Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual



E90-DTU(400SL37)

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1. Introduction

1.1 Brief introduction

E90-DTU(400SL37) is a data transceiver with military-grade LoRa modulation technology.With multiple transmission modes, it works in the (410.125~493.125MHz) frequency band (default 433.125MHz).The transceiver provides transparent RS232/RS485 interface and supports10～36V voltage input. LoRa direct-sequence spread spectrum technology will bring longer communication distances, and has the advantages of concentrated power density and strong anti-interference ability. It features a software FEC forward error correction algorithm, which has high coding efficiency and strong error correction capability. In the case of sudden interference, it can proactively correct the interfered data packets, greatly improving reliability and transmission distance. In the absence of FEC, such packets can only be discarded. It has data encryption. The data transmitted by the transceiver over the air is random, and the data interception is meaningless through strict encryption and decryption algorithms. Packet length setting is available to support different real-time and data packets.

As a communication medium, wireless data transceiver has the same scope as optical fiber, microwave and bright line: it provides real-time and reliable data transmission of monitoring signals in private networks under certain special conditions, with low cost, installation and maintenance. It is convenient, has strong diffraction ability, flexible networking structure and long coverage. It is suitable for occasions with many points and scattered, complex geographical environment, etc. It can be connected with PLC, RTU, rain gauge, liquid level meter and other data terminals.

1.2 Certificate

E90-DTU is certified with CMIIT ID:2017FP5780 by SRRC.

E90-DTU is certified with “Certificate of conformity on explosive application protection”，ID: 201711000975.

E90-DTU is certified with “Electrostatic surge test report” by National Institute of Measurement and Testing Technology，ID： CNEx18.1461.

E90-DTU is certified with “Certificate of Design Patent”，Patent Number： ZL 2016 3 0501980.3.

E90-DTUis certified with “Utility model patent certificate”，Patent Number： ZL 2016 2 1410691.3.

E90-DTU is certified with “CE” , ID： CCISE180514601V.

E90-DTU is certified with “FCC”, ID： 2ALPH-E90-DTU.

E90-DTU is certified with “RoHS”，ID： DTI201807025245.

1.3 Features

★ Using the latest LoRa technology, it is farther away from traditional LoRa digital radio stations and has more powerful performance.

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- ★ Using military-grade LoRa modulation technology, with data encryption, the packet length is available for configuration.
- ★ Large single package, single package is up to 240 bytes, adapt to Modbus.
- ★ Simple and efficient power supply design, support power adapter or crimping mode, support 10 ~ 36V power supply.
- ★ The transmission power can be up to 5W.
- ★ Support LBT function, the transceiver automatically waits to send data according to the current ambient noise intensity. The communication success rate of the module in harsh environments is greatly improved.
- ★ Support wireless send command packets, remotely configure or read wireless module parameters.
- ★ Support communication key function to effectively prevent data from being intercepted.
- ★ Multi-level relay networking can be realized, which effectively extends communication distance for ultra-long-distance communication.
- ★ With temperature compensation circuit, the frequency stability is better than ±1.5PPM.
- ★ Operating temperature range: -40 ° C ~ +85 ° C, to adapt to a variety of harsh working environment.
- ★ All-aluminum alloy casing, compact size, easy installation and good heat dissipation; perfect shielding design, with good electromagnetic compatibility and strong anti-interference ability.
- ★ Multiple protection functions such as power reverse connection protection, over-current protection, and antenna surge protection greatly increase the reliability of the device.
- ★ Powerful software functions, all parameters can be programmed: such as power, frequency, air data rate, address ID, etc.
- ★ with built-in watchdog and precise time layout, once an exception occurs, the transceiver will automatically restart, and continue to work according to the previous parameters.

1. Quick Start

You need to prepare items below,



E90-DTU


Adaptor

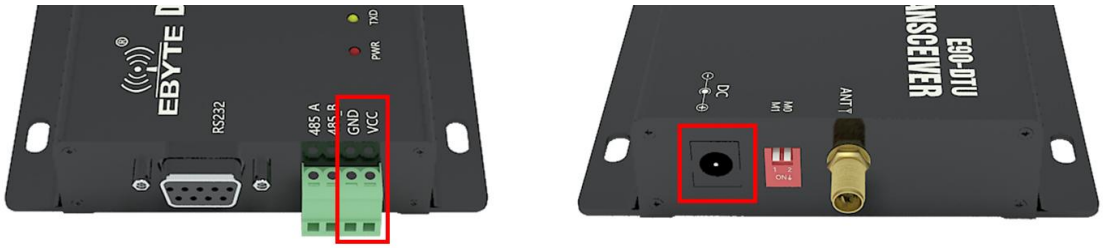

Antenna


Cable

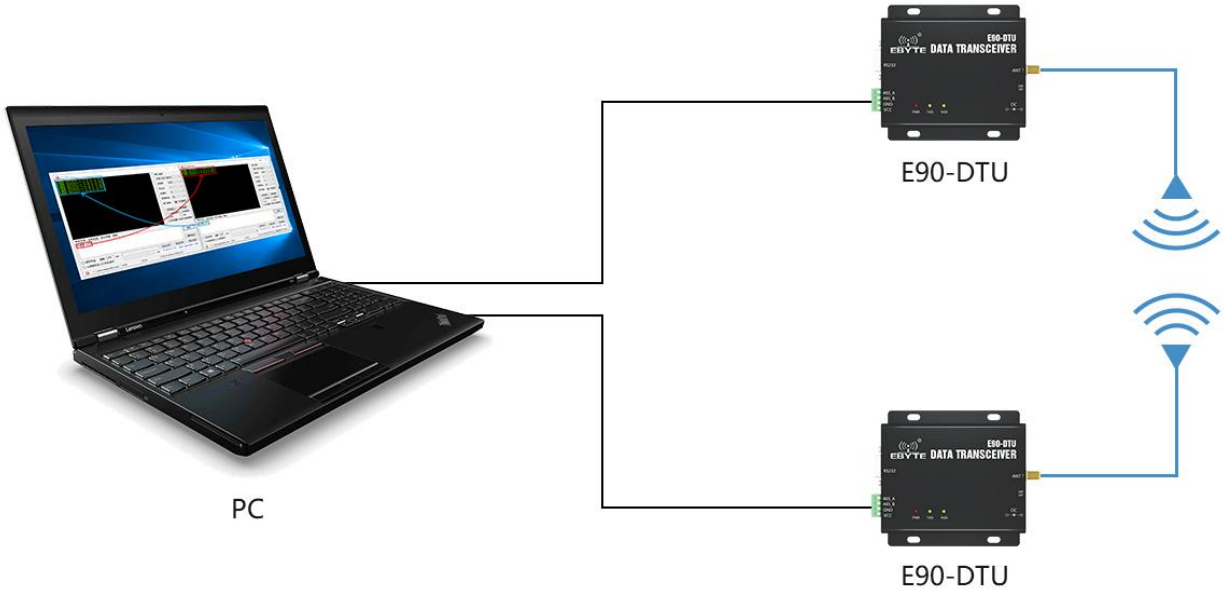
1. First install the antenna for device, then install the power supply, and ensure that the dial switch is in the correct state. The user can select the crimping method or the power adapter to supply power according to the requirements.

