E611-900NW20D User Manual

Star-network Plug-in 868/915MHz wireless module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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1 Overview

1.1 Introduction



The E611-900NW20D module is a long-range video and data transmission integrated solution developed by Chengdu Ebyte Electronics Technology Co., Ltd. Featuring a transmission rate of 16Mbps, it supports simultaneous transmission of four 1080p video streams while enabling transparent transmission over both Ethernet and serial ports. Operating within the 863MHz to 928MHz frequency band, it delivers a maximum RF transmit power of 20dBm.

The E611-900NW20D module uses universal AT commands, making operation simple and quick. The module can be widely used in home automation, home security, remote device monitoring, robot control, intelligent transportation, smart home appliances, wireless flight control, automobiles, industrial internet, intelligent data acquisition, intelligent control, smart cities, outdoor live streaming, and other fields.

1.2 Features and Functions

- Supports star-network, with a maximum of 31 child nodes;
- Supports point-to-point and point-to-multipoint modes;
- The maximum transmission rate can reach 16Mbps;
- The module supports dual transparent transmission via both Ethernet and serial ports;
- Supports integrated image transmission and data transmission;
- Switching between master and slave modes is simple, allowing for one-click pairing and easy operation;
- Ideally, the maximum transmission distance can reach 1km;
- Supports relay networking functionality;
- Equipped with AT commands for easy module Parameter setting;
- The operating frequency band is 863MHz～928MHz, and the default frequency band is 915MHz;

1.3 Application scenarios

- Smart home and industrial sensors, etc
- Home security;
- Smart home appliances;
- Wireless flight control;
- Wireless sensing;
- Intelligent control;
- Robot control;
- Remote device monitoring;
- Remote image transmission for cameras;
- Drone Image Transmission;

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- Industrial Control;
- Smart Agriculture;
- Smart City;
- Outdoor live streaming;

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2 Specifications

2.1 Basic Parameters

Main Parameters		Performance Description			Remark
		Min. value	Typical value	Max. value	
Operating voltage (V)		5	5/12	15	Power supply options include 5V or 12V.
Communication level (V)		-	3.3	-	Using a 5V level carries the risk of burning out.
Operating temperature (°C)		- 40	-	85	Industrial-grade design
Operating frequency band (MHz)		863	-	928	The default frequency band is 915MHz.
Transmit power (dBm)		19.5	20	20.5	-
Power consumption	TX current (mA)	-	500	-	Peak transient current @ 20 dBm
	RX current (mA)	-	84	-	5V power supply
Receiver sensitivity (dBm)		-	-107	-	1M MCS10
Communication distance (m)		-	500	1000	In a clear, open environment, at a height of 1 meter, at 20dBm, the transmission rate is 16Mbps.

2.2 Hardware Parameters

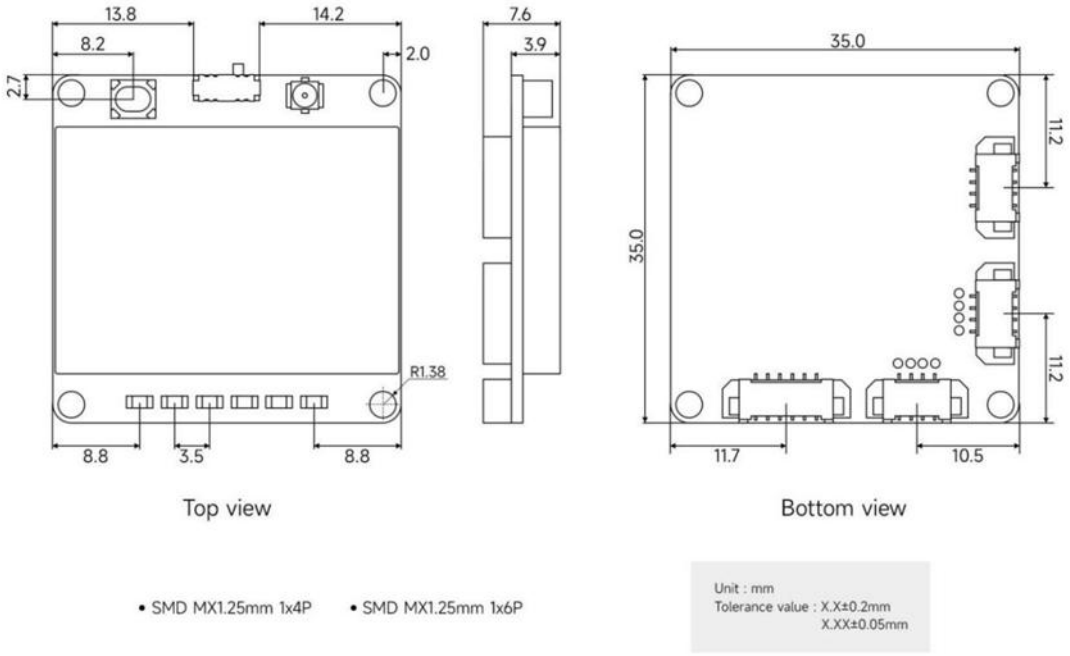
Main Parameters	Description	Remark
Crystal oscillator frequency	32MHz	-
Communication interface	UART/PHY	Serial port parameters (non-modifiable): baud rate 115200, frame format 8N1
Packaging method	Plug-in type	-
FLASH	8MB	-
SRAM	704KB	-
External dimensions (IPEX)	35*35mm	Tolerance range ±0.2mm
Antenna Interface	IPEX	Equivalent impedance approximately 50Ω
Product net weight	6.8g	Tolerance range ±0.2g

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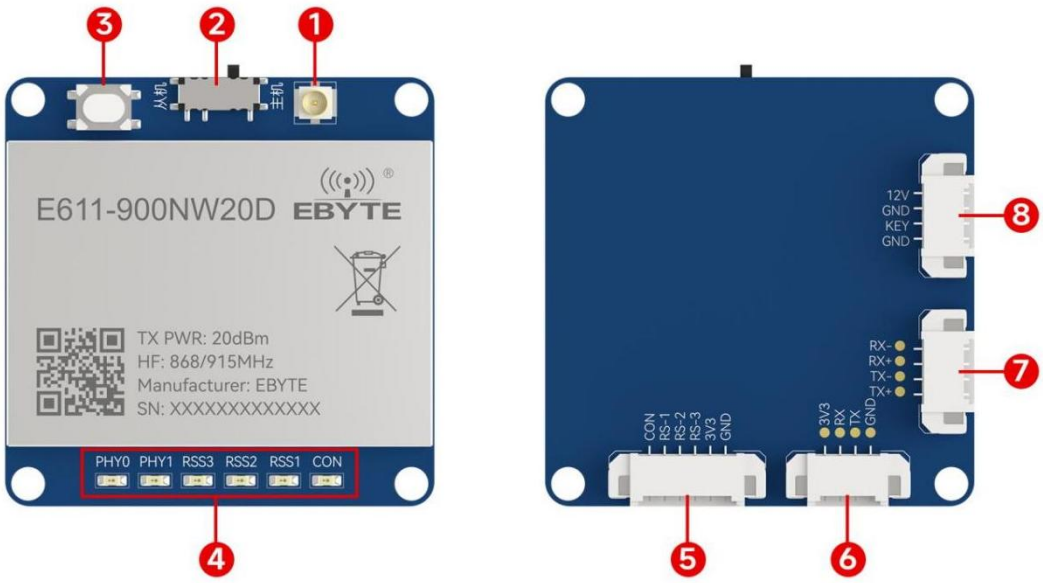
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3 Mechanical dimensions and pin definitions

