Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual



E90-DTU(2G4HD12)

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1. Overview

1.1 Introduction

E90-DTU (2G4HD12) is a high-quality industrial-grade wireless data transmission radio station. Its high-level port protection capability can be used in industrial situations with complex electromagnetic environments. Compared with ordinary digital transmission radio: this radio has the characteristics of low delay, full duplex, automatic frequency hopping, high-speed continuous transmission, etc., combined with its strong anti-interference ability, makes wireless communication more stable and reliable in the industrial field.

E90-DTU (2G4HD12) is a point-to-point, frequency hopping, continuous transmission, duplex wireless data transmission radio station, working in the free 2.4G frequency band around the world. The radio transmission power is +12dBm, supports transparent transmission, provides RS232/RS485 interface, and supports 8~28 V voltage input. Wireless transceiver has CRC check, FEC forward error correction, packet loss retransmission and other technologies, plus automatic frequency hopping technology, so even in the case of sudden interference, it is almost unaffected, greatly improving the reliability of wireless transmission And transmission distance. The radio has a two-way continuous transmission function, so you don't need to pay too much attention to the length of the sub-packet, and you can send data through the interface at any time without caring about the status of the receiving station.

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. It can be connected with PLC, RTU, rain gauge, level gauge and other data terminals.

1.2 Features

- Using automatic frequency hopping technology, it has strong anti-interference ability and stable communication;
- Support two-way continuous data transmission function;
- The product supports AT commands and host computer configuration;
- 4-level port protection capability;
- Simple high-efficiency power supply design, support power supply configuration or pressure line mode, support 8 ~ 28V power supply;
- The transmit power can reach up to 12dbm, and all technical indicators meet European industrial standards;
- Working temperature range: -40℃～+85℃, suitable for various harsh working environments, 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;
- Multiple protection functions such as power reverse connection protection, over-connection protection, and antenna surge protection greatly increase the reliability of the radio;
- Simple and easy to use, wireless communication can be carried out after the factory power-on connection is successful;
- Built-in hardware watchdog, and accurate time layout, once an exception occurs, the module will automatically

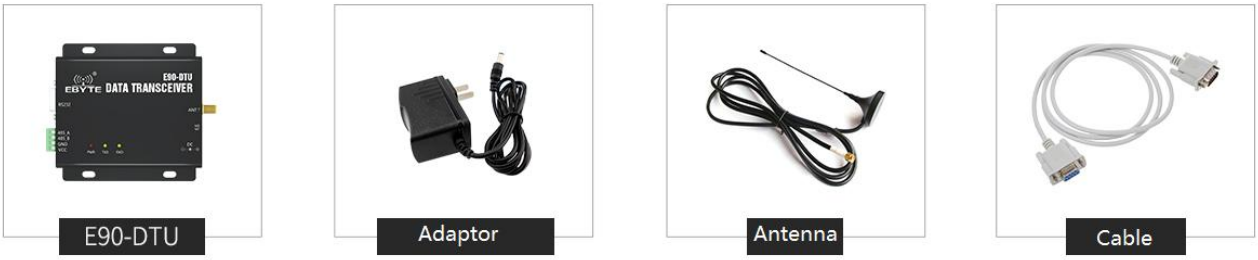
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restart, and can continue to work according to the previous parameter settings.

2. Quick Start

User needs to prepare below parts:



2.1 Configuration Software Guide

First install the antenna to the DTU, and then use USB to RS-232 or USB to RS-485 to connect the computer to the DTU, M1 pulled up, M0 in any position to enter the configuration mode.

The software is used to query and set the module parameters, and the radio station needs to work in configuration mode. The software interface is shown in the figure below:



Picture 2-1 PC software interface

Software Description

No	Description
1	Serial port parameter area
2	Command execution area

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3	Parameter area
4	Special command area

1: Select the current baud rate and parity bit of the module, select the corresponding port number, and open the serial port. You must make the module work in configuration mode and select the correct serial port parameters, otherwise the operation instructions will fail.

