Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual



E90-DTU (900L20)-V8

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1. Introduction

1.1. Brief Introduction

E90-DTU(900L20)-V8 is a wireless data transceiver of 868M with standard RS232/RS485 connectors. They are half-duplex. TX & RX modems with LoRa technology and transparent transmission mode. Voltage supply ranges from 8V to 28V, Working frequency: 862-930MHz (Default:868MHz).

The LoRa direct sequence spread spectrum technology enables the longer communication distance and better power density concentration as well as superior anti-interference ability. The FEC algorism enables higher coding efficiency and correction ability. The interfered data packets will be corrected proactively upon sudden interference, which significantly improves reliability and communication distance. Without FEC, the interfered data packet will be dropped. The transceivers feature data encryption and compression. The data transmitted in air features randomness, the rigorous algorism makes data interception meaningless. The data compression function has possibility to reduce the data transmission time, which in turn reduces the possibility of being interfered, thus improves the reliability and communication efficiency.

1.2. Features

- All core components are originally imported, our transceiver modems have much advanced functions with smaller size and lower cost.
- The top TX power is 100mW, all technical parameters meet European industrial standards.
- Temperature compensators are adopted to make the frequency stability better than ±1.5PPM.
- Operation temperature range: -40℃ ~ +85℃, applicable for various harsh environment, it is real industrial grade products.
- Aluminum alloy case, compact size, great heat dispersion; good shielding, prime electromagnetic compatibility and strong anti-interference.
- Power reverse & overload protection and antenna surge protection functions significantly improve the reliability.
- Parameters can be configured by programming, such as TX power, frequency point, air data rate, address and so on.
- Ultra-low power consumption, standby current is only 28mA (even lower under power-saving and sleep modes), TX current ≤0.2A .
- Embedded watch-dog and precise time layout, modem will restart automatically upon abnormal situation and work with previous parameters.

- All the core components are imported originally , compared with the current imports of digital transceiver , we are the most advanced, most cost effective and the smallest one.

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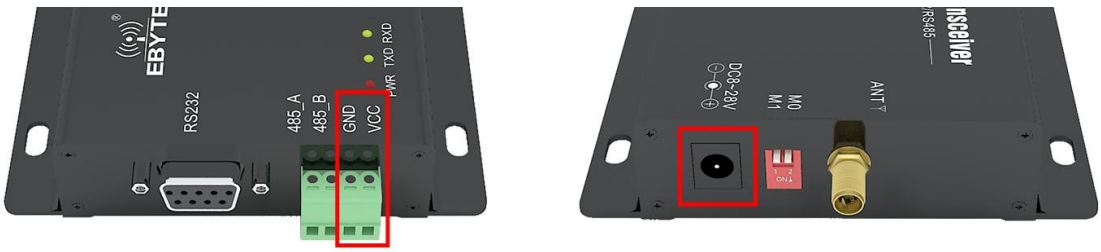
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2. Operation