3.1 E611-900NW20D Mechanical Dimensions



3.2 E611-900NW20D Pin Definitions



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Serial Number	Name	Pin functions and electrical Parameters	Remark
1	Antenna Interface	IPEX-1 Generation	-
2	Mode switch button	Master/Slave mode switch button	-
3	Pairing button	Master-slave pairing button	Set the master DIP switch to master and the slave DIP switch to slave. Press the pairing buttons on both the master and slave devices simultaneously until the RSS1~3 and CON lights are constantly lit, indicating successful pairing.
4	PHY0	Network port indicator light	The Activity light is flashing: This indicates that data packets are being transmitted and the connection is active.
	PHY1	Network port indicator light	A solid Link light indicates that the network port has been successfully connected to the network and the device is working properly.
	RSS3	RSSI signal strength indication I/O	Active low
	RSS2	RSSI signal strength indication I/O	Active low
	RSS1	RSSI signal strength indication I/O	Active low
	CON	Pairing indicator light will illuminate when pairing is successful.	-
5	CON	Pairing indicator light, external indicator light can be connected.	-
	RS-1	RSSI signal strength indication I/O	Active low, can be connected to an external indicator light.
	RS-2	RSSI signal strength indication I/O	Active low, can be connected to an external indicator light.
	RS-3	RSSI signal strength indication I/O	Active low, can be connected to an external indicator light.
	3V3	The internal voltage of the connection module is 3.3V, which is not a concern for the user.	External indicator light power output positive
	GND	power ground	External indicator light power output GND
6	3V3	The internal voltage of the connection module is 3.3V, which is not a concern for the user.	Serial interface Fixed baud rate 115200 Power pin not in use
	RX	RXD receiver pin, TTL level	
	TX	TXD is the transmit pin, TTL level.	
	GND	power ground	
7	RX-	Receive Data -	Ethernet interface
	RX+	Receive Data +	

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	TX-	Transceiver Data - (Send Data)	
	TX+	Transceiver Data + (Send Data+)	
8	12V	The module is externally powered and supports 5-12V.	Module power input positive
	GND	power ground	Module power input ground
	KEY	Configured buttons, can be connected externally	Pairing function button interface, if no lead is required Alternatively, the pairing button on the module board can be used.
	GND	power ground	

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4 Module Parameter Description

4.1 Character Description

The module supports the following four working modes:

Serial Number	Work mode	Mode Details
1	Host mode (AP)	The central role of star networking
2	Slave mode (STA)	Servant role
3	Multicast mode (Group)	Multicast, see multicast commands for details.
4	Relay mode (Apsta)	In relay mode, the device acts as both a slave connecting to the host and a host providing connection services to other slaves.

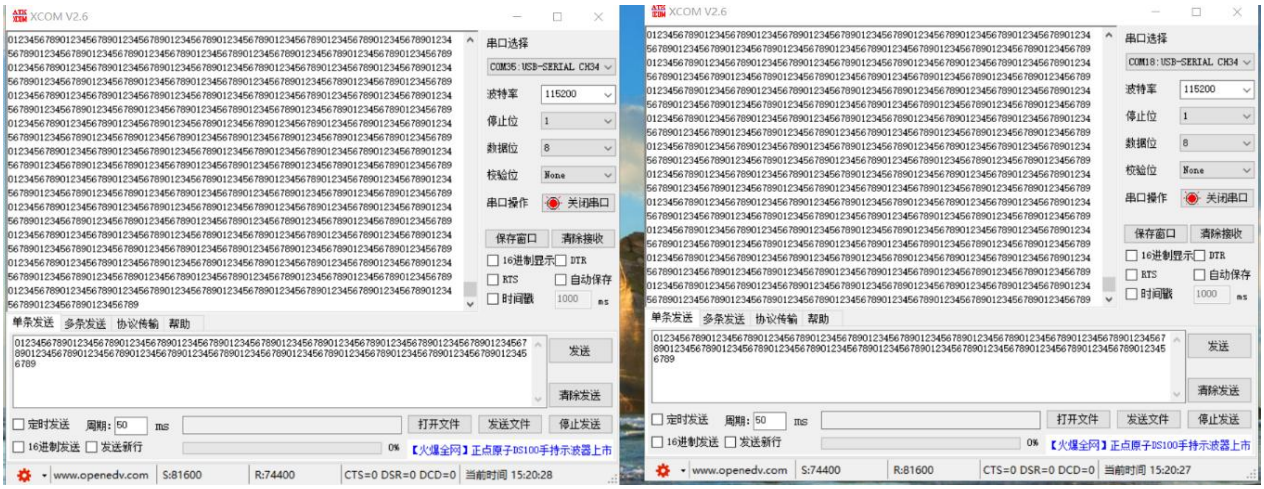
Note: The master mode (AP) and slave mode (STA) can be controlled via pin PA8. Please see the pin definition description for details.

5 Usage Examples

The following test demonstration uses our company's base board.

5.1 Module 1-to-1 connection serial port pass-through

1. Prepare two E611 modules and install the antenna.
2. Connect to PC via Type-C.
3. Press and hold the CON button on both modules simultaneously, wait 2 seconds and then release. You will see the connection light and RSSI signal indicator light stay on.
4. Open XCOM Serial Port Assistant and open the corresponding serial port (note the serial port Parameters 115200, 8N1).
5. Data can be sent directly via the serial port . See the image below:



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5.2 Module 1-to-1 connection as a bridge to connect two PCs

