EWM521-2G4NWxxSX User Manual

2.4GHz ISM 100mW/500mW TTL MESH Wireless Networking module



Chengdu Ebyte Electronic Technology Co.,Ltd.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

CONTENTS

DISCLAIMER 3

1 PRODUCT OVERVIEW 4

1.1 INTRODUCTION 4

1.2 FUNCTION DESCRIPTION 4

1.3 FEATURES 5

1.4 NETWORK TOPOLOGY 5

1.5 APPLICATION 6

2 SPECIFICATION AND PARAMETER 7

2.1 LIMIT PARAMETER 7
2.2 WORKING PARAMETER 7

3 DIMENSION AND PINS DEFINITION 9

4 RECOMMENDED CIRCUIT DIAGRAM 11

5 TEST KITS 12

5.1 INTRODUCTION 12

6 COMMAND INTRODUCTION 14

6.1 AT COMMANDS 14
6.2 COMMAND SET 14
6.3 QUERY COMMAND SET 14
6.4 CONFIGURE COMMAND SET 16
6.5 PARAMETER VALUE TABLE 19
6.6 PARAMETER PRECAUTIONS 20

7 INTRODUCTION TO BASIC FUNCTIONS 22

7.1 OBTAIN THE MAIN PARAMETERS OF THE MODULE 22
7.2 UNICAST COMMUNICATION 25

Copyright ©2012 – 2024，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

7.3 MULTICAST COMMUNICATION 26
7.4 BROADCAST 27
7.5 ANYCAST 28
7.6 INTRODUCTION TO THE ROUTING TABLE 29
7.7 ADDITIONAL FRAME HEADER INFORMATION 30

8 REMOTE CONFIGURATION 31

8.1 INTRODUCTION TO REMOTE CONFIGURATION 31
8.2 INTRODUCTION TO REMOTE SINGLE POINT CONFIGURATION 31
8.3 INTRODUCTION TO REMOTE BROADCAST CONFIGURATION 32

9 INTRODUCTION TO TEST VIA COMPUTER 33

10 HARDWARE DESIGN 36

11. FAQ 37

11.1 COMMUNICATION RANGE IS TOO SHORT 38
11.2 MODULE IS EASY TO DAMAGE 38
11.3 BER(BIT ERROR RATE) IS HIGH 38

12 PRODUCTION GUIDANCE 39

12.1 REFLOW SOLDERING TEMPERATURE 39
12.2 REFLOW SOLDERING CURVE 39

13 E52 SERIES 40

14 ANTENNA GUIDANCE 40

REVISION HISTORY 41

ABOUT US 41

Copyright ©2012 – 2024，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Disclaimer

EBYTE reserves all rights to this document and the information contained herein. Products, names, logos and designs described herein may in whole or in part be subject to intellectual property rights. Reproduction, use, modification or disclosure to third parties of this document or any part thereof without the express permission of EBYTE is strictly prohibited.

The information contained herein is provided “as is” and EBYTE assumes no liability for the use of the information. No warranty, either express or implied, is given, including but not limited, with respect to the accuracy, correctness, reliability and fitness for a particular purpose of the information. This document may be revised by EBYTE at any time. For most recent documents, visit www.cdebyte.com.

Copyright ©2012–2024，Chengdu Ebyte Electronic Technology Co.,Ltd

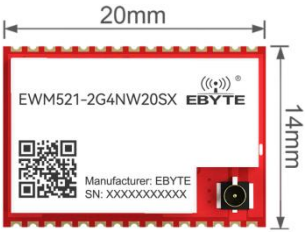
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1 Product Overview

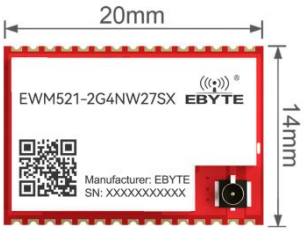
1.1 Introduction

EWM521-2G4NW20/27SX is a wireless serial MESH networking module in the 2.4GHz ISM frequency band, with a maximum output power of 20dBm/27dBm, a maximum air speed of 2Mbps, a maximum support baud rate of 115200 bps, and a working frequency range of 2400-2480 MHz.

EWM521-2G4NW20/27SX adopts the new MESH networking technology, which features decentralization, self routing, network self-healing, multi-level routing and other functions. It is suitable for smart homes, industrial sensors, wireless alarm security systems, building automation solutions, smart agriculture and other application scenarios.



EWM521-2G4NW20SX



EWM521-2G4NW27SX

1.2 Function description

The MESH network adopts a decentralized structure, consisting of only two types of nodes: terminal nodes and routing nodes, without the need for a central node or coordinator to participate in network management; Users can also use only routing nodes to build a MESH network. Routing nodes are similar to terminal nodes, but terminal nodes do not have routing functionality. Terminal nodes are generally deployed at the edge of the network and are commonly used to design low-power nodes, but currently do not support low-power functionality. Routing nodes need to constantly receive data from the network for routing updates and data forwarding, so they cannot function as low-power nodes.

In the MESH network, channel avoidance technology is adopted, and the avoidance mechanism can avoid nodes from sending wireless data simultaneously as much as possible, reducing the probability of data collision errors. Routing nodes will automatically collect information from surrounding nodes to form a multi hop communication network; When a link fails or is abnormal, the routing node will establish a new path after several consecutive communication failures.

The network supports four communication methods: Unicast, Multicast, Broadcast, and Anycast. Users can choose different communication methods according to different application scenarios. Unicast and broadcast are the simplest and most basic communication methods. Under unicast, routes are automatically established and request responses are returned to determine the data transmission path; In broadcast mode, all routing nodes will initiate data relay once they receive data. The mechanism of multicast is relatively complex and can achieve one to many communication. Users need to first configure the multicast group address, similar to a public address. Ubcasting is usually used for data exchange between different networks, and data will not be forwarded under multicast. Under ubiquitous broadcasting, two communication methods can be implemented based on the different target addresses: unicast and broadcast. Users can transmit any data to any module within the communication range.

During network transmission, data is encrypted using special algorithms by default to ensure privacy and security. In addition, in order to avoid data errors caused by interference from other nodes, the network layer also performs multiple verifications on the data to ensure the reliability and accuracy of the transmitted data.

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.3 Features

- MESH: Adopting FSK modulation method, it has the advantage of long-distance anti-interference and improves the coverage range of the entire MESH network;
- Large network capacity: The theoretical number of MESH networks can reach up to 65535, and it is recommended to have a network size of around 100.
- Decentralization: The entire network is composed of only two types of nodes: terminal nodes and routing nodes, without the need for a central node or coordinator to participate in network management;
- Automatic routing: When initiating a data request, each routing node can automatically connect with surrounding nodes to determine the data transmission path, without the need for a coordinator to participate in path planning;
- Network self-healing: When a link fails, the routing node re establishes a new path after several failed communication attempts;
- Multi level routing: Routing nodes can automatically transmit data to lower level routers, and the direction of data transmission is controlled by an automatically generated routing table;
- Path optimization: Routing information will be continuously updated and optimized automatically with data transmission in the network, ensuring the stability of the entire network;
- Avoidance mechanism: Channel avoidance mechanism can greatly reduce the possibility of air signal collision;
- Communication methods: Supports four communication methods: Unicast, Multicast, Broadcast, and Anycast;
- Operating frequency range: 2400~2480 MHz (default 2402 MHz), channel spacing of 1 MHz;
- Multiple verification: ensuring the reliability and accuracy of the data transmission process;
- Encryption transmission: Special encryption algorithms are used during data transmission to ensure the security and privacy of the data;
- High throughput: The entire network combines time and space to achieve high concurrency performance;
- Remote configuration: supports remote modification of basic communication parameters for the entire network.

1.4 Network topology

The MESH network supports two types of devices: routing nodes and terminal nodes.

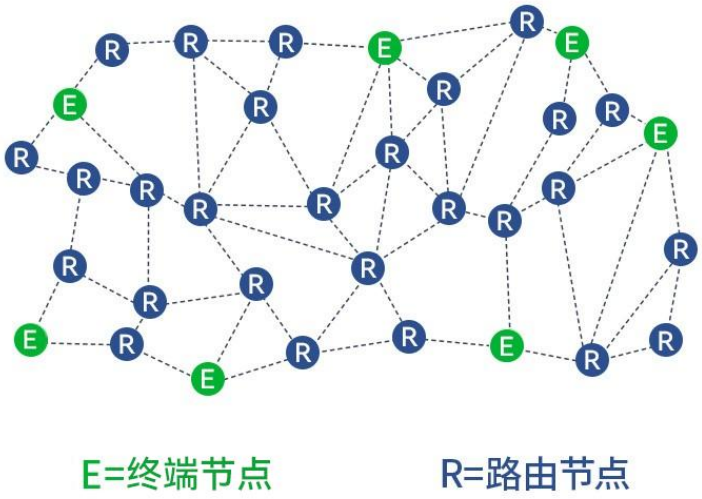
Routing node: The routing node receives data from the network for routing updates and data forwarding.

Terminal nodes: Terminal nodes do not have routing capabilities and are generally deployed at the edge of the network.

The network topology of routing nodes and terminal nodes is shown in the figure:

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000



1.5 Application

- Smart home and industrial sensors, etc;
- Wireless alarm security system;
- Building automation solutions;
- Smart agriculture;
- Smart logistics and warehousing.

