Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual



E95/E96-DTU(433Lxx485)-V8

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1. Introduction

1.1 Brief Introduction

E95/E96-DTU(433Lxx-485)-V8 is a wireless data transmission DTU that uses military-grade LoRa modulation technology. It has a variety of transmission methods. It works at 410～441M (default 433MHz). The DTU provides a transparent RS485 interface, plastic shell. rail type installation structure, support 8～28V（DC）/85～265V（AC）voltage input. LoRa spread spectrum technology will bring a longer communication distance and has the advantage of strong anti-interference ability.

As a communication medium, wireless data transmission station has a certain scope of application 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, with low cost, installation and maintenance Convenience, strong diffraction ability, flexible network structure, and long coverage, suitable for many and scattered locations, complex geographical environment and other occasions, can be connected with PLC, RTU, rain gauge, level gauge and other data terminals.

1.2 Features

- ★ Adopt military-grade LoRa modulation technology, with data encryption, and the packet length can be set;
- ★ Adopt flame-retardant plastic shell, guide rail type installation structure, convenient and efficient installation;
- ★ Hidden buttons are used to switch working modes to avoid false triggers, and the equipment is more reliable in operation;
- ★ Simple high-efficiency power supply design, support power supply configuration or line pressure mode, support 8～28V（DC）/85～265V（AC） power supply;
- ★ The transmit power can reach up to 20/30dBm, and supports multi-level adjustment. All technical indicators meet European industrial standards;
- ★ Support Modbus protocol transmission;
- ★ Support wireless sending of command data packets, remote configuration or reading of DTU parameters;
- ★ Support communication key function, effectively prevent data from being intercepted;
- ★ Working temperature range: -40℃～+85℃, adapt to various harsh working environments;
- ★ Multiple protection functions such as power pulse protection, reverse connection protection, and antenna surge protection increase the reliability of the DTU;
- ★ Powerful software function, 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 DTU will automatically restart and continue to work according to the previous parameter settings.

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1.3 Quick Star

① Prepare two E95-DTU(433L20-485)-V8



② First install the antenna for the digital DTU, and then install the power supply. The user selects the power adapter for power supply according to the needs.



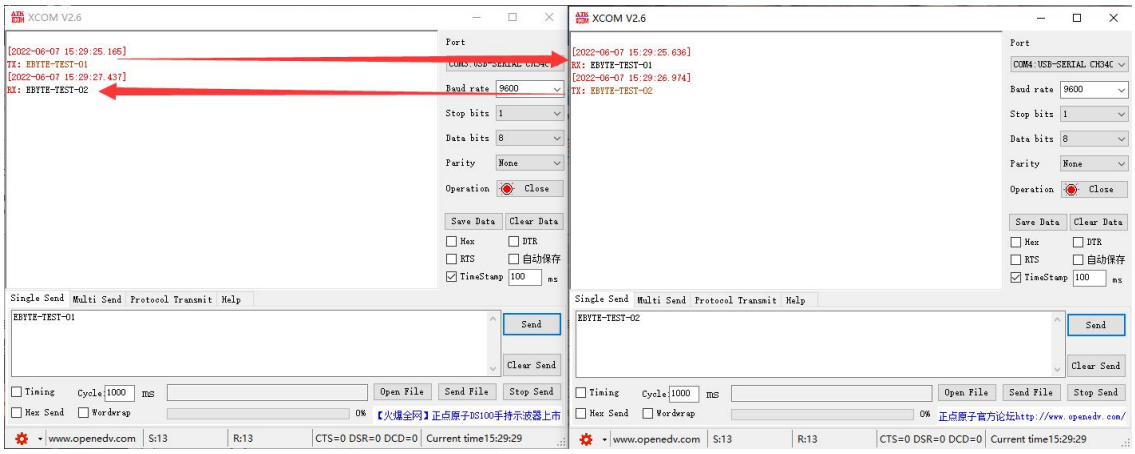
③ Use USB to RS-485 or other methods to connect the computer to the digital DTU.



④ Start two serial port debugging assistants, select the serial port baud rate to be 9600bps (default), and the check method to be 8N1 to make serial port transparent transmission.