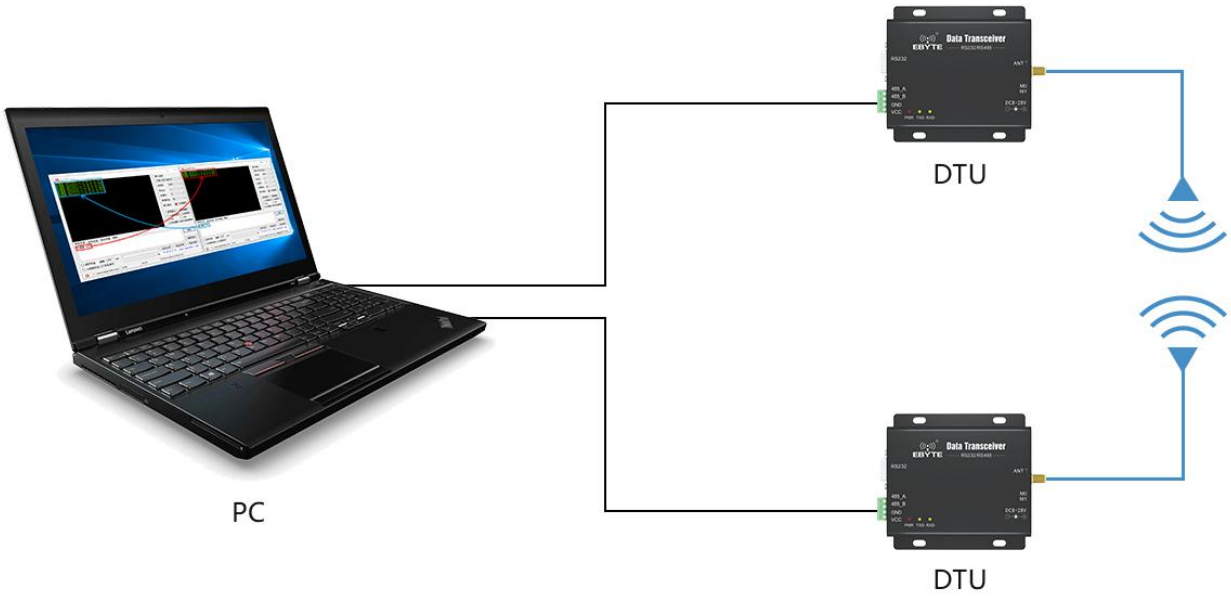
Main parts



1、 First step is to mount antenna, then battery, making sure the dial switch is on its right status. User gets on the power by choosing either VCC/GND or power adapter.



2、 Using USB-(RS232) converter or USB-RS(485) converter or other way to link computer and DTU.

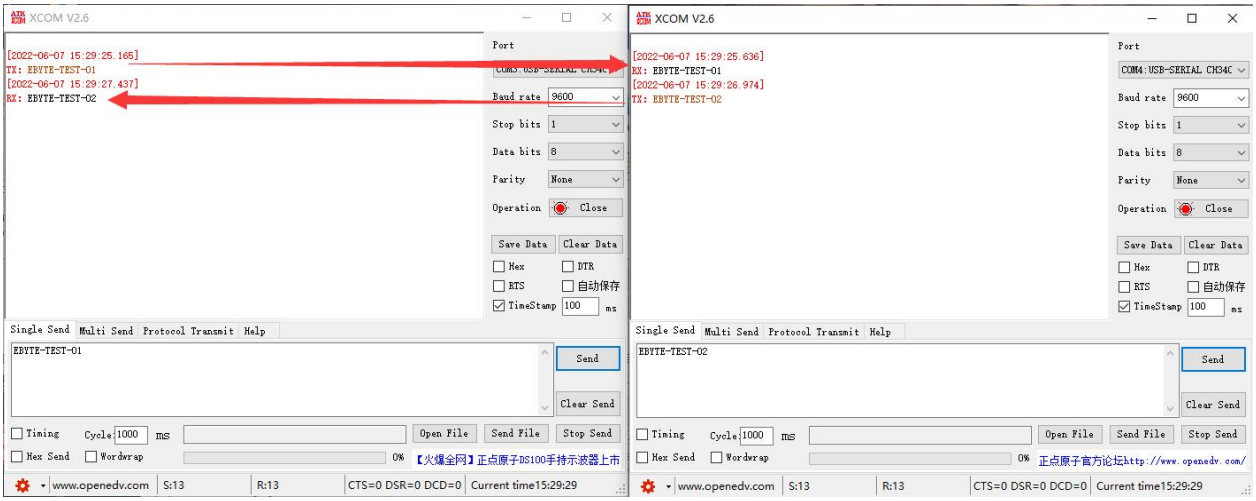


3、 Firing up two XCOMs, choosing Baud rate 9600bps, 8N1, the setting which serial port transmission can be

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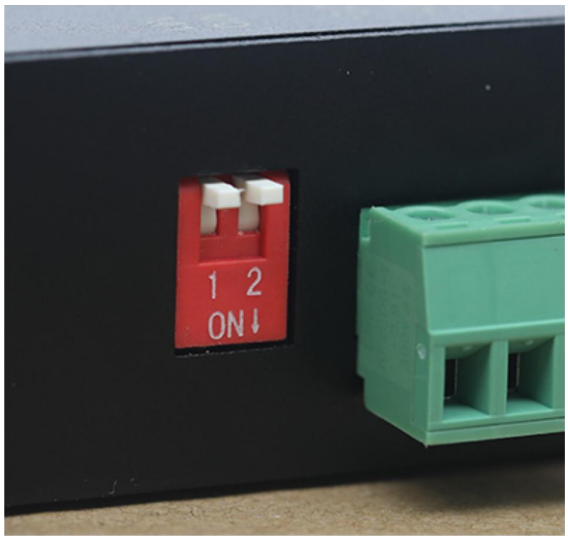
achieved.



4、 User needs to open the mode switch first before link DTU with computer if the user want to modify parameters. Firing up to configuration Tool modify related parameters. The mode switch must be reopened to achieve transmission after the configuration.



