Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual



Zigbee Gateway
EWD181-Z20(ETH)

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1 Introduction

1.1 Product Introduction



EWD181-Z20(ETH) is a ZigBee gateway based on ZigBee3.0 technology . It has complete supporting ZigBee node equipment, supports 10M /100M adaptive network rate , and provides TCP Server, TCP Client, UDP Server, UDP Client, HTTP Client, MQTT Client Six working modes , users can configure them through the web page . This product supports two types of logical devices : coordinator and router, and users can apply it in various scenarios.

1.2 Ethernet Features

- RJ45 supports 10M/100M adaptive Ethernet interface;
- Support multiple working modes (TCP Server, TCP Client, UDP Server, UDP Client, HTTPC, MQTTC);
- Server mode supports multiple Socket connections;
- Supports quick access to Alibaba Cloud, Baidu Cloud, OneNET, Huawei Cloud, and 3.1.1 version standard MQTT server;
- Support DHCP function. After DHCP is turned on, the IP address of the device will be assigned by the router, which may cause the IP address to be uncertain and inaccessible. It is generally recommended to use a static IP.
- Support DNS (domain name resolution), and can customize the domain name resolution server;
- Support Modbus gateway simple protocol conversion;
- Support HTTP protocol (GET/POST request);
- Support timeout restart function, and you can customize the restart time;
- Support short connection function, and you can customize the short connection interval;
- Support heartbeat package and registration package functions;
- Support serial port cache clearing function;
- Support access to external network and local area network;
- Support hardware and web page to restore factory settings;
- Support online upgrade function.
- Supports web page configuration module parameters, users can configure easily.

1.3 ZigBee Features

- Centralized network management: ZIGBEE 3.0 security standard centralized network access mechanism, data security and reliability;
- Interoperability: Complies with the zigbee 3.0 standard network mechanism and is compatible with the ZCL network protocol;
- Large capacity: 1MB flash, 96K RAM, the maximum number of network nodes can be expanded to 200;
- It supports 6 communication modes including transparent transmission mode, semi-transparent transmission mode, Modbus host mode, etc. Users can switch freely.
- Role switching: Users can switch the device between coordinator and router through the DIP switch or web page configuration;
- Support multiple network topologies: point-to-point, star network, MESH network;
- Network self-healing: If an intermediate node in the network is lost, a new Mesh topology is automatically formed, and the lost node is automatically recovered after restart;
- Automatic routing: The module supports network routing function;
- Automatic networking: The networked node searches for coordinator and router signals, automatically connects to the coordinator and router networks, and automatically obtains a network address that does not conflict with other devices.
- Open network networking: The coordinator controls all routing nodes to allow new nodes to access within the open network timeout period. During this period, the network can be detected by the network-entering nodes. The network-entering nodes can join the network by associating with the coordinator or any routing node of the network. After the coordinator closes the access, it can prevent nodes that should not access the network from not accessing the network.
- Automatic channel and PANID: The coordinator automatically creates a network on the optimal channel and automatically allocates a PANID to avoid duplication with other coordinators.
- Automatically obtain MAC address: The coordinator can obtain the node MAC address and short address the moment the node is added to the network, without the need for further processing on the device side.
- Address search: Users can find the corresponding short address based on the MAC address (unique, fixed) of the node that has joined the network. At the same time, users can also find the corresponding long address of each node in the network based on the short address of the node.
- Data security: Integrates ZIGBEE 3.0 security communication standard, and the network contains multi-level security keys;
- Possessing national invention patent certificate, invention name: A method for interconnection and intercommunication of wireless transparent transmission modules based on ZigBee3.0 Patent number: ZL 2019 1 1122430.X

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1.4 Hardware Features

★ All core components are imported. Compared with similar imported digital radios, it has the most advanced functions, the smallest size and the best price.

★ transmission powers are available.

★ Working temperature range: -40℃～+85℃, adapting to various harsh working environments, a true industrial-grade product.

★ 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 and antenna surge protection greatly increase the reliability of the radio.

★ Powerful software functions, all parameters can be set by programming: such as power, address ID, etc.

★ Built-in watchdog and precise time layout. Once an abnormality occurs, the module will automatically restart and continue to work according to the previous parameter settings.

1.5 Application Scenarios

- Smart home and industrial sensors, etc.
- Security systems;
- Wireless game remote control;
- Healthcare products;
- Advanced Metering Infrastructure (AMI);
- Automotive industry applications;
- Building automation solutions;
- Automation application in agricultural greenhouses.

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2 Product Specifications

2.1 Main Specifications

project	illustrate
interface	Network port (RJ45) , 10/100Mbps adaptive
Working Mode	TCP Server (default), TCP Client, UDP Server, UDP Client, HTTP Client, MQTT Client
Socket connection	TCP server supports 5-way client connection
Network Protocol	TCP/UDP, MQTT, HTTP, IPv4, DHCP, DNS
How to obtain IP	Static IP (default), DHCP
DNS domain name resolution	support
DNS Server	114.114.114.114 (customizable)
Configuration	Web page configuration
IP address	192.168.3.7 (customizable)
username	admin (customizable)
password	admin (customizable)
Local Port	888 6 (customizable)
Subnet Mask	255.255.255.0 (customizable)
Gateway	192.168.3.1 (customizable)
Flow Control	Not supported
Measured distance	1300m, clear and open, antenna gain 5dBi, height 2.5m, air rate 250kbps.
Product size	66 × 68 × 21 mm
Product Weight	64 g ± 2 g

