EBYTE E90-DTU 2.4GHz LoRa Modem User Manual

E90-DTU (433C33)
Chengdu Ebyte Electronic Technology Co,; Ltd
E90-DTU (433C33) user manual

Contents

Introduction

1.1. Brief Introduction

E90-DTU (433C33) is a data transmission station that adopts extremely advanced ultra-narrow band modulation technology. On the original basis, power amplifier (PA) and low noise amplifier (LNA) are built-in, so that the maximum transmitting power reaches 0.5w and the receiving sensitivity is also improved to a certain extent. Compared with the products without power amplifiers and low noise amplifiers, the overall communication stability is greatly improved.

Different from the traditional data transmission station, E90-DTU (433C33) is specially developed for Modbus application scenarios. The feature of unlimited packet length can replace the communication cable, making it the most convenient choice for Modbus wireless upgrade. The station works in the 433MHz frequency band, with a communication distance up to 4km. Wireless digital radio as a medium of communication, as well as optical fiber, microwave, open wire, there is a certain scope of application: it provides some special conditions, private network monitoring signals in real-time and reliable data transmission, low cost, easy installation and maintenance, diffraction capability is strong, flexible network structure, the coverage is far characteristic, suitable for some more and occasions, such as dispersion and complex geographical environment with PLC, RTU, rain gauge, level gauge and other data terminal is connected.

1.2. Certificate

E90-dtu has obtained the “radio transmission equipment model approval certificate”, whose approval code is CMIIT ID:2017FP5780

E90-DTU has obtained the “explosion-proof certificate”, whose number is: test no. 201711000975

E90-dtu has obtained the “electrostatic surge detection report” issued by the China testing institute, whose number is CNEx18.1461.

E90-dtu has obtained the “appearance design patent certificate”, and its patent number is ZL 2016 3 0501980.3.

E90-DTU has obtained the “utility model patent certificate”, and its patent number is ZL 2016 2 1410691.3.

E90-dtu has obtained the “CE certificate” (mandatory eu certification), whose verification number is

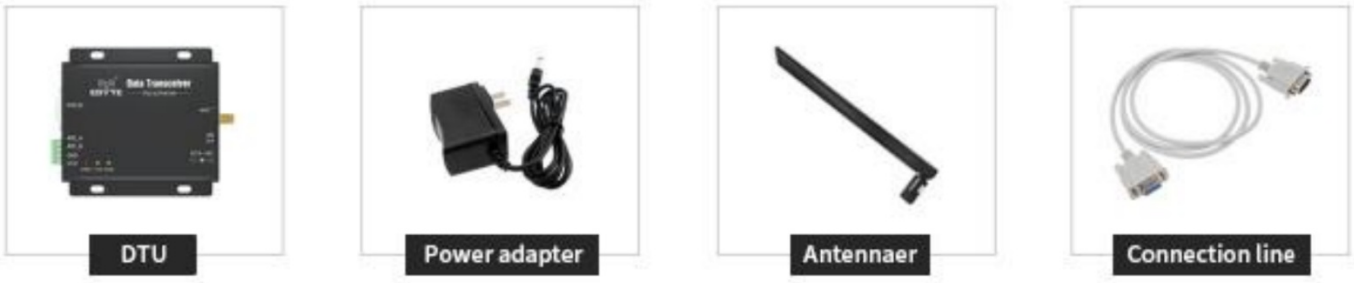
CCISE180514601V.
E90-DTU has obtained an “FCC certificate” with the ID of 2ALPH-E90-DTU.
E90-DTU has obtained the “RoHS certificate” (mandatory EU environmental protection certification), and its report number is DTI201807025245.

Features

- All the core components of the original import, compared with the current similar imported digital radio, the most advanced function, the smallest size, the best price.
- The infinite packet length, supports uninterrupted transmission, Modbus adaptation.
- Tailored for Modbus, all direct replacement of RS-485 cable.
- Simple and efficient power supply design, support power supply device or line pressure mode, support 10~28V power supply.
- Transmission power up to 1w, and multi-level adjustable, all technical indicators up to the 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 environments, it is real industrial-grade products
- All aluminum alloy shell, compact size, easy installation, good heat dissipation; Perfect shielding design, good electromagnetic compatibility, strong anti-interference ability.
- Power reverse connection protection, over-connection protection, antenna surge protection, and other multiple protection functions, greatly increase the reliability of the station.
- Powerful software functions, all parameters can be set through programming: such as power, frequency, airspeed, address ID, etc
- Ultra-low power consumption, the standby current is only 31mA (power-saving mode and sleep mode power consumption is lower), the emission current is 0.9A.
- Built-in watchdog, and accurate time layout, once an exception, the module will automatically restart, and can continue to work in accordance with the previous parameter Settings.