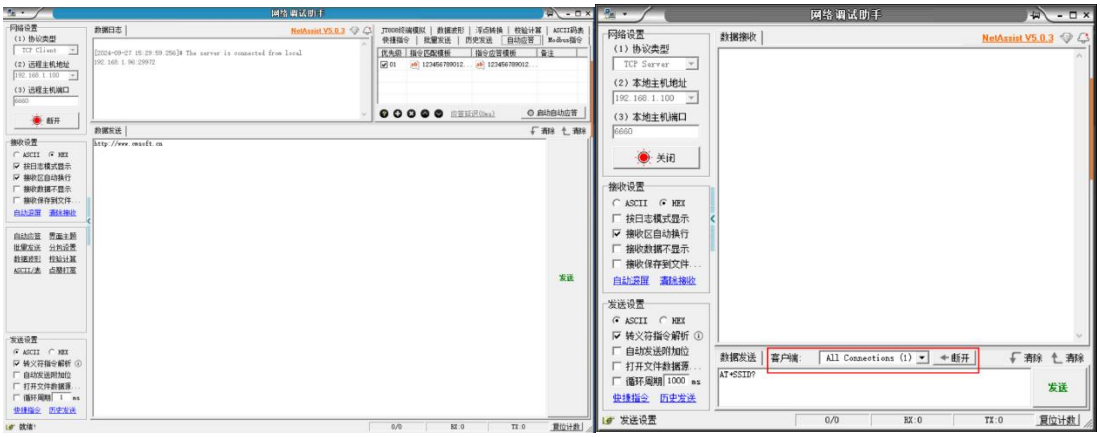
1. Prepare two E611 modules and install the antenna.
2. Ethernet connection to PC
3. After correctly connecting the module and powering it on, you will see the PHY0 indicator light stay on, and an unknown network will appear in the computer's network interface.



4. Manually modify the corresponding static IPs on both PCs. Note that the IPs of both devices must be on the same network segment, and firewalls and other software should be turned off to avoid communication failure.
5. Using a network debugging tool, start the TCP server on a PC, as shown in the image below. Note that the IP address should correspond to the modified Ethernet IP address.



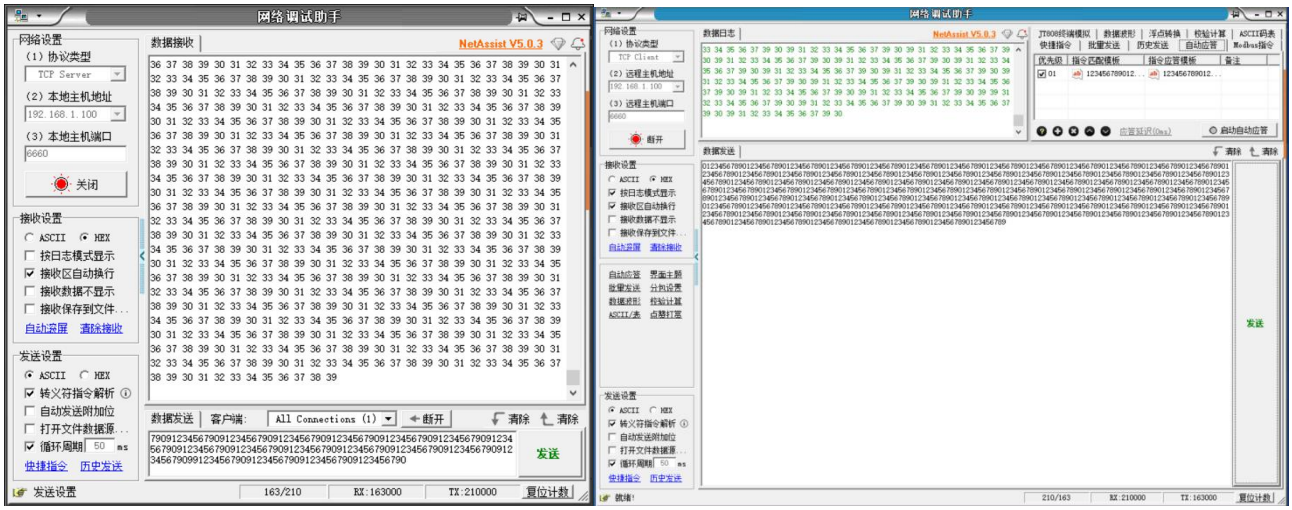
6. Connect another device to the corresponding IP port, and you will see that the connection is successful.



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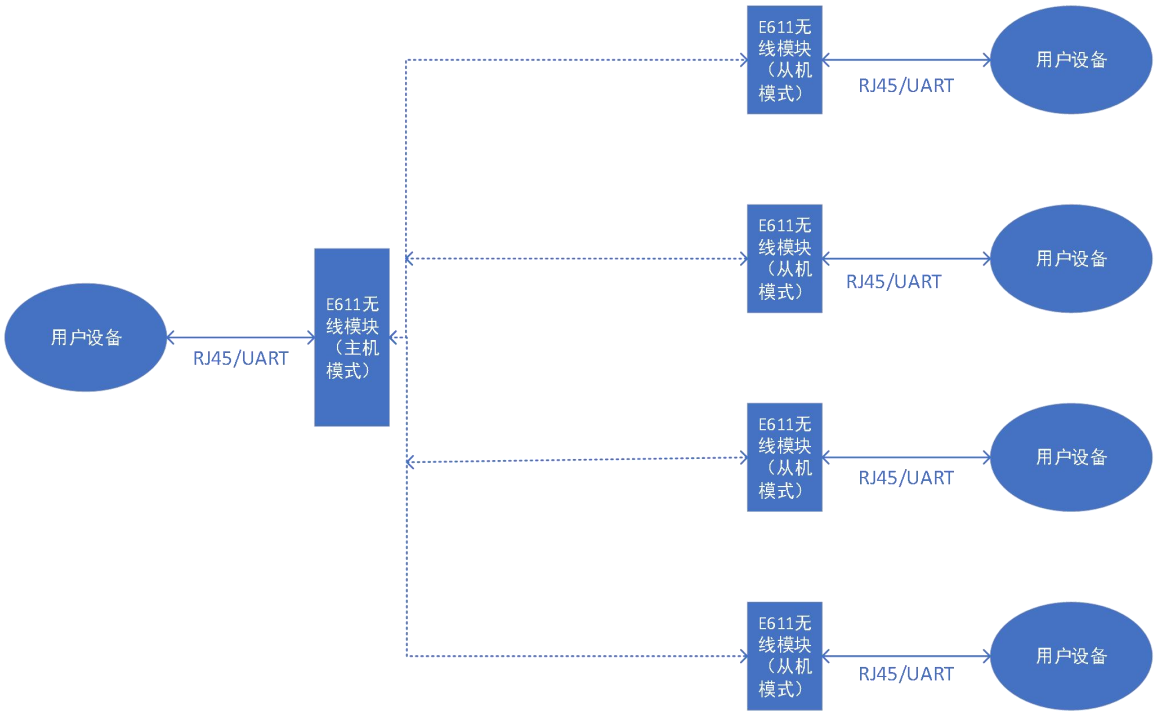
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7. Data testing: 1000 bytes per packet with a 50ms packet interval, as shown in the following figure (data from both server and client).



