



DX-BT24 SERIES

MASTER MODULE SERIAL UART

APPLICATION GUIDE

Version: 2.1

Date: 2022-01-05



Update Record

Version	Date	Illustrate	Author
V2.1	2022/01/05	initial version	DL

Contact Us

Shenzhen DX-SMART Technology Co., Ltd.

Email: sales@szdx-smart.com

Tel: 0755-29978125

Web: www.szdx-smart.com

Add: Room 601, Block A1, Huafeng Zhigu, Hangkong Road, Baoan District, Shenzhen

Contents

1. Introduction	- 5 -
1.1. Applicable Modules	- 5 -
1.2. Serial Port Basic Parameters	- 5 -
1.3. AT Command And Transparent Transmission Mode	- 5 -
1.4. Module Data Throughput	- 6 -
1.5. Computer Test Software	- 7 -
2. Serial Port Usage	- 7 -
2.1. Use Serial Port To Read And Write AT Commands	- 7 -
2.1.1. Module Test Minimal System	- 7 -
2.1.2. The Process Of Reading And Writing AT Commands On The Computer	- 9 -
2.1.3. MCU Read And Write AT Command Process	- 10 -
2.2. Use Serial Communication	- 11 -
2.2.1. Use Master Bluetooth To Communicate With Slave Modules	- 11 -
2.2.2. How To Make Master-Slave Modules Match In Pairs	- 12 -
3. Detailed Explanation Of Related AT Commands	- 12 -
3.1. Command Format Description	- 12 -
3.2. Indication Format	- 13 -
3.3. Examples Of AT Commands	- 13 -
4. AT Command	- 13 -
4.1. Basic Commands	- 13 -
4.1.1. Test Command	- 13 -
4.1.2. Read Firmware Version	- 14 -
4.1.3. Read MAC Address	- 14 -
4.1.4. Read/Write Local Name	- 14 -
4.1.5. Set/Query—Serial-port Stop Bit	- 14 -
4.1.6. Set/Query—Serial-port Parity Bit	- 15 -
4.1.7. Set/Query—UART Baudrate	- 15 -
4.1.8. Disconnect Bluetooth	- 15 -
4.1.9. Software Reset	- 16 -
4.1.10. Restore Factory Settings	- 16 -
4.2. Connect Instruction	- 16 -
4.2.1. Set/Query—Module Search Mode	- 16 -
4.2.2. Set/Query—Filter Signal Strength	- 17 -
4.2.3. Set/Query—Search Time Length	- 17 -
4.2.4. Manually Search For Bluetooth Devices	- 18 -
4.2.5. Manually Connect A Bluetooth Device	- 18 -
4.2.6. Connect To The Specified Address Bluetooth	- 19 -

4.2.7. Set/Query—Bind Bluetooth Address	- 19 -
4.2.8. Set/Query—Automatically Connect To Bluetooth Devices	- 19 -
4.2.9. Clear Connection Memory	- 20 -
4.3. List Of Error Codes	- 20 -
5. Value-added Services	- 21 -

Picture index

Figure 1 : Computer serial port software diagram	- 7 -
Figure 2 : Module minimum system diagram	- 8 -
Figure 3 : Demonstration diagram of computer serial port	- 9 -
Figure 4 : Read and write AT command logic reference diagram	- 10 -
Figure 5 : Master-slave module communication flow chart	- 11 -

1. Introduction

DX-SMART Technology DX-BT24 series main mode Bluetooth module has 5.1 Bluetooth protocol, and the module has built-in standard serial port protocol. You can communicate with our slave bluetooth modules, including BT24 series, BT04-E series and other bluetooth modules of our company, through the serial port of this module. You can connect and communicate between devices through the master-slave module, so as to join the Internet of Things at a very low cost and at a very fast speed, making the devices more convenient and smart.

1.1. Applicable Modules

Series	Module
BT24 series	BT24
	BT24-S

1.2. Serial Port Basic Parameters

- Module serial port default parameters: 9600bps/8/n/1 (Baud/Data /No parity/Stop Bits)

1.3. AT Command And Transparent Transmission Mode

- AT command mode: When the module is not connected to other slave devices, it is in command mode and can respond to commands.
- Transparent Transmission Mode: After the module is connected to other devices, it is in transparent transmission mode, and data can be transmitted at this time.