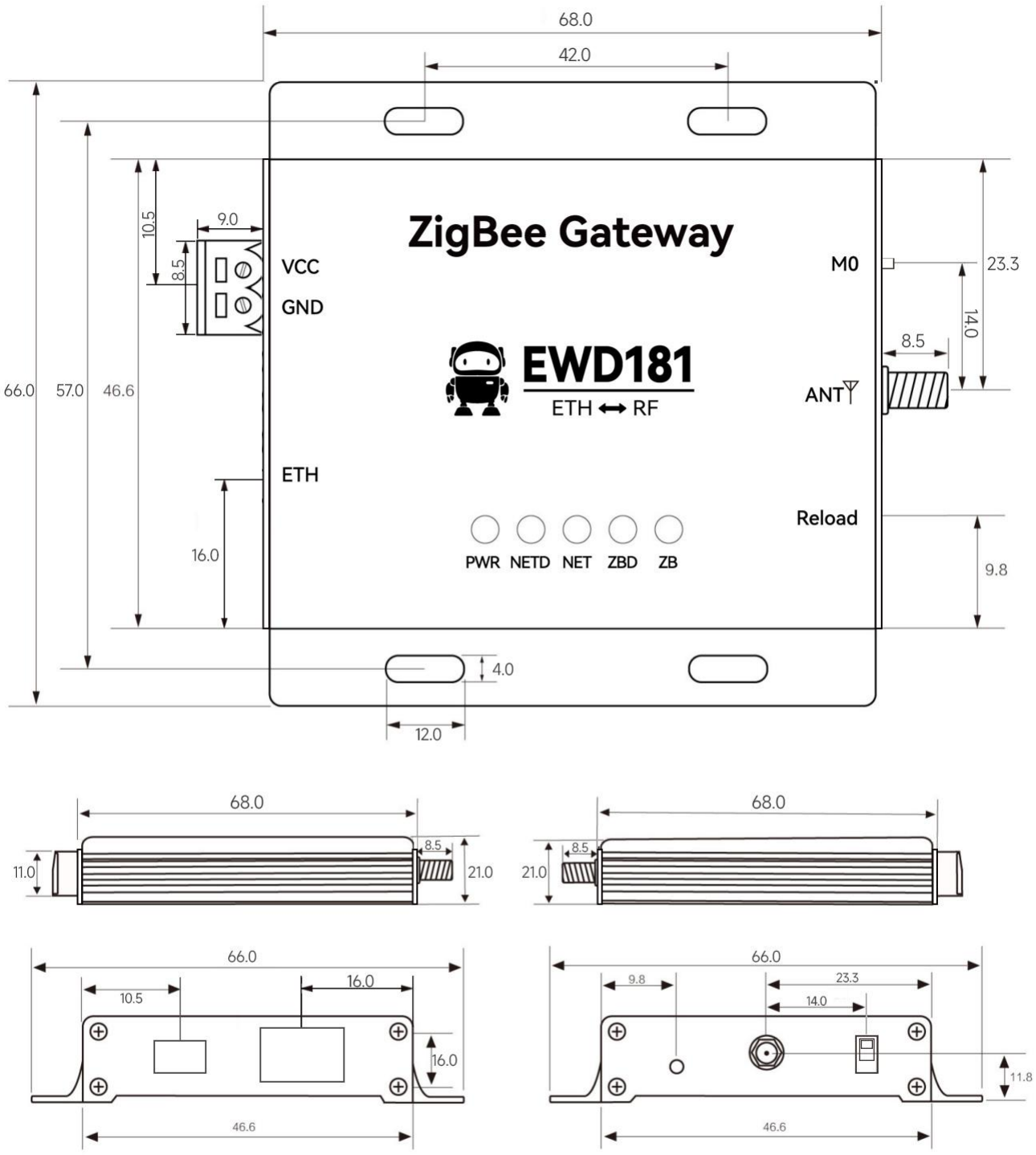
2.2 Electrical parameters

Electrical parameters	unit	Parameter Value	Remark
Operating voltage	V	+8 ~ +28V DC	It is recommended to use 12V or 24V power supply
Transmit power	dBm	20	Maximum transmit power
Blocking power	dBm	10.0	The probability of burning is lower when used at close range
Matching impedance	Ω	50	Equivalent impedance
Average current	mA	156	Instantaneous power @20dBm , 12V power supply
Operating temperature	℃	-40 ~ +85	Industrial Grade
Storage temperature	℃	-40 ~ + 125	-
humidity	RH	5% ~ 95% (no condensation)	-

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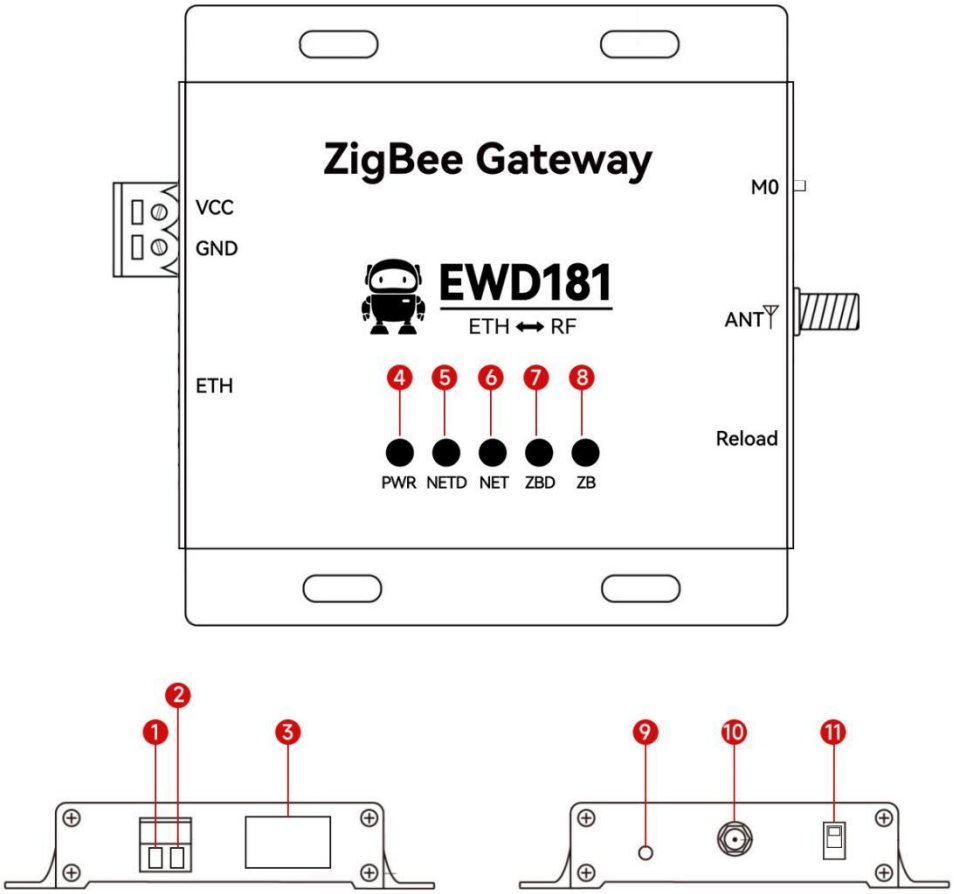
2.3 Mechanical Dimensions