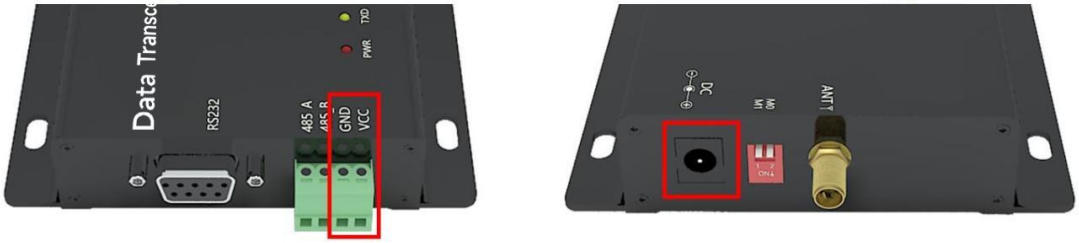
2: Read parameters and write parameters Click to read parameters, it prompts that the read parameters are successful, and the current parameters of the module are displayed in the parameter area. Click to write parameters, and it prompts that the write parameters are successful. The parameters selected/filled in the parameter area have been written into the module

3: The parameter area is used with the "Read Parameters" button to display the current module parameters, or to modify the parameters with the "Write Parameters" button to set the module parameters.

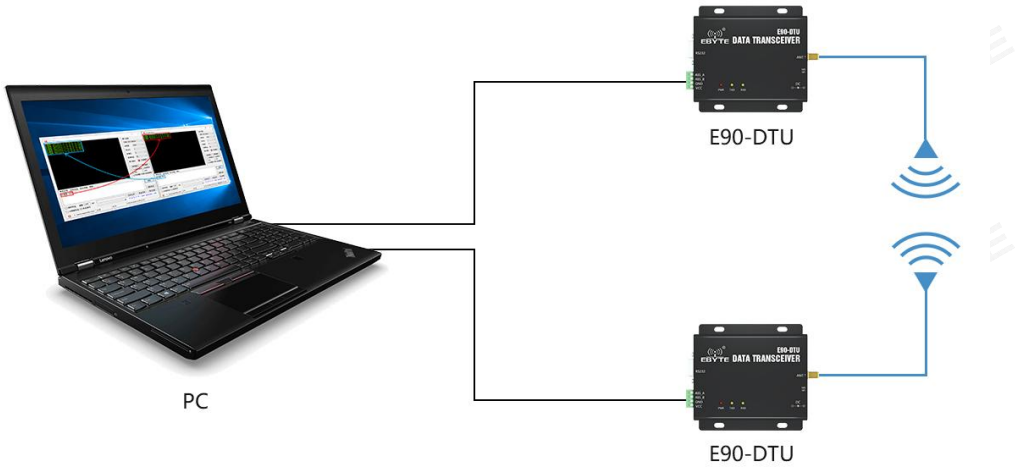
4: Restart and restore factory settings special instructions, which are used to reset the module and restore the module parameters to the factory state.

2.2 Setting Steps

1.First, install the antenna to the DTU, and then install the power supply, M1 pulled down, M0 in any position and enters the transparent transmission mode. The user can power the DTU either by RS485 or power adaptor.



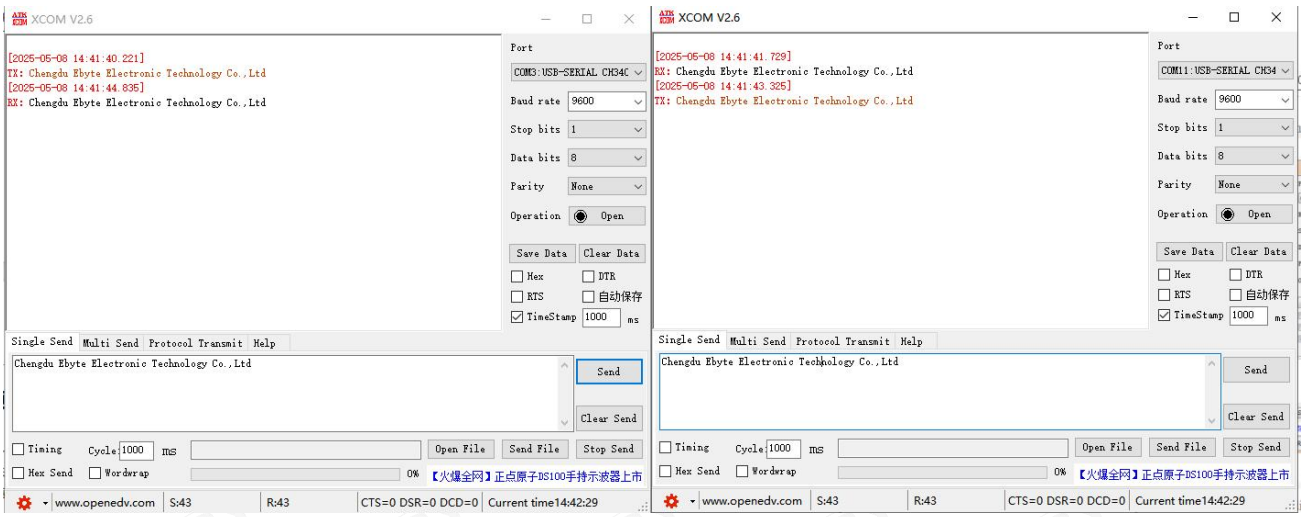
2.Use USB to RS-232 or USB to RS-485 to connect the computer to the DTU. Then connect the DTU power supply. The DTU will automatically establish a connection with another DTU. After the connection is established, the LINK LED will always be on for communication.