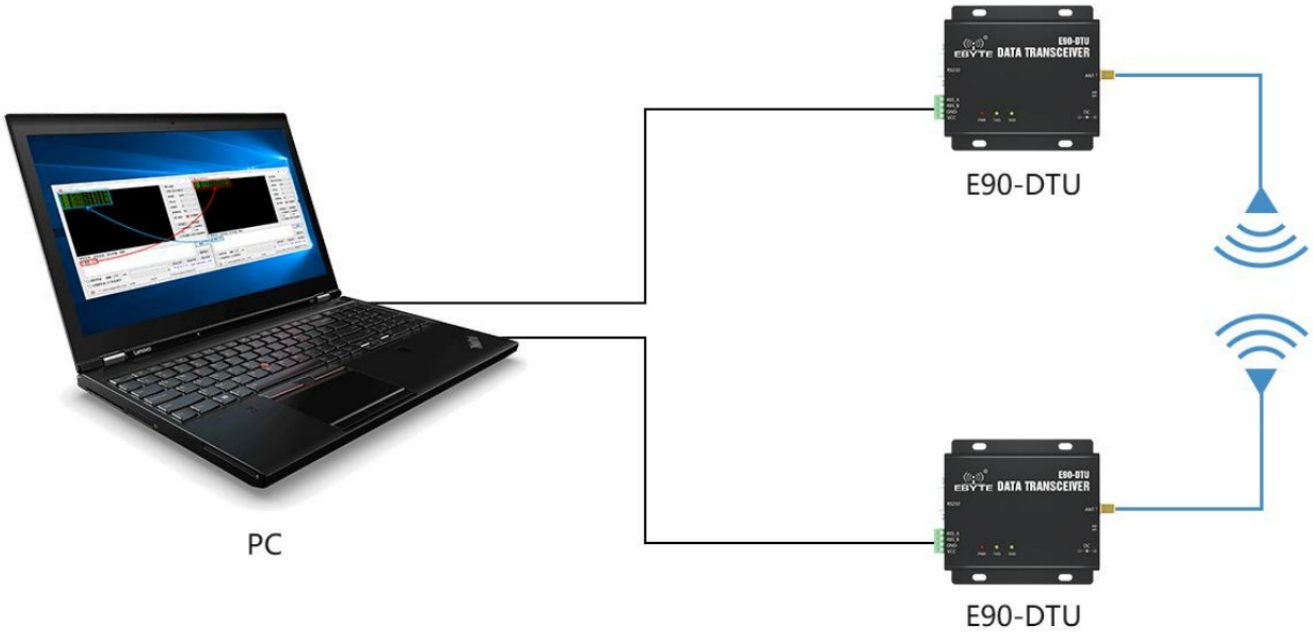
Operation

Main parts

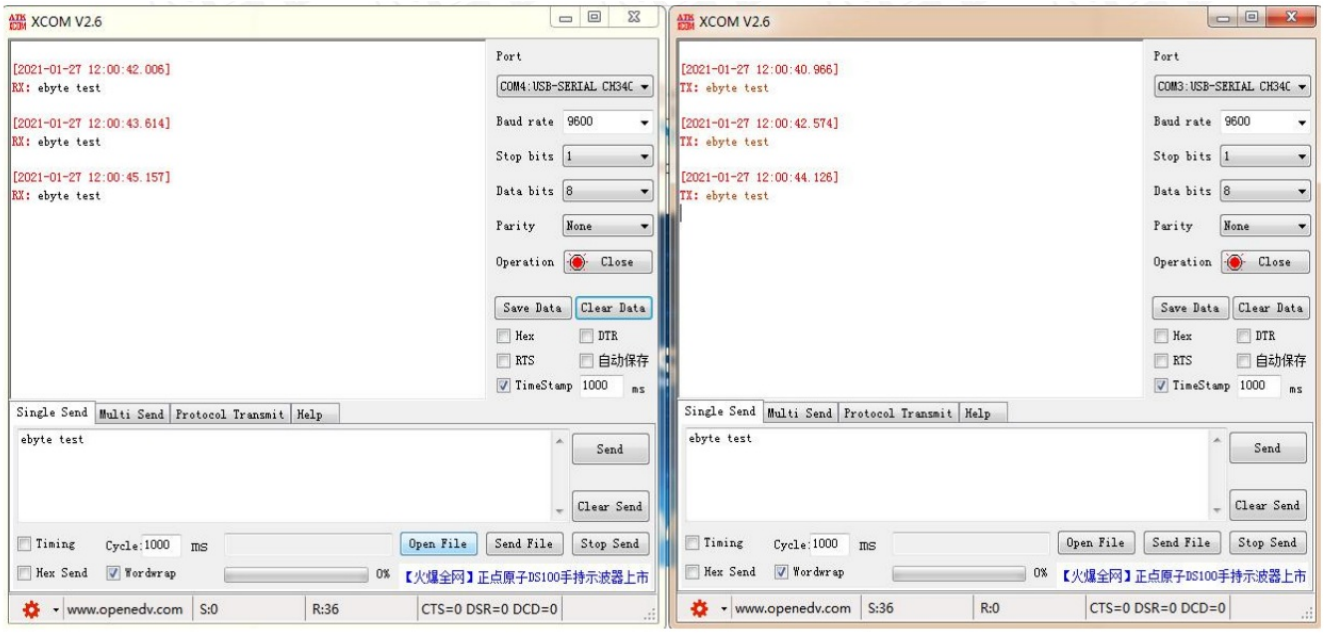


1. The first step is to mount the antenna, then the battery, making sure the dial switch is on its right status. The user gets on the power by choosing either VCC/GND or power adapter.