MODE 0 Default



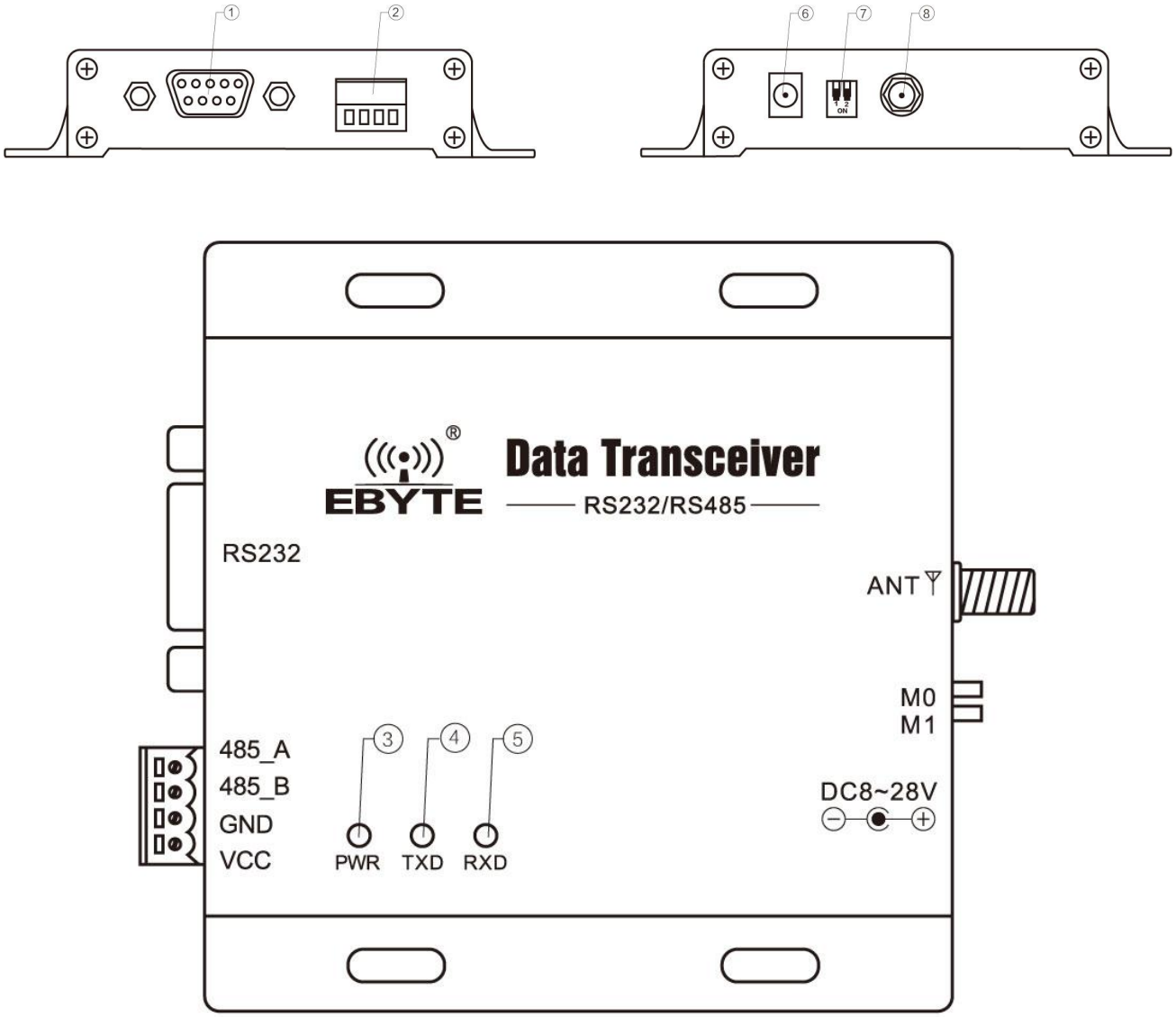
MODE 3 Parameter setting

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3. Installation Specifications

3.1. Structure



Pin NO.	Name	Function	Description
1	DB-9 female socket	RS-232 interface	Standard RS-232 interface
2	3.81 terminal block	RS-485, power interface	Standard RS-485 interface and pressure line power interface
3	PWR-LED	Power LED	Red, lit when the power is on