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2 Specification and parameter

2.1 Limit parameter

Limit parameter			
Main parameter	Performance		Remarks
	Min	Max	
EWM521-2G4NW20SX supply voltage	0V	3.6V	≥ 3.3V can ensure output power, exceeding 3.6V may burn out the module and there is no LDO inside. It is recommended to connect an external 3.3V LDO
EWM521-2G4NW27SX supply voltage	0V	5.5V	≥ 5.0V can ensure output power, exceeding 5.5V may burn out the module
Working temperature	-40℃	+85℃	Industrial grade design
Working humidity	10%	90%	-
Storage temperature	-40℃	+125℃	-

2.2 Working parameter

Working parameter					
Main parameter		Performance			Remarks
		Min	Tpy	Max	
EWM521-2G4NW20SX Working voltage（V）		1.9	3.3	3.6	≥ 3.3V can ensure output power, exceeding 3.6V may burn out the module and there is no LDO inside. It is recommended to connect an external 3.3V LDO
EWM521-2G4NW27SX Working voltage（V）		2.6	5.0	5.5	≥ 5.0V can ensure output power, exceeding 5.5V may burn out the module
Communication level（V）			3.3		Suggest adding level conversion when using 5.0V TTL
Working temperature （℃）		-40	-	+85	Industrial grade design
Working band（MHz）		2400	-	2480	Support ISM frequency band
EWM521-2G4NW 20SXconsumption	TX current （mA）	-	180	Instant aneous power consu mption	Instantaneous power consumption
	Working current （mA）	-	20	-	-

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

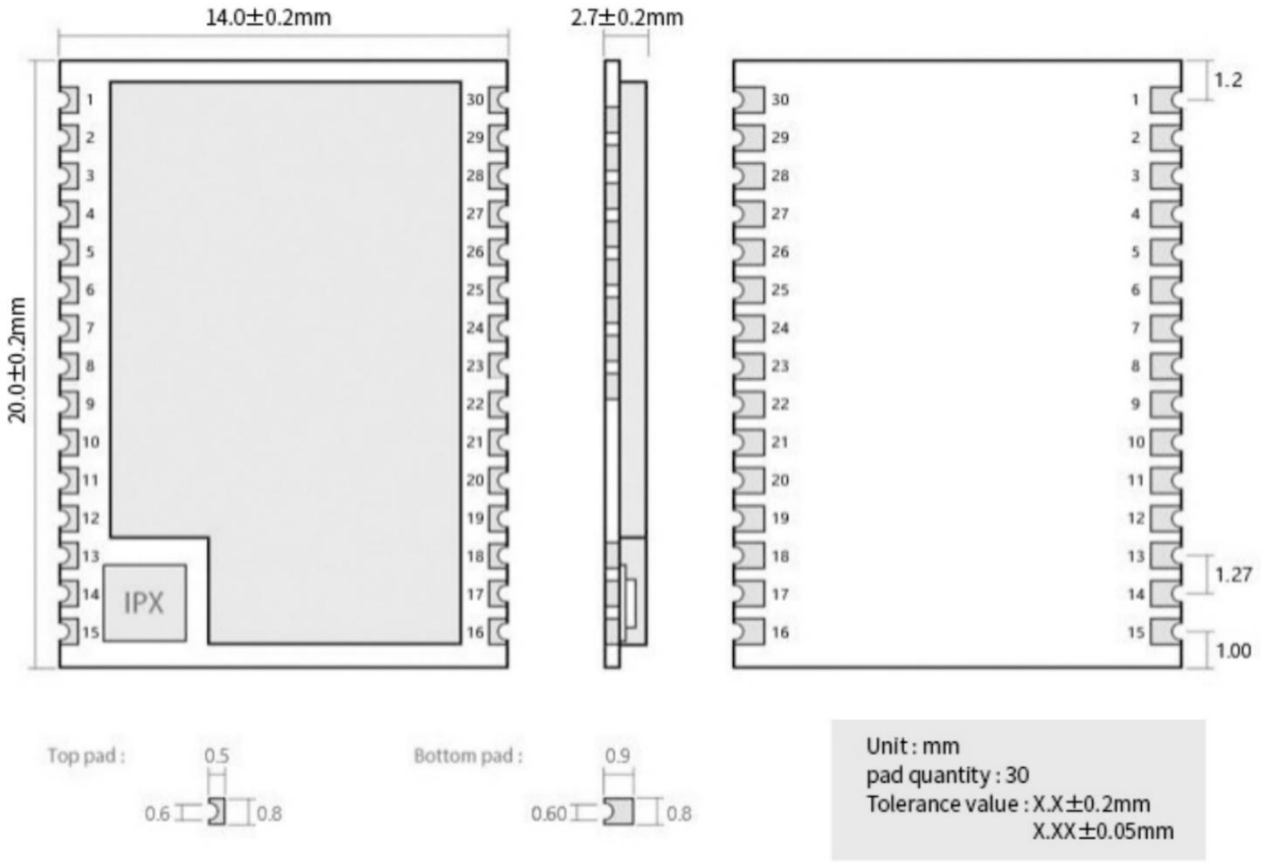
EWM521-2G4NW27SX consumption	TX current（mA）	-	600	-	Instantaneous power consumption
	Working current（mA）	-	30	-	-
EWM521-2G4NW20SX TX power（dBm）		-	20	21	Users can configure it themselves
EWM521-2G4NW27SX TX power（dBm）		-	27	28	
Air data rate（bps）		250K	500K	1M	Four selectable air data rate (250K, 500K, 1M, 2M)

Main parameter		
Main parameter	**Description**	**Remarks**
EWM521-2G4NW20SX distance	0.8 Km	Clear and open environment, antenna gain of 5dBi, antenna height of 2 meters, air speed of 250Kbps
EWM521-2G4NW27SX distance	1.6 Km	
Subcontracting method	32 Byte	Maximum capacity per package
Modulation mode	FSK	-
Communication interface	UART	3.3V TTL level
Packaging method	SMD	-
External dimensions	20*14mm	±0.2mm
Antenna interface	IPEX/Stamp hole	Characteristic impedance approximately 50Ω
EWM521-2G4NW20SX Weight	1.2g	±0.1g
EWM521-2G4NW27SX Weight	1.3g	±0.1g

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3 Dimension and pins definition



No.	Name	Direction	Usage
1	PB4	Input/Output	Not yet used, suggest NC
2	PB7	Input/Output	RF transmission indicator pin, default high level, valid low level (connected to test kit LED1)
3	NC	Input/Output	Not yet used, suggest NC
4	NC	Input/Output	Not yet used, suggest NC
5	NC	Input/Output	Not yet used, suggest NC
6	NC	Input/Output	Not yet used, suggest NC
7	PC1	Input/Output	Not yet used, suggest NC
8	NC	Input/Output	Not yet used, suggest NC
9	PB6	Input/Output	UART_TXD，serial port sending pin
10	PB5	Input/Output	UART_RXD，serial port receiving pin
11	PC0	Input/Output	Not yet used, suggest NC
12	NC	Input/Output	Not yet used, suggest NC
13	GND	Input/Output	Ground wire, connected to the power reference ground
14	ANT	Input/Output	Antenna interface, 50 Ω characteristic impedance (connected to SMA

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

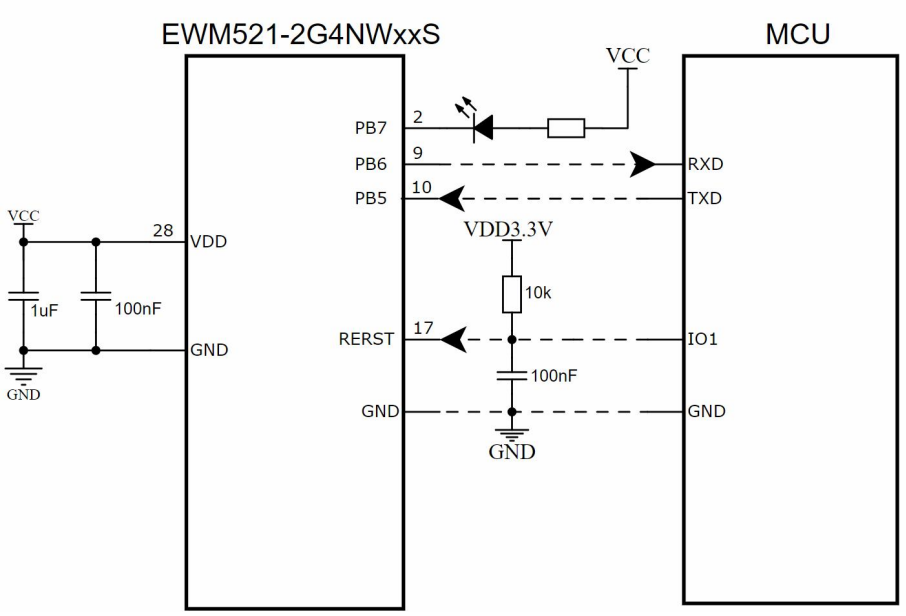
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

			interface of test kit)
15	GND	Input/Output	Ground wire, connected to the power reference ground
16	NC	Input/Output	Not yet used, suggest NC
17	RESET	Input	Reset pin, default high level, low level valid (connected to RST button in test kit)
18	NC	Input/Output	Not yet used, suggest NC
19	NC	Input/Output	Not yet used, suggest NC
20	NC	Input/Output	Not yet used, suggest NC
21	NC	Input/Output	Not yet used, suggest NC
22	PD4	Input/Output	EWM521-2G4NW20SX is not currently in use, suggest NC EWM521-2G4NW27SX has already used this pin internally and must be NC controlled
23	PB3	Input/Output	Not yet used, suggest NC
24	PD6	Input/Output	Not yet used, suggest NC
25	PD7	Input/Output	Not yet used, suggest NC
26	PA7	Input/Output	Not yet used, suggest NC
27	GND	Input/Output	Ground wire, connected to the power reference ground
28	VDD	Input	Power supply VDD, power supply design according to different models
29	SWS	-	Debugging pins
30	PB2	-	Not yet used, suggest NC

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4 Recommended circuit diagram



NO.	Brief connection explanation between module and microcontroller (taking STM8L microcontroller as an example in the above figure)
1	The wireless serial module is TTL level, please connect it to a 3.3V TTL level MCU.
2	Please perform UART level conversion when using a 5V microcontroller.
3	TVS protection and capacitors need to be added externally to the power supply (it is recommended to add a 22uF low ESR electrolytic capacitor or tantalum capacitor).
4	The RF module is sensitive to pulse static electricity, please do not perform hot plugging on the module.
5	There is no LDO inside the EWM521-2G4NW20SX module. It is recommended to connect an external 3.3V LDO for power supply.

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5 Test kits

5.1 Introduction

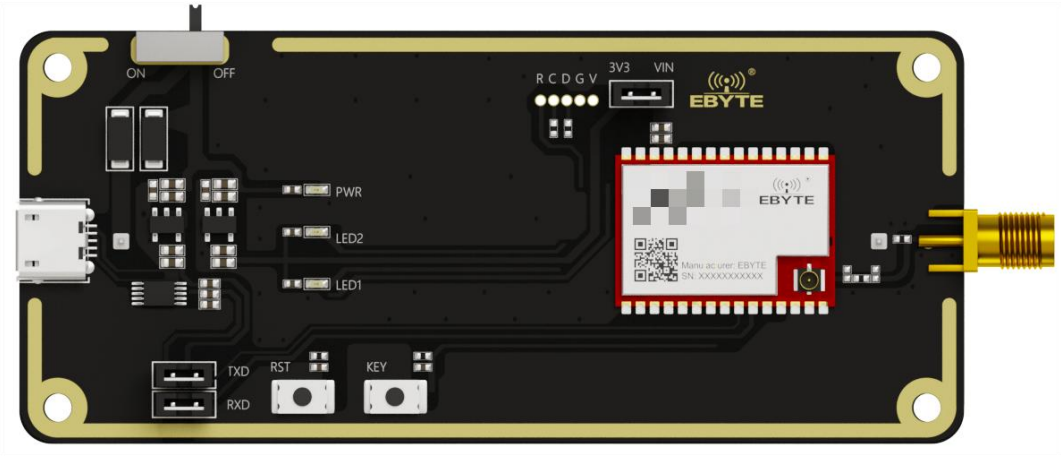


Figure 5.1.1 Test kits

- The EWM521-2G4NW20SX-TB test kit is designed to help users quickly evaluate module related functions. For first-time use, it is recommended to purchase several test kits directly for testing (the test kits have already welded the EWM521-2G4NW20SX module).
- The hardware integrates power supply circuit, reset circuit, button circuit, power indicator light PWR, work indicator light LED, etc., and there is a reserved 18650 battery box at the bottom for customers to install 18650 batteries for testing.
- The test kit has already connected the required pins of the module to the corresponding peripherals, with the most important being the TTL to USB circuit. Users only need to connect the Micro USB to the computer, and a COM port will appear on the device manager of the computer.
- If the corresponding COM is not seen, there may be several possibilities:
  - Automatically installing the driver for CH340, please be patient and wait for a period of time; If the driver cannot be automatically installed, manual installation is required.
  - Check if the module power light PWR is on and if the module is powered on normally?