Unit : mm
Tolerance value:X.X±0.2mm

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2.4 Interface and button definition



Serial number	name	Function	illustrate
1	VCC	Press-wire power interface, positive	DC 8~28V, 12V or 24V is recommended ①
2	GND	Crimping power interface, negative pole	The negative pole of the power supply is connected to the system ground and the shell
3	ETH	10/100M Ethernet interface	Standard RJ45 interface, cross-connection or direct-connection adaptive, connected to the device or PC
4	PWR	Power indicator	Red, always on when power is on
5	NETD	Ethernet data indicator	Flashing when data is interacting
6	NET	Ethernet status indicator	Always on when the link is connected
7	ZBD	ZigBee Data Indicator	Flashes when ZigBee data is being sent or received
8	ZB	ZigBee network status indicator	Flashes when ZigBee is connecting to the network, and stays on after the connection is completed②
9	Reload	Restore factory settings button	Press and hold for 5-10 seconds to exit the network if there is a network, and restore to factory settings if there is no network. Short press the device to join the network.
10	ANT(antenna interface)	SMA-K interface	External thread inner hole, length 8 mm, characteristic impedance 50Ω
11	M0	Mode switch	-

Note: ① When users use the VCC terminal and the GND terminal to supply power, they can use an 8~28V DC power supply, and it is recommended to use a 12V or 24V DC power supply.

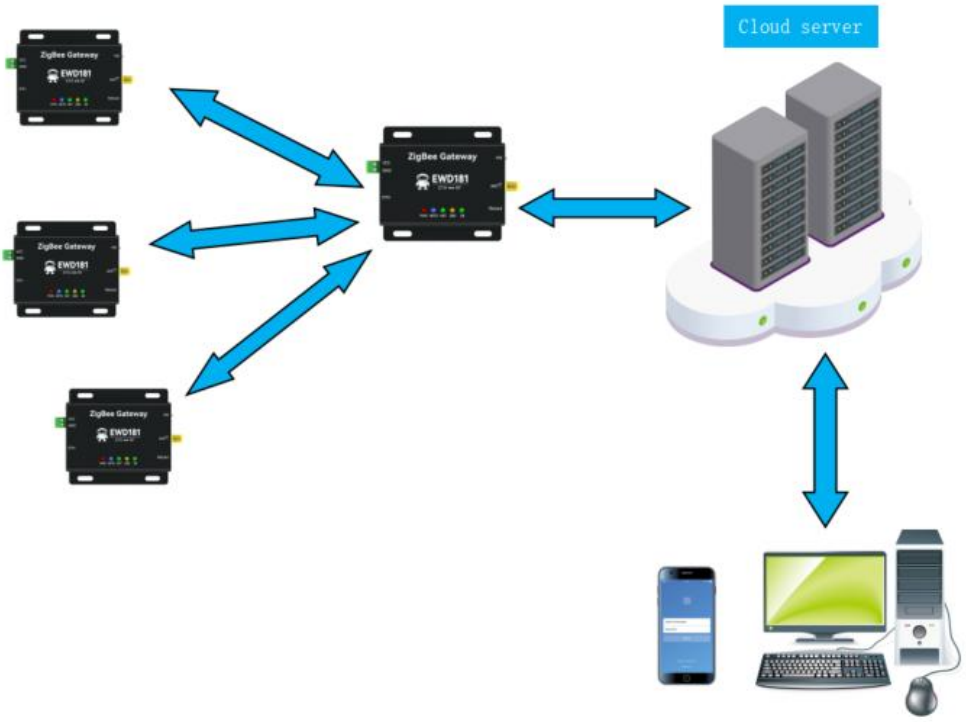
② After the connection fails, the indicator light is still off and you need to re-access the network. The coordinator will flash slowly when allowing access to the network.

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3 Product Function Introduction

3.1 Typical application model



3.2 ZigBee Basic Functions

3.2.1 Introduction to ZigBee Network

ZigBee technology is a short-range, low-complexity, low-power, low-rate, low-cost two-way wireless communication technology. There are two types of logical devices in a ZigBee network: Coordinator and Router. A ZigBee network consists of a Coordinator and multiple Routers, supporting star, tree, mesh or hybrid MESH network topologies.

3.2.1.1 Coordinator

It has the function of establishing and managing the network, controlling whether other nodes are allowed to join the network, storing network information, and has all the functions of a routing device. Its main tasks are to manage the network, record sub-node information, and forward messages. At the same time, the coordinator needs to authenticate the terminal authority requesting to join the network. If there is no need to add new nodes, the network will not collapse after the coordinator is powered off, and the router and terminal will work normally in the current network.

3.2.1.2 Router

The router allows other nodes to connect to the routing device to expand the coverage of the network. Its main task is to forward messages, play a relay routing role, and have all the functions of terminal devices. If there are multiple paths from one node to another, when one of the paths fails, the network will automatically adjust to other optimal paths for transmission to ensure data arrival. The router can establish its own network or join other people's networks. The router is always active, so it must be powered by the main power supply.

3.2.2 Data transmission method

EWD181-Z20 (ETH) has three data transmission modes: unicast, broadcast, and multicast.

ZigBee data packet length: 1~200 bytes, maximum 76 bytes in multicast and broadcast mode, maximum 200 bytes in unicast mode.

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3.2.2.1 Broadcast Mode

In broadcast mode, the sending device sends the data received by the serial port to every node in the network (except the sending end), and all devices in the network will receive the data.