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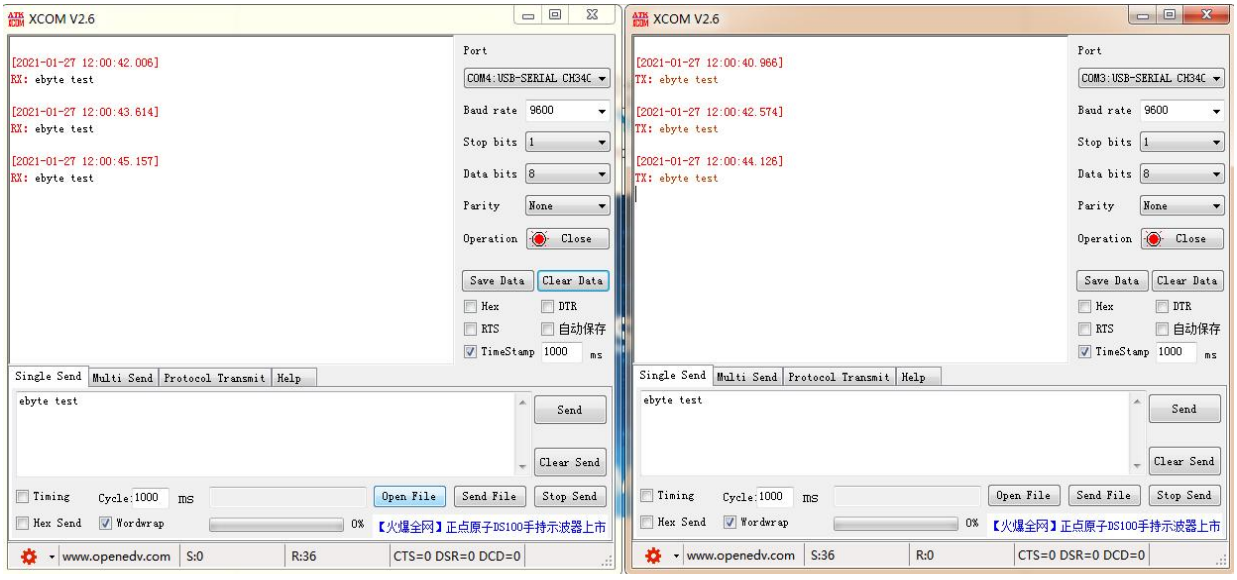
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2. Connect the DTU to computer via USB to RS-232 or USB to RS-485 converter etc.



3. Start two serial port debugging assistants, select the baud rate 9600bps, check mode as 8N1 to realize transparent transmission;



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4. If customer needs to modify the parameters, please dial the switch in the configuration mode and connect to the computer. Open the E90-DTU SL configuration software, you can modify the relevant parameters. After completing the configuration, you must restore the DIP switch status for communication.