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



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



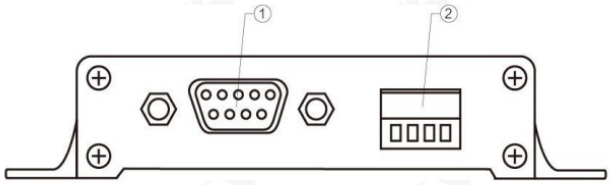
4. The user needs to open the mode switch first before linking DTU with the computer if the user wants to modify parameters. Firing up E90-DTU (E90-DTU parameter configuration application) to modify related parameters. The mode switch must be reopened to achieve transmission after the configuration.

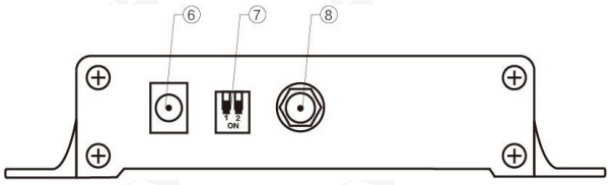
Mode 0 Default

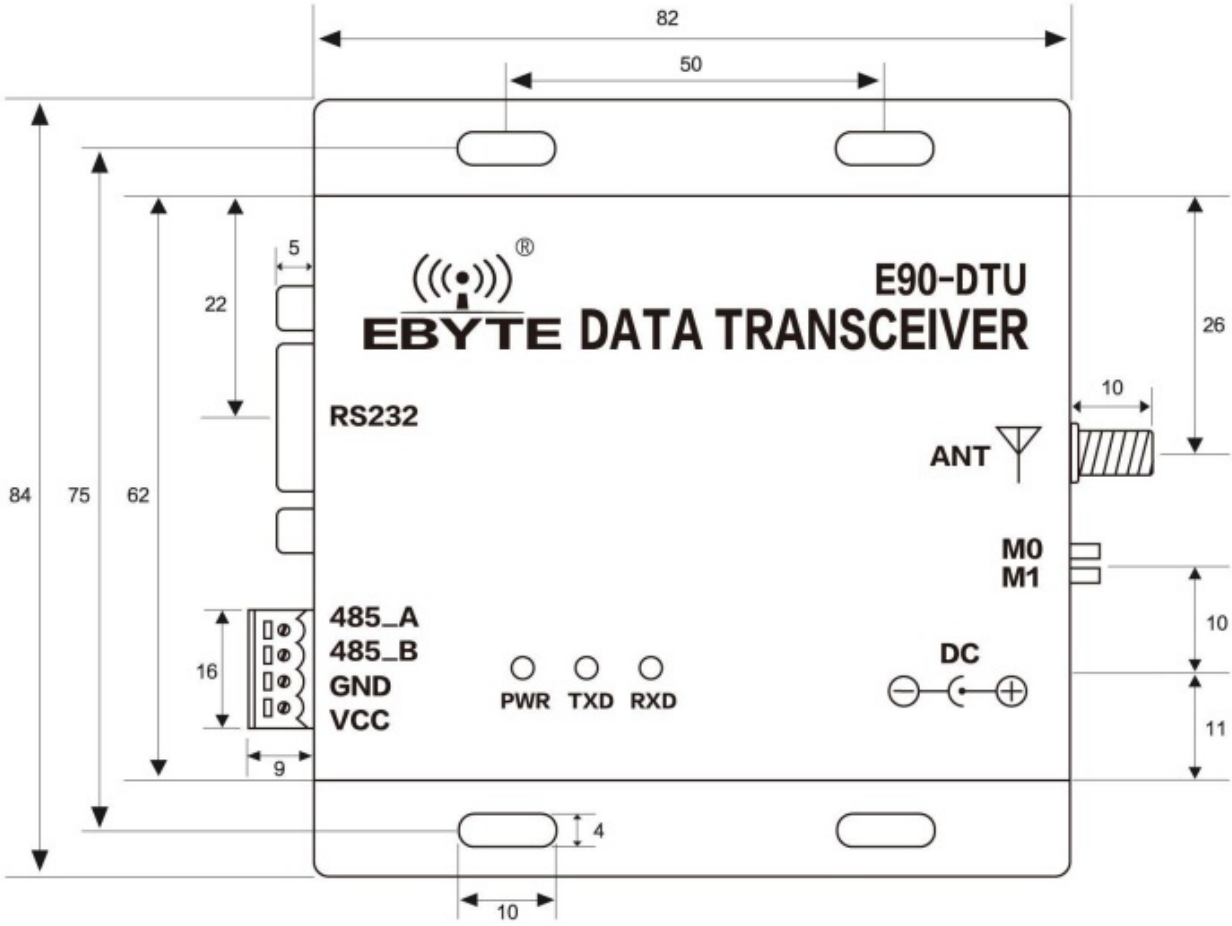
Mode 2 Parameter setting

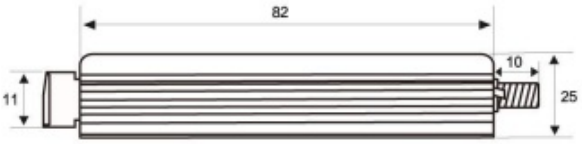
Installation Specification

3.1. Structure






82
50
84
75
62
22
5
26
10
E90-DTU
EBYTE DATA TRANSCEIVER
RS232
ANT
M0
M1
485_A
485_B
GND
VCC
PWR
TXD
RXD
DC
16
9
4
10
11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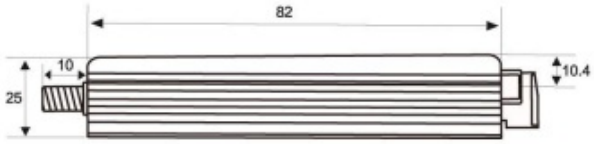