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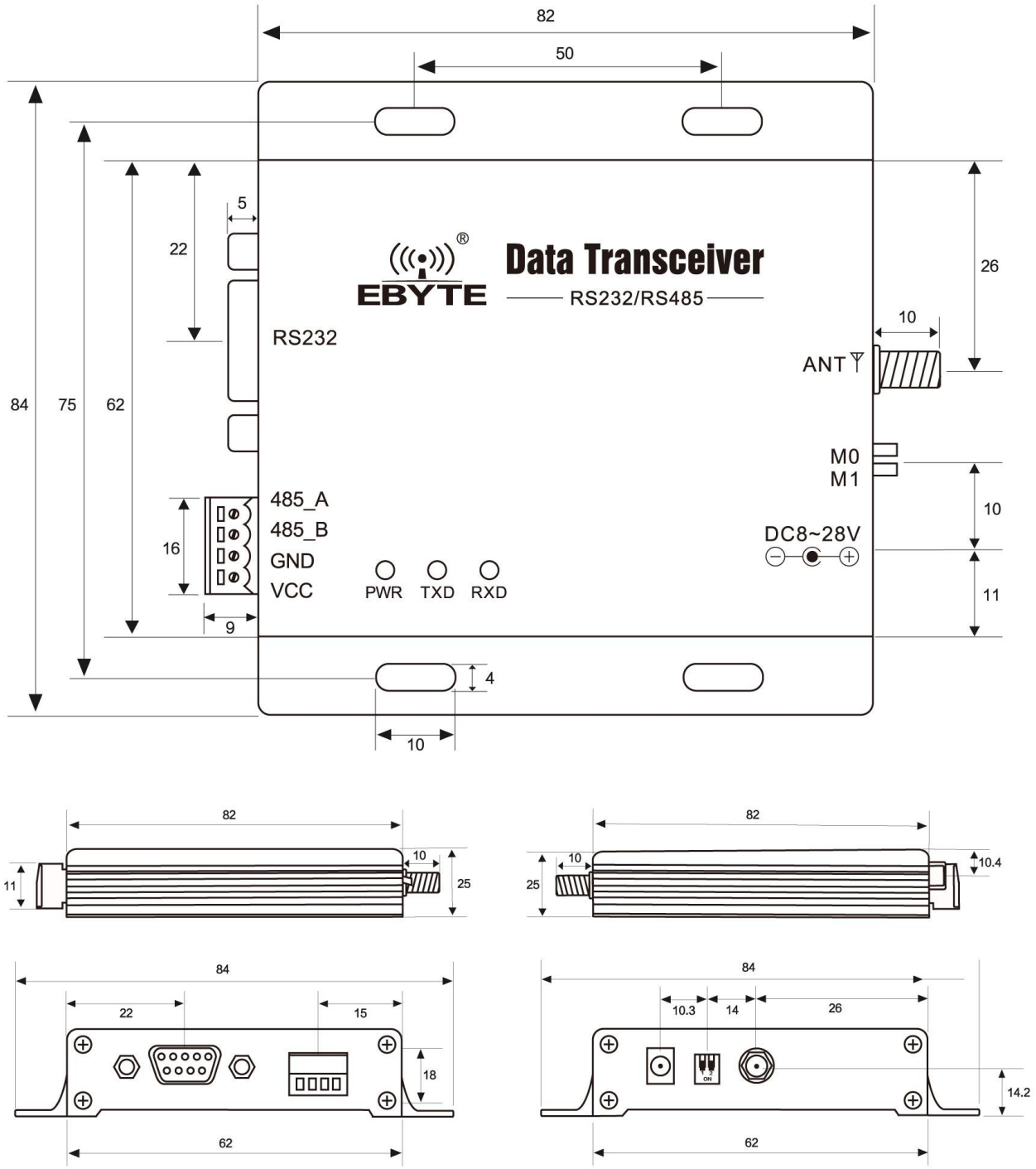
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4	TXD-LED	Transmit LED	Yellow, blinks when sending data
5	RXD-LED	Receive LED	Yellow, blinks when receiving data
6	DC power interface	Power interface	In-line round hole, outer diameter 5.5mm, diameter 2.5mm
7	DIP switch	DIP switch	Controlled by working mode
8	Antenna interface	SMA-K interface	external thread, 10mm, 50Ωcharacteristic impedance