Figure 5.1.2 Device manager checking COM port

- Download any serial port debugging tool. The XCOM serial port debugging assistant can be found under the relevant downloads on the official website;
- Open the serial port debugging assistant, follow the above steps to make simple settings for the software, and send "AT+INFO=?" to read out the parameters related to the module.

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000



Figure 5.1.3 INFO command to check module info

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6 Command introduction

6.1 AT commands

- AT commands are divided into three categories: command instructions, set instructions, and query instructions;
- By default, the AT command uses a baud rate of 115200 bps and does not send new lines;
- The number of parameters required for different AT commands varies, and different parameters need to be separated by ",". The input parameters are uniformly decimal values, and specific instructions need to be carefully read in the instruction set; If the number of input parameters for the AT command is incorrect, the serial port will return data similar to "AT+DSTADDR=CMD_CRR".
- Some AT command parameters may be restricted. If the input value of the AT command is incorrect, the serial port will return data similar to "AT+DSTADDR=CMDVNet ERR";
- If the parameter setting is successful, the serial port will return data similar to "AT+DST_ADRD=OK";
- Data outside the AT instruction set will be considered transparent data, and the module will initiate a data request. Therefore, it is advisable to avoid sending data starting with "AT+" as much as possible;
- After using the save command, all parameters inside the current module will be saved. Most of the setting commands will be directly saved to Flash, and only some commonly used setting commands can choose whether to save to Flash based on the parameters.

6.2 Command set

- The command command has no suffix, just "AT+RESET" is needed to restart the module.

Command	Command function	Description
AT+IAP	Enter IAP upgrade mode	After returning AT+IAP=OK, the module immediately restarts and enters IAP upgrade mode
AT+RESET	Module restart	Keep powered on for about 60 seconds and automatically exit IAP upgrade mode
AT+DEFAULT	Module reset to factory settings	After returning AT+RESET=OK, the module immediately restarts

6.3 Query command set

- The query command suffix is "=?", for example, the query module related information command "AT+INFO=?", the module will return the main parameters of the module.

Query command	Function	Description

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

AT+INFO=?	Main parameters of the query module	Important command, returns the main parameters of the module (displayed and used by the serial assistant)
AT+DEVTYPE=?	Query module model	Return device model such as EWM521-2G4NW20SX
AT+FWCODE=?	Query module firmware code	Return firmware code such as 7509-0-10
AT+POWER=?	Query module transmission power	Return RF output power level
AT+CHANNEL=?	Query module working channel	Return to RF working channel
AT+UART=?	Query module serial port parameters	Return the serial port baud rate and checksum
AT+RATE=?	Query module air speed	Return module air speed
AT+OPTION=?	Query module communication method	Important command, return module communication method
AT+PANID=?	Query network identification code	Return network identification code
AT+TYPE=?	Query the node type of the module	Return module type (routing node/terminal node)
AT+SRC_ADDR=?	Query the address of the current module	Important instruction, returns the address of the current module
AT+DST_ADDR=?	Query the address of the target module	Important instruction, returns the address of the target module
AT+SRC_PORT=?	Query the port of the current module	Return the port of the current module
AT+DST_PORT=?	Query the port of the target module	Return the port of the target module
AT+MEMBER_RAD=?	Query multicast member radius	Return the propagation radius of multicast members, the larger the radius, the larger the coverage area
AT+NONMEMBER_RAD=?	Query multicast non member radius	Return the propagation radius of multicast non members, the larger the radius, the larger the coverage area
AT+CSMA_RNG=?	Query CSMA Random Avoidance Time	Return the maximum random avoidance time
AT+ROUTER_SCORE=?	Maximum consecutive failure times for querying routing	Returns the maximum number of consecutive failures, exceeding which the routing information will be removed
AT+HEAD=?	Check if the additional frame header function is enabled	Is the function of returning additional frame headers enabled

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

AT+BACK=?	Check if the function of sending and returning information is enabled	Is the function of sending return messages enabled
AT+SECURITY=?	Check if the data encryption function is enabled	Return whether the data encryption function is enabled
AT+RESET_AUX=?	Check if LED2 changes during automatic reset	Does LED2 change on during RF restart
AT+RESET_TIME=?	Query the automatic reset time	Return the RF automatic restart time, in minutes
AT+FILTER_TIME=?	Query the timeout period for broadcast filtering	Return the timeout period for broadcast filtering
AT+ACK_TIME=?	Query request response timeout	Return request response timeout
AT+ROUTER_TIME=?	Query routing request timeout	Return routing request timeout
AT+GROUP_ADD=?	Query GROUP information	Return multicast group address table
AT+GROUP_DEL=?		
AT+GROUP_CLR=?		
AT+ROUTER_CLR=?	Query routing table information	Return routing table information
AT+ROUTER_SAVE=?		
AT+ROUTER_READ=?		
AT+MAC=?		Return the unique 32-bit MAC address of MCU
AT+KEY=?	Query MAC unique address	Unable to read, to avoid key leakage

6.4 Configure command set

- Set the instruction suffix to "=% d,% d,% d", for example, set the module target address instruction to "AT+DSTADDR2=25640,0", with the first parameter being the target address and the second parameter being whether to save to Flash, separated by ",".
- The setting instructions will be saved to Flash uniformly without the<save>parameter.

Configure command	Function	Description

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

AT+INFO=0	Advanced parameters of query module	Return to module for more advanced setting parameters (Serial Assistant Display Usage)
AT+POWER=<power>,<save>	Set module transmission power	<power>: RF output power level (0~8) <save>: Whether to save to Flash
AT+CHANNEL=<channel>,<save>	Set the working channel of the module	<channel>: RF working channel (0~80) <save>: Whether to save to Flash
AT+UART=<baud>,<parity>	Set module serial port parameters	Restart to take effect <baud>: Serial port baud rate (0~7 represents 1200~115200) <parity>: checksum (0~2 represents 8N1 8E1 8O1)
AT+RATE=<rate>	Set module air data rate	<rate>：0:150K 1:250Kbps 2:1Mbps 3:2Mbps
AT+OPTION=<option>,<save>	Set module communication method	Commonly used instructions, usually broadcast and unicast <option>: Communication methods (1~4) <save>: Whether to save to Flash
AT+PANID=<panid>,<save>	Set network identification code	Common commands, it is not recommended to use default values <panid>: Network Identification Code (0~65535) <save>: Whether to save to Flash
AT+TYPE=<type>	Set the node type of the module	<type>：0: Routing Node 1: Terminal Node
AT+SRC_ADDR=<addr>,<save>	Set the address of the current module (Ensure uniqueness)	Common commands, default to the last 15 bits of MAC address <addr>: Current address (0~65535) <save>: Whether to save to Flash
AT+DST_ADDR=<addr>,<save>	Set the address of the target module	Common instructions, set target address <addr>: Target address (0~65535) <save>: Whether to save to Flash
AT+SRC_PORT=<port>,<save>	Set the port of the current module	<port>: Default current port 1 <save>: Whether to save to Flash
AT+DST_PORT=<port>,<save>	Set the port of the current module	<port>: Default target port 1 <save>: Whether to save to Flash
AT+MEMBER_RAD=<rad>,<save>	Set module multicast member radius	Multicast usage，Suggest keeping it as default <rad>: multicast member radius (0~15) <save>: Whether to save to Flash
AT+NONMEMBER_RAD=<rad>,<save>	Set module multicast non member radius	Multicast usage，Suggest keeping it as default <rad>: Non member radius for multicast (0~15) <save>: Whether to save to Flash
AT+CSMA_RNG=<rng>	Set CSMA random avoidance time	Suggest keeping it as default Random avoidance time range (20~65535) ms

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

AT+ROUTER_SCORE=<score>	Set the maximum number of consecutive failures for routing	<score>Maximum consecutive failures of routing, After exceeding, a new route needs to be established
AT+HEAD=<enable>	Enable switch for setting additional frame header function	<enable>: Is the additional frame header function enabled
AT+BACK=<enable>	Set the enable switch for sending and returning information	<enable>: Whether sending return information is enabled
AT+SECURITY=<enable>	Enable switch for setting data encryption function	<enable>: Is the data encryption function enabled
AT+RESET_AUX=<enable>	Set the automatic reset LED2 change switch	<enable>: Automatically reset LED2 change enable
AT+RESET_TIME=<reset_time>	Set automatic reset time	<reset_time>: Automatic reset interval time (min)
AT+FILTER_TIME=<time>	Set broadcast filtering timeout	Suggest keeping it as default <time>:broadcast filtering timeout（3000～65535 ms）
AT+ACK_TIME=<time>	Set request response timeout	Suggest keeping it as default <time>:request response timeout（1000～65535 ms）
AT+ROUTER_TIME=<time>	Set the timeout period for routing requests	Suggest keeping it as default <time>:the timeout period for routing requests（1000～65535 ms）
AT+GROUP_ADD=<gruop>	Add GROUP information	<group>: Add multicast group addresses, up to 8 can be added
AT+GROUP_DEL=<gruop>	Delete GROUP information	<group>: Delete multicast group address
AT+GROUP_CLR=<enable>	Delete GROUP Information Table	<enable>: 1: Delete the entire GROUP information table
AT+ROUTER_CLR=<enable>	Clear routing table information	<enable>: 1: Delete the entire routing information table
AT+ROUTER_SAVE=<enable>	Flash operation of routing table	<enable>: 1: Save the routing information table to Flash <enable>: 0: Delete routing information from Flash
AT+ROUTER_READ=<enable>	Read routing information from Flash	<enable>：1：load the routing information table in Flash
AT+KEY=<key>	Set data encryption key	If the keys are different, communication cannot be achieved <key>: Data encryption key [0~0x7FFF FFFF]