3.2.2.2 Multicast Mode

In multicast mode, first set the group number for the devices in the network (grouping), and the sending device must specify the target group number to send (which group to send the data to). Then the sending device sends the data received by the serial port to the network, and the devices with the same group number in the network will receive the data.

3.2.2.3 Unicast Mode

In unicast mode, devices in the network communicate point-to-point through network addresses. The sending device sends the received data to the target address device, and after receiving the data, the target address device can return an ACK to the sending device to indicate that the data has been received.

3.2.3 Output method of received data

The received data output mode refers to the way the network outputs data after EWD181-Z20 (ETH) receives wireless data;

3.2.3.1 Transparent Output

If the output mode of the configured device is transparent output, the module will output the original data through the network port after receiving the wireless data;

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4 Quick Test

4.1 Preparation before use

In order for customers to quickly use this radio, this provides the configuration process for the communication test. The specific contents are as follows:

		
EWD181-Z20-ETH	**Network cable**	**computer**
		
DC 12V power adapter	**2.4GHz Antenna**	

4.2 Working Mode Introduction

Working Mode		illustrate
Transmission Mode	Direct Send Mode	No routing forwarding, how far it can be sent depends on the module power, and it cannot be sent to sleeping devices
	Transparent transmission	Input data is sent directly to the destination defined by the destination address and destination port.
	Transparent transmission with automatic retransmission	Same as transparent transmission, with automatic retransmission mechanism. After turning on "system printing", the delay can be seen from the returned information.

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	Semi-transparent transmission	The first 3 bytes of the input data are the target address (HEX format LSB little-endian format) and the target port, and the subsequent data is the message content to be transmitted.
	Host transfer mode	The first byte of the input is the custom number of the slave. The host automatically communicates in Zigbee unicast mode according to the custom number of the slave. It can be used in conjunction with the command "host mode".

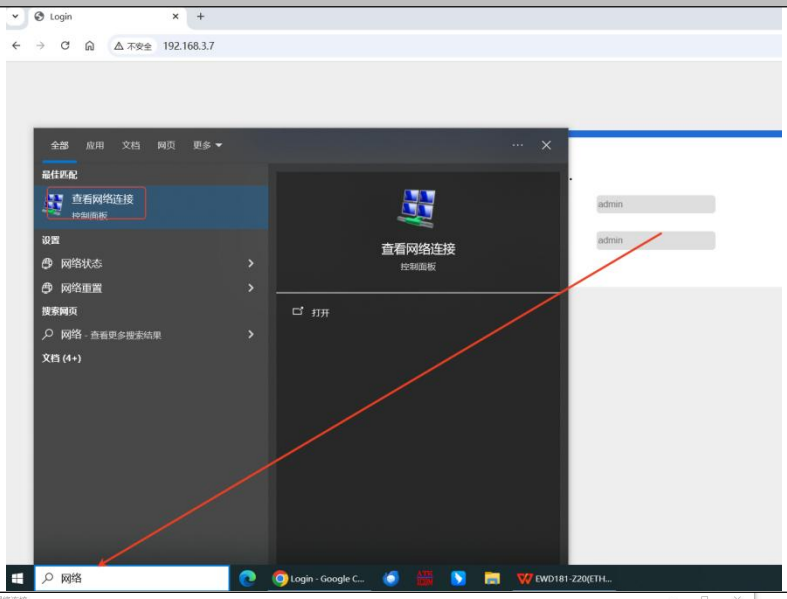
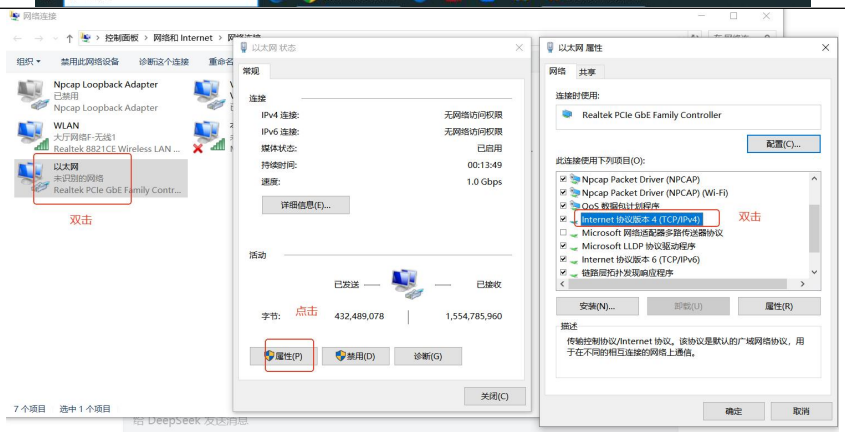
4.3 Introduction to communication methods

Serial number	Communication	describe
1	broadcast	After joining the network, users can broadcast to the entire network according to instructions (divided into three broadcast modes) 1. Broadcast mode 1 - the message is broadcast to all devices in the entire network; 2. Broadcast mode 2 - the message is broadcast only to devices that have turned on reception (except sleep mode); 3. Broadcast mode 3 - The message is broadcast to all full-function devices (routers and coordinators). The target short address is 0xFFFC (broadcast mode 3), 0xFFFD (broadcast mode 2), 0xFFFF (broadcast mode 1), and the target port is 0x01 or 0xFF
2	Multicast	When joining the network, users can multicast to all non-sleeping devices in the network. Non-sleeping devices that receive multicast need to join a group. A device can join multiple groups at the same time and can also exit a specified group freely. The target short address is the group ID, and the target port is 0x00
3	On Demand	When joining a network, users can communicate with devices in the network individually using short addresses according to instructions. The target short address is the other party's short address, and the target port is 0x01