5.3 Module 1 for Multi-Star Networking

The network topology diagram is as follows:

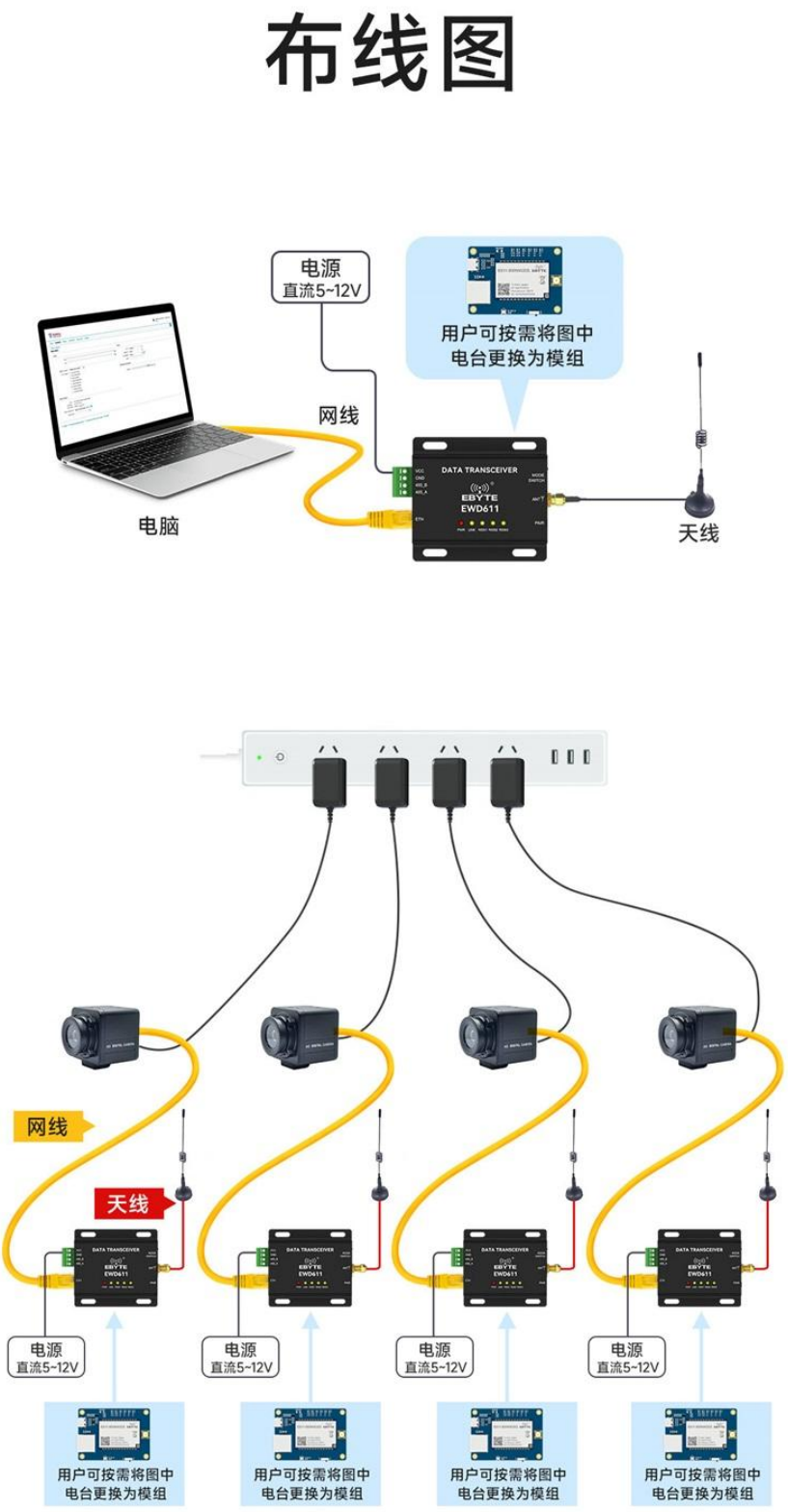


The actual network topology of this product is a star network, consisting of one master device and several slave nodes. A single master node can support up to eight slave devices. Please refer to the official website video for a detailed network demonstration example.

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5.3.1 Refer to the wiring diagram



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5.4 Examples of AT Command Usage

5.4.1 Basic Commands for Establishing Module Connections

Use the at command to initialize the E611 module, which mainly includes frequency setting, bandwidth setting, SSID and password setting.

Host module configuration:

1) AT+CHAN_LIST=9080,9160,9240 to Set 3 frequency points.

2) AT+BSS_BW=8 Set 8M bandwidth.

3) AT+SSID=hgic_ah_test Set SSID

4) AT+KEYMGMT=WPA-PSK Enable encryption

5) AT+PSK=baa58569a9edd7c3a55e446bc658ef76a7173d023d256786832474d737756a82 Set encryption password

6) AT+MODE=ap Set module to access point modeSlave module configuration:

Except for AT+MODE=sta, the other configurations are the same as the host.

5.4.2 Commands for Configuring Relay Networks

Host module:

1) Configure the SSID of the AP. Each AP should be configured differently. You can consider incrementing SSID1, SSID2, etc., for example:

at+ssid=ssid1

2) Configure unencrypted (to simplify the configuration, we will use unencrypted as an example for now)

at+keymgmt=none

Relay module:

1) at+mode=apsta

2) Configure unencrypted: at+keymgmt=none

3) Configure the relay's r_SSID , which is used to connect the relay to the host. It should be the same as the host you want to connect to. The SSIDs are consistent, for example: at+r_ssid=ssid1

4) Configure the repeater's SSID to allow the repeater to connect to the slave device. For easier management, consider connecting it to the master device first.

The SSIDs are the same, but with a suffix added, such as ssid1_r1 , ssid1_r2 , ssid2_r1 , etc. For example : at+ssid=ssid1_r1

Slave module:

1) Configure the STA's SSID to allow the slave device and the trunk to connect. The SSID should be consistent with the connected trunk's SSID, for example: at+ssid=ssid1_r1

2) Configure unencrypted: at+keymgmt=none

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6 AT Commands

6.1 Instruction Description

Instruction type	Instruction format	Description
Query command	AT+[X]?	This command is used to query the Parameters of the setting command.
Setting Instructions	AT+[X]=<…>	This command is used to set user-defined Parameters.
Execute Instructions	AT+[X]	Instructions used without Parameters, such as module reset.

6.2 Configure the module using the network port.

6.2.1 Connect the module to the PC using a network cable.



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6.2.2 Manually change the IP address of the corresponding network to a static IP address.