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⑤ If the customer needs to switch the working mode, it can be controlled by the Mode button to switch between different working modes (M0 indicator, M1 indicator). Hold and press the Mode button for 1 second and release it to switch the mode once. The mode switching details are shown in the table below:

No.	Type	M1	M0	Description
Mode 0	Transparent Transmission Mode	Light Off	Light Off	Serial port open, wireless open, transparent transmission (factory default mode)
Mode 1	WOR Mode	Light Off	Light On	WOR transmission mode, data packet comes with wake-up code
Mode 2	Power Saving Mode	Light On	Light Off	WOR receiving mode, saving its own receiving power consumption, this mode cannot transmit
Mode 3	Configuration Mode	Light On	Light On	The DTU can be programmed using the configuration software

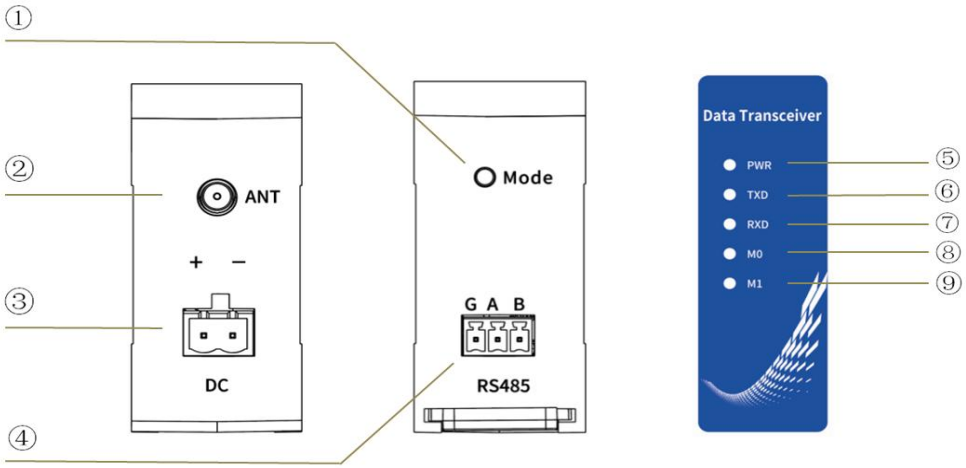
Note:

- **The DTU has a power-down save mode function (the factory default setting is transparent transmission mode), the user needs to switch the corresponding mode according to the M1 and M0 indicators (effective immediately).**
- **"Quick Start" uses "E95-DTU (433L20-485)" as an example, other models refer to the configuration, pay attention to the power input of the AC equipment.**