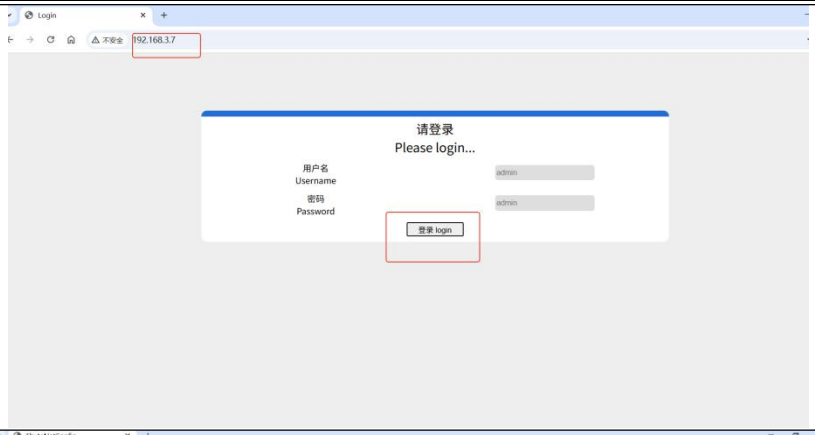
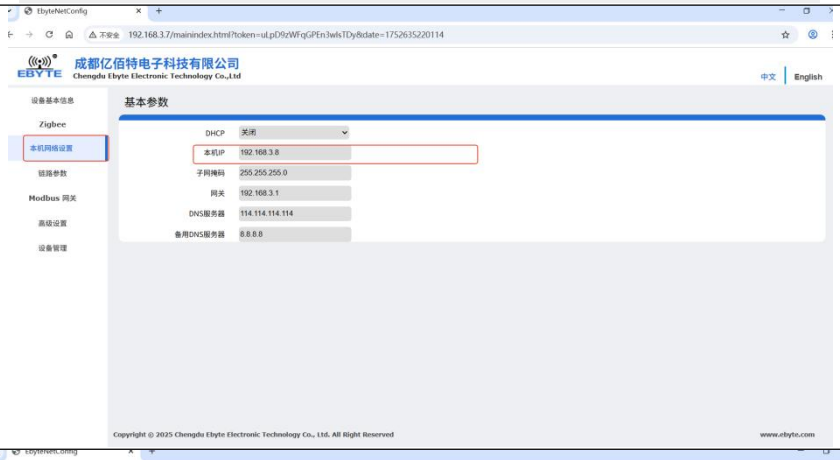
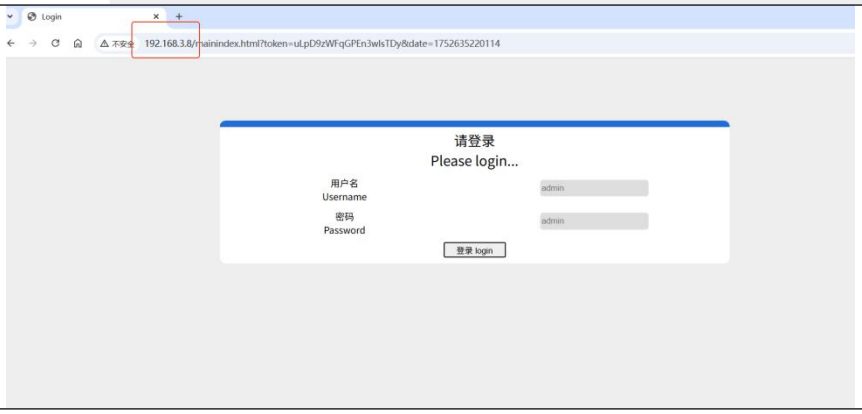
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4.4 Quick Test Operation Steps

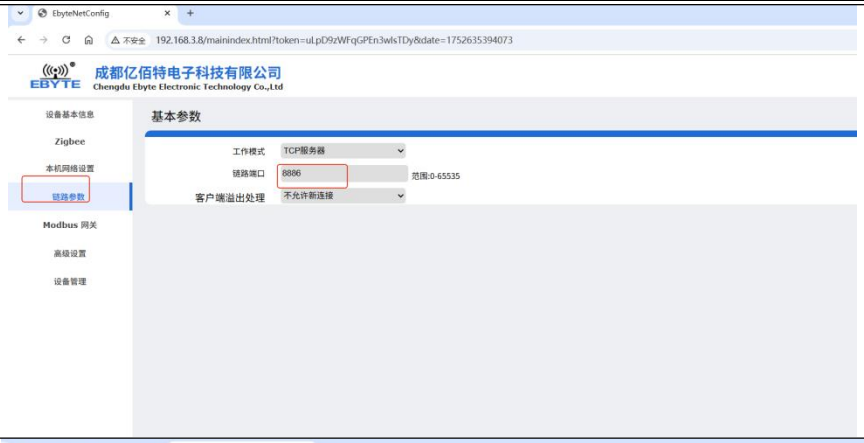
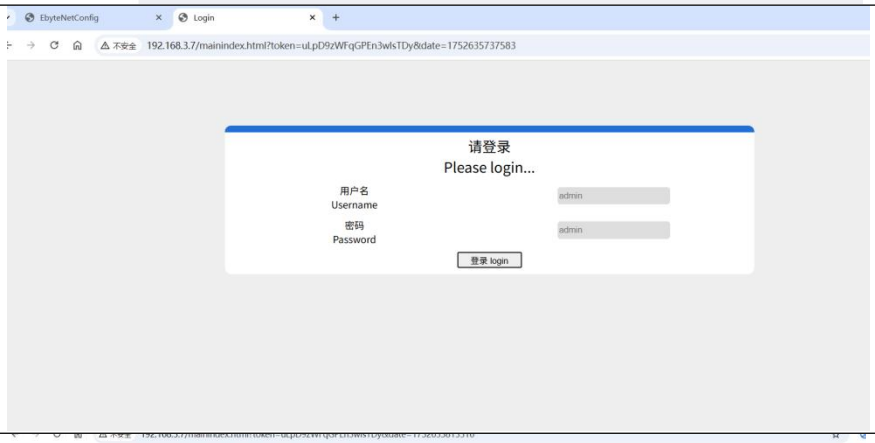
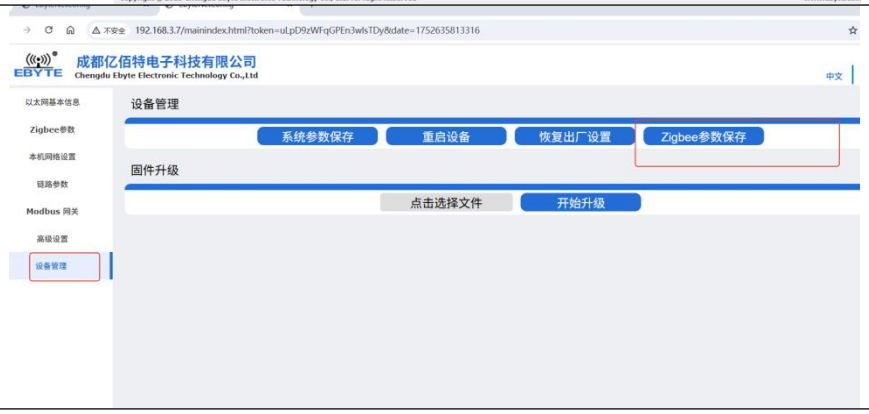
Serial number	Operation details	Example
1	Enter view network connections in the Windows search box and click this setting to enter the control panel.	
2	Double-click Ethernet to enter the IP configuration interface (the name may be different on different computers)	
3	Configure as follows. Note that the module's default IP is: 192.168.3.7	