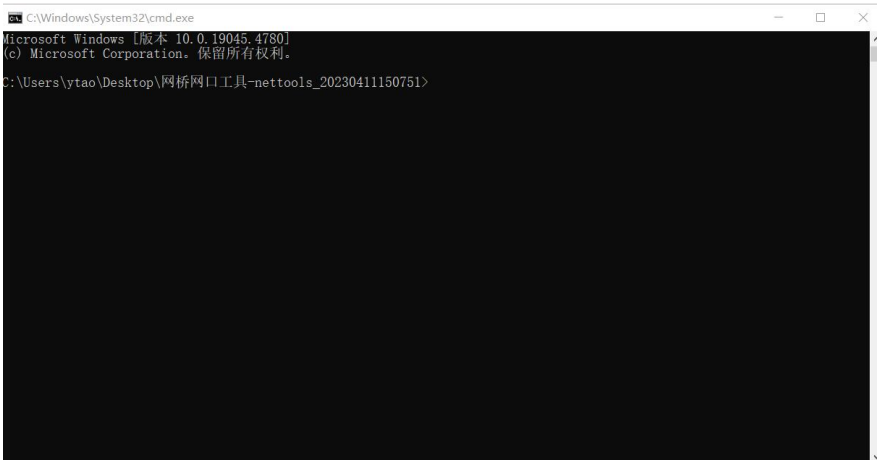
6.2.3 Open the network port tools folder and enter cmd in the search bar.



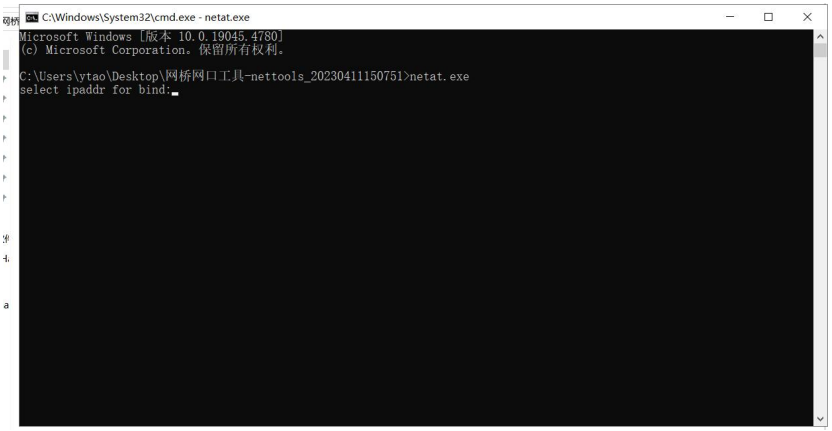
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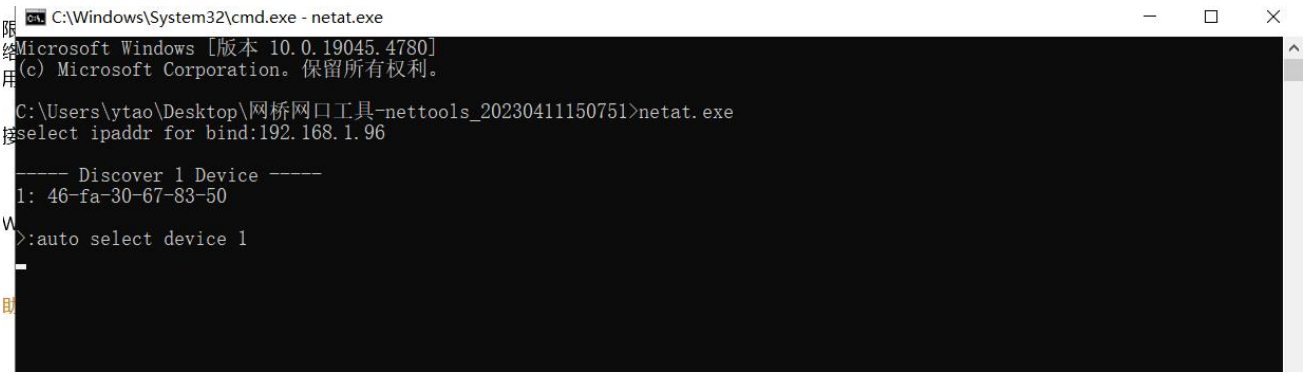
6.2.4 Press Enter to enter the command line interface



6.2.5 Type netat.exe and press Enter.



6.2.6 Enter the IP address you just modified, and you can then send the corresponding configuration commands normally.



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6.3 Instruction Table

6.3.1 Working Mode

Instruction	**AT+MODE?**	**Response**	**+MODE:<mode> OK**
Description	Read module working mode		
Parameter	<mode>: ap/sta/group/apsta (4 modes)		
Instruction	**AT+MODE=<mode>**	**Response**	**Success: OK Failure: ERROR**
Description	Configurate module working mode		
Parameter	<MODE>: ap/sta/group/apsta (4 modes)		
Example	AT+MODE=APSTA sets the module to work in APSTA mode.		
Explain	AT+MODE=<mode>The command only saves power-off settings for AT+MODE=APSTA.		

6.3.2 Setting SSID

Instruction	**AT+SSID?**	**Response**	**+SSID:<ssid> OK**
Description	Read the SSID in the host mode of the module		
Parameter	<ssid>: The SSID name under the host.		
Instruction	**AT+SSID=<ssid>**	**Response**	**Success: OK Failure: ERROR**
Description	Set the SSID name in module host mode.		
Parameter	<ssid>: Character type with a length of less than 32 characters		
Example	AT+SSID=ebyte_test		

6.3.3 Setting the Encryption Method

Instruction	**AT+KEYMGMT?**	**Response**	**+KEYMGMT:<enc> OK**
Description	Encryption method for reading modules		
Parameter	<enc>: WPA-PSK Encryption Enabled / NONE Encryption Disabled		
Instruction	**AT+KEYMGMT=<enc>**	**Response**	**Success: OK Failure: ERROR**
Description	Configure module encryption method		
Parameter	<MODE>: WPA-PSK Encryption Enabled / NONE Encryption Disabled		
Example	AT+KEYMGMT=WPA-PSK		

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6.3.4 Set an encryption password

Instruction	AT+PSK?	Response	+PSK:<psk> OK
Description	Read module encrypted password		
Parameter	<psk>: 64 hex characters		
Instruction	AT+PSK=<psk>	Response	Success: OK Failure: ERROR
Description	Set module encryption password		
Parameter	<MODE>: 64 hex characters		
Example	AT+PSK =baa58569a9edd7c3a55e446bc6 58ef76a7173d023d256786832474d7377 56a82		

6.3.5 Pairing Control

Instruction	AT+PAIR=<pair>	Response	OK
Description	1. AP has configured SSID and password, but STA has not: During pairing, the STA will obtain the AP's SSID and password. 2. Neither AP nor STA has configured SSID and password: During pairing, the AP will generate a random password for each STA. After successful pairing, a PAIR SUCCESS message will be generated, but pairing will not automatically exit. Execute AT+PAIR=0 to stop pairing. After pairing stops, a connection will be established automatically. Generate a random password. Upon successful pairing, a PAIR SUCCESS message is generated, but pairing does not automatically exit. Execute AT+PAIR=0 to terminate pairing. Connection is automatically established after pairing stops. If both AP and STA have SSID and other Parameters configured, PAIR is unnecessary; connection occurs automatically based on SSID and other Parameters.		
Parameter	<psk>:0/1		
Example	AT+PAIR=1 // Initiate pairing AT+PAIR=0 // Stop pairing		

6.3.6 Setting BSS Bandwidth

Instruction	AT+BSS_BW?	Response	+BSS_BW:<bw> OK
Description	Read module BSS bandwidth		
Parameter	<bw>: 1:1MHz 2:2MHz 4:4MHz		

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	8:8MHz		
Instruction	**AT+BSS_BW=<bw>**	**Response**	**Success: OK** **Failure: ERROR**
Description	Set module BSS bandwidth		
Parameter	<bw>: 1:1MHz 2:2MHz 4:4MHz 8:8MHz		
Example	AT+BSS_BW=4 sets the bandwidth to 4MHz.		