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1.4 Parts Description

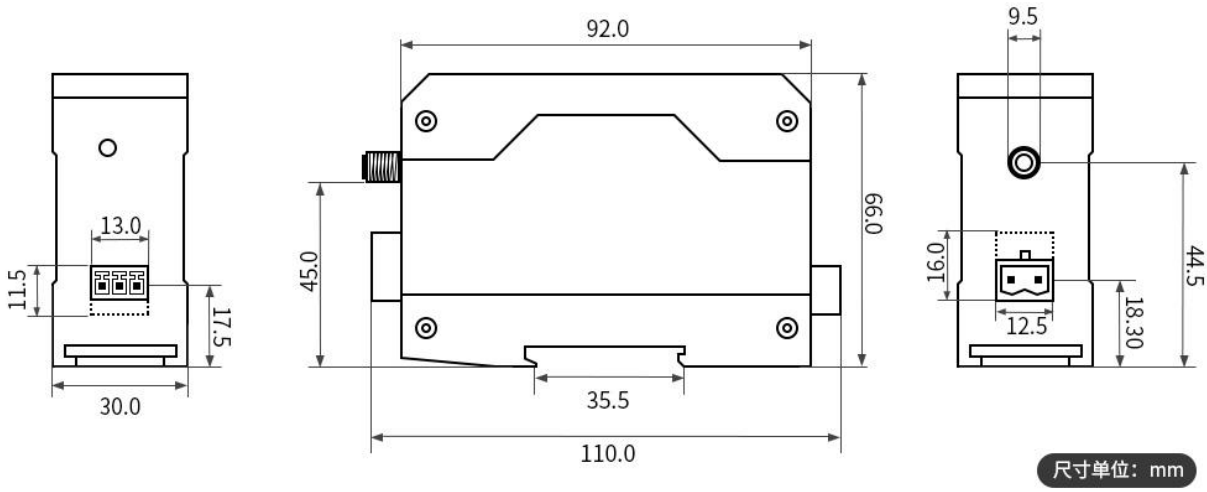


No.	Name	Function	Description
1	Mode	Mode switch button	Working mode switching control
2	ANT	RF interface	SMA-K，External thread inner hole
3	DC	Power supply	DC power input port, pressure line port
4	RS485	RS485 interface	Standard RS-485 interface
5	PWR-LED	Power indicator	Lights up when the power is on
6	TXD-LED	Sending indicator	Flashes when sending data
7	RXD-LED	Receiving indicator	Flashes when receiving data
8	M0-LED	Mode indicator	Working mode indicator
9	M1-LED	Mode indicator	Working mode indicator

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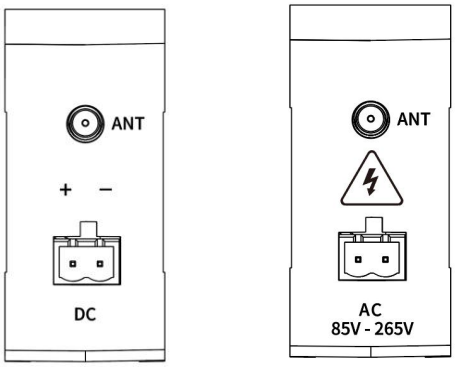
1.5 Size



Uint: mm

2. Interface Description

2.1 Power interface description



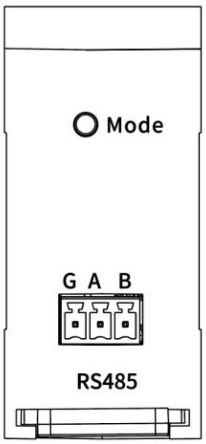
E95/E96-DTU(433LXX-485)-V8 can be powered by 8～28V DC /85～265V（AC）power supply. The wiring port is connected by a wiring terminal (2 Pin).

2.2 Communication interface description

E95/E96-DTU(433LXX-485)-V8 can be connected to the equipment through RS485/RS232 using terminal blocks.

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No.	Standard definition	Function	Description
1	G	Signal ground	Grounding
2	A	RS-485 bus A interface	RS-485 A interface is connected to device A interface
3	B	RS-485 bus B interface	RS-485 B interface is connected to device B interface

★Note: When the device is connected with multiple devices, the communication is not smooth, but there is no such phenomenon when a single device is connected. Please try to connect a 120Ω resistor in parallel between the 485_A terminal and the 485_B terminal.

3. Technical Parameter

3.1 Model specifications

Model	Working Frequency	Transmit Power	Distance	Specifications	Recommended Application Scenarios
	MHz	dBm	km		
E95-DTU(433L20-485)-V8	410 ～ 441	20	3	LoRa spread spectrum anti-jamming, DC power supply	Suitable for small data volume and long-distance application environment
E95-DTU(433L30-485)-V8	410 ～ 441	30	8	LoRa spread spectrum anti-jamming, DC power supply	Suitable for small data volume and long-distance application environment
E96-DTU(433L20-485)-V8	410 ～ 441	20	3	LoRa spread spectrum anti-jamming, AC power supply	Suitable for small data volume and long-distance application environment
E96-DTU(433L30-485)-V8	410 ～ 441	30	8	LoRa spread spectrum anti-jamming, AC power supply	Suitable for small data volume and long-distance application environment

★ Note: Sunny, open environment without obstruction, 12V/1A power supply, 5dBi suction antenna, antenna height 2 meters from

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the ground, use factory default parameters.