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4	Open the browser, enter 192.168.3.7 to enter the login interface, and click the login button to enter the configuration interface	
5	Click on the local network configuration and modify the local IP (to avoid IP duplication when configuring the second radio station)	
6	Click Device Management, click System Parameters to save and restart the device	
7	Change the browser IP address to 192.168.3.8, and you can see that it has been modified.	

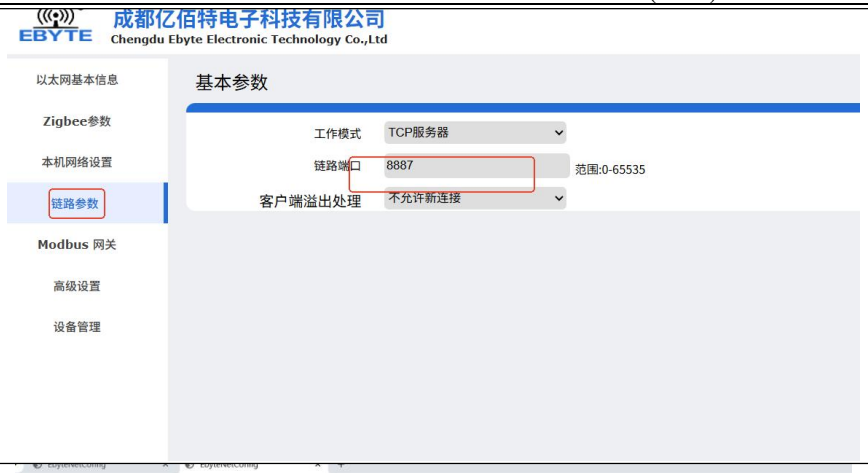
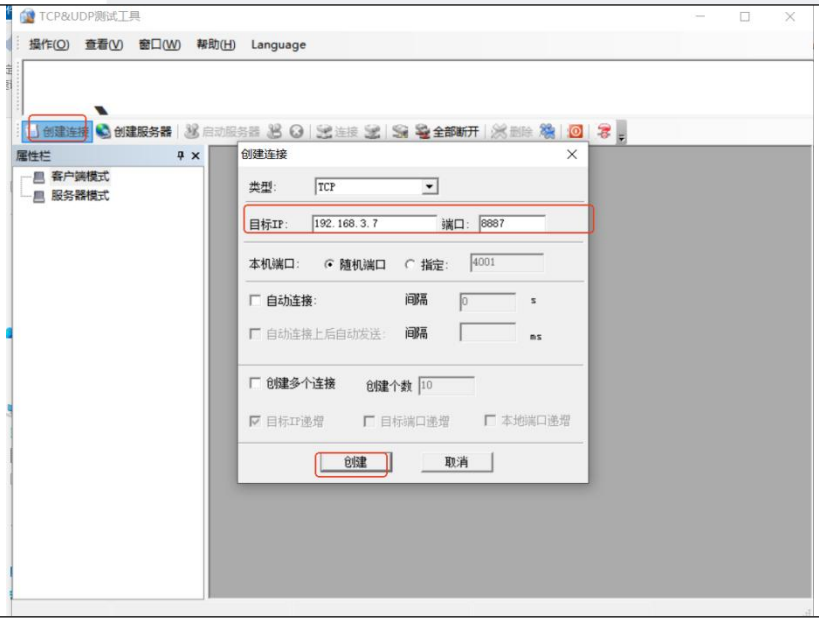
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8	Pay attention to the TCP parameters of the link parameters. The default values are used here without modification.	
9	To configure the radio as a router, open a new page in the browser, enter 192.168.3.7 as the address, press Enter, click Login, and enter the configuration interface	
10	In this interface, configure the device type as router (to modify the router, the network status needs to be not connected, otherwise you need to log off the network first and then modify the device type)	
11	Enter device management and click Zigbee parameter save	

