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- When station A is received, it can receive all the data under the 0x04 channel to achieve the purpose of listening.

4. work pattern

E95-DTU has three working modes. When there is no harsh low power consumption demand, it is recommended to configure the radio station as the transparent transmission mode (mode 0);

The default setting of the station is transmission mode (mode 0).

order number	class	M1	M0	explanatory note
pattern 0	Through transmission mode	light goes out	light goes out	Serial port open, wireless open, transparent transmission (factory default mode), support special command air configuration.
pattern 1	WOR pattern	light goes out	light on	Can be defined as WOR sender and WOR receiver, support aerial wake up
pattern 2	Configuration mode	light on	light goes out	The user accthe register through the serial port to control the working status of the station. The user can configure the station through the upper computer configuration software.

Note: If no low power requirements, no concern about WOR mode (mode 1).

4.1 Transmission mode (mode 0)

type	When the M0 indicator is out, the M1 indicator is out and the station works in mode 0
launch	Users can enter the data through the serial port, and the radio station will start the wireless transmission.
receive	The radio wireless reception function is turned on, and it will be output through the serial port TXD pin after receiving the wireless data.

4.2 WOR Mode (Mode 1)

type	When the M0 indicator is on, the M1 indicator is off and the station works in mode 1
launch	When defined as the transmitting side, the wake-up code is automatically added for a certain time before launch
receive	Data can be received normally, and the receiving function is equivalent to mode 0

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4.3 Configuration Mode (Mode 2)

type	When the M0 indicator is off, the M1 indicator lights on and the station works in mode 2
launch	Wireless configuration is available
receive	Wireless configuration is available
configure	The user can access the register to configure the radio operating status

5. Register read and write control

5.1 Instruction format

Under the configuration mode (mode 2: M 1 = OFF, M 0 = ON), the supported instruction list is as follows (when setting, only 9600,8N1 format is supported):

order number	instruction format	define
1	Set the register	Instructions: C0 + starting address + length + parameter Response: C1 + starting address + length + parameter Example 1: The configuration channel is 0x09 Command start address length parameter Send to: C0 05 01 09 Return: C1 05 01 09 Example 2: simultaneously configure the module address (0x1234), network address (0x00), serial port (9600 8N1), empty speed (2.4K) Send to: C0 00 04 12 34 00 60 Return: C1 00 04 12 34 00 60
2	Read the register	Instructions: C1 + starting address + length Response: C1 + starting address + length + parameter Example 1: Read the access channel Command start address length parameter Send to: C1 05 01 Return: C1 05 01 09 Example 2: Read the module address, network address, serial port, and empty speed simultaneously Send to: C1 00 04 Return: C1 00 04 12 34 00 60
3	Set up the temporary register	Instructions: C2 + starting address + length + parameter Response: C1 + starting address + length + parameter Example 1: The configuration channel is 0x09 Command start address length parameter Send to: C2 05 01 09 Return: C1 05 01 09

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		Example 2: simultaneously configure the module address (0x1234), network address (0x00), serial port (9600 8N1), empty speed (2.4K) Send to: C2 00 04 12 34 00 60 Return: C1 00 04 12 34 00 60
4	Wireless configuration	Instruction: CF CF + General instruction Response: CF CF + conventional response Example 1: The wireless configuration channel is 0x09 Wireless command header command starting address length parameter Send to: CF CF C0 05 01 09 Return: CF CF C1 05 01 09 Example 2: wireless simultaneous configuration module address (0x1234), network address (0x00), serial port (9600 8N1), and airspeed (2.4K) Send to: CF CF C0 00 04 12 34 00 60 Return: CF CF C1 00 04 12 34 00 60
5	format error	Format error response FF FF FF / "=ERR "