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3.Open two serial port debugging assistants on the computer, select the default serial port baud rate 115200bps, parity is 8N1, you can realize serial port transparent transmission.



4. If the user needs to modify the parameters, please pull down M0 and M1, connect to computer, open E65_E90-DTU(HD)DTU setting software to modify the parameters. After completing the configuration, the user must restore M0 and M1 to transceiving mode.



Transceiving Mode

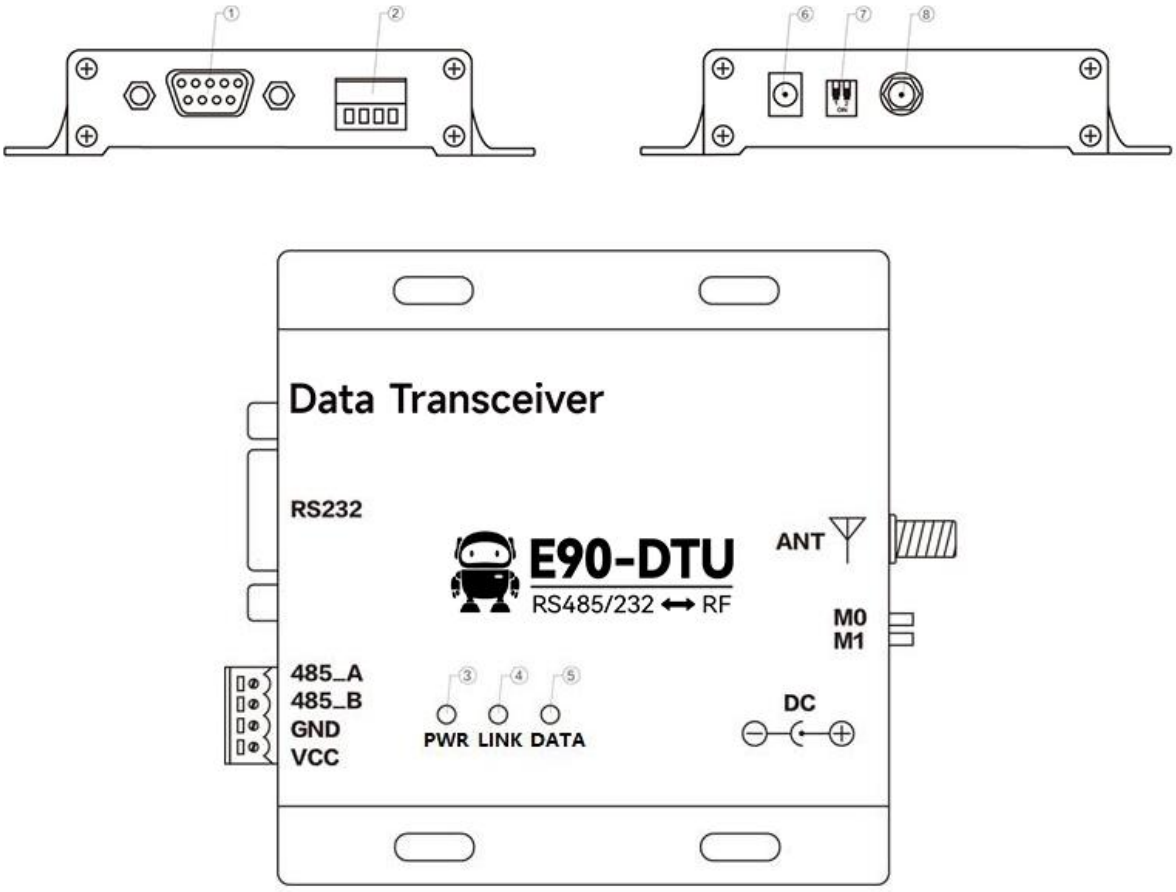


Configuration Mode

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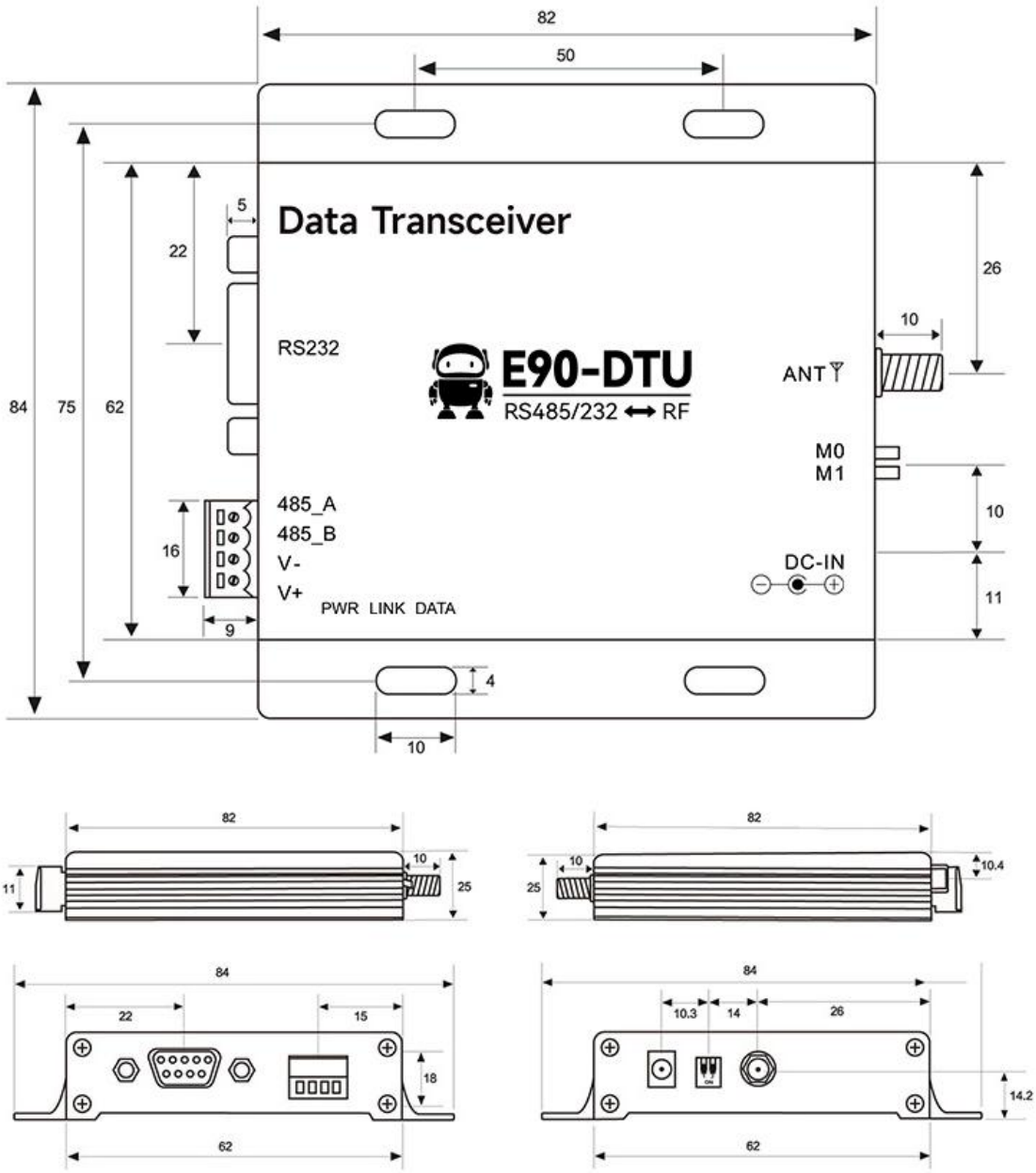
3. Housing and Ports