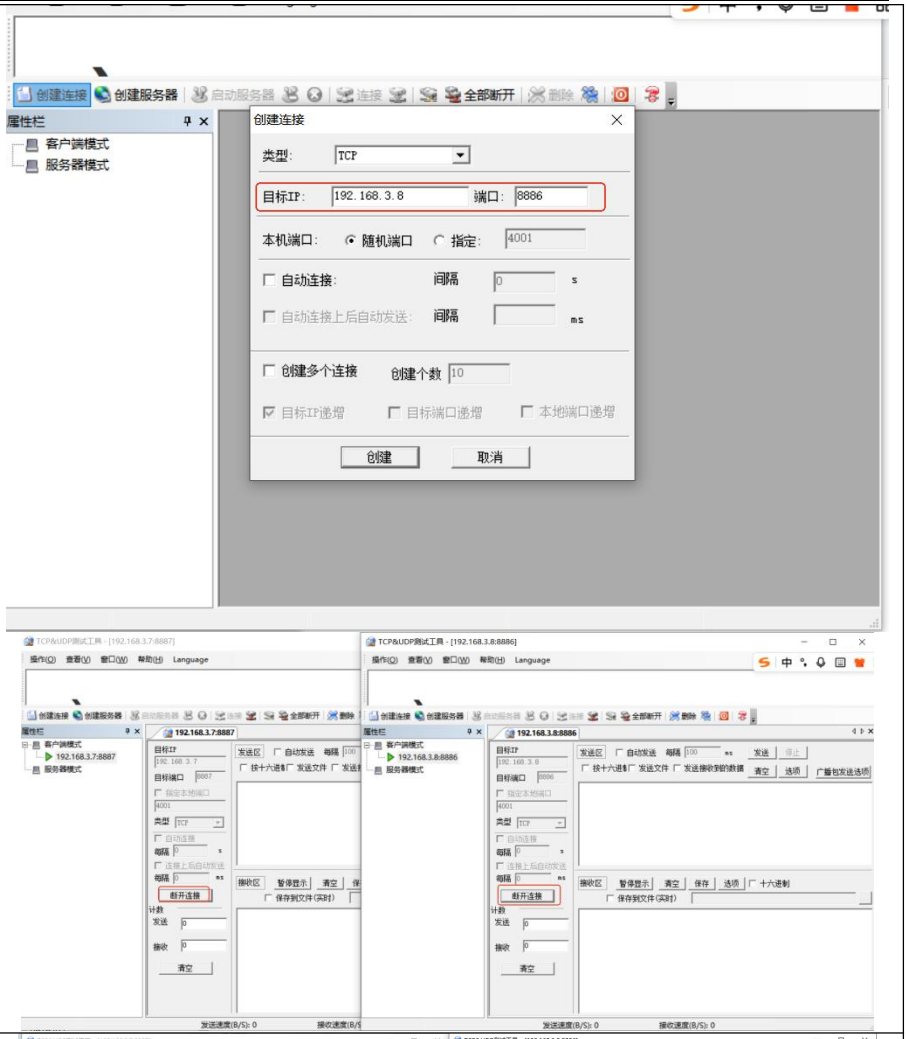
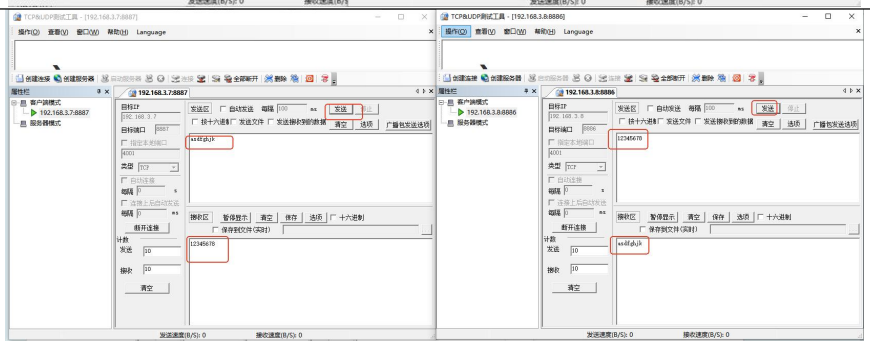
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12	After entering the link parameters, change the port number to 8887	
13	Enter device management, click Save System Parameters, and restart the device.	
14	Open the TCP debugging software tool and create a connection. The connection parameters here correspond to the link parameters in the above process (the tool is not unique, here we introduce TCP&UDPDebug tool)	

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15	After the connection is successful, you still need to network Zigbee. Short press the button on the side of the radio and wait for the indicator light to flash. When the indicator lights of the two modules are always on, the network connection is complete. Then send data directly on the TCP debugging tool for transparent transmission.	

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5 Product Networking Notes

5.1 ZigBee network roles and considerations

Serial number	describe
1	This module adopts ZigBee network networking, and the network consists of a coordinator and any other devices .
2	It has self-organization, self-routing, and network multi-hop functions. (The default supported network depth is 30, the total number of sub-nodes is 20, and the number of sub-routing nodes is 6)
3	The parent node devices (coordinator and router) can save data for dormant terminals for 7 seconds.
4	ShortAddress communication is used for network communication. Note: The short address is randomly assigned when the device joins the network. The device MacAddress long address is unique and fixed. If you don't know the short address, you can use the corresponding instructions to find the ShortAddress in the network based on the MacAddress , and then conduct point-to-point communication.
5	The coordinator is unique in the network and its short address is fixed to 0000.
6	If the on-demand address is FFFF, FFFD, or FFFC, it corresponds to three broadcast modes respectively.
7	When the network parameter PANID is FFFF, it is automatically assigned. If the device PANID is different, networking cannot be achieved.
8	The network key is randomly generated by the coordinator each time it is restored to factory settings. The router cannot set the key. The router uses the key of the coordinator it joins.
10	All devices in the network have the broadcast function turned on. Multiple devices broadcasting at the same time or a single device broadcasting at a high frequency may cause serious network congestion. Please try to avoid this situation.
11	The module does not need to join the group when multicasting. It can directly multicast to any group according to the communication method. A module can join multiple multicasts at the same time, and the local group number will not change due to different multicast numbers.
1 2	After entering sleep mode, the device can be awakened through the serial port or through the wake-up pin. Note: In sleep mode, the first frame of data after the serial port wakes up is invalid. It is recommended that the first frame of data be a single byte 00, and the subsequent data be sent within 5ms~100ms.
1 3	a ZigBee network , the transmission cycle of a single packet of data cannot be too fast (generally recommended to be more than 1 second) as this may cause data loss. (Pay special attention to the fact that if there are too many nodes in the network, a too fast broadcast cycle may cause network instability.)