5.2 Register description

<table>
<tr><th>order number</th><th>read-write</th><th>name</th><th colspan="5">description</th><th>remarks</th></tr>
<tr><td>00H</td><td>Read / write</td><td>ADDH</td><td colspan="5">ADDH (default 0)</td><td rowspan="2">Module address of high and low bytes;
Note: When the module address is equal to FFFF, it can be used as a broadcast and listening address, that is, the module will not filter the address</td></tr>
<tr><td>01H</td><td>Read / write</td><td>ADDL</td><td colspan="5">ADDL (default 0)</td></tr>
<tr><td>02H</td><td>Read / write</td><td>NETID</td><td colspan="5">NETID (default 0)</td><td>Network address, used to distinguish networks;
When communicating with each other, set it as the same.</td></tr>
<tr><td rowspan="15">03H</td><td rowspan="15">Read / write</td><td rowspan="15">REG0</td><td>7</td><td>6</td><td>5</td><td>UART Serial Rate (bps)</td><td rowspan="9">The two modules of mutual communication, the serial port port rate can be different, the calibration mode can also be different;

When large data packets are launched continuously, users need to consider the data blocking caused by the same port rate, or may even be lost;

It is generally recommended that the same have the same the same.</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>The serial port port rate is 1200</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>The serial port port rate is 2400</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>The serial port port rate is 4800</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>Serial port port rate of 9600 (default)</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>The serial port port rate is 19200</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>The serial port port rate is 38400</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>The serial port port rate is 57600</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>The serial port port rate is 115200</td></tr>
<tr><td>4</td><td>3</td><td colspan="2">Serial check bit</td><td rowspan="6">The communication two sides serial port mode can be different;</td></tr>
<tr><td>0</td><td>0</td><td colspan="2">8N1 (by default)</td></tr>
<tr><td>0</td><td>1</td><td colspan="2">8O1</td></tr>
<tr><td>1</td><td>0</td><td colspan="2">8E1</td></tr>
<tr><td>1</td><td>1</td><td colspan="2">8N1 (equivalent to 00)</td></tr>
</table>

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			2	1	0	Wireless aerial rate (bps)	Both parties to communicate, the air rate, must be the same; The higher the air rate, the smaller the delay, and a shorter the transmission distance.
			0	0	0	Aerial rate of 2.4k (default)	
			0	0	1	The air rate is 4.8k	
			0	1	0	The air rate is 9.6k	
			0	1	1	Aerial rate 19.2k	
			1	0	0	Aerial rate 38.4k	
			1	0	1	Aerial rate 62.5k	
04H	Read / write	REG1	7	6	Subcontract setting		The data sent by the user is less than the subcontract length, and the serial port output of the receiving end is presented as uninterrupted continuous output; If the data sent by the user is greater than the subcontract length, the serial port of the receiving end will subcontract the output.
			0	0	240 bytes (by default)		
			0	1	128 Bytes		
			1	0	64 Bytes		
			1	1	32 Bytes		
			5	The RSSI ambient noise is enabled			When enabled, instruction C0 C1 C2 C3 can read register in transmission mode or WOR transmission mode; Register 0x00: current ambient noise RSSI; Register 0X01: RSSI last received (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; like send C0 C1 C2 C3 00 01 Return to C1 00 01 RSSI (address only starts from 00)
			0	Disable (default)			
			1	start using			
			4	Software mode switching			**If we use our upper position computer configuration parameters, we will actively close the bit.** If you do not want to use M0 M1 pins to switch working mode, you can enable this function, use specific serial instructions to switch mode. Format: C0 C1 C2 C3 02 + working mode Send C0 C1 C2 C3 02 00 to transmission mode Send the C0 C1 C2 C3 02 01 to switch to the WOR mode Send the C0 C1 C2 C3 02 02 to switch to the configuration mode Send the C0 C1 C2 C3 02 03 to switch to the sleep mode Return: C1 C2 C3 02 + working mode Note: When this function is enabled, only 9600 baud rate is supported in WOR mode and sleep mode.
			0	Disable (default)			
			1	start using			
			3	2	continue to have		
			1	0	transmitting power		Power and current are nonlinear relationship, when the maximum power, the power supply efficiency is the highest;
			0	0	22 / 30 dBm (by default)		
			0	1	17/27dBm		