6.3.7 Setting the operating frequency range

Instruction	**AT+ FREQ_RANGE ?**	**Response**	**+ FREQ_RANGE:<start>-<end>** **OK**
Description	Read the operating frequency range		
Parameter	<start>: Starting frequency <end>: Cut-off frequency		
Instruction	**AT+FREQ_RANGE=<start>,<end>**	**Response**	**Success: OK** **Failure: ERROR**
Description	Set operating frequency range		
Parameter	1. This command is used to set the range of frequencies to be used continuously, specifying the start and end center frequencies. The AH module will automatically calculate the frequency list. 2. start and end are the center frequency multiplied by 10.		
Example	AT + FREQ _ RANGE = 9080,9240 set up start freq=908MHz end freq=924MHz The generated channel list is 908M. 916M, 924M Note that if AT+CHAN_LIST is also set, The Parameters take precedence over the CHAN_LIST settings.		

6.3.8 Setting the Operating Frequency List

Instruction	**AT+CHAN_LIST?**	**Response**	**+AT+CHAN_LIST:<freq1>,<freq2>, … <freq16>** **OK**
Description	Read the operating frequency		
Parameter	1. The specified frequency value is the center frequency multiplied by 10. 2. Supports up to 16 frequency points, separated by commas.		

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Instruction	AT+CHAN_LIST=<freq1>,<freq2>, … ,<freq16>	Response	Success: OK Failure: ERROR
Description	Set operating frequency		
Parameter	1. This command is used to set a list of non-contiguous frequency points. 2. The specified frequency value is the center frequency * 10 . 3. It supports up to 16 frequency points, separated by commas.		
Example	AT + CHAN_LIST = 9080,9240 sets two frequency points: 908MHz and 924MHz.		

6.3.9 Check the device signal quality

Instruction	AT+RSSI?	Response	+RSSI:<rssi> OK
Description	Query device RSSI value		
Parameter	AT+RSSI=index/mac_addr index: Specifies the device index to query, starting from 1. mac_addr: Specifies the MAC address of the device being queried.		
Example	AT+RSSI // If no Parameter is specified, query the RSSI of the first device. AT+RSSI=1 // Specifies the RSSI of the first device to be queried AT+RSSI=f4:de:09:68:6c:20 // Specifies how to query RSSI based on MAC address		

6.3.10 Check connection status

Instruction	AT+CONN_STATE	Response	+CONNECTED // Connected +DISCONNECT // Not connected
Description	Check connection status		
Parameter			
Example	AT+CONN_STATE		

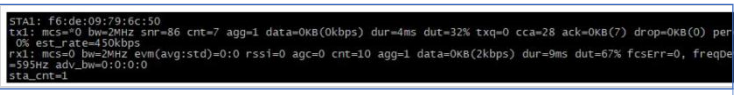
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6.3.11 Viewing Device Parameter Information

Instruction	AT+WNBCFG	Response	
Description	View device Parameter information		
Parameter			
Example	AT+WNBCFG		

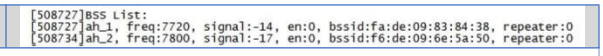
6.3.12 View STA information

Instruction	AT+STA_INFO =<id>	Response	
Description	View the STA information for the corresponding ID.		
Parameter			
Example	View the LMAC statistics for the corresponding STA ID, including RSSI, EVM, and other information; AP can use this command, STA cannot; ID is the sequence number of STA, starting from 1; When using this command, you can first turn off the default LMAC printing: AT+SYSDBG=LMAC		

6.3.13 Scan surrounding AP information

Instruction	AT+SCAN_AP=2	Response	OK
Description	Scan surrounding AP information		
Parameter			
Example	This command is executed in STA mode,to scan for surrounding AP information. After scanning, use the BSSLIST command below to query the results.		

6.3.14 Retrieve the scanned AP list

Instruction	AT+BSSLIST=2	Response	
Description	Obtain surrounding AP information		
Parameter			
Example	After executing the `scan_ap` command, you can use this command to obtain a list of scanned access points (AP must have an SSID set to be scanned).		

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6.3.15 Set the maximum transmit power

Instruction	**AT+TXPOWER?**	**Response**	**+TXPOWER:<pwr>dbm** **OK**
Description	Query maximum transmit power		
Parameter	<pwr>: Maximum transmit power		
Instruction	**AT+TXPOWER=<pwr>**	**Response**	**Success: OK** **Failure: ERROR**
Description	Set maximum transmit power		
Parameter	<pwr>: Maximum transmit power, range 6~20		
Example	AT+TXPOWER=20		

6.3.16 Setting the ACK TIMEOUT

Instruction	**AT+ACKTMO?**	**Response**	**+ACKTMO:<time>** **OK**
Description	Query the ACK timeout time in the WiFi protocol		
Parameter	<time>: Timeout period		
Instruction	**AT+ACKTMO=<time>**	Response	**Success: OK** **Failure: ERROR**
Description	Set the timeout for the ACK timeout in the WiFi protocol.		
Parameter	<time>: Timeout period Configure and increase the acktimeout value of the WiFi protocol Parameter for the AH module , in microseconds; the default value is 0 . This Parameter only needs to be set for communications exceeding 1km . The calculation formula is 10 * (distance in kilometers - 1), for example, set acktmo=10 for 2km . Modified values are saved even after power failure;		
Example	AT+ACKTMO=100 increases the ACK packet timeout by 100us.		