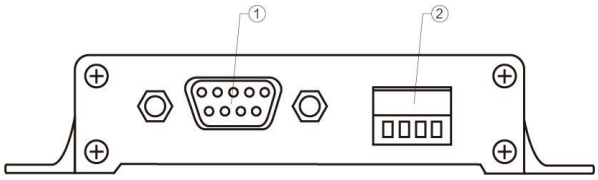
Mode 0 Factory default

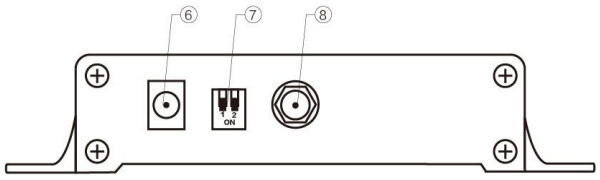


Mode 2 Parameter configuration

2. Dimensions

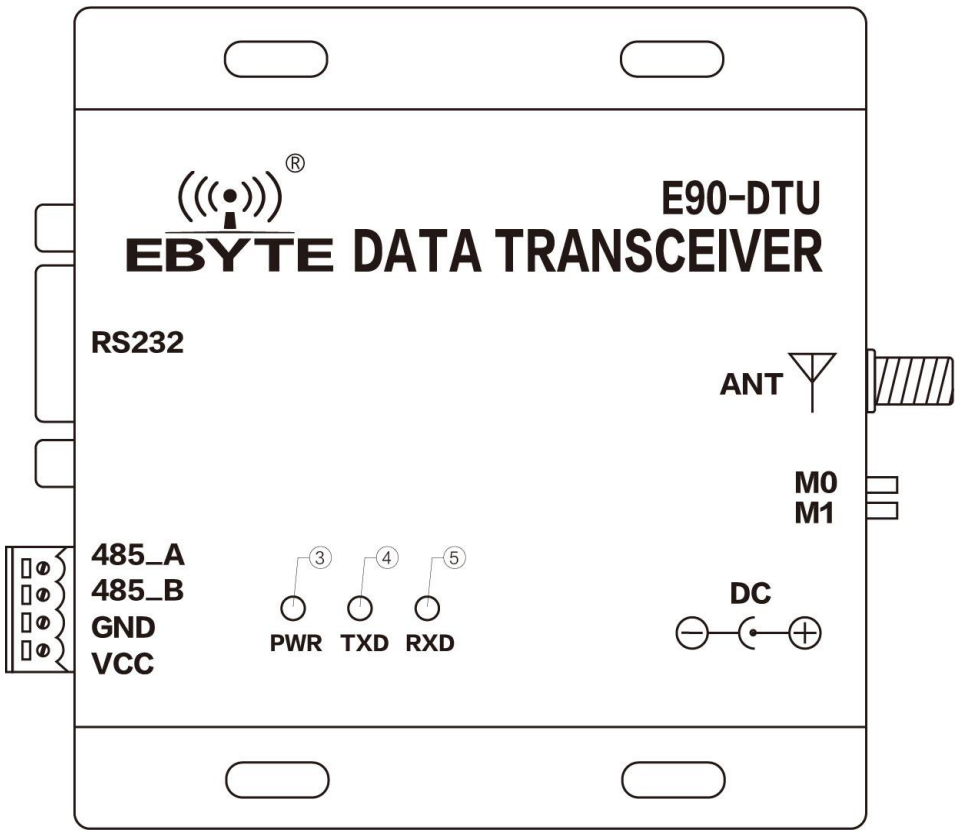
3.1 Parts description





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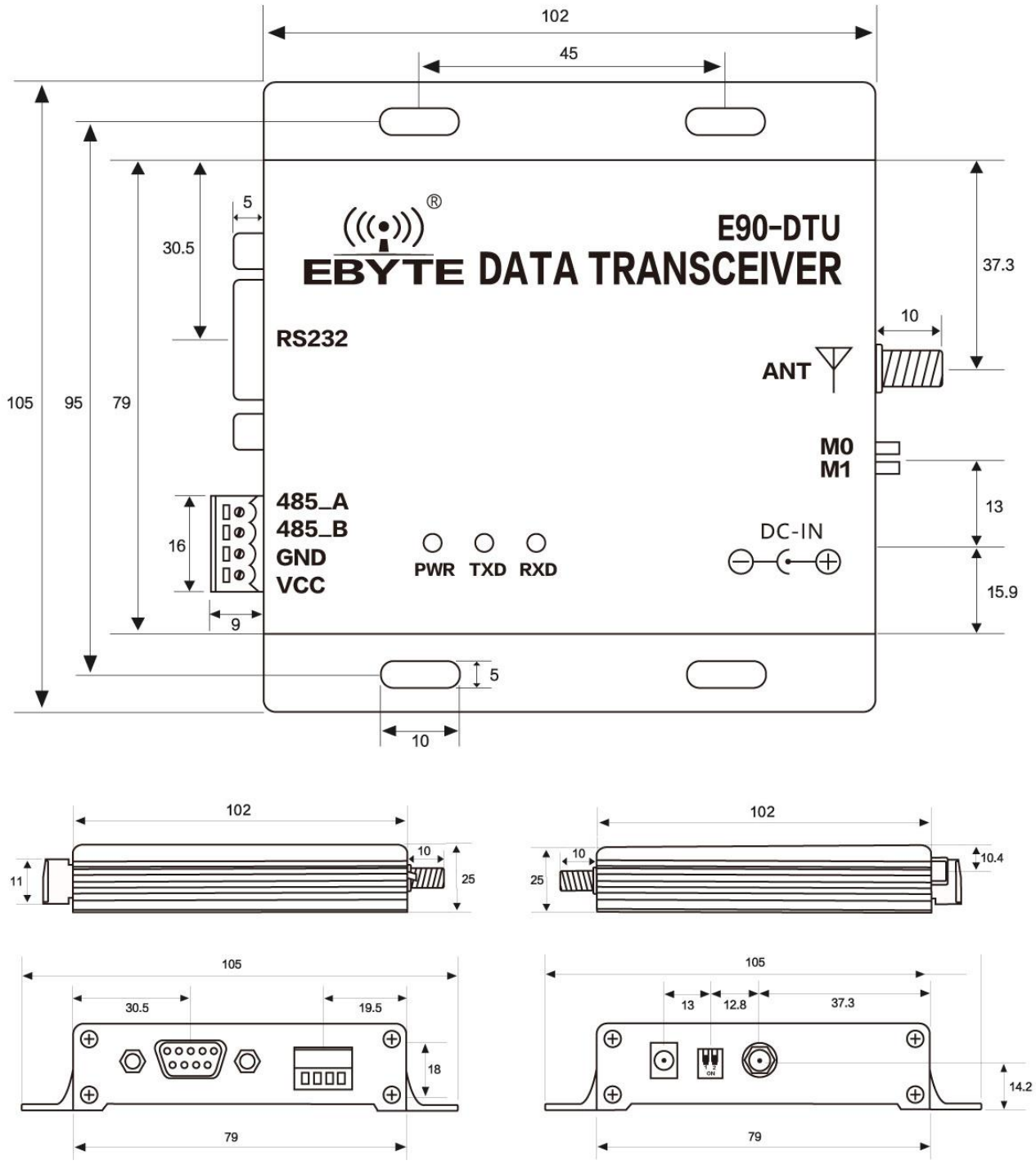
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No.	Name	Function	Note
1	DB-9 female socket	RS-232 interface	Standard RS-232 interface
2	3.81 terminal block	RS-485, power interface	Standard RS-485 interface and pressure line power interface
3	PWR-LED	Power LED	Red, lit when the power is on
4	TXD-LED	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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单位：mm

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3. Interface definition

4.1 Power interface



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 users can choose the VCC and GND terminal power supply from ② , both are optional；

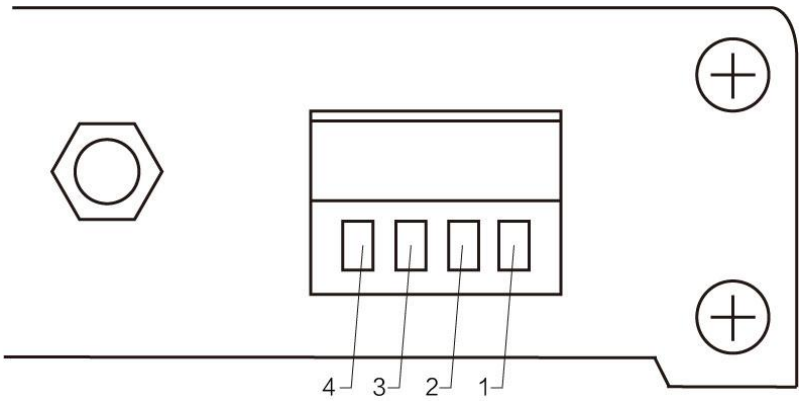
8 ~ 28V DC power supply, it is recommended to use 12V or 24V DC power supply for E90-DTU.

4.2 RS232

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

4.3 RS485

E90-DTU can be connected to the 485_A terminal and 485_B terminal from ② with the RS-485 A terminal and B terminal of other device respectively.



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Pin NO.	Definition	Function	Description
1	VCC	Crimping power interface, positive	10~36V 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 120Ω resistor between 485_A terminal and 485_B.