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3.2. Dimension



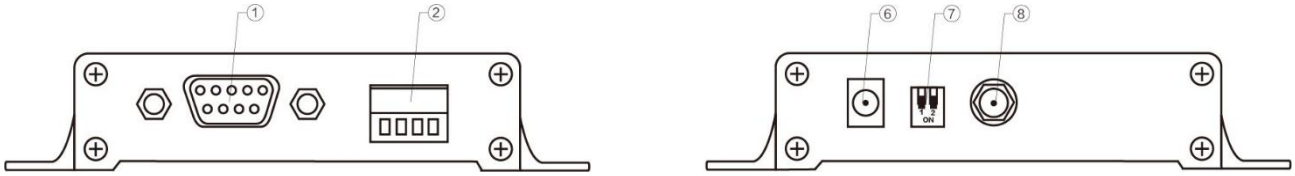
Unit: mm

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4. Interface Defination

4.1. Power interface definition



Users can choose ⑥ DC power interface, using the power adapter supply with the interface of the 5.5mm outer diameter , 2.5mm diameter ;

Also choose the VCC and GND terminal power supply, only choose any one of the power supply is OK;

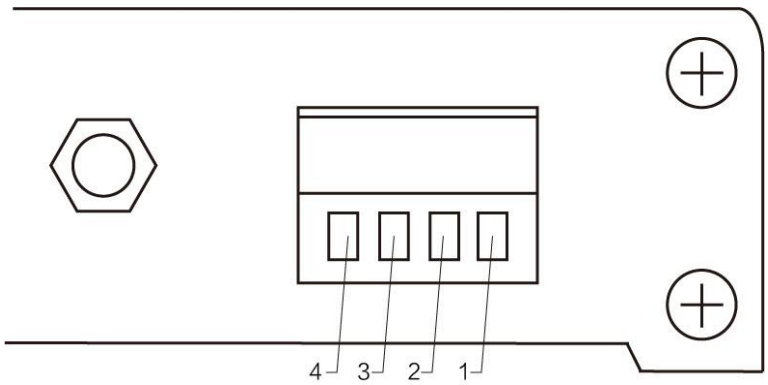
DTU can use 8~ 28V DC power supply, but it is recommended to use 12V or 24V DC power supply.

4.2. RS232 Interface definition

The DTU can be connected to the device via RS-232 using the standard DB-9 interface.

4.3. RS485 Interface definition

DTU can connect the 485_A terminal and 485_B terminal with the device RS-485 A terminal and B terminal.



★

Pin NO.	Definition	Function	Description
1	VCC	Crimping power interface, positive	8 ~ 28V DC, recommended 12V or 24V
2	GND	Crimping power interface, negative	The power supply negative pole is connected to the system ground and the housing

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3	485_B	RS-485 interface, interface B	The RS-485 interface B is connected to the device interface B
4	485_A	RS-485 interface, interface A	The RS-485 interface A is connected to the device interface A

★ Note: The transceiver will be in poor communication when connected to multiple devices , it is recommended to be connected to a single device, please try to use parallel 120Ω resistor between 485_A terminal and 485_B.

5. Technical indicators

5.1. Model specifications

Model	Frequency	Transmit power	Distance	Specifications	Application
	Hz	W	km		
E90-DTU (900L20)-V8	868	0.1	5	Strong penetration, anti - interference	To the environment with small data, long distance, many obstacles

★ Note: Test condition: in clear and open air without shelters, 12V /2A power supply, 5dBi gain sucker antenna over 2 meters height from the ground, with the factory default parameters.

5.2. General specification parameters

NO.	Model	Specification	Description
1	Size（H*W*D）	82 * 62 * 25 mm	See more at 3.2 Dimension
2	Weight	131g	Tolerance: 4.5g
3	Temperature	-40℃～+70℃	Meet industrial level
4	Antenna impedance	50 Ω	Standard 50 Ω characteristic impedance
5	Supply voltage	+8 ~ +28V DC	It is recommended to use 12V or 24V
6	Communication interface	RS232/RS485	Standard DB9 hole / 3.81 terminal block
7	Baud rate	Default 9600	from 1200 to 115200 bps
8	Address	Default 0	65536 configurable addresses

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5.3. Frequency range and channels

Model	Default frequency	Frequency range	Channel spacing	Channels
	MHz	MHz	MHz	
E90-DTU (900L20)-V8	868	862~930	1M	68，half duplex

★ Note: In the same area when multiple data transceivers are communicating one to one at the same time, it is recommended to set the channel spacing between each group of data transceivers at 2MHz or more.

5.4. Transmit power level

Model	10mW	25mW	50mW	100mW
E90-DTU (900L20)-V8	√	√	√	√

★ Note: The lower the transmit power, the closer the transmission distance, but the working current won't be declined in exact proportion ,it is recommended to use the maximum transmit power.