6.3.17 Setting up TX MCS

Instruction	**AT+TX_MCS?**	**Response**	**+TX_MCS:<mcs>** **OK**
Description	Query module MCS value		
Parameter	<mcs>: mcs index value		
Instruction	**AT+TX_MCS=<mcs>**	Response	**Success: OK** **Failure: ERROR**
Description	Set module MCS index value		
Parameter	Set the TX MCS . The range is 0~7 or 10 in 1M mode , which means it is fixed to a certain MCS . Other values mean that the MCS will be adjusted automatically. This command will be saved when the power is off.		
Example	AT+TX_MCS=2		

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6.3.18 Set heartbeat interval

Instruction	**AT+HEART_INT?**	**Response**	**+HEART_INT:<time> OK**
Description	Query heartbeat interval		
Parameter	<time>: Heartbeat interval, in milliseconds (ms)		
Instruction	**AT+HEART_INT=<time>**	Response	**Success: OK Failure: ERROR**
Description	Set heartbeat interval		
Parameter	Set the heartbeat interval in milliseconds (ms) , with a minimum of 500. The more STAs there are, the larger the recommended heartbeat interval should be. A suitable heartbeat interval length is approximately STA_count * 500. Earlier software versions required setting the same heartbeat interval for both APs and STAs ; otherwise, connection problems would occur. This command is saved even after power loss. From version V1.6.2 onwards, only the AP 's heartbeat interval needs to be set; the AP will automatically synchronize with the STAs . This command is no longer effective for STA.		
Example	AT+HEART_INT=2000 sets the heartbeat interval to 2 seconds.		

6.3.19 Configure to unpair a specified sta

Instruction	**AT+UNPAIR ?**	**Response**	**No Response**
Description			
Parameter			
Instruction	**AT+UNPAIR=<mac_addr>**	Response	**Success: unpair sta:mac_addr Failure: sta:mac_addr is not exist**
Description	Configure to unpair a specified sta.		
Parameter	<mac_addr>: The other party's MAC address		
Example	at+unpair=f6:de:09:75:a3:61		

6.3.20 Restore factory settings

Instruction	**AT+LOADDEF=1**	**Response**	
Description	Factory reset		
Parameter			
Example	AT+LOADDEF=1		

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6.3.21 Setting Print Information

Instruction	AT+SYSDBG=<type>,<vale>	Response	Success: OK
Description	Set print debugging information		
Parameter	<type>: LMAC/WNB <vale>: 0 Off / 1 On LMAC statistics are enabled by default and contain a lot of information; you can disable them if needed. WNB statistics are disabled by default.		
Example	AT+SYSDBG=LMAC,0 Turn off LMAC printing		

6.3.22 Setting the serial port baud rate

Instruction	AT+BAUDRATE? (Not supported temporarily)	Response	<value>
Description	Query the baud rate of the serial port		
Parameter	<value> : Baud rate value		
Instruction	AT+BAUDRATE=<value> (Not supported temporarily)	Response	Success: OK
Description	Set the serial port baud rate		
Parameter	<value>: Serial port baud rate range 9600-400k		
Example	AT+BAUDRATE=115200		
illustrate	This product does not support port rate modification. The port rate is fixed at 115200, Frame format 8N1		

6.3.23 Joining Multicast Networks

Instruction	AT+JOINGROUP=<group_addr>,<aid>	Response	Success: OK Failure: ERROR
Description	Configure the module to add multicast. After setting the WiFi module's operating mode to "group ," this command can be used to configure the WiFi module to join a multicast network. Once joined, the WiFi module will only receive data from that multicast network. All data communication will be conducted via multicast addresses. If the operating mode is set to " group" but the module is not joined to a multicast network, all data communication will be broadcast. Note that the "JOINGROUP" command can only be configured after "GROUP" mode has been set .		
Parameter	AT+JOINGROUP=group_addr,AIDgroup_addr: The address of the multicast network to be joined. AID : The AID of this device in the multicast network . Valid AID values: 1~N (N is the maximum number of STAs supported by the firmware). The AID of each device in the network should be unique. Setting a valid AID : The WiFi module will periodically send heartbeats in the multicast network to		

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	announce its presence to other WiFi modules. Setting an invalid AID : The WiFi module will not send heartbeats and will not notify other WiFi modules. If all devices have AID set to 0 , then the maximum number of STAs can be exceeded without firmware support .
Example	AT+JOINGROUP=11:22:33:44:55:66,3 Joined multicast address: 11:22:33:44:55:66 AID set to 3

6.3.24 Setting up intermediate SSID

Instruction	**AT+R_SSID?**	**Response**	**+R_SSID:<repeater_ssid> OK**
Description	Query the SSID of the upstream AP in relay mode.		
Parameter	<value> : SSID of the parent AP		
Instruction	**AT+R_SSID=<repeater_ssid>**	**Response**	**Success: OK Failure: ERROR**
Description	Configure the SSID of the intermediate connection to the upper-level AP.		
Parameter	<repeater_ssid>:ssid		
Example	AT+R_SSID=ebyte_test		

6.3.25 Setting the Encryption Password for the Relay

Instruction	**AT+R_PSK?**	**Response**	**+R_PSK:<psk> OK**
Description	Query the encryption password for connecting to the upstream AP in relay mode.		
Parameter	<psk> : The encryption password of the parent application (AP)		
Instruction	**AT+R_PSK=<psk>**	**Response**	**Success: OK Failure: ERROR**
Description	Configure the intermediate connection to the upper-level AP's PSK.		
Parameter	<psk>: Encryption password, must be 64 hex characters.		
Example	AT+R_PSK= baa58569a9edd7c3a55e446bc658ef76a7173d023d256786832474d737756a82		

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7 Hardware Design

- It is recommended to use a DC regulated power supply to power this module, with the power supply ripple coefficient as small as possible, and the module must be reliably grounded;
- Please ensure the correct connection of the power supply positive and negative terminals. Reversing the connection may cause permanent damage to the module.
- Please check the power supply and ensure it is within the recommended voltage range. Exceeding the maximum value will cause permanent damage to the module.
- Please check the power supply stability; the voltage should not fluctuate significantly or frequently.
- When designing power supply circuits for modules, it is often recommended to retain a margin of more than 30% to ensure long-term stable operation of the entire unit.
- The module should be kept as far away as possible from power supplies, transformers, high-frequency traces, and other parts with high electromagnetic interference.
- High-frequency digital traces, high-frequency analog traces, and power traces must avoid the area under the module. If it is absolutely necessary to run the traces under the module, assuming the module is soldered on the Top Layer, lay ground copper on the Top Layer of the module contact area (all copper and well grounded), and run the traces close to the digital part of the module on the Bottom Layer .
- Assuming the module is soldered or placed in the Top Layer, it is also wrong to arbitrarily route traces in the Bottom Layer or other layers, as this will affect the module's stray emissions and receiver sensitivity to varying degrees .
- If there are devices around the module that cause significant electromagnetic interference, it will greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep them away from the module. If possible, appropriate isolation and shielding can be implemented.
- If there are traces around the module that cause significant electromagnetic interference (high-frequency digital, high-frequency analog, power supply traces), it will greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep them away from the module. If possible, appropriate isolation and shielding can be implemented.
- Try to stay away from TTL protocols that also use a physical layer of 2.4GHz, such as USB 3.0;
- The antenna mounting structure has a significant impact on module performance; therefore, it is essential to ensure that the antenna is exposed, ideally vertically upwards. When the module is installed inside the housing, a high-quality antenna extension cable can be used to extend the antenna to the outside of the housing.
- Antennas should never be installed inside a metal casing, as this will greatly reduce the transmission distance.