4. Technical specification

5.1 Model specification

Model No.	Frequency	TX power	Distance	Features	Recommended application
	Hz	W	km		
E90-DTU(400SL37)	433.125M	5	14.4	LoRa, anti-interference	Suitable for transmission of fast speed in complex environment with data interference over a long distance

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 parameter

No.	Item	Value	Note
1	Size	124 * 105 * 25 mm	See more in 3.2. Dimensions
2	Weight	253g	± 5g
3	Temperature	-40℃～85℃	
4	Antenna impedance	50Ω	Standard 50 Ω characteristic impedance
5	Supply voltage	+10 ~ +36V 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 1200~115200
8	Address	Default 0	65536 configurable address

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5.3 Frequency and channel numbers

Model No.	Default Frequency	Frequency Range	Channel Interval	Channel numbers
	Hz	**Hz**	**Hz**	
E90-DTU(400SL37)	433.125M	410.125～493.125M	1M	84，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 Air data rate

Model	Default	Levels	Air data rate (bps)
	bps		bps
E90-DTU(400SL37)	2.4k	6	2.4、4.8、9.6、19.2、38.4、62.5k

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

Model	TX current mA		Standby current mA	
	12V	24V	12V	24V
E90-DTU(400SL37)	1100	586	50	27

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 TX and RX FIFO and sub-packing method

Model No.	Buffer	Sub-packing method
E90-DTU(400SL37)	1000 bytes	Can be sub-packed to 32/64/128/240 byte each time via command

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;

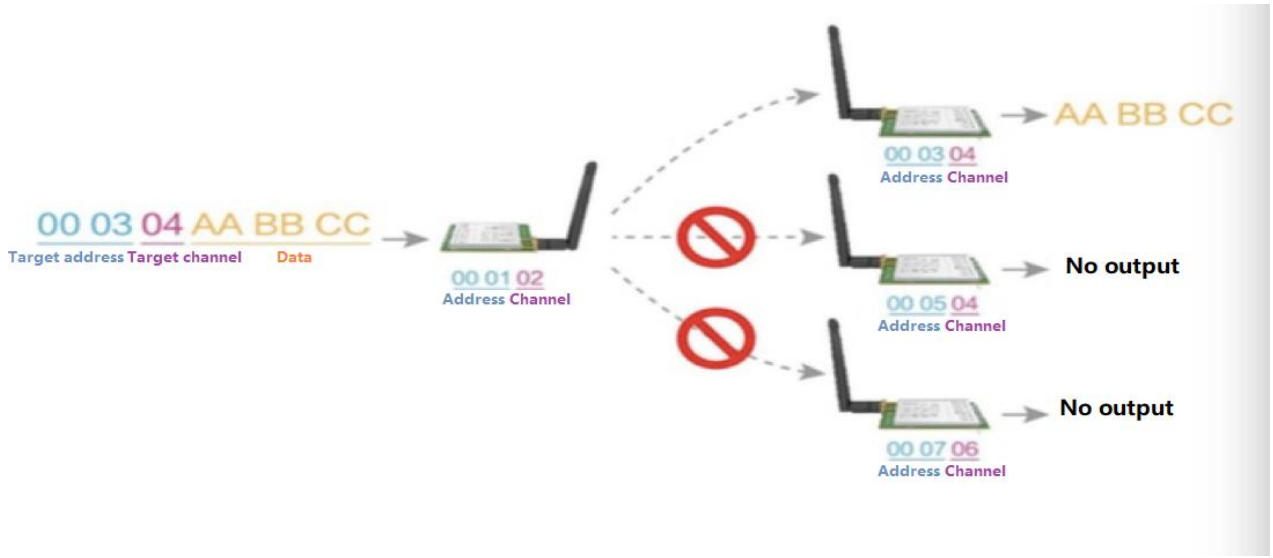
2. The data transceiver can not receive data which is more than the buffer capacity.

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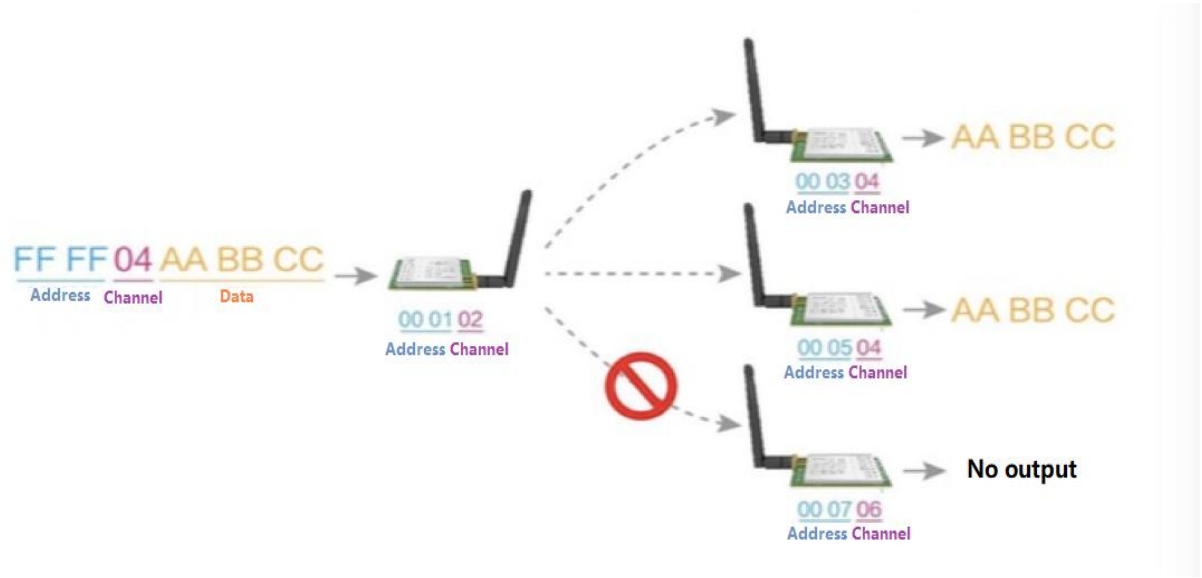
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6. Function Description

6.1 Fixed Transmission



6.2 Broadcast Transmission



6.3 Broadcast Address

- For example: Set the address of module A as 0xFFFF and channel as 0x04.
- When module A is the transmitter (same mode, transparent transmission), all modules under channel 0x04 will receive the data, the purpose of broadcast is realized.

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6.4 Monitor Address

- For example: Set the address of module A as 0xFFFF and channel as 0x04;
- When module A is the receiver, it can receive the data sent from all modules under channel 0x04. The purpose of monitor is realized.

7. Operating mode

The E90-DTU (230SL30) has two working modes. In normal communication, the radio is configured in the normal mode (mode 0); the default setting of the radio is also the normal mode (mode 0).