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.5 Parameter Value Table

Name	Value	Function	Description
<save>	[0~1]	Are the parameters saved to Flash	[1：saved，0：not saved]
<power>	[0~8]	Set the module transmission power level	RF output power level setting, 0 represents maximum power level, default power level is maximum output power. EWM521-2G4NW20SX:[0:20dBm 1:16dBm 2:13dBm 3:12dBm 4:10dBm 5:9dBm 6:6dBm 7:3dBm 8:-2dBm] EWM521-2G4NW27SX:[0:27dBm 1:23dBm 2:20dBm 3:18dBm 4:14dBm 5:11dBm 6:9dBm 7:5dBm 8:0dBm]
<channel>	[0~80]	Set the working channel of the module	Working channels [0~80], Corresponding frequency 2400~2480 MHz Working frequency=2400+channel * 1 MHz
<baud>	See description	set baud rate	The restart takes effect and supports the following baud rates:[0:1200 1:2400 2:4800 3:9600 4:19200 5:38400 6:57600 7:115200]
<parity>	[0~2]	Set checksum	Serial port checksum [0:8N0 1:8E1 2:8O1]
<rate>	[0~3]	Set air speed	[0:150K 1:250Kbps 2:1Mbps 3:2Mbps]
<option>	[1~4]	Set communication method	Communication method [1: Unicast 2: Multicast 3: Broadcast 4: Ubiquitous]
<panid>	[0~65534]	Set network identification code	Network identification code [0x0000~0xFFFE]
<type>	[0~1]	Set the node type of the module	Set the node type of the module [0: Routing Node 1: Terminal Node]
<addr>	[0~65534]	Set module address	Address range [0x0000~0xFFFE] Routing nodes: 0x0000~0x7FFF Terminal nodes: 0x8000~0xFFFE
<group>	[0~65534]	Set multicast group address	Group address range[0x0000~0xFFFE]
<port>	[1、14]	Port settings	Different ports correspond to different functions, while other ports currently have no functions Port 1: Output data directly through UART Port 14: Parse data as AT commands

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

<rad>	[0~15]	Set the propagation radius for multicast	Multicast propagation radius [0~15] The larger the radius, the more propagation levels there are. Multicast propagation radius [0~15] The larger the radius, the more propagation levels there are
<rng>	[20~65535]	Set CSMA random avoidance time	Random avoidance time [20~65535] ms
<score>	[1~15]	Set the maximum number of consecutive failures,exceeding will require re initiating routing requests	Maximum number of consecutive failures [1-15]
<enable>	[0~1]	Various functional switches	[1: Function enabled 0: Function disabled]
<reset_time>	[0~255]	Automatic reset RF time	Automatic reset time [1~255] minutes [0: Turn off automatic reset]
<time>	See description	Network timeout	Broadcast filtering timeout [3000~65535] ms Request response timeout [1000~65535] ms Routing request timeout [1000~65535] ms
<key>	[0~0x7FFF FFFF]	Network encryption key	Encryption key[0~0x7FFF FFFF]

6.6 Parameter precautions

- If there is no save option<save>parameter, the command will be saved to Flash uniformly.
- After the baud rate<baud>and parity<parity>are set, they need to be restarted to take effect, and can be reset using "AT+RESET".
- It is generally not recommended to set the address<addr>and network identifier<panid>to 0xFFFF, as 0xFFFF is used as the broadcast address and broadcast network.
- Node type<type>will change the highest bit of the local address. Generally, it is necessary to set the node type<type>after setting the local address<addr>.
- Port<port>usually defaults to port 1. Only in remote configuration, the target port needs to be changed to port 14, and the other ports are currently not functional.
- The multicast radius<rad>is generally set to level 2 by default. The larger the multicast radius<rad>, the larger the coverage area.
- The CSMA random avoidance time<rng>is generally set to 127 by default (the random avoidance time is 0-127ms). The longer the random avoidance time, the slower the network response speed, but the lower the possibility of conflict. If you want to modify this time, you need to pay attention to the response time and conflict probability of the entire network, and it is generally not recommended to shorten this time.
- The maximum number of consecutive failures<score>is generally set to 3 by default, and it will affect the probability of re establishing the route.

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- The smaller the maximum number of consecutive failures<score>, the shorter the time it takes to rebuild the route when there is a link failure or communication anomaly. However, rebuilding the route takes some time, so it is generally sufficient to keep it as default. When communication is successful, the current number of failures will be reset.
- The RF automatic reset time<reset_time>is generally set to 5 minutes by default. When data is received, the RF automatic reset time will be reset without affecting normal data transmission. In areas with severe environmental interference, this time can be shortened. Setting it to 0 minutes will disable the automatic restart function.
- The default values for the broadcast filtering timeout<time>at different airspeed are 15s, 30s, and 60s, respectively. When duplicate data frames are received within the broadcast filtering timeout<time>, filtering will be performed, and it is not recommended to shorten this time.
- Request response timeout<time>The default values maintained at different airspeed are 6s, 5s, 4s, and 3s, respectively.
- Under unicast, the target device needs to return a response ACK. If a response ACK is received from the target address, it will immediately return 'Success'. Otherwise, it will wait for the request response timeout<time>to end before returning' NO ACK '.
- After passing through multiple levels of routing devices, the request response timeout<time>should be longer. By default, around 5 levels of routing devices can be supported.
- The default values for routing request timeout<time>at different airspeed are 6s, 5s, 4s, and 3s, respectively..
- Under unicast, it is necessary to initiate a routing request first, collect routing information from each device within the timeout period<time>of the routing request, and only initiate a data request again after it is completed.
- The routing request timeout<time>needs to cover the entire process from the initiation of the routing request to the complete completion of the network. If the routing is not successfully established, NO ROUTER will be returned.
- The more devices there are, the longer the routing request timeout<time>should be. By default, around 50 devices can be supported to establish routing. More than 50 devices require an instruction to extend this time.
- When returning 'OUT OF CACHE', it indicates that the send buffer is full. The sending cache can cache up to 5 items, and under normal circumstances, the cache is generally not full. It only occurs when the interval between consecutive sending is too fast, and the module will forcibly clear all sending data caches.
- The network protocol layer uses data RSSI to optimize the entire network link, and the routing nodes automatically select the best routing nodes for routing, so users do not need to consider signal strength issues anymore.

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

7 Introduction to Basic Functions

7.1 Obtain the main parameters of the module

- The main parameters of the module can be obtained through the "AT+INFO=?" AT command, which is mainly used for serial port display, as shown in Figure 8.1.1.
- If it is difficult to parse it using MCU, the correct operation of MCU should be obtained using a separate AT instruction, as shown in Figure 8.1.2