5.5. Air data rate

Model	Default air data rate	Levels	Air data rate(bps)
	bps		bps
E90-DTU (900L20)-V8	2.4	4	2.4、4.8、9.6、19.2

★ Note: The higher the air data rate, the faster the transmission rate, the transmission distance is also closer; when the rate meets the requirements, the lower air data rate, the better quality.

5.6. Current parameters

Model	Transmitting current mA		Standby current mA	
	12V	24V	12V	24V
E90-DTU (900L20)-V8	134	81	28	28

★ Note: It is recommended to retain more than 50% of the current margin when selecting the power supply, which will help the data transceiver to work steadily for a long time.

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5.7. Transceiver Length and Sub-packing Mode

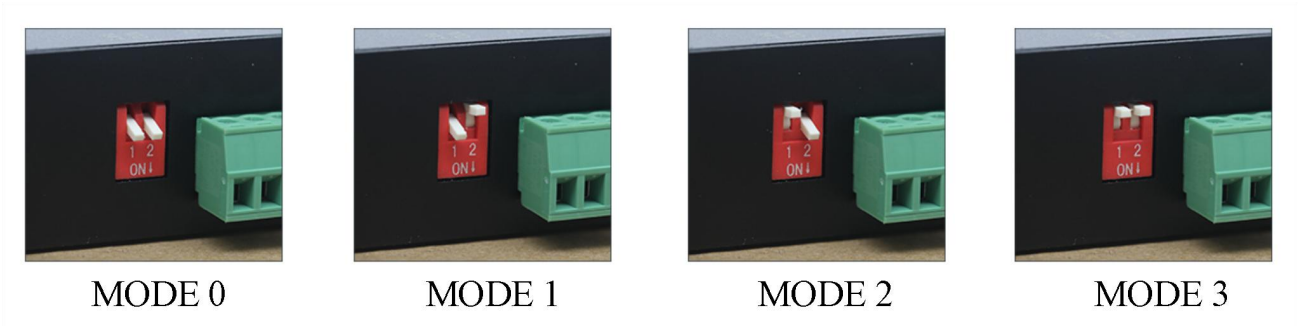
Model	Buffer	Sub-package
E90-DTU (900L20)-V8	512Byte	Automatically send 58 bytes per package

★ Note:
1. When the receiving data is more than a single packet capacity, the beyond part will be automatically assigned to the second transmission until it is completed;
2. The data transceiver can not receive data which is more than the buffer capacity;

6. Operating mode

DTU has four operating modes, if low power consumption is not required, normal communication is recommended to configure the data transceiver for the normal mode (mode 0);
The factory default is normal mode (mode 0).

	Categories	M1	M0	Description
Mode 0	Normal Mode	ON	ON	Open UART and RF，transparent transmission is on
Mode 1	Wake-up Mode	ON	OFF	Air wake-up mode, the packet comes with a wake-up code,
Mode 2	Power-saving Mode	OFF	ON	The air wake-up receive mode, saving receive power, the mode can not be transmitted
Mode 3	Sleep Mode	OFF	OFF	Parameter setting using the configuration software



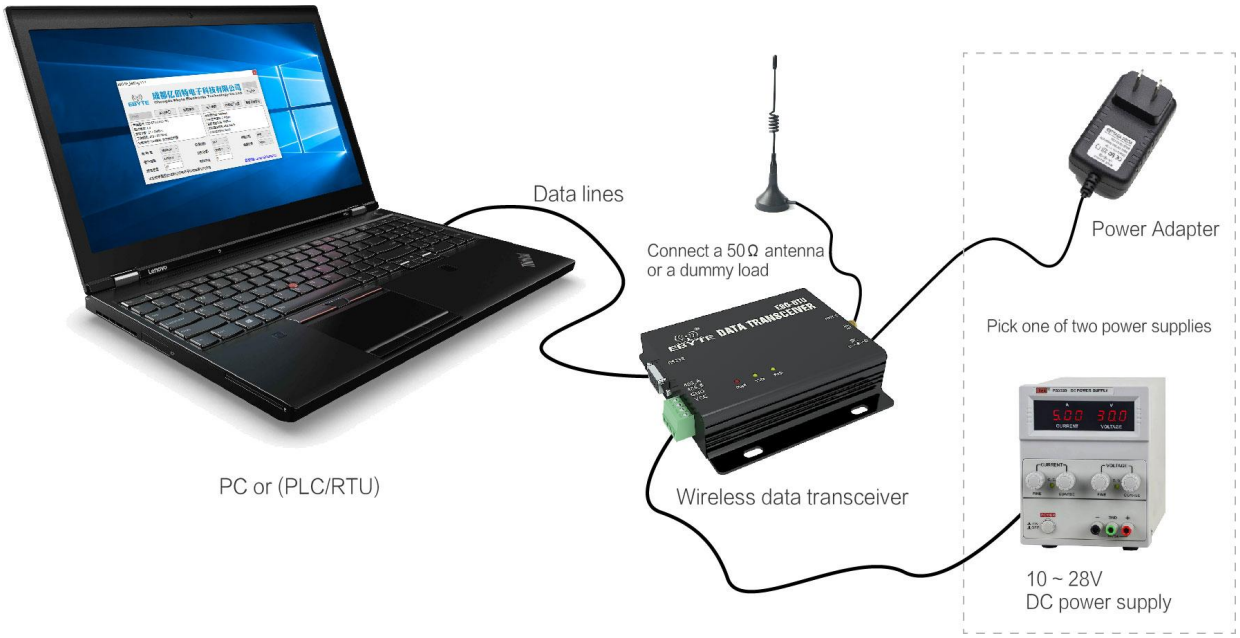
★ Note: no need to care about the wake-up mode (mode 1) and power saving mode (mode 2) if it doesn't request low power consumption.