	Categories	M1	M0	Notes
Mode 0	Normal Mode	ON	ON	Open UART Comm port and RF， transparent transmission is on, configuration over air via special command is available.
Mode 1	Reserved mode	ON	OFF	Reserved, no special features
Mode 2	Configuration Mode	OFF	ON	Users access the register through the serial port to control the working state of the device. The DTU can be configured through the configuration software on computer.
Mode 3	Reserved mode	OFF	OFF	Reserved, no special features



Mode 0



Mode 1



Mode 2



Mode 3

7.1 Normal mode（mode 0）

Type	**When M0 = ON and M1 = ON, the module works in mode 0.**
Transmitting	Users send data via UART. The device will start wireless transmission.
Receiving	Wireless receiving is enabled, data received will be output via pin TXD.

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7.2 Configuration mode (mode 2)

Type	When M0 = ON and M1 = ON, the module works in mode 2.
Transmitting	Wireless transmission is off.
Receiving	Wireless receiving is off.
Configuration	Users can visit register to configure the working status.

8. Register read and write control

8.1 Command format

In configuration mode（mode 2：M1=OFF，M0=ON），supported commands are as follows（only **9600，8N1 are available**）：

NO	Command format	Description
1	Configure register	command：C0+start address+length+parameter Reply：C1+start address+length+parameter Example 1：set channel as 0x09 command start address length parameter Transmit：C0 05 01 09 Return：C1 05 01 09 Example 2：set module address（0x1234),network address (0x00),UART(9600 8N1),air data rate(1.2K) Transmit：C0 00 04 12 34 00 61 Return：C1 00 04 12 34 00 61
2	Read register	Command：C1+start address+length Reply：C1+start address+length+parameter Example 1: read channel command start address length parameter Transmit：C1 05 01 Return：C1 05 01 09 Example 2: read module address, network address, UART and air data rate Transmit：C1 00 04 Return：C1 00 04 12 34 00 61
3	Configure temporary register	Command：C2 +start address+length+parameter Reply：C1 +start address+length+parameter Example 1：Set channel as 0x09

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		command start address length parameter Transmit: C2 05 01 09 Return: C1 05 01 09 Example 2: set module address (0x1234), network address (0x00), UART (9600 8N1), air data rate (1.2K) Transmit: C2 00 04 12 34 00 61 Return: C1 00 04 12 34 00 61
5	Wireless configuration	Command: CF CF + general command Reply: CF CF + general response Example 1: set channel as 0x09 wireless command head command start address length parameter Transmit: CF CF C0 05 01 09 Return: CF CF C1 05 01 09 Example 2: set module address (0x1234), network address(0x00), UART(9600 8N1), air data rate(1.2K) Transmit: CF CF C0 00 04 12 34 00 61 Return: CF CF C1 00 04 12 34 00 61
6	Format error	Reply: FF FF FF

8.2 Register description

Address	Read/ Write	Name	Description	Remark
00H	Read/ Write	ADDH	ADDH (Default 0)	● High and low byte of the module address. Note: When the module address is FFFF, it can be used as the broadcast and monitor address, that is the module will not perform address filtering.
01H	Read/ Write	ADDL	ADDL (Default 0)	
02H	Read/ Write	NETID	NETID (Default 0)	● Network address, used to distinguish the network. When communicating with each other, they should be set to the same.

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03H	Read/ Write	REG0	7，6，5 UART baud rate（bps） 000：baud rate is 1200 001：baud rate is 2400 010：baud rate is 4800 011：baud rate is 9600（Default） 100：baud rate is 19200 101：baud rate is 38400 110：baud rate is 57600 111：baud rate is 115200 --- 4，3：UART parity bit 00：8N1（Default） 01：8O1 10：8E1 11：8N1（same as 00） --- 2，1，0，air data rate 010：air data rate is 2.4k（Default） 011：air data rate is 4.8k 100：air data rate is 9.6k 101：air data rate is 19.2k 110：air data rate is 38.4k 111：air data rate is 62.5k	● For the two modules that communicate with each other, the serial port baud rate can be different, and the verification method can also be different. ● When transmitting large packets continuously, users need to consider the data blocking caused by the same baud rate, and data may even be lost. It is generally recommended that both parties have the same baud rate. --- ● It should be the same for both communication parities. ● The higher the rate, the shorter the distance.
04H	Read/ Write	REG1	7，6：sub-packing setting 00：240byte（Default） 01：128byte 10：64byte 11：32byte --- 5：enable RSSI environmental noise 1：on 0：off（Default） --- 4，3，2 remain --- 1，0：TX power 00：37dbm（Default） 01：37dbm 10：37dbm	● When the data is smaller than the sub packet length, the serial output of the receiving end is an uninterrupted continuous output. When the data is larger than the sub packet length, the receiving end serial port will output the sub packet. --- ● When enabled, the C0 C1 C2 C3 command can be sent in the transmitting mode or WOR transmitting mode to read the register. Register 0x00: Current ambient noise rssi Register 0X01: rssi when the data was received last time. （Current channel noise is: dBm =-RSSI/2） Command format: C0 C1 C2 C3 + starting address + read length Returns: C1 + address address + read length + read valid value E.g: send C0 C1 C2 C3 00 01 Return C1 00 01 rssi ---

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			11：37dbm	---------- ● Power and current are nonlinear, and power efficiency is highest at maximum power. ● The current does not decrease in proportion to the decrease in power.
05H	Read/ Write	REG2	Channel （CH） 0-83 stands for 84 channel respectively	● Actual frequency= 410.125 + CH *1M
06H	Read/ Write	REG3	7 enable RSSI byte 1：on 0：off（Default） ---------- 6, fixed transmission 1：fixed transmission 0：transparent transmission （Default） ---------- 5 enable repeater 1：on 0：off ---------- 4 enable LBT （listen before transmit） 1：on 0：off（Default） ---------- 3 WOR TX and RX control 1：WOR transmitter TX and RX are enabled, certain preamble code is added when transmitting date. Data receiving is on. 0 ： WOR receiver （Default） Transmission is unavailable. Module works in WOR monitoring, (see details about WOR time below) to save power. ---------- 2，1，0，WOR time 000：500ms 001：1000ms 010：1500ms 011：2000ms（Default） 100：2500ms 101：3000ms	● When enabled, the module receives wireless data and it will follow an RSSI strength byte after output via the serial port TXD .---------- ● The module recognizes the first three bytes of the serial data as: address high + address low + channel and takes it as the wireless transmitting target. ---------- ● After the reply function is enabled, if the target address is not the module itself, the module will forward it once. ● In order to prevent data return-back, it is recommended to use it in conjunction with the fixed point mode. That is: the target address is different from the source address. ---------- ● When enabled, wireless data will be monitored before it is transmitted, which can avoid interference to a certain extent, but may cause data delay. ---------- ● Only valid in Mode 1. ● After the WOR receiver receives the wireless data and outputs it through the serial port, it will wait for 1000ms before entering the WOR again. Users can input the serial port data and return it via the wireless during this period. Each serial byte will be refreshed for 1000ms. Users must transmit the first byte within 1000ms. ---------- ● Only valid in Mode 1. ● Time T= （1+WOR）*500ms，Max 4000ms，Min 500ms ● The longer the WOR monitoring interval period, the lower the average power consumption, but the