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

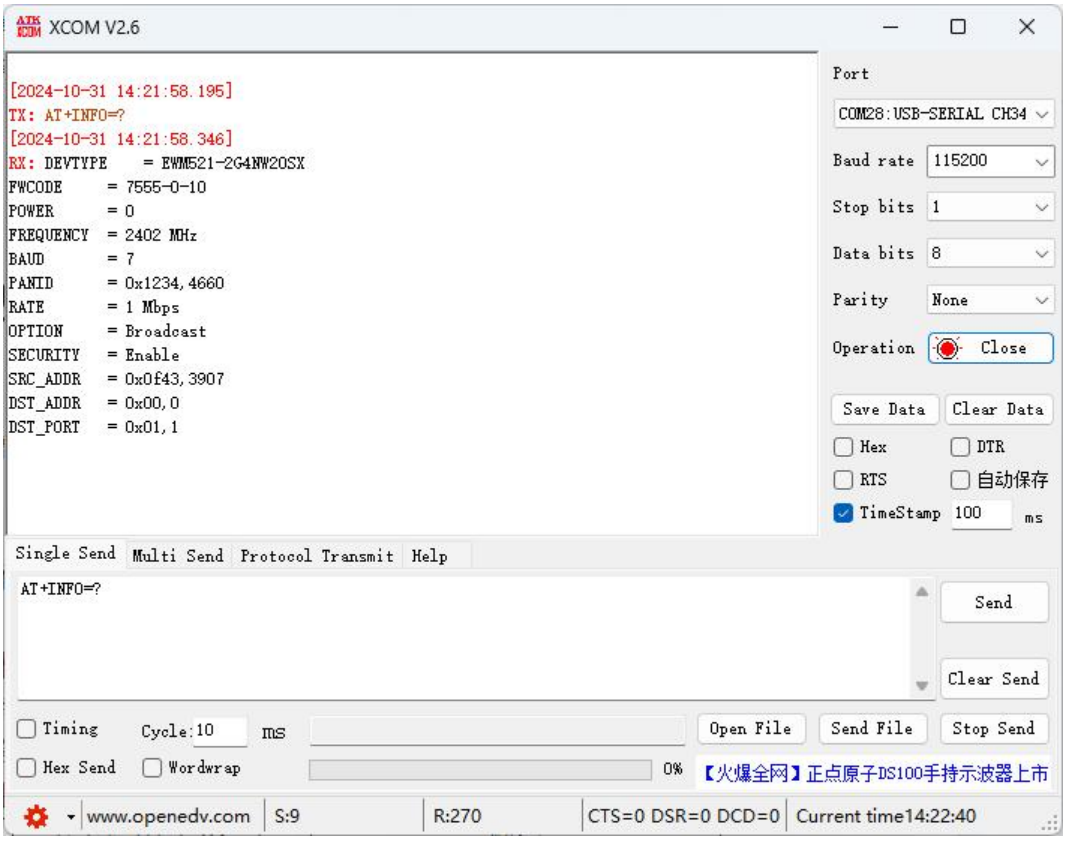


Figure 7.1.1 AT+INFO=? command

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000





Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

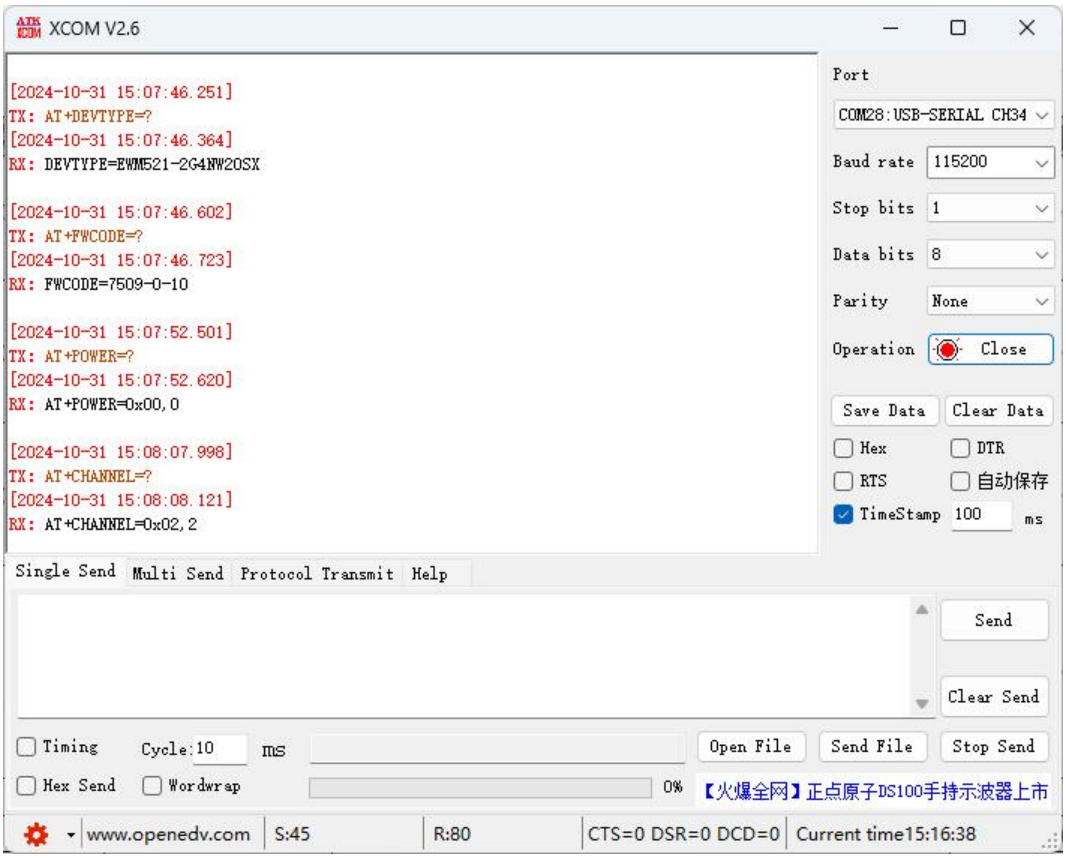


Figure 7.1.2 MCU obtain parameters

7.2 Unicast communication

- Unicast communication requires prior knowledge of the address of the target module (module B's address), and specific steps for obtaining basic parameters can be found in section 8.1.
-
- The first unicast request requires waiting for the route to be established (the waiting time varies at different airspeed). After the route is established, the module will automatically send the user data 1234567890 again. After the route is established, there is no need to wait for the route to be re established when accessing again, until there are more than 3 consecutive communication failures with a certain node.
- The routing table can be queried using the "AT+ROUTER-CLR=?" command.
- The data frame header can be closed using the "AT+HEAD=0" command.
- User data cannot be internal AT commands of the module, otherwise it will be recognized as AT commands by the module, resulting in the inability to send user data.

- The basic operation steps of unicast are as follows:

Step 1: Module A uses the instruction "AT+DST_ADRD=26034,0" to configure the target address as the address of module B;

Step 2: Module A uses the "AT+OPTION=1,0" command to change the communication mode to Unicast mode;

Step 3: Module A sends user data 1234567890. Sending successfully will return 'Success'; If the transmission fails, it will return NO ROUTE or NO ACK. NO ROUTE represents route establishment failure; NO ACK indicates that the route has been successfully established but no response has been received. If there are 3 NO ACKs, the routing table

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

needs to be re established.

Step 4: Module B received the (ASCII code) 1234567890 sent by Module A and converted it to HEX format of 31 32 33 34 35 36 37 38 39 30 (with different display encoding), and added additional data frame headers.

- The time for initiating unicast requests for the first time varies at different airspeed, with at least 1.5 routing request timeouts

  The first unicast request initiated at 62.5K airspeed requires a wait of approximately 4 seconds,

  The first unicast request initiated at 21.875K airspeed requires a wait of approximately 8 seconds,

  The first unicast request initiated at 7K airspeed requires a wait of approximately 25 seconds.

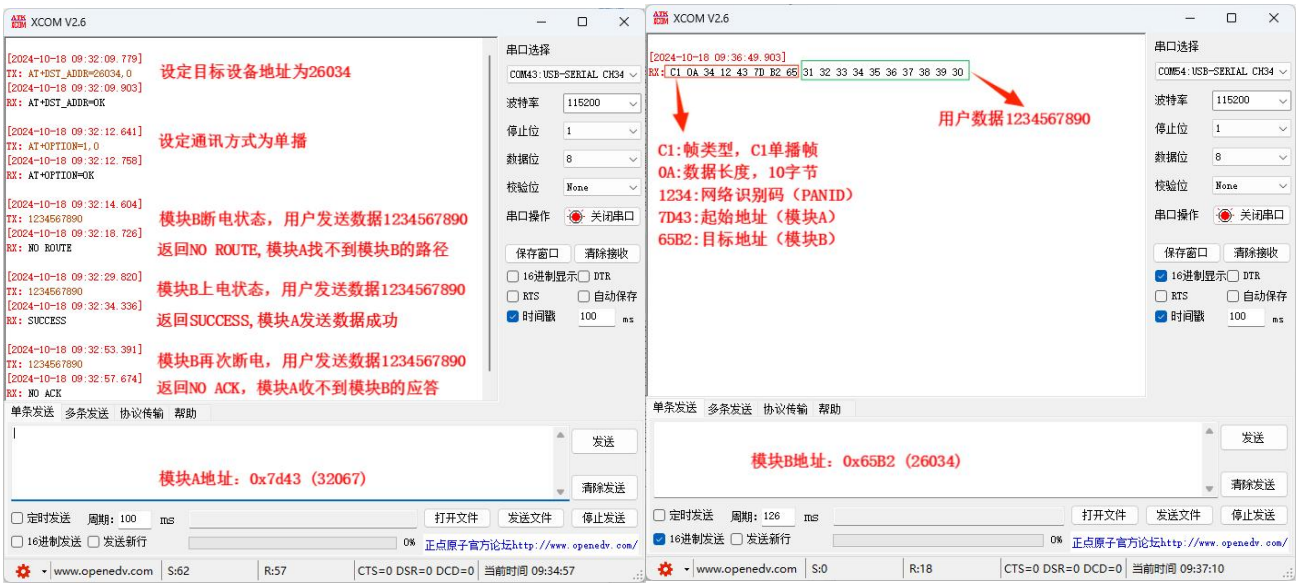


Figure 7.2.1 Unicast communication

7.3 Multicast communication

- The multicast communication method requires advance grouping management of target modules, and all target modules need to be grouped in advance using "AT+GROUP_ADD=<group>".
- <group>can be understood as a public address, and each module can set up to 8 group addresses.
- In multicast mode, the route needs to be re established each time, and it is recommended to initiate multicast continuously at intervals of about 5 seconds.
- AT+GROUP_DEL=<group>"can delete group addresses with a public address of group, and at the same time save the new group information to Flash.
- AT+GROUP_CLK=1 "can clear all group addresses and also clear group information in Flash.
- The routing table can be queried using the "AT+ROUTER-CLR=?" command.
- The data frame header can be closed using the "AT+HEAD=0" command.
- User data cannot be internal AT commands of the module, otherwise it will be recognized as AT commands by the module, resulting in the inability to send user data.

- The basic operation steps of multicast are as follows:

  Step 1: Use "AT+GROUP_ADD=123" to group module B in advance;

  Step 2: Module A uses the "AT+OPTION=2,0" command to change the communication mode to multicast mode;

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Step 3: Module A uses the "AT+DST_ADRD=123,0" instruction to change the communication mode to multicast mode and set the target group address;

Step 4: Module A sends user data 1234567890. Sending successfully will return 'Success'; If the transmission fails, it will return NO ROUTE or NO ACK. NO ROUTE represents route establishment failure; NO ACK indicates that the route has been successfully established but no response has been received. If there are 3 NO ACKs, the routing table needs to be re established.

Step 5: Module B received the (ASCII code) 1234567890 sent by Module A and converted it to HEX format of 31 32 33 34 35 36 37 38 39 30 (with different display encoding), and added additional data frame headers.

- The time for initiating unicast requests for the first time varies at different airspeed, with at least 1.5 routing request timeouts

The first unicast request initiated at 62.5K airspeed requires a wait of approximately 4 seconds,
The first unicast request initiated at 21.875K airspeed requires a wait of approximately 8 seconds,
The first unicast request initiated at 7K airspeed requires a wait of approximately 25 seconds.

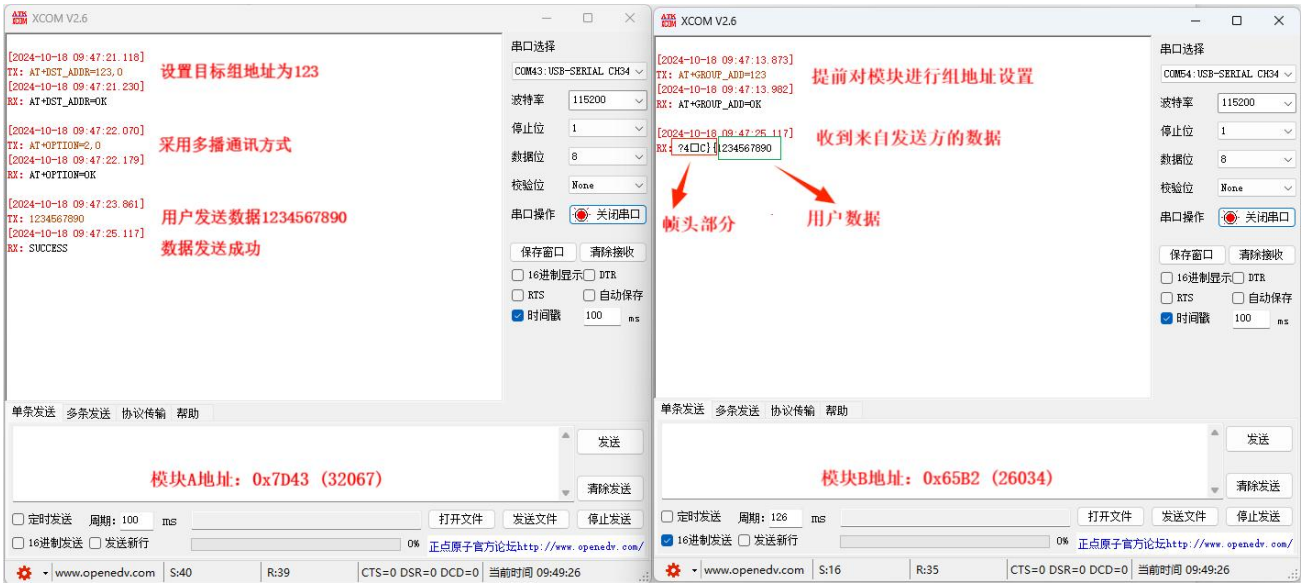


Figure 7.3.1 Multicast communication

7.4 Broadcast

- The broadcast communication method does not require knowing the address of the target module.
- Under the broadcast module, there will be no timeout or need to establish a route, but all receiving modules will forward the data again after receiving it. The built-in CSMA avoidance mechanism and broadcast filtering mechanism in the module can effectively prevent data collision and secondary forwarding.
- User data cannot be internal AT commands of the module, otherwise it will be recognized as AT commands by the module, resulting in the inability to send user data.