3.2 General parameter

No.	Terms	Specifications	Description
1	Size	92*66*30 mm	Review installation dimensions for details
2	Weight	95 g	Weight tolerance 5g
3	Working Temperature	-40℃～+85℃	Meet the needs of industrial use
4	Voltage Range	8～28V（DC） 85～265V（AC）	12V or 24V recommended for DC version 110V/220V for AC version
5	Interface	RS485	RS485
6	Baud Rate	Default 9600	Baud rate range 1200～115200
7	Address Code	Default 0	A total of 65536 address codes can be set

3.3 Frequency range and channel number

Model	Default Frequency	Frequency Range	Channel Spacing	Number of Channels
	Hz	Hz	Hz	
E95/E96-DTU(433Lxx-485)-V8	433M	410～441M	1M	32，Half Duplex

★ Note: In the same area, multiple groups of digital DTUs are used for one-to-one communication at the same time. It is recommended that each group of digital DTUs set the channel spacing above 2MHz.

3.4 Transmit power level

Model	20dBm / 30dBm	17dBm / 27dBm	13dBm / 24dBm	10dBm / 21dBm
E95/E96-DTU(433Lxx-485)-V8	Factory Default	√	√	√

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

3.5 Air data rate level

Model	Default Air Rate	Level	Air Data Rate Level
	bps		bps

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E95/E96-DTU(433Lxx-485)-V8	2.4k	6	0.3k、1.2k、2.4k、4.8k、9.6k、19.2k

★ The higher the air speed setting, the faster the transmission rate and the shorter the transmission distance; therefore, when the speed meets the requirements of use, it is recommended that the airspeed be as low as possible.

3.6 Current parameter

Model	Transmitting Current mA		Waiting Current mA	
	12V	24V	12V	24V
E95/E96-DTU(433L20xx-485)	230	135	20	12
E95/E96-DTU(433L30xx-485)	306	152	22	18

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

3.7 Sending and receiving length and sub-packing method

Model	Cache Size	Sub-packing Method
E95/E96-DTU(433Lxx-485)-V8	512 bytes	Auto sub-packing 58 bytes

★ Note:

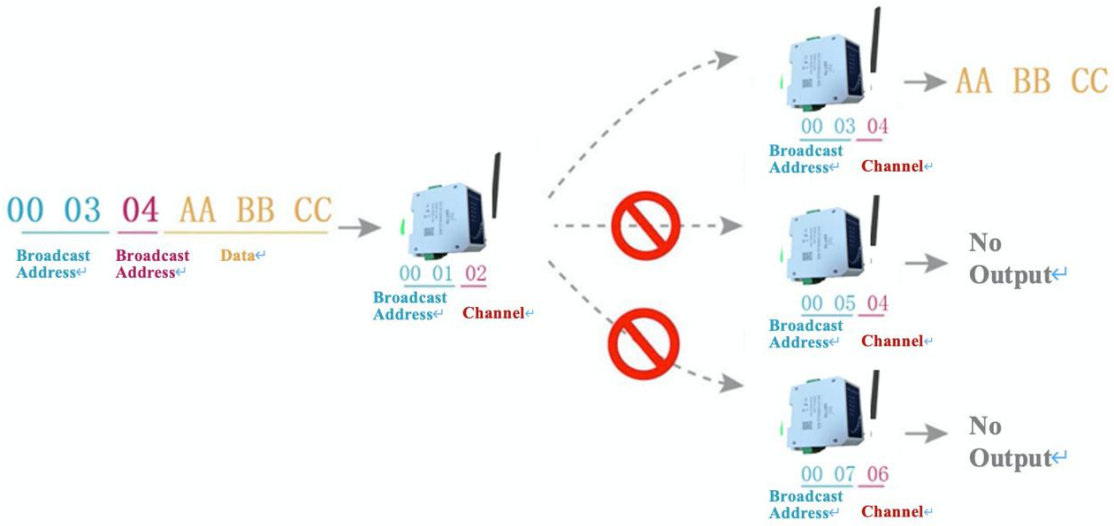
1. If the DTU's single received data is greater than the single packet capacity, the excess data will be automatically allocated to the second transmission until the transmission is completed;
2. The single received data of the DTU cannot be larger than the buffer capacity.