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			110：3500ms 111：4000ms	greater the data delay ● Both the transmitter and the receiver must be the same (very important).
07H	Write	CRYPT_H	key high byte（Default 0）	● Write only, read and return 0. ● Used for user encryption to avoid intercepting airborne wireless data by similar modules.
08H	Write	CRYPT_L	key low byte（Default 0）	● The module will internally use these two bytes as a calculation factor to transform and encrypt the over-the-air wireless signal.
80H~86H	Read only	PID	7 bytes of product information	● product information: 7 bytes

8.3 Factory default parameter

	Default parameter：62 00 17 03 00 00						
Model NO.	Frequency	Address	Channel	Air data rate	Baud rate	Parity bit	TX power
E90-DTU (400SL37)	433.125MHz	0x0000	0x17	2.4kbps	9600	8N1	37dBm

9. Repeater networking mode

No.	Description
1	After setting the repeater mode by configuration, switch to the normal mode and the repeater starts working.
2	In the repeater mode, ADDH, ADDL are no longer used as the module address, but is correspondingly paired with the NETID. If the data of one of the networks is received, it is forwarded to another network. The network ID of the repeater itself is invalid.
3	In repeater mode, the repeater module cannot transmit and receive data, and cannot perform low-power operation.

Repeater networking rules:

1. Forwarding rules, the repeater can forward data in both directions between two NETIDs.

2. In repeater mode, ADDH\ADDL is no longer used as the module address, and it is used as a NETID forwarding pairing flag.

Figure:

① Primary repeater

“Node 1” NETID is 08.

“Node 2” NETID is 33.

Primary repeater 1‘s ’ADDH\ADDL are 08，33.

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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 transmitted by node 1 can be received by node 2.

② Secondary repeater

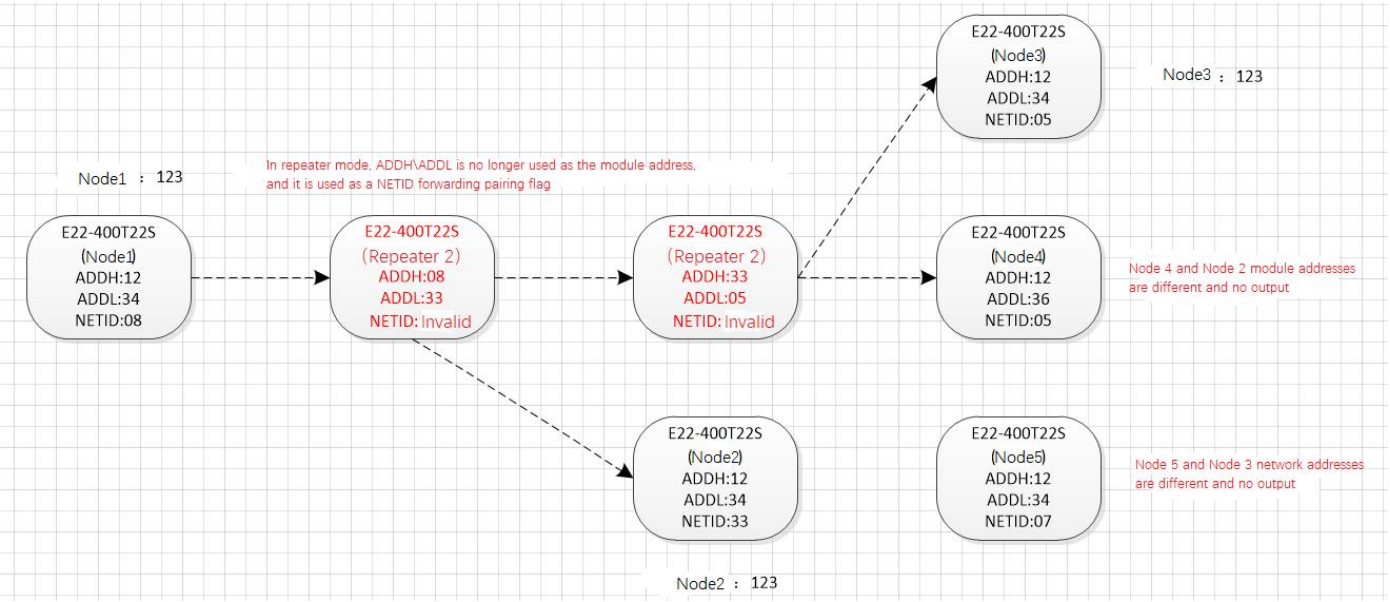
Secondary repeater's ADDH\ADDL are 33，05.

Therefore, Repeater 2 can forward the data of Repeater 1 to the network NETID: 05.

Thus node 3 and node 4 can receive node 1 data. Node 4 outputs data normally, and node 3 has a different address than node 1, so no data is output.

③ Two-way repeater

As shown in the figure: the data sent by node 1, the nodes 2, 4 can receive the data sent by node 2, 4, and node 1 can also receive it.



10. Configuration instructions on computer

- The following figure shows the E90-DTU SL configuration interface on computer, users can switch to the command mode through M0M1, and quickly configure and read the parameters on computer.