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			1	0	13/24dBm	The current will not decrease in equal proportion with the power decrease.
			1	1	10/21dBm	
05H	Read / write	REG2	Channel Control (CH) 0-83 each represent a total of 84 channels (900 band applicable)			Actual frequency = 410.125 + CH * 1M
06H	Read / write	REG3	7	Enable the RSSI bytes		When enabled, the module receives wireless data and the output through the serial port TXD will follow an RSSI strength byte.
			0	Disable (default)		
			1	start using		
			6	transmission mode		During the fixed-point transmission, the module will identify the first three bytes of the serial port data as: address high + address low + channel, and take it as the wireless transmission target.
			0	Transparent transfer (by default)		
			1	Fixed-point transmission		
			5	Relay function		After the relay function is enabled, if the target address is not the module itself, the module will start a forward; To prevent data return, it is recommended to work with fixed point mode; namely, target address and source address are different.
			0	Disable Relay function (default)		
			1	Enable relay function		
			4	LBT enable		After enabling, the wireless data will be monitored before transmission, which can avoid interference to a certain extent, but may bring data delay; The maximum residence time of LBT is 2 seconds, reaching two seconds.
			0	Disable (default)		
			1	start using		
			3	The WOR mode transceiver control		Only valid for mode 1; 1. In the receiving mode of word, the module can modify the delay time after wake up, and the default time is 0; 2. The receiving terminal needs to send instruction C0 09 02 03 E8 in configuration mode (C0 is a write command, 09 is the register initiator address, 02 is the length, 03 E8 is the set delay, the maximum FFFF is 65535ms, and set to 0, the wake up delay is closed.) 3. Data can be sent within the delay
			0	WOR recipient (default) Working in WOR listening mode, the listening cycle see below (WOR cycle), can save a lot of power consumption.		
			1	The WOR transmitter party The module sends and receives open, and adds a certain time wake code when transmitting data.		
			2	1	0	WOR period	Only valid for mode 1; Cycle T= (1 + WOR) * 500ms, maximum 4000ms, minimum 500ms; The longer the WOR monitoring interval period, the lower the average power consumption, but the greater the data delay; It must be consistent (very important)
			0	0	0	500ms	
			0	0	1	1000ms	
			0	1	0	1500ms	
			0	1	1	2000ms (by default)	
			1	0	0	2500ms	
			1	0	1	3000ms	
			1	1	0	3500ms	
			1	1	1	4000ms	
07H	write	CRYPT_H	Key High Bytes (default 0)			Write only, read back to 0; For encryption, to avoid the aerial wireless data intercepted by similar modules; These two bytes will be used as the calculation factor to encrypt the wireless signal in the air.
08H	write	CRYPT_L	Key Low Bytes (default 0)			
80H ～ 86H	a slight pause	PID	Product information is 7 bytes			Use has been suspended for reserved only. Please refer to the AT + DEVTYPE and AT + FWCODE

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	in reading			instructions in Section 9.1.

5.3 Factory default parameters

Factory default parameter value	**C0 00 09 00 00 00 60 00 23 03 00 00**						
Module model	frequency	address	channel	Air rate	Baud rate	Serial port format	transmitting power
E95M -DTU (400SL 20-485)	433.125MHz	0x0000	0x 23	2.4kbps	9600	8N1	20dBm
E95M -DTU (400SL 30-485)	433.125MHz	0x0000	0x 23	2.4kbps	9600	8N1	30dBm

6. AT Directive

- Using AT instructions for parameter configuration or query should be performed in configuration mode;
- AT instructions are used in configuration mode. AT instructions are divided into three categories: command instruction, setting instruction and query instruction;
- Users can go through the words " AT + HELP =?"Query to the AT instruction set supported by the module, the AT instruction adopts the port rate of 9600 8N0;
- When the input parameter exceeds the range, it will be limited. Please do not let the parameter exceed the range to avoid the unknown situation.