- The basic operation steps for broadcasting are as follows:

Step 1: Module A uses the "AT+OPTION=3,0" command to change the communication mode to Broadcast mode;

Step 2: Module A sends user data 1234567890. Sending successfully will return 'Success', and users can wait for' Success' to determine if the data has been sent;

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Step 3: Module B received the (ASCII code) 1234567890 sent by Module A and converted it to HEX format of 31 32 33 34 35 36 37 38 39 30 (with different display encoding), and added additional data frame headers.

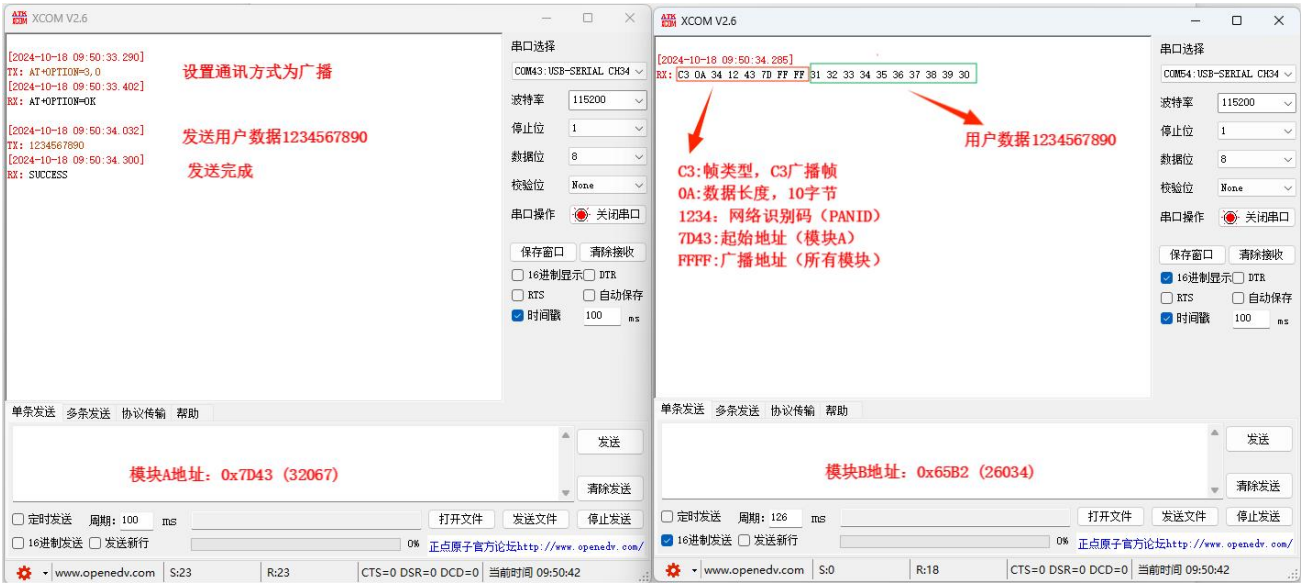


Figure 7.4.1 Broadcasting

7.5 Anycast

- Ubiquitous communication is generally used for communication between different networks, and the network identification codes of different networks are different. Unicast, multicast, and broadcast communication methods cannot directly exchange data between networks. In this case, multicast can be used for data exchange between different networks.
- Ubiquitous communication can send data to individual or all nodes within a single hop coverage range, depending on the set target address.
- Data cannot be relayed or responded to in multicast mode.
- Ubiquitous broadcasting cannot guarantee the reliability of data transmission, similar to simple data transmission.
- User data cannot be internal AT commands of the module, otherwise it will be recognized as AT commands by the module, resulting in the inability to send user data.

- The basic operation steps for pan broadcasting are as follows:

Step 1: Module A uses the instruction "AT+DST_ADRD=26034,0" to configure the target address as the address of module B;

Step 2: Module A or use the "AT+DST_ADRD=65535,0" instruction to configure the target address for all modules;

Step 3: Module A uses the "AT+OPTION=4,0" command to change the communication mode to Anycast mode;

Step 4: Module A sends user data 1234567890. Sending successfully will return SUCESS, and users can wait for Success to determine if the data has been sent;

Step 5: Module B received the (ASCII code) 1234567890 sent by Module A and converted it to HEX format of 31 32 33 34 35 36 37 38 39 30 (with different display encoding), and added additional data frame headers.

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

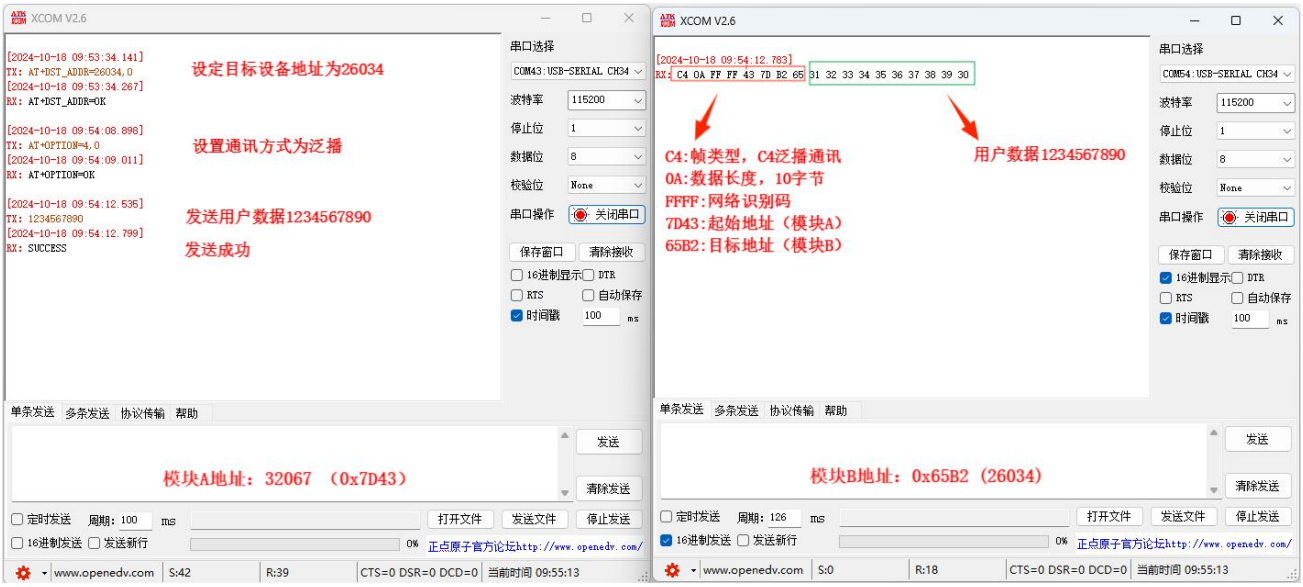


Figure 7.5.1 Anycast communication

7.6 Introduction to the routing table

- The routing table is automatically established by routing requests and cannot be manually modified. It is saved in RAM and will be lost if the module is restarted. The routing table is only for viewing paths, and users do not need to pay attention to it or perform AT command parsing on the routing table.
- The routing table can be saved to Flash using the "AT+ROUTER_SAVE=1" command, and can be loaded using the "AT+ROUTER-RED=1" command when powered on again.

To clear the routing information saved in Flash, you can use the "AT+ROUTER-SAVE=0" command to clear it.

- If you only want to clear the routing information in RAM, you can use the "AT+ROUTER-CLR=1" command to clear it.
- The routing table can be read through three instructions: "AT+ROUTER-CLR=?", "AT+ROUTER-SAVE=?", and "AT+ROUTER-READ=?".
- The routing table contains parameters such as destination address, subordinate address, score, signal strength, etc.
- When the DST and HOP in the routing table are different, it means that the module needs to pass through the routing node to reach the target module.
- The routing information of NO.01 tells the module that if data needs to be sent to the module of 26034, the next level can directly transmit the data to the routing node of 26034.

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000



Figure 7.6.1 Routing table

7.7 Additional frame header information

- When the module receives data from other modules, additional frame header information will be added to the serial output data.
- Frame header meaning:

Frame type	Data length	Network identification code	Starting address	Target address	User data
C1	03	34 12	8E 6C	28 64	01 02 03
C3	01	34 12	AA 71	28 64	AA

  - Frame types: C1 represents unicast frames, C2 represents multicast frames, C3 represents broadcast frames, and C4 represents multicast frames;
  - Data length: User data length, maximum value of 32 bytes;
  - Network identification code: Different networks have different network identification codes, which can determine which network the source is from;
  - Address: specifies the source and destination of data;
  - User data: User data area, maximum 32 bytes.

- In the header of the data frame, the address and network identification bits come first, such as network identification 34 12, which should actually be 0x1234 for easy parsing using structures.
- The data frame header can be closed using the "AT+HEAD=0" command.

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

8 Remote configuration

8.1 Introduction to remote configuration

- In addition to basic communication, the module also supports remote configuration function. Due to the fact that remote configuration can change the basic communication parameters of the entire network, it is necessary to use it with caution to avoid important parameters of certain nodes being changed and unable to communicate normally with the previous network.

- Under remote configuration, it can be divided into two types: single point configuration and broadcast configuration. In both configuration modes, the instruction will be delayed for a certain period of time before execution, in order to maintain the current parameters and continue forwarding data to the next level module, ensuring that the data can be transmitted to the entire network before taking effect.

- In single point configuration, it is also necessary to establish a route in advance. When the target receiving module receives the correct AT command, it will return "+OK" or "+FAIL" via RF to indicate the module's execution result. In the broadcast configuration, it is still the same as basic broadcast communication. All modules that receive data will forward the data once to ensure that all modules in the network can receive this instruction. However, there will be no RF data response in the broadcast configuration.

- The default target port for normal basic communication is port 1, which corresponds to the function of directly outputting user sent data through the serial port and adding additional information frame headers. The target port used for remote configuration is port 14, which corresponds to the function of parsing the remote configuration instructions sent by the user and delaying them for a period of time before executing or responding. The remote configuration command needs to be supplemented with "++" to distinguish it from the local configuration. After the remote configuration is completed, the target port should be restored to port 1 in a timely manner to avoid affecting the next basic communication.

- The delay time varies at different airspeed, and the specific delay time is as follows (a route establishment timeout):
  The instruction delay execution time at 150K airspeed is about 6 seconds,
  The instruction delay execution time at 250K airspeed is about 5 seconds,
  The instruction delay execution time at 1M airspeed is about 4 seconds,
  The instruction delay execution time at 2M airspeed is about 3 seconds.