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- In the configuration on computer, the module address, frequency channel, network ID, and key are all in decimal mode. The range of values of each parameter is:

  Network address: 0-65535

  Frequency channel: 0-83

  Network ID: 0-255

  Key: 0-65535

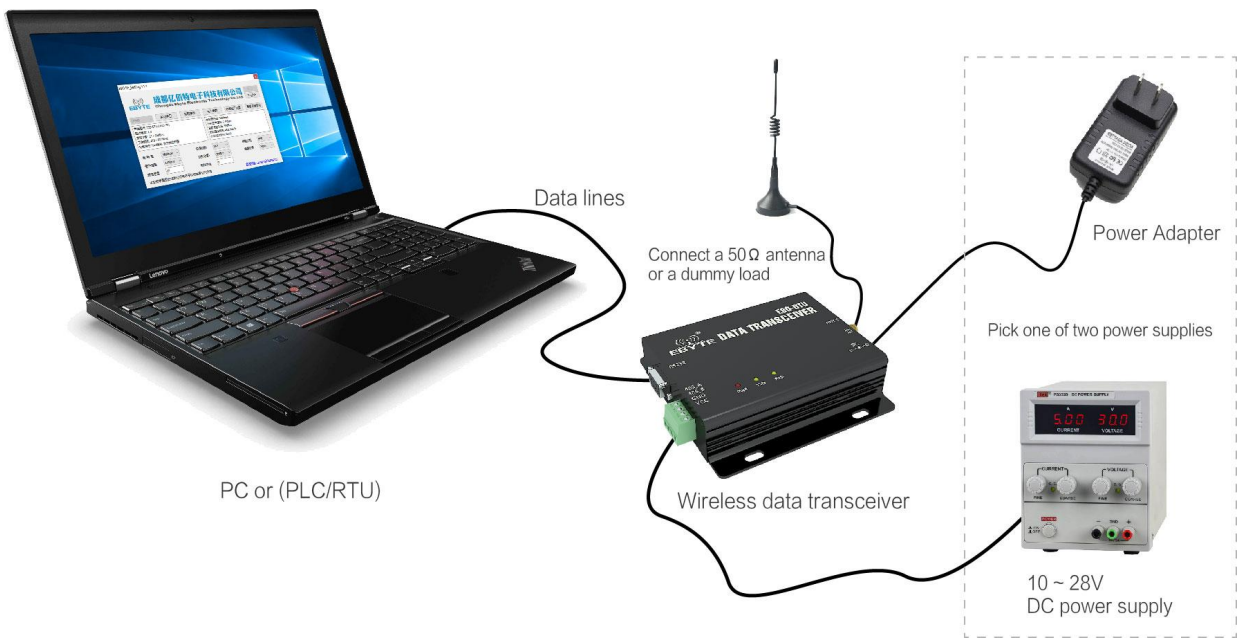
- When the user configures the repeater mode using the host computer, special attention must be paid. Since the parameters are in decimal mode in the host computer, the module address and network ID need to be converted into hexadecimal. For example, if the network ID input by the transmitting end A is 02, and the network ID input by the receiving end B is 10, when the repeater end R sets the module address, the hexadecimal value 0X020A is converted into the decimal value 522 as the repeater end R. Module address. That is, the module address value of the repeater terminal R is 522 at this time.

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11. Programming the modem

11.1 Connection diagram



Operating mode	M1	M0	Note
Configuration mode	OFF	ON	Programming via the configuration software is available only in this mode

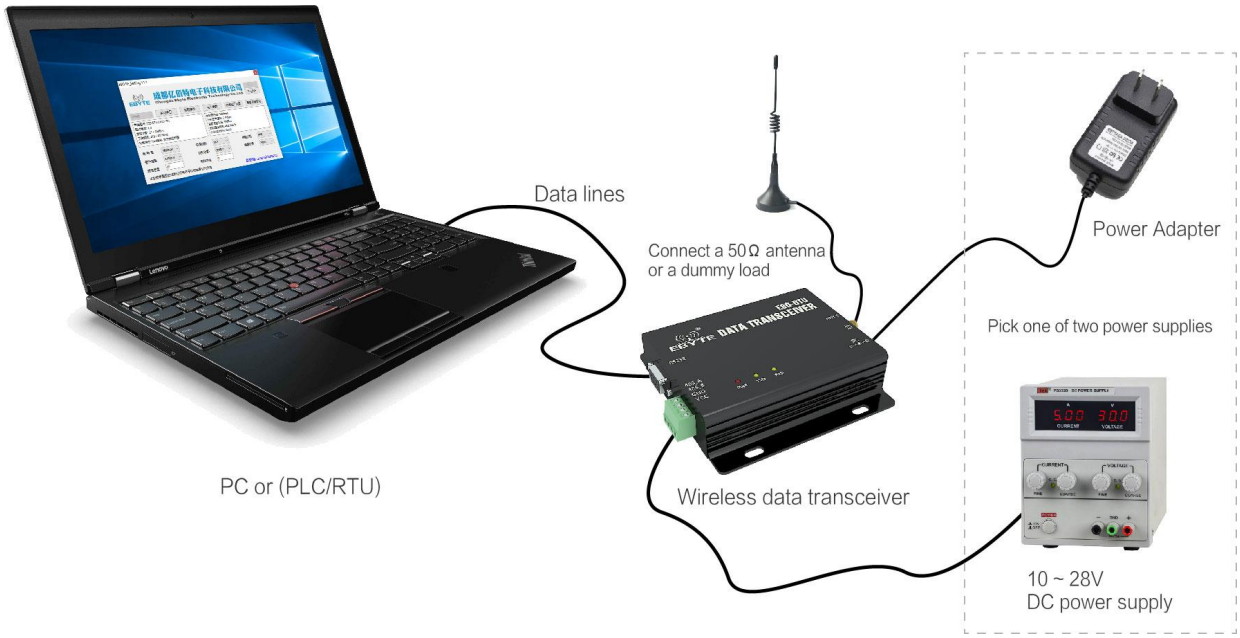


1. Programming can only be performed in a specific operating mode (see table above). When programming fails, please confirm that the radio working mode is correct.
2. Users can modify parameters via E90-DTU SL configuration software.

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12. Connection diagram in test and practical application



13. E90-DTU

Model No.	Interface	Frequency Hz	TX Power dBm	Distance km	Features
E90-DTU(230SL22)	RS232 RS485	230M	22	5	Low frequency LoRa，ultra strong diffraction ability for complex environment
E90-DTU(230SL30)	RS232 RS485	230M	30	10	Low frequency LoRa，ultra strong diffraction ability for complex environment
E90-DTU(400SL22)	RS232 RS485	433\470M	22	5	LoRa,wireless configuration，networking transmission, long distance, anti-inference
E90-DTU(400SL30)	RS232 RS485	433\470M	30	10	LoRa, wireless configuration，networking transmission，long distance, anti-inference
E90-DTU(900SL22)	RS232 RS485	868\915M	22	5	LoRa, wireless configuration，networking transmission，long distance, anti-inference
E90-DTU(900SL30)	RS232 RS485	868\915M	30	10	LoRa, wireless configuration，networking transmission，long distance, anti-inference
E90-DTU(170L30)	RS232 RS485	170M	30	8	LoRa，strong diffraction ability
E90-DTU(433L30)	RS232 RS485	433M	30	8	LoRa，long distance, anti-inference
E90-DTU(433L37)	RS232 RS485	433M	37	20	LoRa，20km ultra long distance, anti-inference