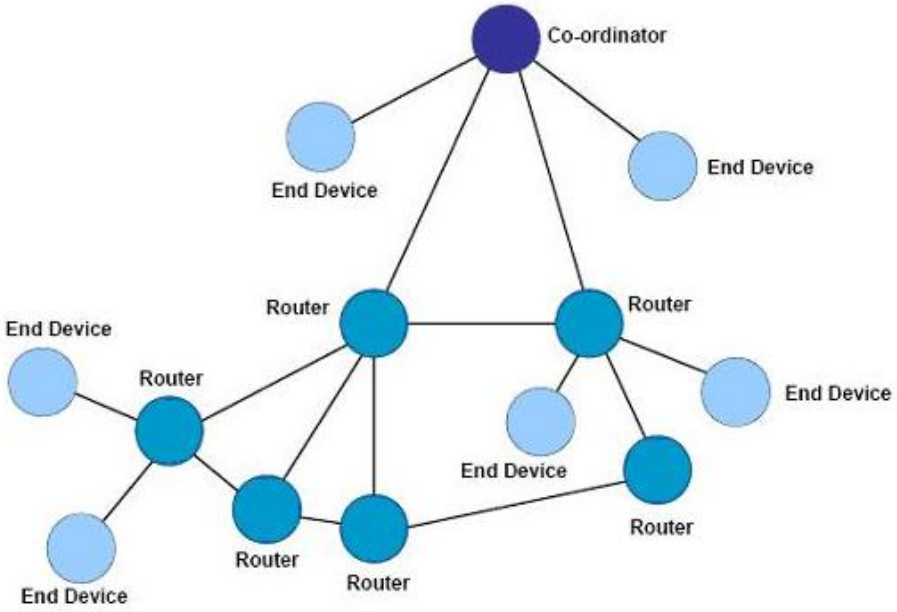
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5.2 Network Structure

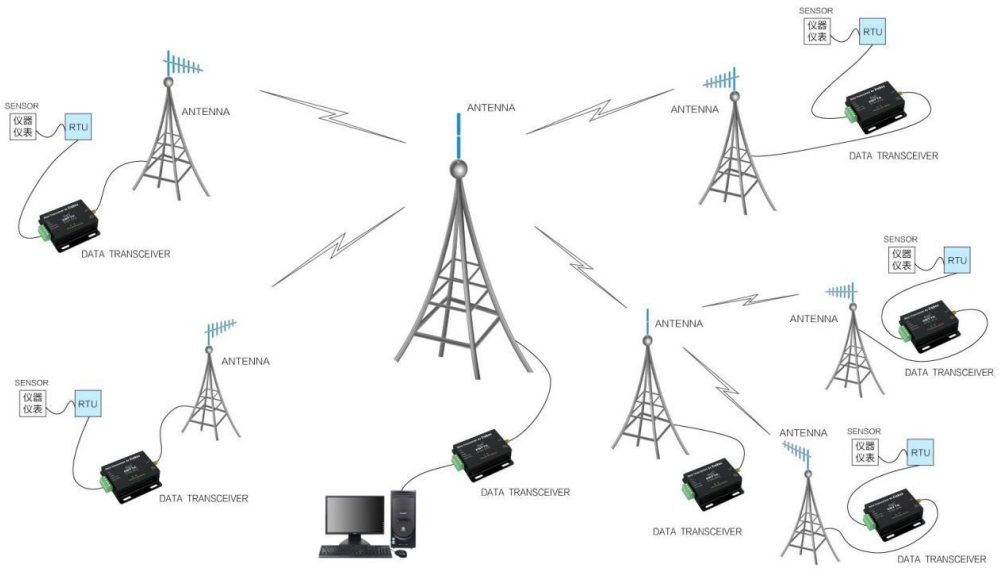
The network structure is a mesh network structure (MESH)
The network with MESH topology has powerful functions, and the network can communicate through "multi-hop"; This topology can also form an extremely complex network; the network also has self-organization and self-healing functions; The recommended ratio of routers to terminal nodes is no less than 1:10;

Network Mesh



6 Practical Application Fields

Ebyte digital radio is suitable for all kinds of point-to-point and point-to-multipoint wireless data transmission systems, such as smart home, Internet of Things transformation, power load monitoring, distribution network automation, hydrological and water conditions monitoring, water pipe network monitoring, urban street light monitoring, air defense alarm control, railway signal monitoring, railway water supply centralized control, oil and gas supply pipe network monitoring, GPS positioning system, remote meter reading, electronic crane scale, automatic target reporting, earthquake monitoring, fire prevention and theft prevention, environmental monitoring and other industrial automation systems, as shown in the following figure:



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7 Precautions for use

1. Please keep the warranty card of this device properly. The warranty card contains the factory number of the device (and important technical parameters), which is of great reference value for users' future maintenance and new equipment.
2. During the warranty period, if the radio is damaged due to the quality of the product itself and not caused by human damage or natural disasters such as lightning strikes, it will enjoy free warranty. Users are requested not to repair it by themselves. If there is any problem, please contact our company. Yibite provides first-class after-sales service.
3. Do not operate this radio in flammable places (such as coal mines) or near explosive and dangerous objects (such as detonators).
4. A suitable DC regulated power supply should be selected, which is required to have strong resistance to high-frequency interference, small ripple, and sufficient load capacity; it is best if it also has overcurrent, overvoltage protection and lightning protection functions to ensure the normal operation of the digital radio station.
5. Do not use the device in an environment that exceeds the environmental characteristics of the digital radio, such as high temperature, humidity, low temperature, strong electromagnetic field, or dusty environment.
6. Do not allow the digital radio to continuously operate at full load, otherwise the transmitter may burn out.
7. The ground wire of the digital radio should be well connected with the ground wire of the external device (such as PC, PLC, etc.) and the ground wire of the power supply, otherwise it is easy to burn out the communication interface, etc.; never plug or unplug the serial port when it is powered on.
8. When testing a digital radio station, a matching antenna or a 50Ω dummy load must be connected, otherwise the transmitter may be easily damaged. If an antenna is connected, the distance between the human body and the antenna should be more than 2 meters to avoid injury. Do not touch the antenna during transmission.
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% of 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 perspective of antenna quality and antenna installation method. You can also contact support@cdebyte.com for help.
11. When selecting a power supply, in addition to retaining a 50% current margin as recommended, you should also pay attention to the ripple not exceeding 100mV.

8 Version Revision Record

Version	Revision Date	Revision Notes	Maintainer
1.0	2025-7-18	Initial release	Hao

9 Contact us

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