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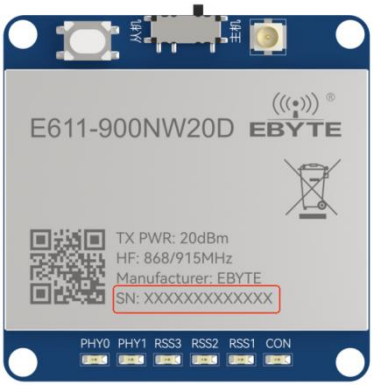
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8 Firmware Update

- How firmware versions are distinguished on the product:

The E611-900NW20D module comes in two firmware versions: one supporting up to 8 sub-nodes and another supporting up to 31 sub-nodes. Users can distinguish between them based on the production batch number in the module's SN code. Modules with a production batch number greater than 5204730 run the firmware version supporting up to 31 sub-nodes; conversely, those with a production batch number less than 5204730 run the firmware version supporting up to 8 sub-nodes.

Serial Number Explanation: S5204730S00001, where 5204730 is the production batch number and 00001 is the serial number.



Example:

1. If a user's module production batch is 5204731 > 5204730, the module with production batch 5204731 supports a maximum of 31 sub-node firmware versions;

2. If the user's module production batch is 5204729 ≤ 5204730, the module with production batch 5204729 supports a maximum of 8 sub-node firmware versions.

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9 Frequently Asked Questions

9.1 Transmission distance is not ideal

- When there are obstacles in line-of-sight communication, the communication distance will be reduced accordingly ;
- Temperature, humidity, and co-channel interference can all lead to increased packet loss rates in communications .
- The ground absorbs and reflects radio waves, and the test results are poor when the ground is close to the ground .
- Seawater has a strong ability to absorb radio waves, so testing results are poor at the seaside .
- If there are metal objects near the antenna, or if it is placed inside a metal casing, the signal attenuation will be very severe .
- Power register settings are incorrect; air speed is set too high (the higher the air speed, the shorter the distance) .
- At room temperature, the power supply voltage is lower than the recommended value; the lower the voltage, the lower the power output .
- The antenna may be poorly matched with the module or have quality issues.

9.2 Module is easily damaged .

- Please check the power supply and ensure it is within the recommended voltage range. Exceeding the maximum value will cause permanent damage to the module .
- Please check the power supply stability; the voltage should not fluctuate significantly or frequently .
- Please ensure anti-static operation during installation and use, as high-frequency devices are sensitive to electrostatic discharge .
- Please ensure that the humidity is not too high during installation and use, as some components are humidity-sensitive .
- Unless there are special requirements, it is not recommended to use it at excessively high or low temperatures.

9.3 Too high error rate

- If there is interference from a co-channel signal nearby, move away from the source of interference or change the frequency or channel to avoid the interference.
- An inadequate power supply can also cause garbled characters, so it is essential to ensure the reliability of the power supply.
- Poor quality or excessive length of extension lines or feeders can also lead to a high bit error rate.

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10 Welding Operation Instructions

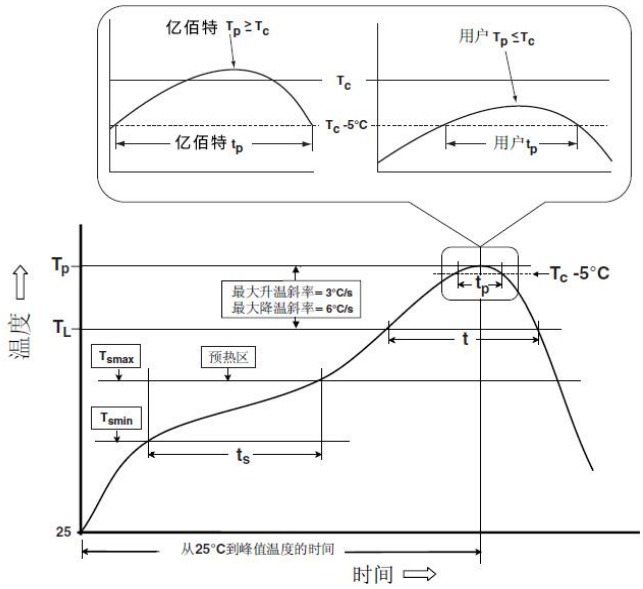
10.1 Reflow soldering temperature

Reflow soldering profile characteristics		Lead-based assembly	Lead-free assembly
Preheating/Insulation	Minimum temperature (Tsmin)	100℃	150℃
	Maximum temperature (Tsmax)	150℃	200℃
	Time (Tsmin~Tsmin)	60-120 seconds	60-120 seconds
Temperature rise slope (TL~Tp)		3℃/second, maximum value	3℃/second, maximum value
Liquid phase temperature (TL)		183℃	217℃
Duration above TL		60~90 seconds	60~90 seconds
Package peak temperature Tp		Users must not exceed the temperature specified on the product's "humidity sensitivity" label.	Users must not exceed the temperature specified on the product's "humidity sensitivity" label.
The time (Tp) within 5°C of the specified grading temperature (Tc) is shown in the figure below.		20 seconds	30 seconds
Cooling slope (Tp~TL)		6℃/second, maximum value	6℃/second, maximum value
Time from room temperature to peak temperature		6 minutes, the longest	8 minutes, the longest
* The peak temperature (Tp) tolerance of the temperature profile is defined as the user's upper limit.			

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10.2 Reflow Soldering Profile



11 Related Models

Product Model	Carrier frequency Hz	Transmit power dBm	Test distance (km)	Air speed bps	Packaging	Product dimensions (mm)	Antenna type
E70-433NW14S	433M	14	2.5	2.5k ~ 168k	SMD	16 * 26	IPEX/Stamp Hole
E70-433NW30S	433M	30	6.5	2.5k ~ 168k	SMD	24 * 38.5	IPEX/Stamp Hole

Important Notice

- EBYTE reserves the right to make final interpretations and modifications to all content in this manual.
- Due to ongoing improvements in the product's hardware and software, this manual is subject to change without prior notice; the latest version of the manual shall prevail.
- Users of this product are advised to visit the official website to stay updated on product developments and receive the latest information in a timely manner.

Revision History

Version	Revision Date	Revision Notes	Maintainer
1.0	2025-12-12	Initial version	Lan

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1.1	2026-3-9	Modified the description of the serial port instructions	Lan
1.2	2026-4-22	Content modified and addition of Chapter 8: Firmware Upgrade and Important Notes	Lan
1.3	2026-6-18	Modified the description of the configuration mode instructions	Lan

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