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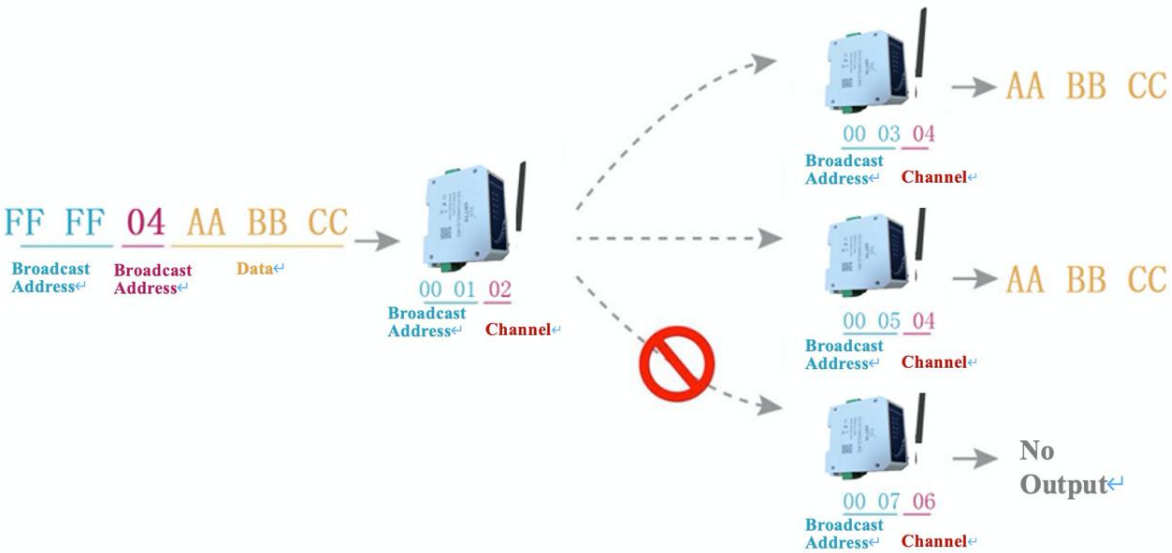
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4. Function Details

4.1 Point-to-Point transmission (hexadecimal)



4.2 Broadcast transmission (hexadecimal)



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4.3 Broadcast address

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

4.4 Listening address

- Example: Set the address of DTU A to 0xFFFF and the channel to 0x04.
- When DTU A is receiving, it can receive all the data under channel 0x04 to achieve the purpose of monitoring.

5. Operating Mode

E95-DTU has four working modes. When there is no demanding low power consumption requirement, it is recommended to configure the DTU to transparent transmission mode (mode 0) if normal communication is required;
The default setting of the DTU at the factory is transparent transmission mode (mode 0).

No.	**Type**	**M1**	**M0**	**Description**
Mode 0	Transparent transmission mode	Light Off	Light Off	Serial port open, wireless open, transparent transmission (factory default mode)
Mode 1	WOR Mode	Light Off	Light On	WOR transmission mode, data packet comes with wake-up code
Mode 2	Power Saving Mode	Light On	Light Off	WOR receiving mode, saving its own receiving power consumption, this mode cannot transmit
Mode 3	Configuration Mode	Light On	Light On	The DTU can be programmed using the configuration software

5.1 Transparent transmission mode (mode 0)

Type	**When the M0 indicator light is off and the M1 indicator light is off, the DTU is working in mode 0**
Sending	Users can input data through the serial port, and the DTU will start wireless transmission.
Receiving	The DTU receiving function is turned on, and after receiving the wireless data, it will be output through the serial port TXD pin.

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5.2 WOR mode (mode 1)

Type	When the M0 indicator light is on and the M1 indicator light is off, the DTU is working in mode 1
Description	WOR transmission mode, data packet comes with wake-up code

5.3 Power Saving mode (mode 2)

Type	When the M0 indicator light is off and the M1 indicator light is on, the DTU is working in mode 2
Description	WOR receiving mode, saving its own receiving power consumption, this mode cannot transmit

5.4 Configuration mode (mode 3)

Type	When the M0 indicator light is on and the M1 indicator light is on, the DTU is working in mode 3
Description	The DTU can be programmed using the configuration software

6. PC Configuration Instruction

The following figure shows the display interface of the E95/E96-DTU(433LXX-485)-V8 configuration host computer. The user can switch to the configuration mode through the MODE button, and quickly configure and read the parameters on the host computer.