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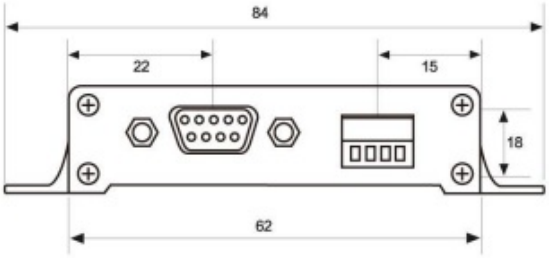
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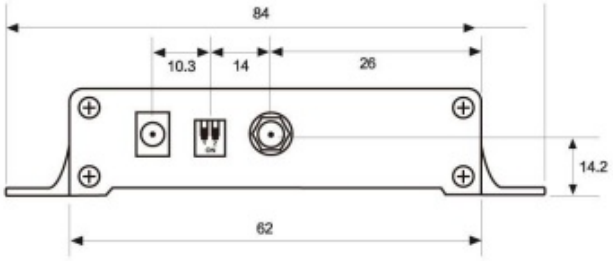
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14.2
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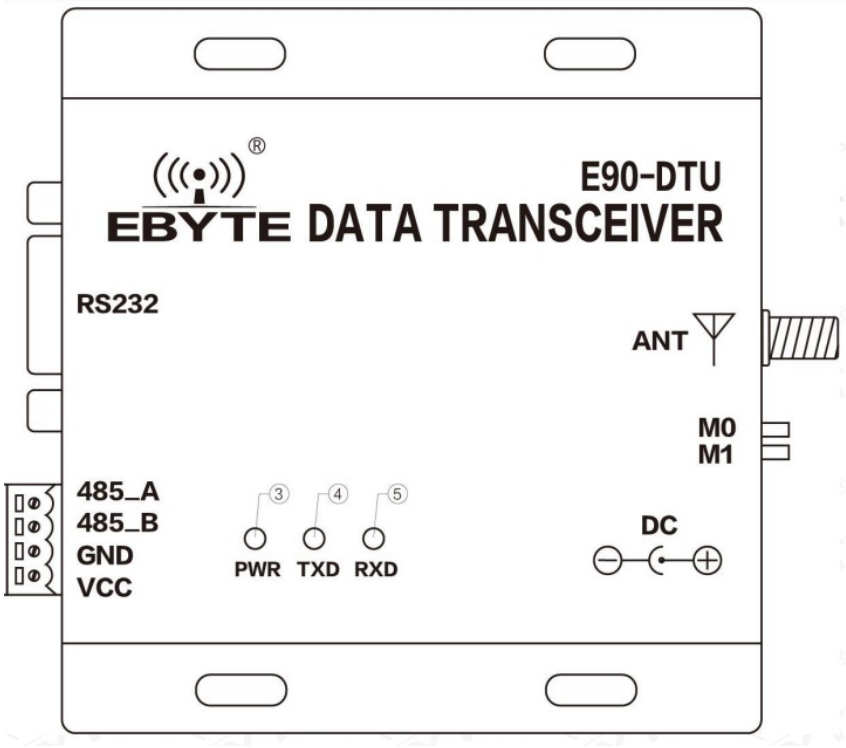
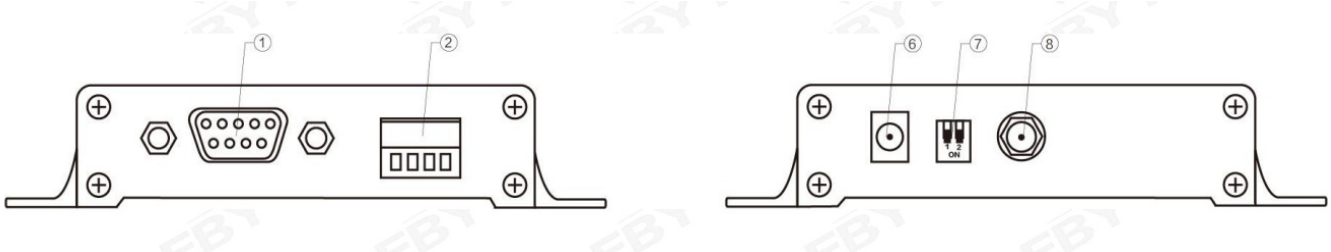
Pin NO.	Name	Function	Description
1	DB-9 female socket	RS-232 interface	Standard RS-232 interface
2	3.81 terminal block	RS-485, power interfa ce	Standard RS-485 interface and pressure line power interface
3	PWR-LED	Power LED	Red, lit when the power is on
4	TXD-LED	Transmit LED	Yellow, blinks when sending 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 intert tee	external thread, 10mm, 50f/characteristic impedanc e