6.1 The AT instruction sheet

command instruction	description	instance	Example description
AT + IAP (Use carefully, see article 6.3 serial port upgrade firmware considerations)	Enter the IAP upgrade mode	AT+IAP	Enter the IAP upgrade mode
AT+RESET	Equipment restart	AT+RESET	Equipment restart
AT+DEFAULT	Configure the parameters to restore the default And the device restarted	AT+DEFAULT	Configure the parameters to restore the default And the device restarted

Set instructions	description	instance	Example description
AT+UART=baud,parity	Set the port rate and check	AT+UART=3,0	Set the port rate to 9600,8N1

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AT+RATE=rate	Set air rate	AT+RATE=7	Set the air rate to 62.5K
AT+PACKET=packet	Set the length of the package	AT+PACKET=0	Set the packet to 240 bytes
AT+WOR=role,period	Set the WOR roles and cycles	AT+WOR=0,3	Set to WOR receive for a period of 2000ms
AT+POWER=power	Set the sending power	AT+POWER=0	The transmission power is set to be 20 / 30 dBm
AT+TRANS=mode	Set the send mode	AT+TRANS=1	Set to point mode
AT+ROUTER=router	Set relay mode	AT+ROUTER=1	Set to the relay mode
AT+LBT=lbt	Set the Listen Before Talk function switch	AT+LBT=1	Set on, refer to section 5.2 LBT enable for details
AT+ERSSI=erssi	Set the ambient noise RSSI switch	AT+ERSSI=1	Set on, refer to section 5.2 RSSI environmental noise function in detail
AT+DRSSI=data_rssi	Sets the receiving data RSSI switch	AT+DRSSI=1	The receive data RSSI function is turned on
AT+ADDR=addr	Set module address	AT+ADDR=1234	Set the module address to 1234
AT+CHANNEL=channel	Set up the module working channel	AT+CHANNEL=23	Set the frequency to 433.125M
AT+NETID=netid	Set the network ID	AT+NETID=2	Set the network ID to 2
AT+KEY=key	Set the module key	AT+KEY=1234	Set the module key to 1234
AT+DELAY=delay	Set the WOR delay sleep time	AT+DELAY=1000	Set the WOR delay dormancy to 1000ms (during which send tasks can be performed. It is often used for the WOR receiver to perform wireless transmission without switching to the transtransmission mode.）
AT+SWITCH=switch	Set the software switching mode switch	AT+SWITCH=1	Set on in configuration mode to allow software switching
AT+MODE=mode	Switch the working mode	AT+MODE=0	Switch to transmission mode

Query instructions	description	Return an example	Example description
AT+HELP=?	Query the AT timetable		Returns the AT repertoire
AT+DEVTYPE=?	Query module model	DEVTYPE=E90-DTU(900SL33)	Return Module Model
AT+FWCODE=?	Query firmware encoding	FWCODE=7432-0-10	Return firmware version
AT+UART=?	Query the baud rate and the check	AT+UART=3,0	Return to a port rate of 9600,8N0

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AT+RATE=?	Query air rate	AT+RATE=7	The return to the air rate is 62.5k
AT+PACKET=?	Query the length of the package	AT+PACKET=0	Return packet is 240 bytes
AT+WOR=?	Query the WOR roles and cycles	AT+WOR=0,3	Return to WOR receive with a period of 2000ms
AT+POWER=?	Query send power	AT+POWER=0	The return sending power is 20 / 30 dBm
AT+TRANS=?	Query send mode	AT+TRANS=1	Returns to the fixed-point mode
AT+ROUTER=?	Query Relay Mode	AT+ROUTER=1	Returns to the relay mode
AT+LBT=?	Query the Listen Before Talk function switch	AT+LBT=1	Return to the LBT switch status
AT+ERSSI=?	Query the ambient noise RSSI switch	AT+ERSSI=1	Return to the ambient noise switch state
AT+DRSSI=?	Query the RSSI output	AT+DRSSI=1	The return-channel RSSI function is turned on
AT+ADDR=?	Query module address	AT+ADDR=1234	The return module address is 1234
AT+CHANNEL=?	Query the module working channel	AT+CHANNEL=23	The return frequency is set at 433.125M
AT+NETID=?	Query network ID	AT+NETID=2	The return network ID is 2
AT+KEY=?	Query module key	Read is not supported (security considerations)	return ERR
AT+DELAY=?	Query WOR delay dormancy time	AT+DELAY=1000	The return WOR delay sleep time is 1000ms
AT+SWITCH=?	Query software switch mode switch	AT+SWITCH=0	Software switching mode is turned off
AT+MODE=?	Query the current working mode (available in all modes)	AT+MODE=0	Return to the current transmission mode