NO.	Name	Function	Notes
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 Indicator	Red, lights up when the power is on
4	LINK-LED	Data transceiver indicator	Yellow, the connection is successful
5	DATA-LED	Serial data indicator	Yellow, flashing during data transmission
6	DC power interface	Power connector	Push-in round hole, outer diameter 5.5mm, inner diameter 2.5mm
7	DIP switch	Mode selection	Configuration mode: M1=UP, M0=any; Transparent transmission mode: M1=Down, M0=Any
8	Antenna interface	SMA-K interface	External thread inner hole, length 10mm, characteristic impedance 50Ω

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Unit: mm

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4. Definitions

4.1 Power Connection Ports



User can choose either:

Port ⑥ to connect to the DC power port whose interface is 5.5mm in outer diameter and 2.5mm in inner diameter

Or Port② RS485 by VCC and GND.

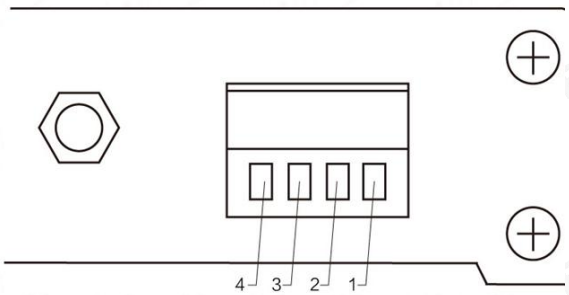
The DTU can be powered by 8～28V DC power supply, and 12V or 24V DC power supply is recommended.

4.2 RS232 Interface

E90-DTU can use standard DB-9 interface to connect to devices through RS-232.

4.3 RS485Interface

E90-DTU can use the 485_A terminal and 485_B terminal in ② to connect to the RS-485 A terminal and B terminal of the device respectively.



NO.	Name	Function	Notes
1	VCC	Screw type power connector, positive	DC 8～28V, 12V or 24V is recommended
2	GND	Screw type power connector, negative	The negative pole of the power supply is connected to the ground and the shell
3	485_B	RS-485 B interface	RS-485 interface B interface is connected to device B interface
4	485_A	RS-485 A interface	RS-485 interface A interface is connected to device A interface

★ Note: If the DTU is connected to multiple devices, communication may not be smooth. Please try to connect a 120Ω resistor in parallel between the 485_A terminal and the 485_B terminal. There is no such phenomenon when connecting a single device.

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5. Parameters

5.1 Model details

Model	Freq.	TX Power	Test range	feature	Application feature
	Hz	dbm	m		
E90-DTU(2G4HD12)	2.4G	12	800	Point-to-point frequency hopping, bidirectional continuous transmission	Suitable for applications with long communication distance and radio interference

★ **Test range conditions:** sunny and clear sky, test environment is open and unobstructed, 12V/1A power supply, 5dBi antenna, the antenna is 2 meters above the ground, and the default parameters are used.

5.2 Other parameters

No	Name	Value	Description
1	Product Size	82*62*25 mm	See installation dimensions for details
2	product weight	130g	Weight tolerance 4.5g
3	Operating temperature	-40℃～+85℃	Meet the needs of industrial use
4	Antenna impedance	50Ω	Standard 50Ω characteristic impedance
5	voltage range	8～28V DC	Recommend to use 12V or 24V
6	Communication Interface	RS232/RS485	Standard DB9 hole/3.81 terminal block
7	Baud rate	Default 115200	Baud rate range 1200～921600，Please refer to 6.4 Hardware baud rate control for more information.

5.3 Frequency range and Channels

Mode	Main Freq.	Range	Channel Width	Channels
	Hz	Hz	Hz	
E90-DTU(2G4HD12)	2.4G	2.4～2.48G	1M	80(full duplex)

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5.4 Electronic Parameters

Mode	Ave. Tx Current mA		Ave. Standby Current mA	
	12V	24V	12V	24V
E90-DTU(2G4HD12)	35	18	35	18

★ Note: 12V transient transmission MAX current: 66mA, 24V transient transmission MAX current: 33mA, it is recommended to reserve ≥50% MAX current margin when selecting the power supply, which is beneficial to the long-term stable operation of DTU.

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6. Working Mode

6.1 Modes

Two working modes are controlled by M1 buttons.