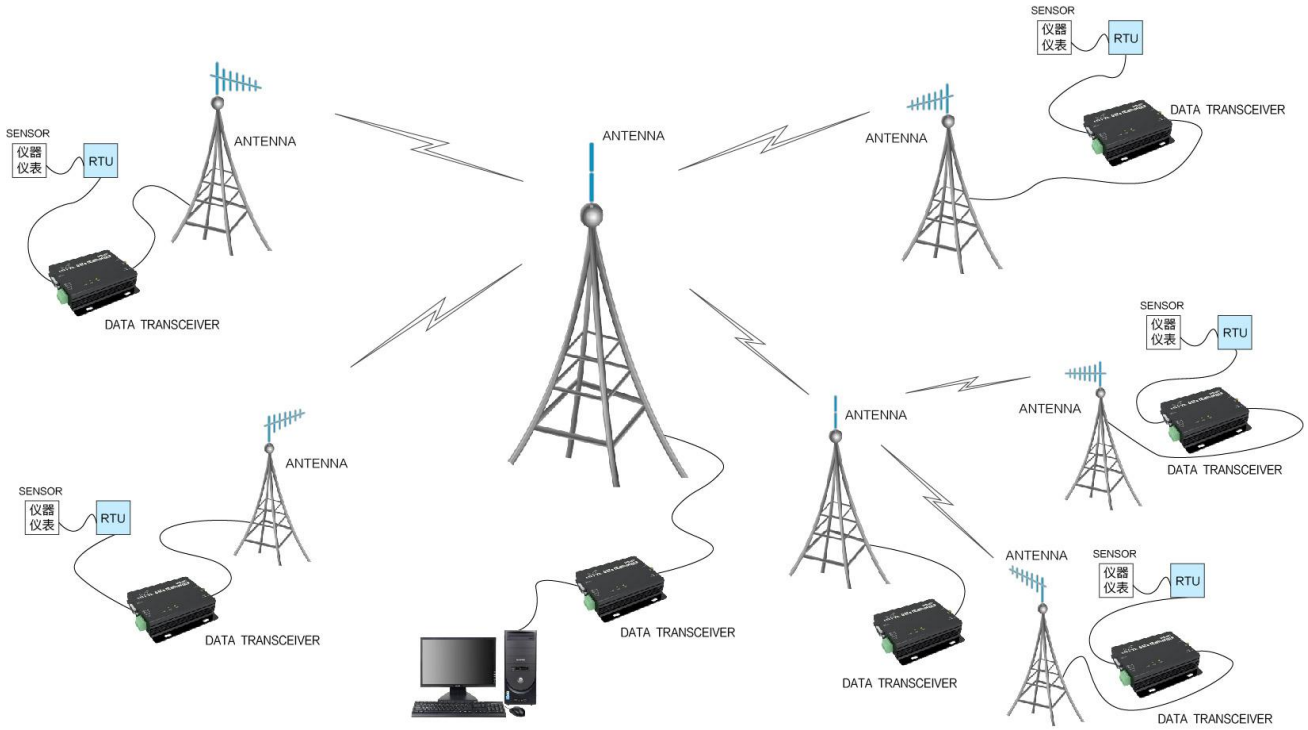
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E90-DTU(433C30)	RS232 RS485	433M	30	3	High-speed continuous transmission，ModBus protocol
E90-DTU(433C33)	RS232 RS485	433M	33	4	High-speed continuous transmission，ModBus protocol
E90-DTU (433C37)	RS232 RS485	433M	37	10	High-speed continuous transmission，ModBus protocol，long distance
E90-DTU(230N27)	RS232 RS485	230M	27	5	Low frequency narrow band，for complex environment
E90-DTU(230N33)	RS232 RS485	230M	33	8	Low frequency narrow band，for complex environment
E90-DTU(230N37)	RS232 RS485	230M	37	15	Low frequency narrow band，for complex environment，strong diffraction ability

14. Application field

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:



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15. Operation notes

1. Please keep the warranty card of this equipment safely. The factory number (and important technical parameters) of the equipment is on the warranty card, which has important reference value for future maintenance and new equipment.
2. During the warranty period, if the radio is damaged due to the quality of the product itself, not caused by human damage or lightning, please enjoy the free warranty. Please do not repair it yourself. If there is any problem, please contact us. After sales service.
3. The device may not be operated in the vicinity of some flammable places (such as coal mines) or explosive dangerous objects (such as detonators for detonators).
4. Appropriate DC stabilized power supply should be selected, which requires strong anti-high frequency interference, small ripple, and sufficient load capacity; it also has functions such as overcurrent, overvoltage protection and lightning protection to ensure data transmission.
5. Do not use it in a working environment that exceeds the environmental characteristics of data transceiver, such as high temperature, humidity, low temperature, strong electromagnetic field or dusty environment.
6. Do not let the data transceiver continuously be in full-load transmission state, otherwise the transmitter may be burned out.
7. The ground wire of the data transceiver should be well connected with that of the external equipment (such as PC, PLC, etc.) and of the power supply. Otherwise, it is easy to burn the communication interface; do not plug or unplug the serial port when electrified.
8. When testing the data transceiver, it must be connected with a matching antenna or a 50Ω dummy load, otherwise it will easily damage the transmitter; if the antenna is connected, the distance of the human body from the antenna should preferably exceed 2 meters to avoid injury and cut. Do not touch the antenna while launching.
9. Wireless modem 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, Communication distance margin above50. %.
10. If the measured communication distance is not ideal, it is recommended to check the antenna quality and the installation method of the antenna. You can also contact support@cdebyte.com for assistance.
11. Power supply is required to remain 50% of current, it should be noted that the ripple should not exceed 100mV.
12. Wireless communication products need to be connected with an impedance matching antenna to work properly, even for short-term testing.

Important statement

1. EBYTE reserves the right of final interpretation and modification of all contents in this manual.
2. As the hardware and software of the product continue to improve, this manual may be subject to change without further notice, and the final version of the manual shall prevail.
3. To protect the environment, everyone is responsible: in order to reduce the use of paper, this manual only prints the Chinese part, the English manual only provides electronic documents, if necessary, please go to our official website to download; in addition, if the user does not require special, when the user orders in bulk, We only provide product specifications according to a certain percentage of the order quantity. Not every digital radio station is equipped with one

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by one, please understand.

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