8.2 Introduction to Remote Single Point Configuration

- The basic operation steps for remote single point configuration are as follows:
  Step 1: Module A uses the instruction "AT+DST_ADRD=26034,0" to configure the target address as the address of module B;
  Step 2: Module A uses the "AT+OPTION=1,0" command to change the communication mode to Unicast mode;

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Step 3: Module A uses the "AT+DST-PORT=14,0" command to modify the target port to the remote parsing AT command function;

Step 4: Module A sends the AT command "++AT+PANID=4660,0". Sending successfully will return 'Success';

Step 5: After receiving the instruction, module B will wait for a timeout period for the establishment of a route, and output the execution result of the corresponding instruction through the serial port. It will respond with "+OK:" or "+FAIL:" through RF, and send the current module parameters through RF. If the sending is successful, it will return "Success";

Step 6: Module A receives module information from module B in response and outputs it through the serial port.

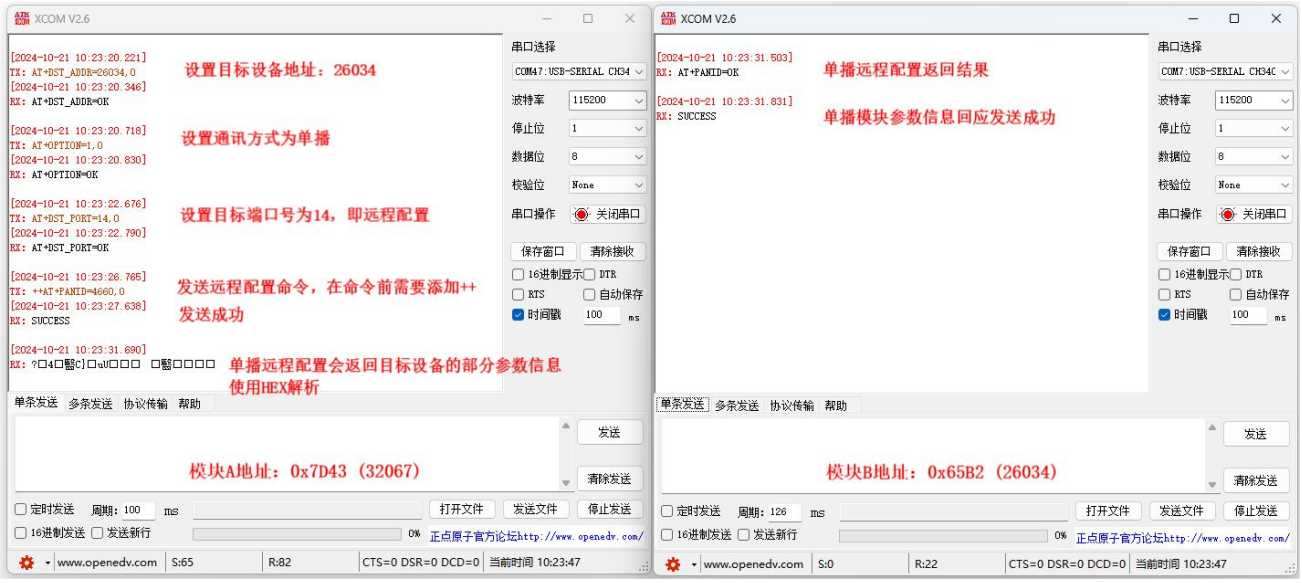


Figure 8.2.1 Remote single point configuration steps

Analysis of parameter information returned by unicast remote configuration（HEX）:



8.3 Introduction to Remote Broadcast Configuration

- The basic steps for configuring remote broadcasting are as follows:

  Step 1: Module A uses the "AT+OPTION=3,0" command to change the communication mode to Broadcast mode;

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Step 2: Module A uses the "AT+DST-PORT=14,0" command to modify the target port to the remote parsing AT command function;

Step 3: Module A sends the AT command "++AT+PANID=4660,0". Sending successfully will return 'Success';

Step 4: After receiving the instruction, module B waits for a timeout period for the establishment of a route and outputs the execution result of the corresponding instruction through the serial port.

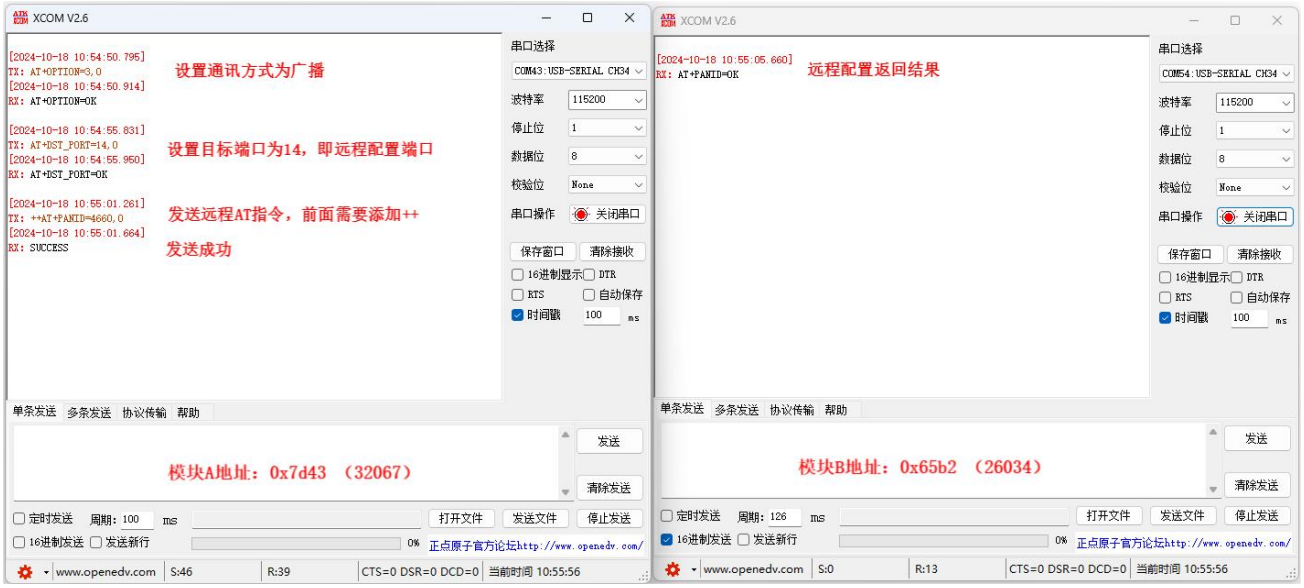


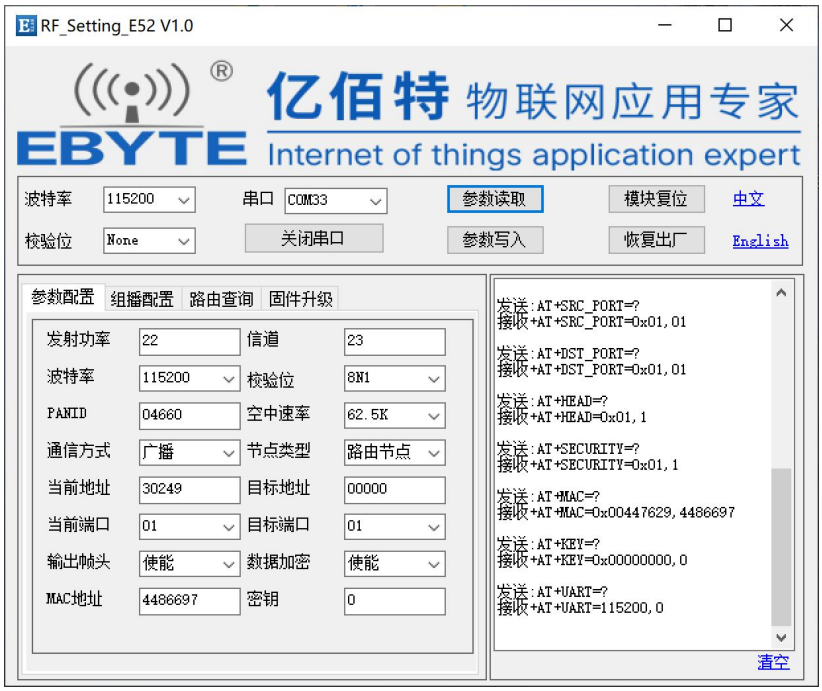
Figure 8.3.1 remote broadcast configuration steps

9 Introduction to test via Computer

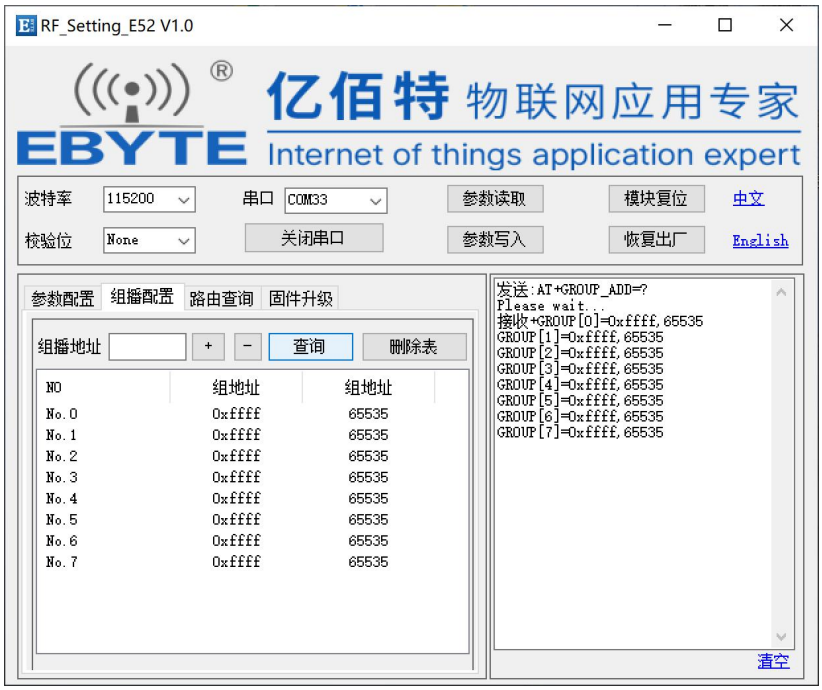
- Users can configure the module using the upper computer provided on the official website. When using it, users need to virtualize the module's serial port into a COM port. The upper computer interface is shown below, with basic function buttons at the top to set the COM port, baud rate, parity, and perform operations such as parameter reading, writing, restoring default settings, and restarting the module. The left side below is the parameter area, and the right side below is the log area, which will print and display the corresponding AT instructions executed. Users can operate the module based on the logs.

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000



- The second page is about multicast related group address settings. Users can add, delete, and query multicast group addresses, which can support up to 8 different addresses.