6.2 AT parameter resolution

When the serial port receives the correct instruction, the serial port returns "instruction =OK", otherwise it returns "= ERR"

Instruction parameters	Parameter meaning
Baud (serial port 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 (air rate)	0:2.4K 1:2.4K 2:2.4K 3:4.8K 4:9.6K 5:19.2K 6:38.4K 7:62.5K
Packet (Packet length)	0:240 1:128 2:64 3:32

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Role (WOR role)	0: receive 1: send
Period (WOR Cycle)	0:500ms 1:1000ms 2:1500ms 3:2000ms 4:2500ms 5:3000ms 6:3500ms 7:4000ms
Power (transmit power)Note 1	0:22dBm 1:17dBm 2:13dBm 3:10dBm
	0:30dBm 1:27dBm 2:24dBm 3:21dBm
Mode (Transport mode)	0: transparent 1: fixed point
Router (Relay mode)	0: Off 1: On
LBT(listen before talk)	0: Off 1: On
Erssi (Environmental RSSI)	0: Off 1: On
Data _ rssi (Data RSSI)	0: Off 1: On
Addr (module address)	Module address 0~65535 (10 r)
Channel (Module channel)	Module channel 0~80 (10 decimal system)
Netid(network ID)	Module network 0~255 (10 r)
Key(cipher code)	Module key 0~65535 (10 r)
Delay (WOR delay dormancy)	Delay hibernation 0~65535 (10 decimal point)

Note 1: Different module sets for different powers. You can check the transmitting power in manual 6.2.

6.3 Notes for serial port upgrade firmware

If the customer needs to upgrade the firmware, it needs to find the corresponding BIN file provided by the official, and then use the official provided upper machine to upgrade the firmware. Generally, the user does not need to upgrade the firmware, so do not use the "AT + IAP" command.

First connect to RS485 / RS232 / TTL, then send "AT + IAP" command instruction in configuration mode into upgrade mode. If you need to exit the IAP upgrade mode, you need to stay on and wait for 60 seconds, the program will automatically exit, otherwise even if the restart, it will enter the upgrade mode indefinitely.

After entering the upgrade mode, the port rate will automatically switch to 115200 until you automatically exit, with a log output.

7. Use of the relay network mode

order 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 relay mode, ADDH, ADDL is no longer used as the radio address, but corresponds to NETID forwarding pair. If one of the networks is received, it is forwarded to another network. The repeater's own network ID is invalid.
3	In relay mode, the relay radio cannot send and receive data and cannot perform low-power operation.
4	The user enters another mode from mode 3 (sleep mode), or during the reset process, the station will reset the user parameters, during which the AUX outputs a low level.

Description of the relay networking rules:

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

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2、In relay mode, ADDH \ ADDL is no longer paired as a radio address and as a NETID forwarding pair.

as shown in the figure:

① Level 1 Relay

"Node 1" NETID is 08.

"Node 2" NETID is 33.

The ADDH \ ADDL for relay 1 was 08,33, respectively.

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

At the same time, node 1 and node 2 have the same address, so the data sent by node 1 can be received by node 2.