Mode	Position	Description
Transparent transceiving mode	0 (low level)	The serial port is open. DTU is in the state of receiving and sending, transparent transmission (valid when LINK is low level)
Configuration Mode	1 (high level)	Users can query/set module parameters through the serial port, and DTU stops sending and receiving.

Note: The transparent transmission mode will take effect only when the LINK-LED light is always on.

6.1.1 Transparent transceiving mode

When M1 is set to transparent transmission mode, data can be sent and received only when the LINK-LED is always on. When the LINK-LED is off, it means that the module is searching for a device with the same communication link, and communication is not possible at this time. After the device with the same communication link is searched and connected successfully, the LINK-LED is always on. Communication.

6.1.2 Configuration Mode

In configuration mode, DTU cannot transmit or receive data via radio frequency. Users can send AT commands to DTU.

6.1.3 Mode Switching

The M1 button of DTU is used to switch the working mode. Mode will be switched in100ms after M1 button change.

6.1.4 DTU Reset

After DTU hardware reset or software restart, LINK-LED goes out, LINK-LED is always on after the connection is completed, and starts to work normally according to the working mode specified by M1. Therefore, user data needs to be transmitted wirelessly when the LINK-LED is always on.

6.2 DATA LED Indicator

DATA LED displays the state of transparent transmission, it indicates whether there is data receiving or sending on the DTU communication interface, and it flashes when data is being sent or received.

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6.3 Point-to-point communication mechanism

- The valid range of the value of the communication link is 1 to 9999, which can be set using AT commands or upper computer. The factory default setting of the communication link value is "1";
- If the connection is disconnected due to power failure, excessive distance or strong interference, it is recommended to adjust the distance or avoid obstacles. DTU enters the search state again until it finds the device with the same link and establishes the connection.
- If there are two or more E90-DTU (2G4HD12) DTUs with the same communication link, and they are powered on at the same time, a connection will be established randomly. If multiple DTU applications are involved, it is recommended to configure the link value of each pair of DTUs in advance to distinguish them.

6.4 Hardware baud rate control

- User can use Chapter 7 commands or the host computer to set the flow control function on or off, and the hardware flow control is turned off by default;
- Only the RS232 port of DTU supports the hardware flow control function, and the two-way transmission of big data can be carried out under flow control. The RS232 port supports a maximum of 115200bps;
- The DTURS485 interface can support 1.2K~3Mbps baud rate without flow control.

6.5 Full duplex/high-speed continuous transmission

- In two-way communication, especially when transferring files, the channel resources occupied by the two ends are different, which will cause the transmission rate of one end to be slower than the other end, which is normal;
- During continuous data transmission, such as sending large files, to make full use of the transmission rate, please ensure that the data stream is continuous. Frequent small data frame breaks may reduce wireless transmission efficiency.

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7. AT command

7.1 Default Parameter for AT command

Baud rate	115200 bps
Parity	0（parity disabled）
Flow Control	0（off）
Communication link	1

7.2 AT Command Description

1. The AT command is character content;
2. The AT command ends with "\r\n" (the description of \r\n will not be repeated later).
3. The AT command does not distinguish between upper and lower case.
4. The numeric type of the unspecified type parameter in the AT command is a decimal string.

7.3 AT Command Error Code

Error Code	Description	Possible reason for the error
-1	The parameter length is wrong or empty	Compare the instruction parameter range described in the instruction table, the instruction does not carry parameters
-2	Parameter data error	Compare the instruction parameter range described in the instruction table
-3	Instruction does not exist	Compare the instruction format described in the instruction table
-4	No terminator (\r\n)	Serial port tool not selected: send a new line

7.4 AT Command List

7.4.1 AT Test

Command	Reply
AT	+OK
Note: +Ok means the DTU has enter AT mode	

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7.4.2 AT+RESET: Restart

Command	Reply
AT+RESET	+OK
Note: effective at once	

7.4.3 AT+RESTORE: Restore to Default Setting

Command	Reply
AT+RESTORE	OK
Note: **After resetting, it will restart automatically;** **In the process of restoring factory settings, any form of reset is prohibited, and power off before the operation is completed is prohibited;**	