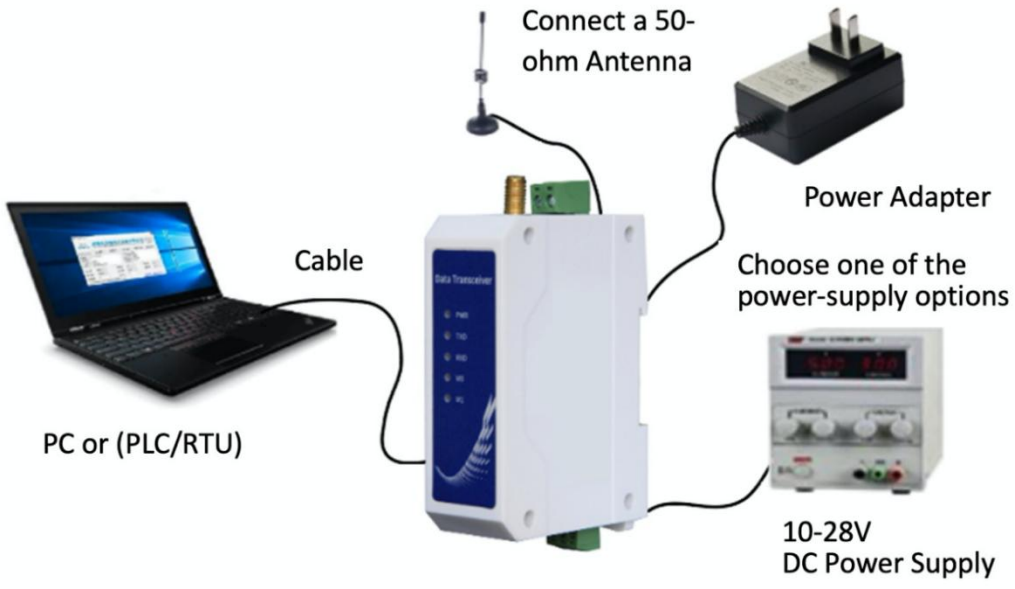


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Parameter	Details
Baud rate	Baud rate when operating 1200bps～115200bps
Parity	8N1:none；8E1: odd；8O1:even；8 data bit，1 stop bit
Air data rate	Wireless communication rate, also called air baud rate. The air rate is high, the data transmission speed is fast, and the time delay for transmitting the same data is small, but the transmission distance will be shortened.
Frequency channel	The working frequency of the DTU, each channel corresponds to its different working frequency, in theory, different frequency channels cannot communicate with each other. If there are multiple groups of wireless data transmission stations in the same area, it is recommended that the communication frequency be separated by 2~5MHz.
TX power	The output power is the power radiated to the outside. In order to ensure the working efficiency, it is recommended to use the maximum power. If the transmit power is reduced, the communication distance will be shortened, and the current consumed will be reduced.
DTU address	The internal address of the DTU has nothing to do with the Modbus address. Only DTU with the same radio address can communicate with each other. This feature can be used to realize software filtering and grouping. Input range: 0～65535, decimal number.
TX method	Transparent transmission；Fixed point: send data to fixed point in Hex format
Wake-up time	It is not directly related to the communication delay. If customers need low-power applications, they need to adjust this option as required. In the power saving mode, the longer the wake-up time, the lower the power consumption of the receiver, and the greater the communication delay.