② Secondary Relay

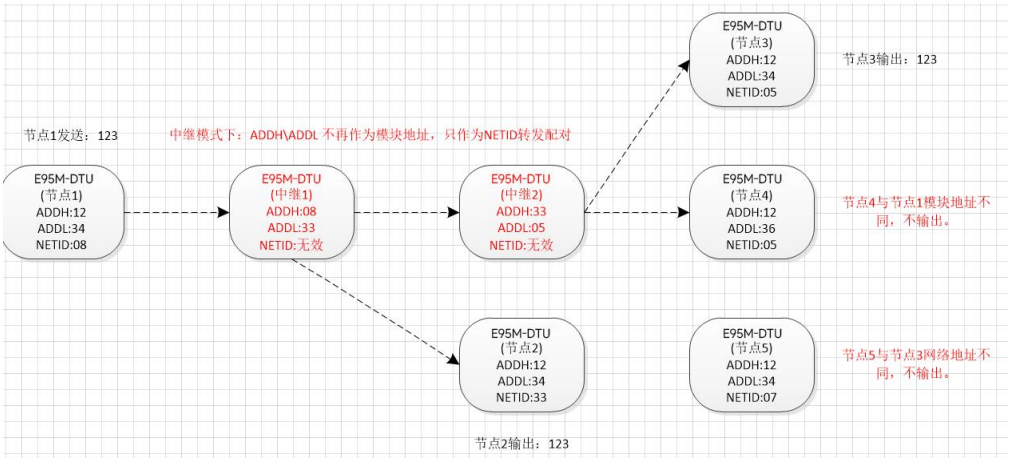
The ADDH \ ADDL for relay 2 was 33,05, respectively.

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

Thus, the nodes 3 and the node 4 can receive the node 1 data. Node 4 normally outputs data, and node 3 has different addresses from node 1, so it does not output data.

③ bi-directional relay

As configured, data nodes 2 and 4 sent by nodes 1 may be received, and data sent by nodes 2 and 4 can also be received by nodes 1.



8. Description of the upper computer machine configuration

- The following figure shows E95M-DTU (400SLxx-xxx) configure the upper machine display interface. Users can switch to configuration mode through the MODE key, and quickly configure and read parameters in the upper machine.

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- In the configuration computer, the radio address, frequency channel, network ID and key are all in decimal display mode, including the value range of each parameter:

  Network address: 0~65535

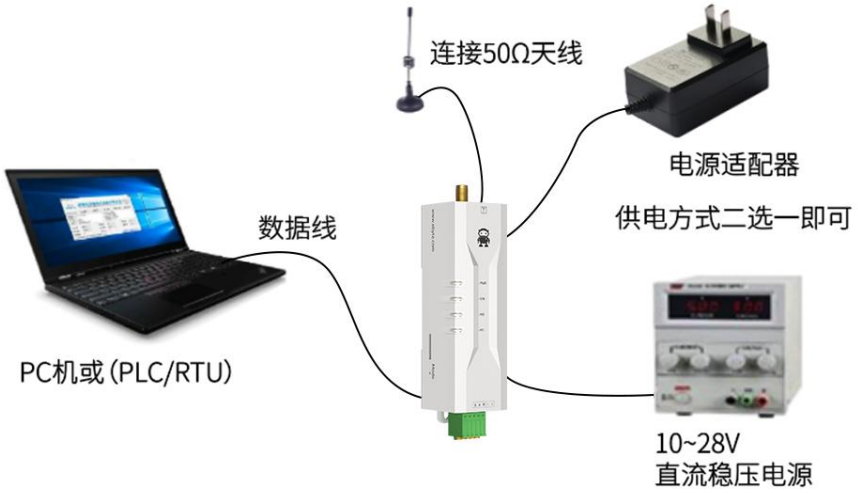
  Frequency channel: 0~83

  network ID:0~255

  Key: 0~65535

- When using the upper computer to configure the relay mode, users need to pay special attention to it. In the upper computer, the parameters are decimal display mode, so the radio address and network ID need to be converted into binary. If the network ID input by the transmitter A is 02 and the network ID input by the receiver B is 10, then the relay terminal R sets the station address, then the hex value 0X020A is converted to the decimal value 522 as the radio address filled by the relay end R. That is, the radio address value of the relay terminal R that needs to be filled in is 522.