7.4.4 AT+BAUD: Setting baud rate

Command		Reply
Query	AT+BAUD?	+OK=[baud]
Setting	AT+BAUD=[baud]	+OK：Success +ERR=[NUM]：Fail
NO	**BAUD**	**Value（bps）**
	0	1200
	1	2400
	2	4800
	3	9600
	4	19200
	5	38400
	6	57600
	7	115200（factory default）
	8	230400
	9	256000
	10	460800
	11	921600
	12	1000000
Note	Effective after reboot, still effective when next power on	
Example	AT+BAUD=7: to set baud rate to 115200	

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7.4.5 AT+PARITY, Parity Setting

Command		Reply
Query	AT+PARITY?	+OK=[parity]
Format	AT+PARITY=[parity]	+OK：Success +ERR=[NUM]：error
data	**Parity**	**Description**
	0	No Parity (default)
	1	Even parity
	2	Odd parity
note	Reboot to take effect, save when power off	
example	AT+PARITY=0, no parity	

7.4.6 AT+HWFC , Serial flow control

Command		Reply
Query	AT+HWFC?	+OK=[para]
Format	AT+ HWFC =[para]	+OK：success +ERR=[NUM]：error
data	**Para**	**Description**
	0	Flow control off (default)
	1	Flow control on
note	Reboot to take effect, save when power off	
example	AT+HWFC=0	

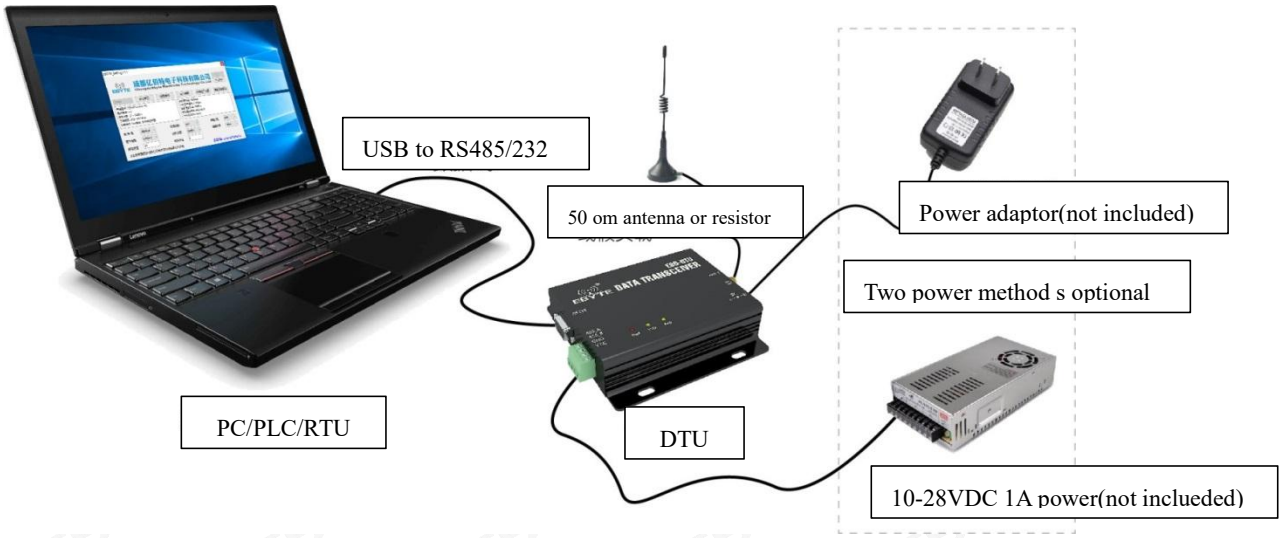
7.4.7 AT+LINK , Communication link setting

Command		Reply
Query	AT+LINK?	+OK=[para]
Format	AT+ LINK =[para]	+OK：success +ERR=[NUM]：error
data	Para: Communication link. The value range is 1 to 9999, and the default value is 1	
note	Take effect immediately (and automatically restart), save when power off;	
example		

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8. Devices Connection Reference.