7. Program the DTU



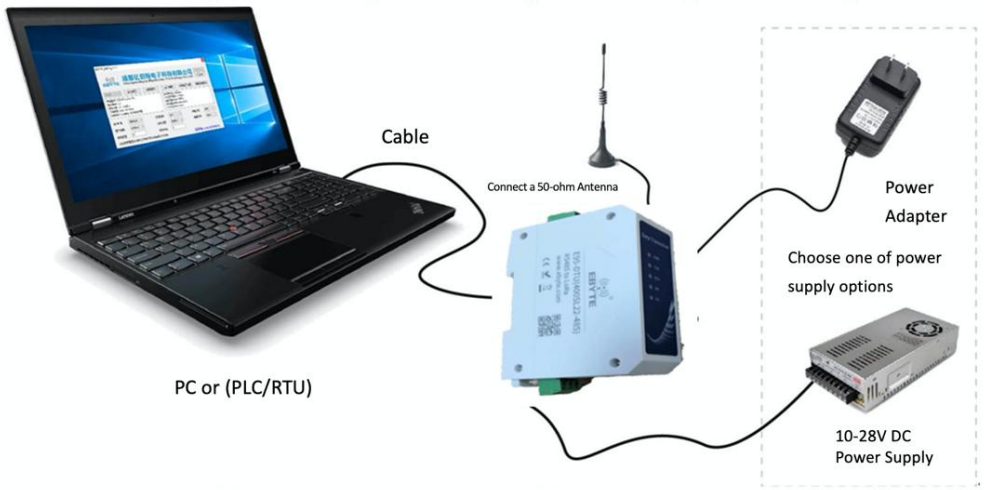
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Operating Mode	M1	M0	Remark
Configuration mode	Light On	Light on	Only use the configuration software to program the DTU in the current mode

1. Programming can only be carried out in a specific working mode (see the above table). If the programming fails, please confirm whether the working mode of the DTU is correct.
2. If you don't need complicated programming to open the E95/E96-DTU(433LXX-485)-V8 configuration software, you can modify the relevant parameters.

8. Connection Diagram in Test and Practical Application



9. Related Products

Model	Interface Type	Frequency Hz	Transmit power dBm	Distance km	Features
E32-DTU (433L37) -V8	RS232 RS485	410-441M	37	20	LoRa spread spectrum, long-distance anti-interference
E32-DTU (900L30) -V8	RS232 RS485	862-930M	30	8	LoRa spread spectrum, long-distance anti-interference
E32-DTU (900L20)-V8	RS232 RS485	862-930M	20	3	LoRa spread spectrum, long-distance anti-interference
E32-DTU (433L30) -V8	RS232 RS485	410-441M	30	8	LoRa spread spectrum, long-distance anti-interference
E32-DTU (433L20) -V8	RS232 RS485	410-441M	20	3	LoRa spread spectrum, long-distance anti-interference

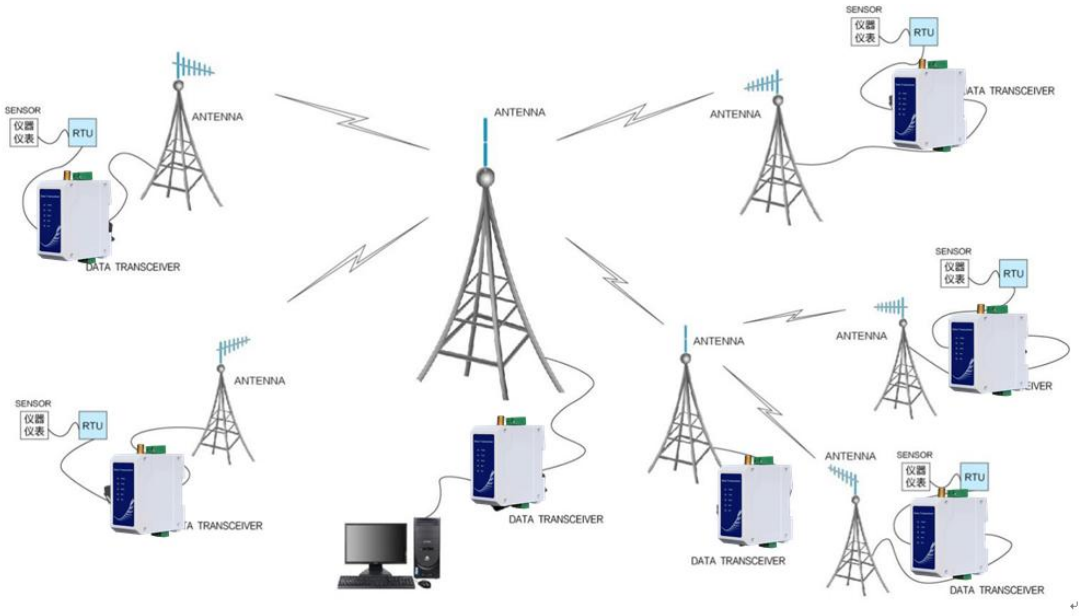
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E90-DTU (433L37) -V8	RS232 RS485	410-441M	37	20	LoRa spread spectrum, long-distance anti-interference
E90-DTU (433L20) -V8	RS232 RS485	410-441M	20	3	LoRa spread spectrum, long-distance anti-interference
E90-DTU (433L30) -V8	RS232 RS485	410-441M	30	8	LoRa spread spectrum, long-distance anti-interference
E95-DTU (433L20-485)-V8	RS485	410-441M	20	3	LoRa spread spectrum, long-distance anti-interference
E95-DTU (433L30-485)-V8	RS485	410-441M	30	8	LoRa spread spectrum, long-distance anti-interference
E96-DTU (433L20-485)-V8	RS485	410-441M	20	3	LoRa spread spectrum, long-distance anti-interference
E96-DTU (433L30-485)-V8	RS485	410-441M	30	8	LoRa spread spectrum, long-distance anti-interference
E800-DTU (400SL20-485)-V8	RS485	410-441M	20	3	LoRa spread spectrum, long-distance anti-interference
E800-DTU (400SL30-485)-V8	RS485	410-441M	30	8	LoRa spread spectrum, long-distance anti-interference