9. Program the radio stations



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work pattern	M1	M0	explanatory note
Configuration mode	The indicator light is bright	The indicator lights go out	Stations can only be programmed by using the configuration software in the current mode

1、 Programming can only be performed in specific working mode (see table above). Please sure the radio working mode is correct.

2、 Relevant parameters can be modified by opening the E95M-DTU (400 SLxx-xxx) configuration software without complex programming.

10. The connection diagram in the test and practical application

11. Related products

product model	interface type	service frequency M Hz	transmitting power dBm	Reference distance	functional characteristics
E95-DTU(400SL22-485)	RS485	410.125 ～ 493.125	22	5	New generation LoRa, guide rail type, RS485, E90-DTU S L system type communication, DC power supply
E95-DTU(400SL 22-232)	RS232	410.125 ～ 493.125	22	5	New generation LoRa, guide rail type, RS232, E90-DTU S L system type communication, DC power supply
E95-DTU(400SL 30-485)	RS485	410.125 ～ 493.125	30	10	New generation LoRa, guide rail type, RS485, E90-DTU S L system type communication, DC power supply

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E95-DTU(400SL 30-232)	RS232	410.125 ～ 493.125	30	10	New generation LoRa, guide rail type, RS232, E90-DTU S L system type communication, DC power supply
E95-DTU(400SL22P -485)	RS485	410.125 ～ 493.125	22	5	New generation LoRa, guide rail type, RS232, E90-DTU SL series interchange, high protection, DC power supply
E95-DTU(400SL 22P -232)	RS232	410.125 ～ 493.125	22	5	New generation LoRa, guide rail type, RS485, E90-DTUL system interconnection, high protection, DC power supply
E95-DTU(400SL 30P -485)	RS485	410.125 ～ 493.125	30	10	New generation LoRa, guide rail type, RS232, E90-DTU SL series interchange, high protection, DC power supply
E95-DTU(400SL 30P -232)	RS232	410.125 ～ 493.125	30	10	New generation LoRa, guide rail type, RS485, E90-DTU S L series interchange, high protection, DC power supply
E96-DTU(400SL22-485)	RS485	410.125 ～ 493.125	22	5	New generation of LoRa, guide rail type, RS485, E90-DTU S L system class communication, AC power supply
E96-DTU(400SL 22-232)	RS232	410.125 ～ 493.125	22	5	New generation of LoRa, guide rail type, RS232, E90-DTU S L system class communication, AC power supply
E96-DTU(400SL 30-485)	RS485	410.125 ～ 493.125	30	10	New generation of LoRa, guide rail type, RS485, E90-DTU S L system class communication, AC power supply
E96-DTU(400SL 30-232)	RS232	410.125 ～ 493.125	30	10	New generation of LoRa, guide rail type, RS232, E90-DTU S L system class communication, AC power supply

12. Practical applications

Radio is suitable for all kinds of point-to-point, multi-point wireless data transmission system, such as intelligent home, Internet of things, power load monitoring, distribution network automation, hydrological hydrologic monitoring, water pipe network monitoring, city street lamp monitoring, air defense alarm control, railway signal monitoring, railway water supply centralized control, oil gas supply network monitoring, GPS positioning system, remote meter reading, electronic weighing, report, automatic target, earthquake monitoring, fire prevention, security, environmental monitoring and other industrial automation system, the chart below:

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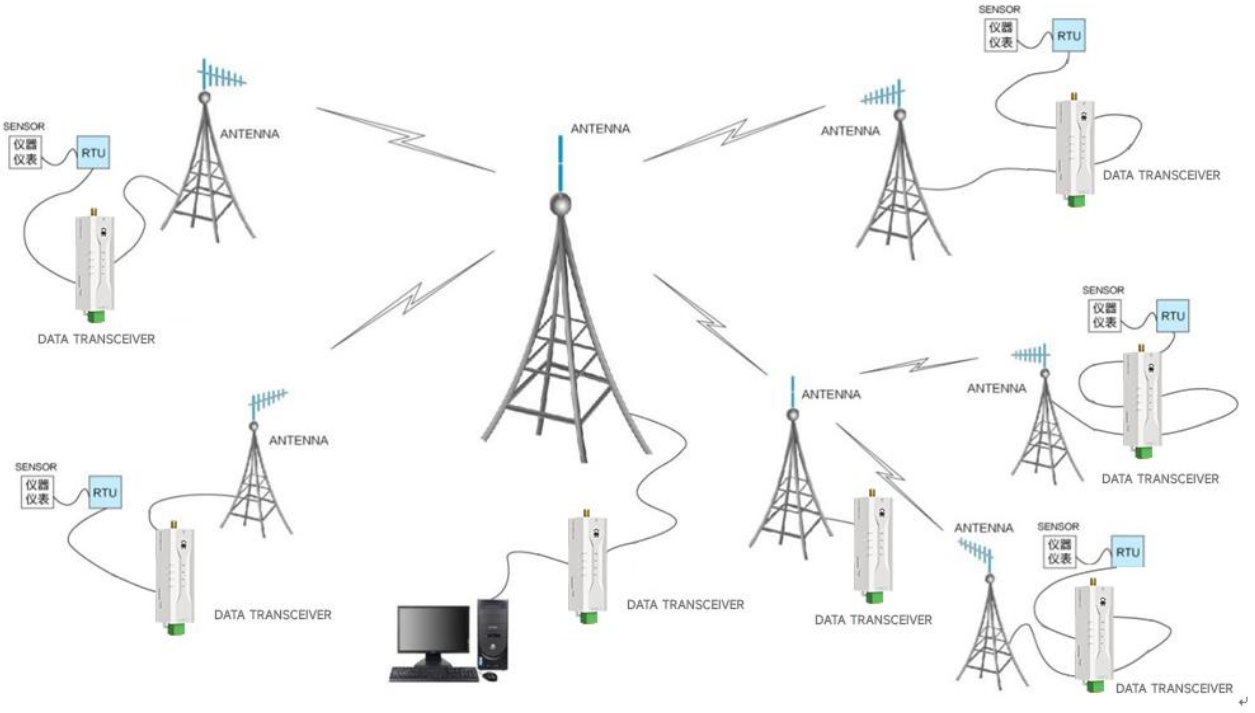

13. Notes for use

1. This radio station shall not be operated near some flammable places (such as coal mines) or explosive dangerous objects (such as detonators).
2. Suitable DC voltage power supply should be selected for strong high frequency interference resistance, small ripple, and sufficient load capacity; preferably overcurrent, overvoltage protection and lightning protection functions to ensure the normal operation of digital transmission station.
3. Do not use it in a working environment beyond the environmental characteristics of the digital transmission radio station, such as high temperature, humidity, low temperature, strong electromagnetic field, or large dust environment.
4. Do not let the transmission station continuously at full capacity, otherwise the fire may burn the transmitter.
5. The ground wire of digital transmission station should be well connected with the ground wire of external equipment (such as PC, PLC, etc.) and the ground wire of power supply, otherwise it is easy to burn out the communication interface; do not plug or pull the serial port.
6. During the test, the matching antenna or 50 Ω false load must damage the transmitter. If the antenna is connected, the distance between the human body should be more than 2 meters to avoid damage, do not touch the antenna during transmission.
7. Wireless data transmission stations often have different communication distances in different environments, which is often affected by temperature, humidity, obstacle density, obstacle volume and electromagnetic environment. In order to ensure stable communication, it is suggested to reserve more than 50% communication distance margin.
8. If the measured communication distance is not ideal, it is suggested to analyze and improve the communication distance from the antenna quality and antenna installation mode. Also available with support@cdebyte.com get in touch and seek help.

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9. When selecting the power supply, in addition to keeping the 50% current allowance as recommended, it should be noted that the ripple should not exceed 100 mV.

14. Important statement

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

Revise the history

edition	Revised date	revision note	Maintain people
1.0	2023-6-28	The initial version	Hao

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