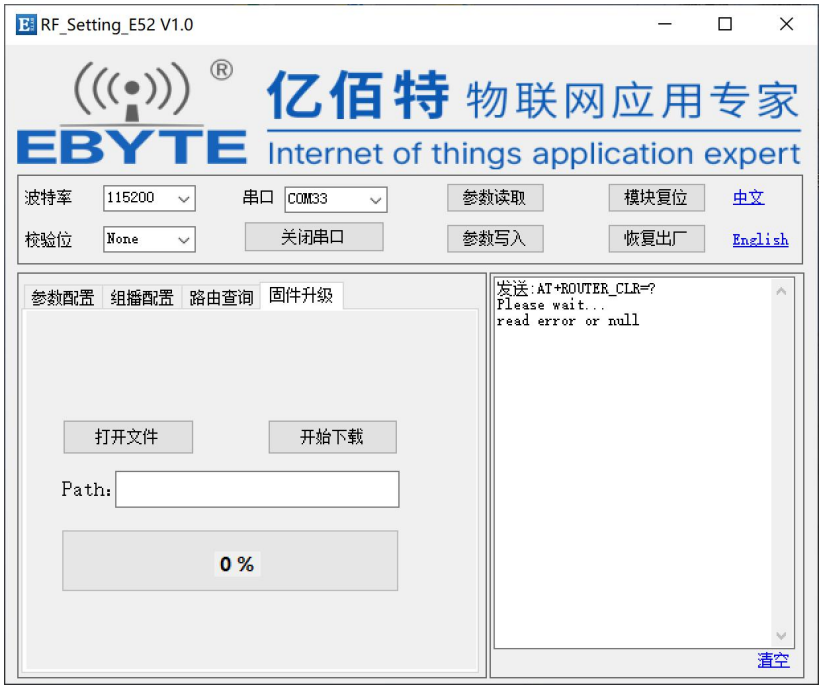
Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- The third page is about routing table related functions, where users can read and clear routing tables, as well as perform read and write operations related to Flash. Due to the large amount of data, it takes about 4 seconds to read the routing table. If there is no routing table information, an error of "read error or null" will be returned.
- The routing table will continuously update the path based on the transmitted data in the network, optimizing the network transmission efficiency.
- It is not recommended to perform routing table reading operations at low baud rates such as 1200, 2400, 4800, as it can take a long time.



- The fourth page is the online upgrade (IAP) function, where users can perform firmware upgrades and generally do not need to upgrade. If accidentally entering IAP upgrade mode, keep the power on for about 30 seconds, and the module will automatically exit IAP upgrade mode, even if restarted.



Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

10 Hardware design

- It is recommended to use a DC stabilized power supply. The power supply ripple factor is as small as possible, and the module needs to be reliably grounded.;
- Please pay attention to the correct connection of the positive and negative poles of the power supply. Reverse connection may cause permanent damage to the module;
- Please check the power supply to ensure it is within the recommended voltage otherwise when it exceeds the maximum value the module will be permanently damaged;
- Please check the stability of the power supply, the voltage can not be fluctuated frequently;
- When designing the power supply circuit for the module, it is often recommended to reserve more than 30% of the margin, so the whole machine is beneficial for long-term stable operation.;
- The module should be as far away as possible from the power supply, transformers, high-frequency wiring and other parts with large electromagnetic interference.;
- High-frequency digital routing, high-frequency analog routing, and power routing must be avoided under the module. If it is necessary to pass through the module, assume that the module is soldered to the Top Layer, and the copper is spread on the Top Layer of the module contact part(well grounded), it must be close to the digital part of the module and routed in the Bottom Layer;
- Assuming the module is soldered or placed over the Top Layer, it is wrong to randomly route over the Bottom Layer or other layers, which will affect the module's spurs and receiving sensitivity to varying degrees;
- It is assumed that there are devices with large electromagnetic interference around the module that will greatly affect the performance. It is recommended to keep them away from the module according to the strength of the interference. If necessary, appropriate isolation and shielding can be done;
- Assume that there are traces with large electromagnetic interference (high-frequency digital, high-frequency analog, power traces) around the module that will greatly affect the performance of the module. It is recommended to stay away from the module according to the strength of the interference. If necessary, appropriate isolation and shielding can be done.
- If the communication line uses a 5V level, a 1k-5.1k resistor must be connected in series (not recommended, there is still a risk of damage);
- Try to stay away from some physical layers such as TTL protocol at 2.4GHz , for example: USB3.0;
- The mounting structure of antenna has a great influence on the performance of the module. It is necessary to ensure that the antenna is exposed, preferably vertically upward. When the module is mounted inside the case, use a good antenna extension cable to extend the antenna to the outside;
- The antenna must not be installed inside the metal case, which will cause the transmission distance to be greatly weakened.

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

11. FAQ

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

11.1 Communication range is too short

- The communication distance will be affected when obstacle exists.
- Data lose rate will be affected by temperature, humidity and co-channel interference.
- The ground will absorb and reflect wireless radio wave, so the performance will be poor when testing near ground.
- Sea water has great ability in absorbing wireless radio wave, so performance will be poor when testing near the sea.
- The signal will be affected when the antenna is near metal object or put in a metal case.
- Power register was set incorrectly, air data rate is set as too high (the higher the air data rate, the shorter the distance).
- The power supply low voltage under room temperature is lower than 2.5V, the lower the voltage, the lower the transmitting power.
- Due to antenna quality or poor matching between antenna and module.

11.2 Module is easy to damage

- Please check the power supply source, ensure it is in right range. Voltage higher than max value will damage the module.
- Please check the stability of power source, the voltage cannot fluctuate too much.
- Please make sure antistatic measure are taken when installing and using, high frequency devices have electrostatic susceptibility.
- Please ensure the humidity is within limited range, some parts are sensitive to humidity.
- Please avoid using modules under too high or too low temperature.

11.3 BER(Bit Error Rate) is high

- There are co-channel signal interference nearby, please be away from interference sources or modify frequency and channel to avoid interference;
- Poor power supply may cause messy code. Make sure that the power supply is reliable.
- The extension line and feeder quality are poor or too long, so the bit error rate is high;

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

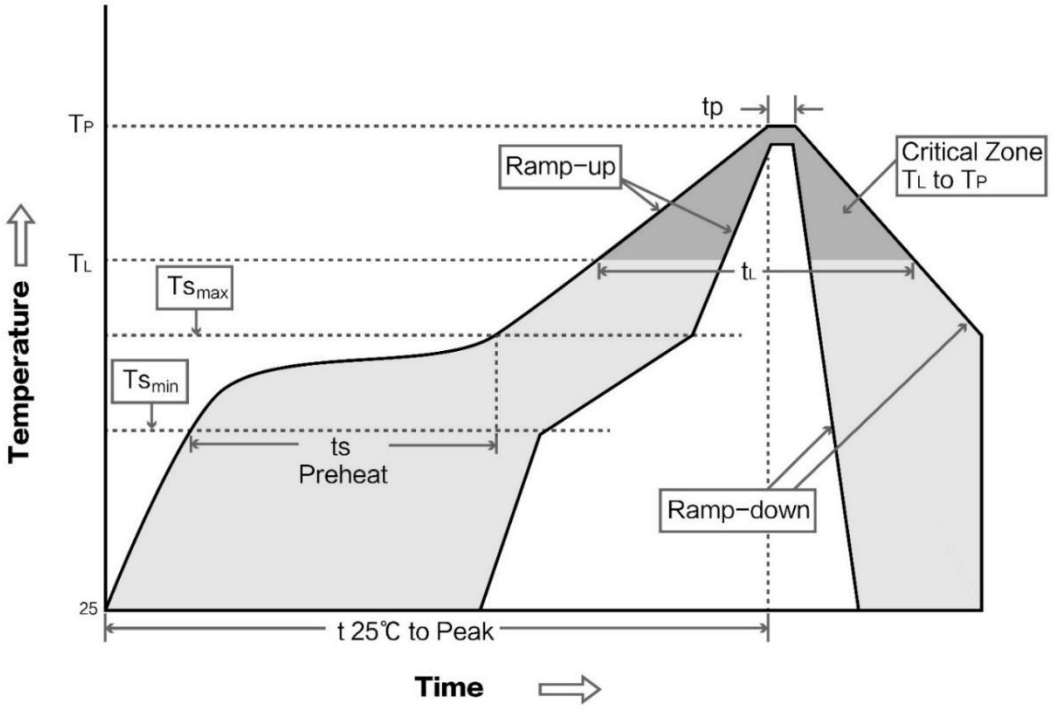
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

12 Production guidance

12.1 Reflow soldering temperature

Profile Feature	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min （Tsmin）	100℃	150℃
Preheat temperature max (Tsmax)	150℃	200℃
Preheat Time (Tsmin to Tsmax)(ts)	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	3℃/second max	3℃/second max
Liquidous Temperature (TL)	183℃	217℃
Time（tL）Maintained Above（TL）	60-90 sec	30-90 sec
Peak temperature（Tp）	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	6℃/second max	6℃/second max
Time 25℃ to peak temperature	max 6 minutes	max 8 minutes

12.2 Reflow soldering curve



Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

13 E52 series

Model No.	Band MHz	Tx power dBm	Distance km	Air data rate bps	Package	Size mm	Antenna
E52-400NW22S	410.125~ 509.125	22	2.5	7k～62.5k	贴片	14*20	IPEX/Stamp hole
E52-900NW22S	850.125~ 929.125	22	2.5	7k～62.5k	贴片	14*20	IPEX/Stamp hole

14 Antenna guidance

Model No.	Type	Band	Gain	Size	Cable	Interface	Feature
		Hz	dBi	mm	cm		
TX2400-NP-5010	FPC antenna	2.4G	2.0	10x50	-	IPEX	Flexible FPC soft antenna
TX2400-JZ-3	Rubber antenna	2.4G	2.0	30	-	SMA-J	Ultra short straight, omnidirectional antenna
TX2400-JZ-5	Rubber antenna	2.4G	2.0	50	-	SMA-J	Ultra short straight, omnidirectional antenna
TX2400-JW-5	Rubber antenna	2.4G	2.0	50	-	SMA-J	Fixed bend, omnidirectional antenna
TX2400-JK-11	Rubber antenna	2.4G	2.5	110	-	SMA-J	Flexible rubber rod, omnidirectional antenna
TX2400-JK-20	Rubber antenna	2.4G	3.0	200	-	SMA-J	Flexible rubber rod, omnidirectional antenna
TX2400-XPL-150	Sucker antenna	2.4G	3.5	150	150	SMA-J	Small suction cup antenna, cost-effective

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Revision history

Version	Date	Description	Issued by
1.0	2024-12-11	Initial version	Bin
1.1	2025-08-18	Content revision	Bin

About us

Hot line:4000-330-990
Technical support: support@cdebyte.com
Documents and RF Setting download link: https://www.cdebyte.com
Thank you for using Ebyte products! Please contact us with any questions or suggestions: info@cdebyte.com
---
Address: B2 Mould Park, 199# Xiqu Ave, High-tech District, Sichuan, China

Chengdu Ebyte Electronic Technology Co.,Ltd.

Copyright ©2012 – 2025，Chengdu Ebyte Electronic Technology Co.,Ltd

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000