3.2. Dimension



Interface Definition

4.1. Power interface definition



Users can choose 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 choosing any one of the power supplies is OK; E90-

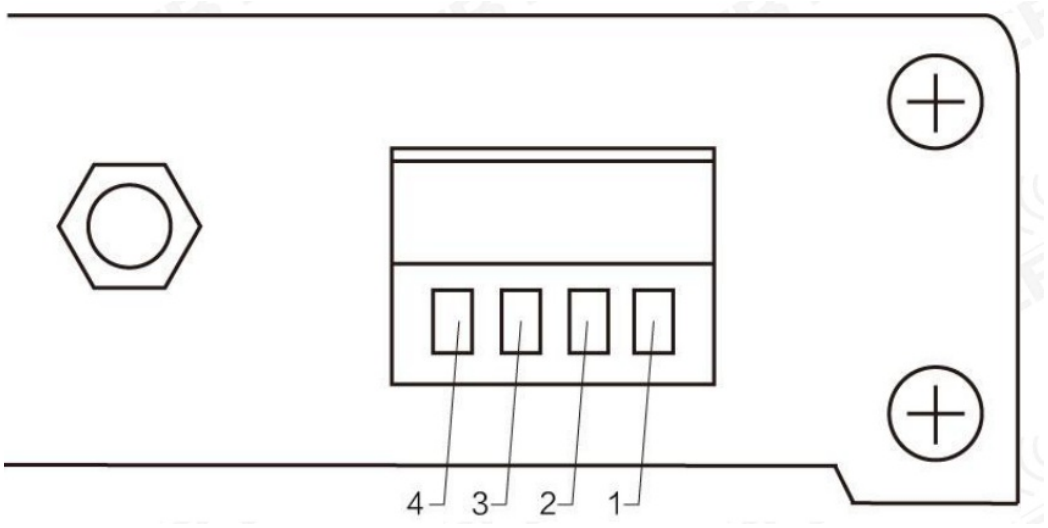
DTU can use a 10~ 28V DC power supply, but it is recommended to use a 12V or 24V DC power supply.

4.2. RS232 Interface definition

The E90-DTU can be connected to the device via RS-232 using the standard DB-9 interface.

4.3. RS485 Interface definition

E90-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
I	VCC	Crimping power interface, positive	10 — 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
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 120 resistors between 485_A terminal and 485_B.

Technical indicators

5.1. Model specifications

Model	Frequency	Transmit power	Distance	Specifications	Application
	Hz	W	km		
E90-DTU (433C33)	433M	2	4	Continuous transmission, support Modbus	Suitable for large data volume applications, support Modbus.

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.

NO.	Model	Specification	Description
1	Size H*W*D	82 * 62 * 25 mm	See more at 3.2 Dimension
2	Weight	130g	Tolerance: 4.5g
3	Temperature	-40℃ 85℃	Meet industrial level
4	Antenna impedance	50 Ω	Standard 50 Ω characteristic impedance
5	Supply voltage	+10 ~ +28V DC	It is recommended to use 12V or 24 V
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

5.2. Frequency range and channels

Model	Default frequency	Frequency range	Channel spacing	Channels
	Hz	Hz	Hz	
E90-DTU (433C33)	433M	425~450.5M	100K	256 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.

5.3. Transmit power level

Mode	2W	1W	500mW	250mW
E90-DTU (433C33)	√	√	√	√

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.

5.4. Air data rate

Model	Default air data rate	Levels	Air data rate(bps)
	bps		bps
E90-DTU(433C33)	N/A	N/A	Unadjustable, the airspeed will automatically adjust to the baud rate

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.

5.5. Current parameters

Model	Transmitting current mA		Standby current mA	
	12V	24V	12V	24V
E90-DTU (433C33)	938	417	31	24

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.

5.6. Transceiver Length and Sub-packing Mode

Model	Buffer	Sub-package
E90-DTU(433C33)	Single input unlimited (baud rate ≤57600)	Continuous transmission, no subcontracting

Note:

1. If the data received by the station in a single time is larger than the capacity of a single packet, the excess data will be automatically allocated to the second transmission until the completion of the transmission.
2. The data transceiver cannot receive data that is more than the buffer capacity;