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7. Program the DTU

7.1. diagrammatic drawing



	Mode	M1	M0	Description
Mode 3	Sleep Mode	Off	Off	Only be programmed using the configuration software in the current mode



★ Note:

1.programming can only be carried on in a specific mode(see above), if fails, please confirm the work mode.

2. Open the configuration tool to configure the digital radio.

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7.2. Parameter setting instruction

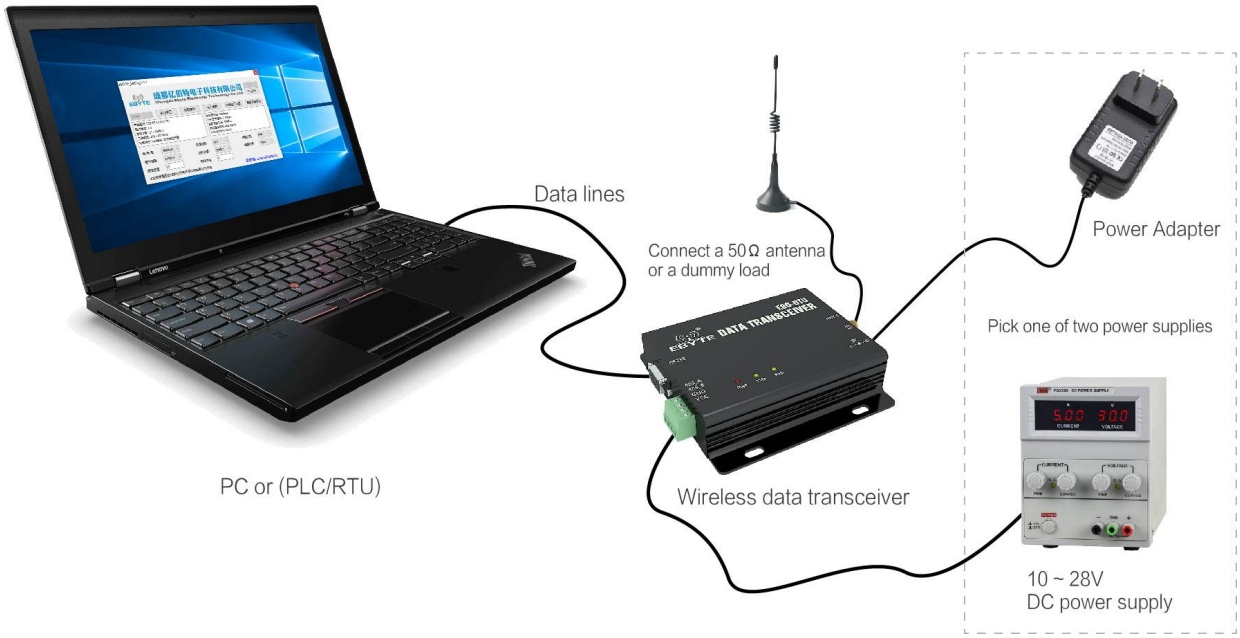


Parameter	Details
Baud rate	Baud rate when operating 1200bps～115200bps
Parity	8N1:none；8E1: odd；8O1:even；8 data bit，1 stop bit
Air data rate	Wireless communication rate, also called air baud rate. The air rate is high, the data transmission speed is fast, and the time delay for transmitting the same data is small, but the transmission distance will be shortened.
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.
FEC	The lost or interfered data can be partially corrected through a complex coding method, which can improve the equivalent receiving sensitivity by about 3dBm. Turning this feature off can reduce communication delays.
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.
IO MODE	NONE
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.
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.