10. Practical Application

Ebyte DTU is suitable for all kinds of point-to-point and point-to-multipoint wireless data transmission systems, such as smart homes, IoT transformation, power load monitoring, distribution automation, hydrology and water regime monitoring and reporting, tap water pipe network monitoring, urban street lights Industrial automation such as monitoring, air defense alarm control, railway signal monitoring, railway water supply centralized control, oil and gas supply pipeline network monitoring, GPS positioning system, remote meter reading, electronic hoisting scale, automatic target reporting, earthquake observation and reporting, fire prevention and theft prevention, environmental monitoring, etc. System, as shown below:



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11. Precautions for Use

1. Please take good care of the warranty card of the device. The warranty card contains the factory number (and important technical parameters) of the device, which has important reference value for the user's future maintenance and new equipment.
2. During the warranty period, if the DTU is damaged due to the quality of the product itself rather than man-made damage or natural disasters such as lightning strikes, it enjoys free warranty; please do not repair by yourself, and contact our company if there is a problem. Ebyte provides first-class After-sales service.
3. Do not operate this DTU in the vicinity of some flammable places (such as coal mines) or explosive dangerous objects (such as detonators for detonation).
4. A suitable DC stabilized power supply should be selected, which requires strong anti-high frequency interference, small ripple, and sufficient load capacity; preferably, it should also have over-current, over-voltage protection and lightning protection functions to ensure that the DTU is normal jobs.
5. Do not use it in a working environment that exceeds the environmental characteristics of the DTU, such as high temperature, humidity, low temperature, strong electromagnetic field or dusty environment.
6. Don't let the DTU continuously be in full load transmitting state, otherwise the transmitter may be burnt out.
7. The ground wire of the DTU should be well connected with the ground wire of the external equipment (such as PC, PLC, etc.) and the ground wire of the power supply, otherwise the communication interface will be burnt easily; do not plug or unplug the serial port with power on.
8. When testing a DTU, you must connect a matching antenna or a 50Ω dummy load, otherwise the transmitter will be easily damaged; if the antenna is connected, the distance between the human body and the antenna should be more than 2 meters to avoid injury. Touch the antenna when transmitting.
9. 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% The communication distance margin.
10. If the measured communication distance is not ideal, it is recommended to analyze and improve the communication distance from the antenna quality and antenna installation method. You can also contact support@cdebyte.com for help.
11. When selecting the power supply, in addition to keeping 50% of the current margin as recommended, it should also be noted that its ripple must not exceed 100mV.
12. Wireless communication products need to be connected to an impedance-matched antenna to work normally. Even short-term tests cannot be omitted. Product damage caused by this reason will not be covered by the warranty.

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Revision History

Version	Date	Description	Issued By
1.0	2022-06-07	Original Version	LC

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