Operating Mode

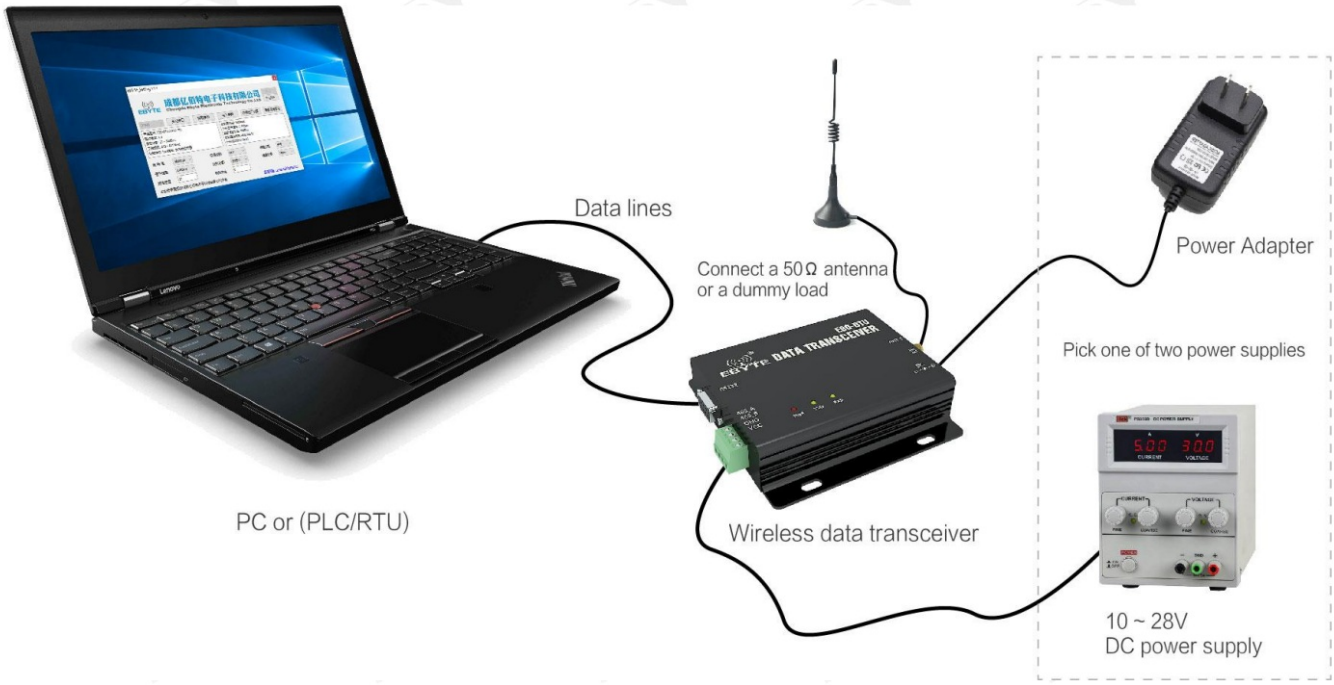
E90-DTU(230C27) has four operating modes, if low power consumption is not required, normal communication is recommended to configure the data transceiver for the normal mode (mode 0); The factory default is normal mode (mode 0).

	Categories	M1	M0	Description
Mode 0	Normal Mode	ON	ON	Serial port open, wireless open, transparent transmission (factory default mode)
Mode 1	Retained mode	ON	OFF	Nonsense, both serial and wireless are disabled
Mode 2	Command mode	OFF	ON	The radio can be programmed using the configuration software
Mode 3	Sleep Mode	OFF	OFF	The module enters hibernation and the serial port and module are closed

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.

Connection diagram when programming

7.1. Diagrammatic drawing



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

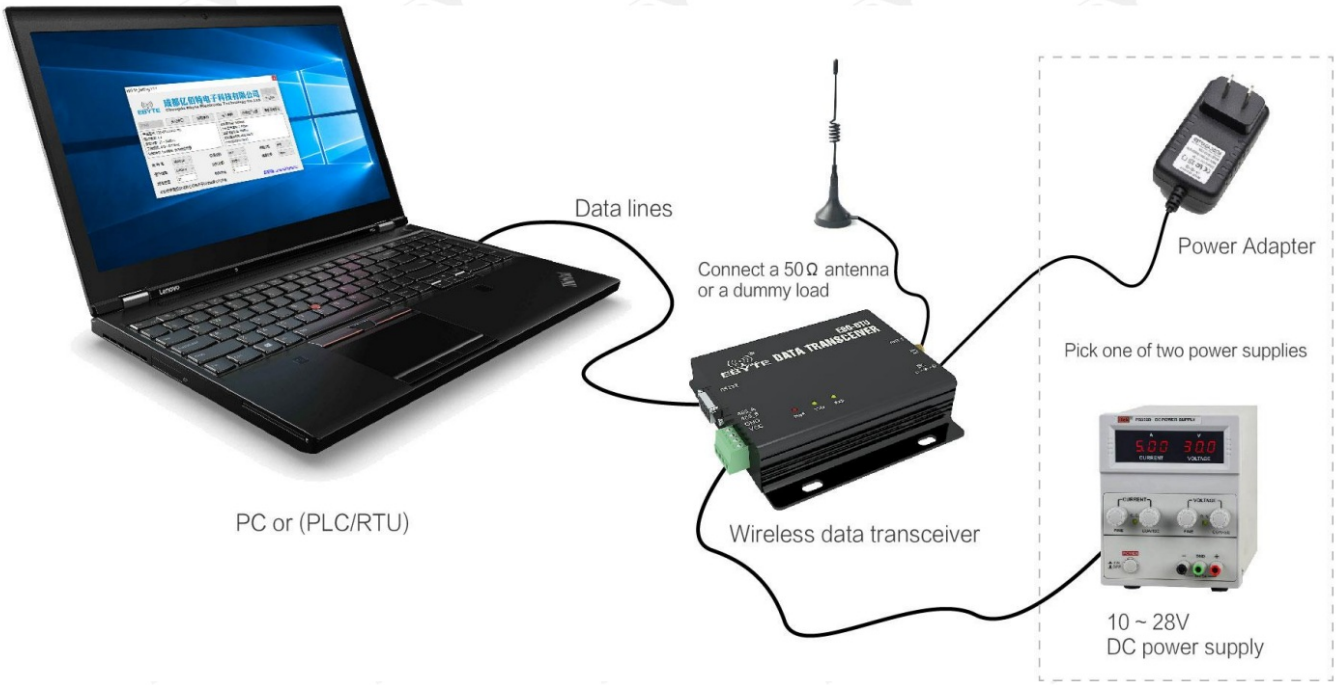
Note:

1. programming can only be carried on in a specific mode (see above), if fails, please confirm the work mode. 2.If there's no complicated programming, opening the E90-DTU (E90-DTU parameter configuration application) to modify parameters.

7.2. Parameter setting instruction

Parameter	Description
Baud rate	The serial port baud rate of a wireless data station at work is 1200bps 115200bps
Odd-even check	Support 8N1:no check 8E1:even-check 8O1:odd-check Both are 8-bit data bits and 1-bit st op bits.
Air data rate bps	Wireless communication rate, also known as air baud rate air rate high, data transmission s peed, the transmission of the same data time delay is small, but the transmission distance will become shorter.
Transmitting pow er	In order to ensure working efficiency, it is recommended to use the maximum power. If the tr ansmitted power is reduced, the communication distance will become shorter and the requir ed current will be reduced
FEC	The lost or interfered data can be partially corrected by complex encoding, which can impro ve the equivalent receiving sensitivity by about 3dBm. Turning off this function can reduce th e communication delay.
Transmission mo de	Fixed length transmission: automatic subcontracting in traditional wireless transmission mode, with a maximum of 77 bytes per packet. Continuous transmission: unlimited packet le ngth, supporting wireless continuous transmission.
Wake Up Time	There is no direct relationship with the communication delay. If the customer needs low-pow er applications, this option shall be adjusted as required. In the power-saving mode, the longer the wake-up time, the lower the power consumption of the receiving end, and the gre ater the communication delay.
Station Address	Internal address of wireless data station, stations with the same address as those independent of Modbus address can communicate with each other. This feature can be use d to realize software filtering grouping input range:0~65535, decimal number.
Frequency Chan nel	It is equivalent to the working frequency of the wireless data transmission station. Each cha nnel corresponds to its different working frequency. Theoretically, different frequency chann els cannot communicate with each other If there are multiple groups of wireless data station s in the same area, the communication frequency interval is suggested to be 2~5MHz.
Cipher function	Only stations with the same ciphertext can communicate, and the secondary ciphertext can only be written but cannot be read.
Ciphertext set	Radio ciphertext, input range :0 ~ 65535, decimal number.