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8. Connection diagram in test and application



9. Related Products

Model	Interface Type	Frequency Hz	Transmit power dBm	Distance km	Features
E90-DTU (900L30) -V8	RS232 RS485	862-930M	30	8	LoRa spread spectrum, long-distance anti-interference
E90-DTU (900L20)-V8	RS232 RS485	862-930M	20	3	LoRa spread spectrum, long-distance anti-interference
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,

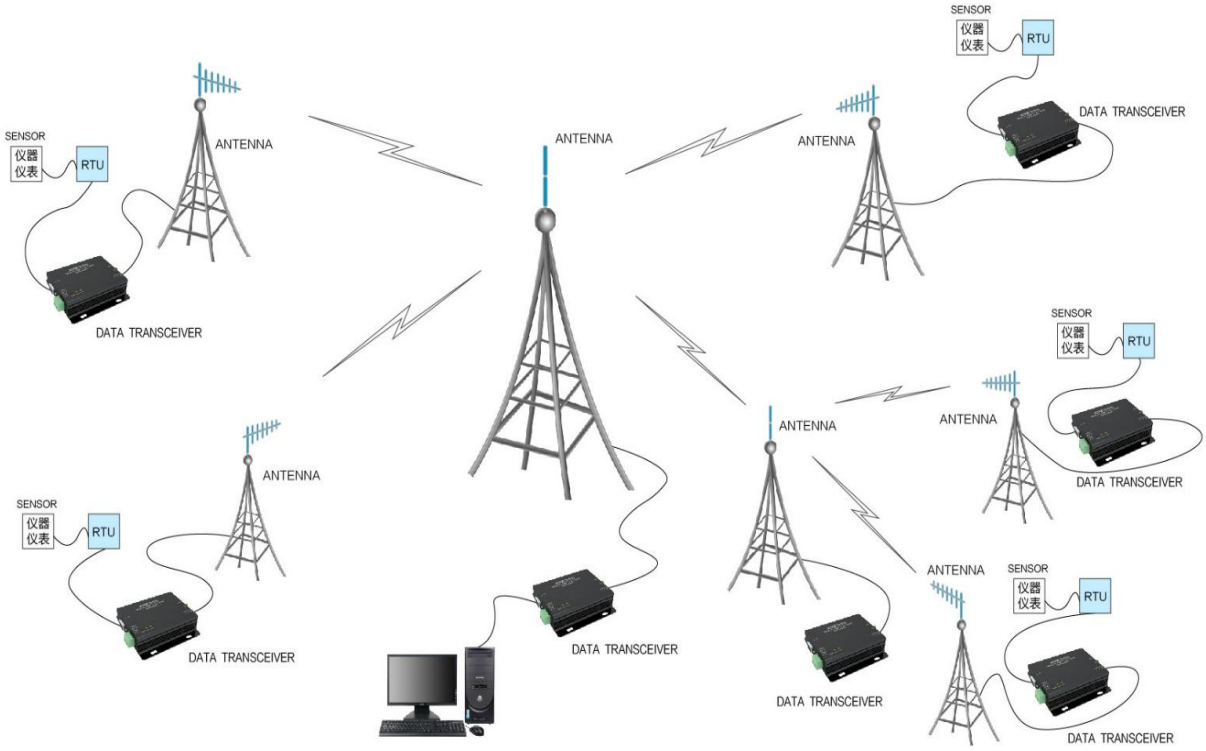
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					long-distance anti-interference
E800-DTU (400SL30-485)-V8	RS485	410-441M	30	8	LoRa spread spectrum, long-distance anti-interference

10. Practical application

The data transceiver of CDEBYTE is applied for all kinds of point to point, one point to multiple points wireless data transmission system, such as smart home, Internet of things transformation, power load monitoring, distribution network automation, hydrological and hydrological forecasting, water pipe network monitoring, urban street lamps Monitoring, air defense alarm control, railway signal monitoring, centralized control of railway water supply, oil supply pipe network monitoring, GPS system, remote meter reading, electronic crane, automatic reporting, seismic forecasting, fire prevention, environmental monitoring and other industrial automation system, as shown below:



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

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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
V1.0	2024-7-18	Initial version	Hao

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