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9.0 Similar products

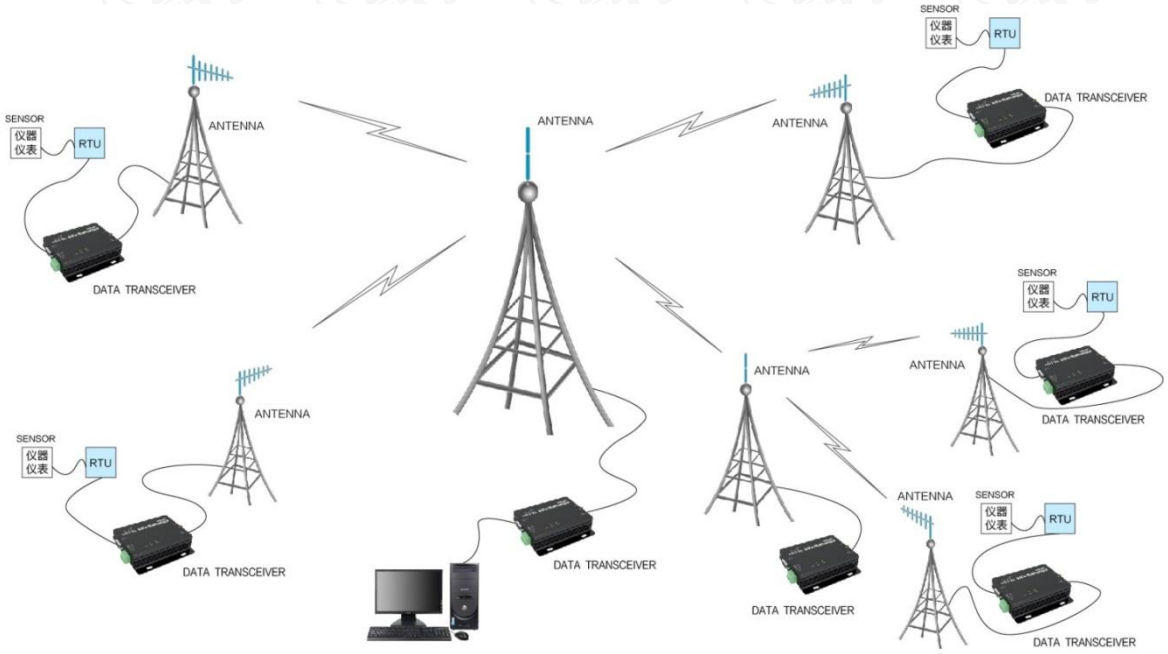
Model	interface	Freq(Hz)	Tx Power	Test Range	Main Features
E34-DTU(2G4H27)	RS232/RS485	2.4G	27dBm	5km	Automatic frequency hopping, retransmission if any packets lost.
E34-DTU(2G4H20)	RS232/RS485	2.4G	20dBm	2.5km	Automatic frequency hopping, retransmission if any packets lost.

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10. Appications:

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



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11. User Notes and Safety Notice

1. Please take good care of the warranty card of the device. The warranty card has 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 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, which is provided by Ebyte First-class after-sales service.
3. Do not operate this DTU near 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 ability, small ripple, and sufficient load capacity; preferably, it should also have overcurrent, overvoltage protection and lightning protection functions to ensure that the DTU is normal jobs.
5. Do not use in a working environment that exceeds the environmental characteristics of DTU, such as high temperature, humidity, low temperature, strong electromagnetic field or dusty environment.
6. Don't let the DTU be continuously in full load transmission 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 it is easy to burn out the communication interface, etc.; do not plug or unplug the serial port with power on.
8. When testing the DTU, a matching antenna or 50Ω dummy load must be connected, 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 DTUs 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 retaining 50% of the current margin as recommended, it should be noted that its ripple should not exceed 100mV.
12. Wireless communication products need to be connected to an impedance-matched antenna to work normally. Even a short-term test cannot be omitted. If the product is damaged due to this reason, it will not be covered by the warranty.

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2. Due to the continuous improvement of product hardware and software, this manual may be changed without prior notice, and the latest version of the manual shall prevail.
3. It is everyone's responsibility to protect the environment: In order to reduce the use of paper, this manual only prints the Chinese part, and the English manual only provides electronic documents. If necessary, please download from our official website; in addition, if not specifically requested by users, users can order in bulk At the time, we only provide product manuals according to a certain proportion of the order quantity, not every DTU is matched one by one, please understand.

Revision History

Version	Description	Issued by
1.0	Initial version	Li
1.1	Modified 6.1.2 Baud Rate Fixed 115200 in Configuration Mode 7.4.8 Content added	ken
1.2	Initial version	LY
1.3	Error corrected	Bin
1.4	Error corrected	Hao
1.5	Example Modify the baud rate description	Hao

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