8. Connection diagram in test and application



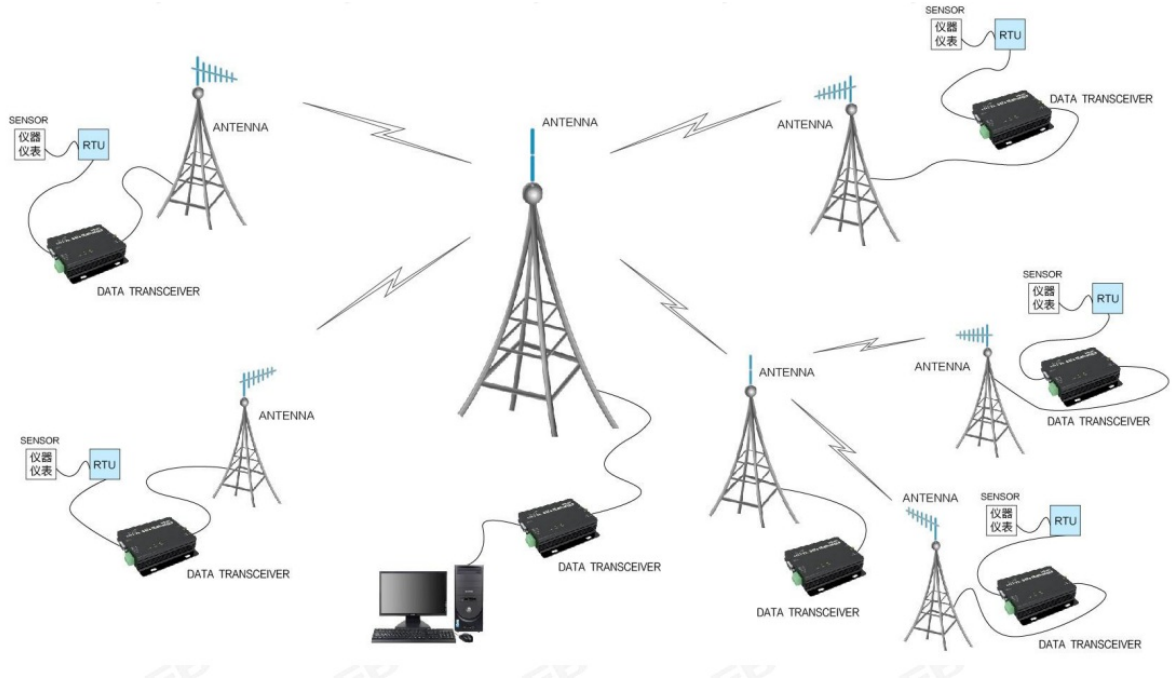
9. E90 Series

Mode No.	Interface	Frequency Hz	Tx power dBm	Distance km	Function feature
E90-DTU(170L30)	RS232 RS485	170M	30	8	LoRa spread spectrum, ultra-strong through diffraction
E90-DTU(433L30)	RS232 RS485	433M	30	8	LoRa spread spectrum, long distance, anti -interference
E90-DTU(433L37)	RS232 RS485	433M	37	20	LoRa spread spectrum, 20km long distance, anti- interference
E90-DTU(433C30)	RS232 RS485	433M	30	3	High-speed continuous transmission, supportModBus protocol

E90-DTU(433C33)	RS232 RS485	433M	33	4	High-speed continuous transmission, supportModBus protocol
E90-DTU(433C37)	RS232 RS485	433M	37	10	High-speed continuous transmission, support Modbus protocol, long-distance
E90-DTU(230N27)	RS232 RS485	230M	27	5	Low-frequency narrow band, suitable for complex environment
E90-DTU(230N33)	RS232 RS485	230M	33	8	Low-frequency narrow band, suitable for complex environment
E90-DTU(230N37)	RS232 RS485	230M	37	15	Low-frequency narrow band, suitable for the complex environment, super diffraction

Practical application

The data transceiver of CDEBYTE is applied for all kinds of point to point, one point to multiple points wireless data transmission systems, 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 another industrial automation system, as shown below:



11. Note

1. Please keep the warranty card of the equipment which includes the factory number (and important technical parameters) and is important for the user's future maintenance and new equipment.
2. Transceiver during the warranty period, if the quality of the product itself rather than man-made damage or lightning and other natural disasters caused by damage, enjoys free warranty; please do not repair by yourself, the problem and please contact with our company when problem occurring, we offer the first-class after-sales service.
3. Please do not operate the transceiver in some flammable places such as coal mines or near explosive atmospheres (such as detonators).
4. Please use the appropriate DC power supply, high-frequency interference ability, small ripple, and enough load capacity are required; it's better to have over-current, over-voltage protection and lightning protection, and other functions to ensure that transceiver working properly.
5. Please do not use it in the working environment beyond the transceiver environmental characteristics, such as high temperature, humidity, low temperature, strong electromagnetic fields or dust larger environment.
6. Please do not continuously keep the transceiver transmitting in full capacity, or the transmitter might be damaged.
7. Please connect the ground with the external ground of the power supply (such as PC, PLC, etc.) , otherwise, it is easy to burn out the communication interface; do not plug the interface with the power supply.
8. When testing, please connect the antenna or 50 loads, otherwise transceiver will be damaged easily;the distance from the antenna is better than 2 meters, so as to avoid harm, please do not touch the antenna when transmitting.'
9. Wireless data transceiver has different communication distance in different environments, communication distance is influenced by temperature, humidity, obstacle density, obstacle volume and electromagnetic environment; in order to ensure stable communication, it is recommended to reserve at least 50 % of the communication distance.
10. When communication distance is not perfect, it is recommended to improve the antenna quality and the installation mode of the antenna. You can send mail to **support@cdebyte.com** for support.

11. When choosing a power supply, it is recommended to keep at least 50% current left and the ripple must not exceed 100mV.

Important statement

1. CDEBYTE reserves the right of final interpretation and modification of all the contents of this manual.
2. As the hardware and software products continuously improve, this manual may be subject to change without notice, please refer to the latest version.
3. Everyone is responsible for protecting the environment: to reduce the use of paper, we only provide electronic documents of the English manual, if necessary, please go to our official website to download; In addition, for special requirements, we agree to offer a certain amount of documents according to order quantity, not every data transceiver are supplied with one manual, please understand;

Revision history

version	Date	Description	Issued by
1.2	2019-04-12	initial version	Molly
1.3	2020-10-14	initial version	ly
1.4	2020-1-27	initial version	ly

About us
Technical support: **support@cdebyte.com**
Documents and RF Setting download link: **www.ebyte.com**
Thank you for using Ebyte products!
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Web: **www.ebyte.com**
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4# XI-XIN Road, Chengdu, Sichuan, China

Documents / Resources

	**EBYTE E90-DTU 2.4GHz LoRa Modem** [pdf] User Manual E90-DTU, 2.4GHz LoRa Modem

References

- **LoRa/ZigBee/WiFi/ - - - - -**