1.4. Module Data Throughput

Data throughput			
Master module -> BT24 series slave		BT24 series slave->Master module	
Baud	115200	Baud	115200
connection interval(ms)	15	connection interval(ms)	15
data pack(bytes)	240	data pack(bytes)	240
send interval(ms)	20	send interval(ms)	20
Throughput(bytes/s)	8918	Throughput(bytes/s)	8918
Characteristic	Write without Response	Characteristic	Notify
Master module->BT04-XX Dual mode slave		BT04-XX Dual mode slave->Master module	
Baud	115200	Baud	115200
connection interval(ms)	15	connection interval(ms)	15
data pack(bytes)	20	data pack(bytes)	20
send interval(ms)	20	send interval(ms)	20
Throughput(bytes/s)	694	Throughput(bytes/s)	694
Characteristic	Write without Response	Characteristic	Notify
Master module -> BT04-XX BLE mode slave		BT04-XX BLE mode slave->Master module	
Baud	115200	Baud	115200
connection interval(ms)	15	connection interval(ms)	15
data pack(bytes)	40	data pack(bytes)	40
send interval(ms)	20	send interval(ms)	20
Throughput(bytes/s)	1380	Throughput(bytes/s)	1380
Characteristic	Write without Response	Characteristic	Notify

Remark

The data in the above table is for reference only. The maximum MTU value supported by this module is 253. The data throughput is related to the MTU value of the mobile phone's Bluetooth and the connection interval. The actual data shall prevail.

1.5. Computer Test Software

Please download and install the sscom5.13.1 computer serial port software in the data package for the computer test software for testing. The serial port software interface is as follows:

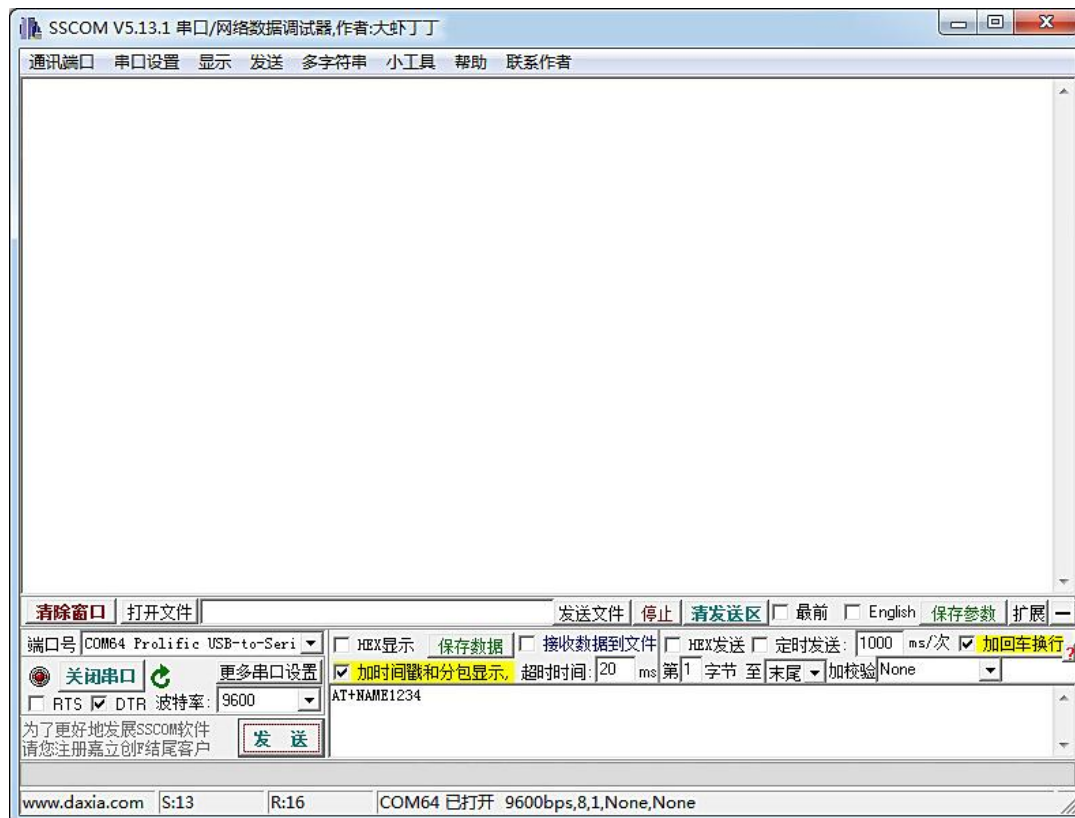


Figure 1: Computer serial port software diagram

2. Serial Port Usage

2.1. Use Serial Port To Read And Write AT Commands

2.1.1. Module Test Minimal System

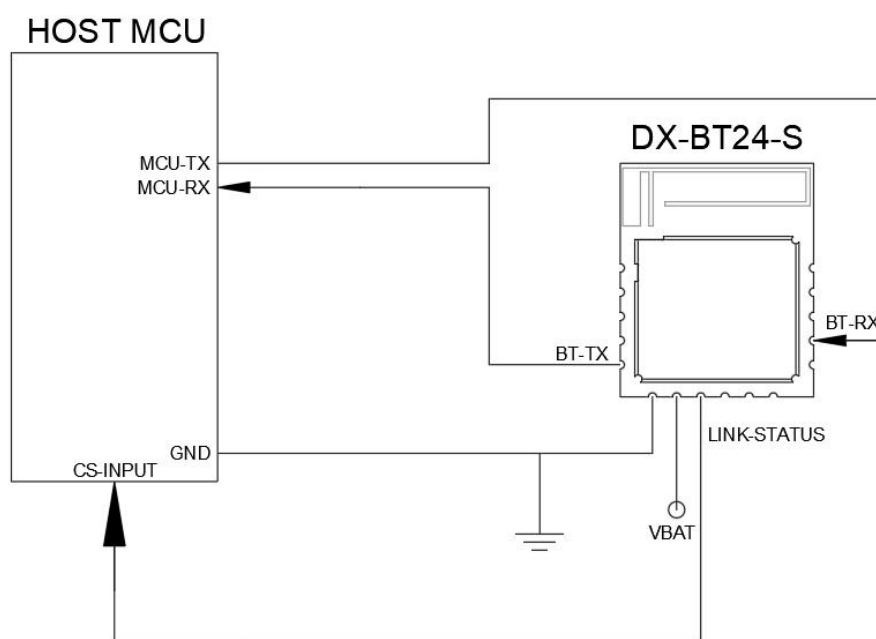
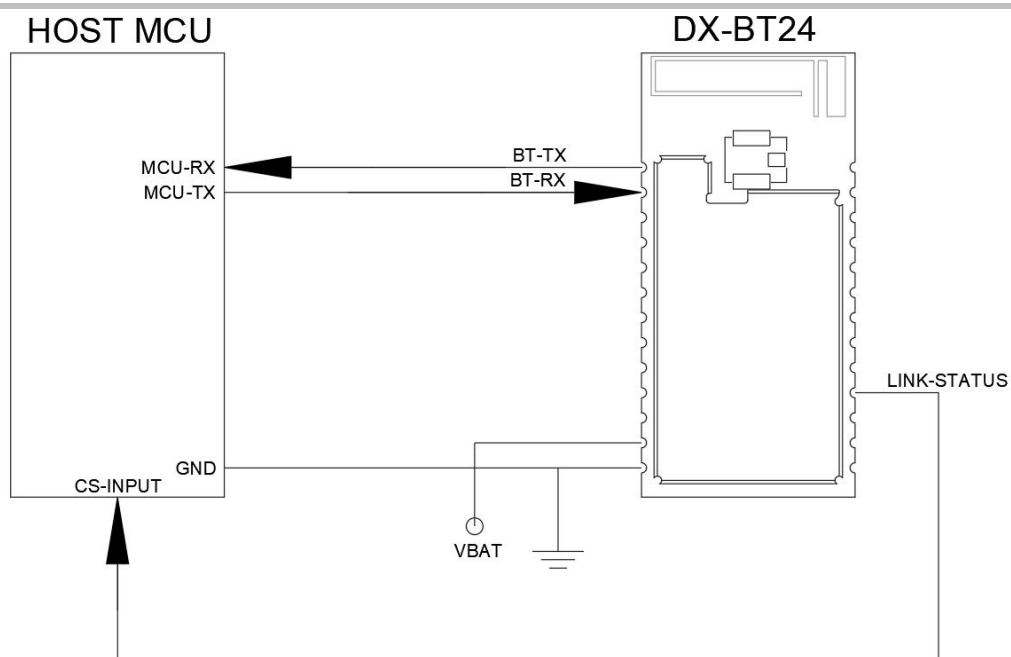


Figure 2: Module minimum system diagram

2.1.2. The Process Of Reading And Writing AT Commands On The Computer

Install the serial assistant software on the computer, use the USB to TTL serial cable to communicate with the module, refer to "Module Test Minimum System" for wiring, and then send AT commands to query and configure parameters. Note: The power supply of the module is 3.3V.

Example: Change the name of the Bluetooth module to: 1234.

Install the sscom5.13.1 computer serial port software, open the serial port software and select the corresponding COM port, and configure the default parameter configuration of the serial port software installation: 9600bps/8/n/1 (baud rate/data bit/no parity/stop bit), Fill in the corresponding AT+NAME1234 command, and be sure to add a carriage return and line feed (you can directly press the Enter key) or check "Add carriage return and line feed", and then send the command, as shown below:

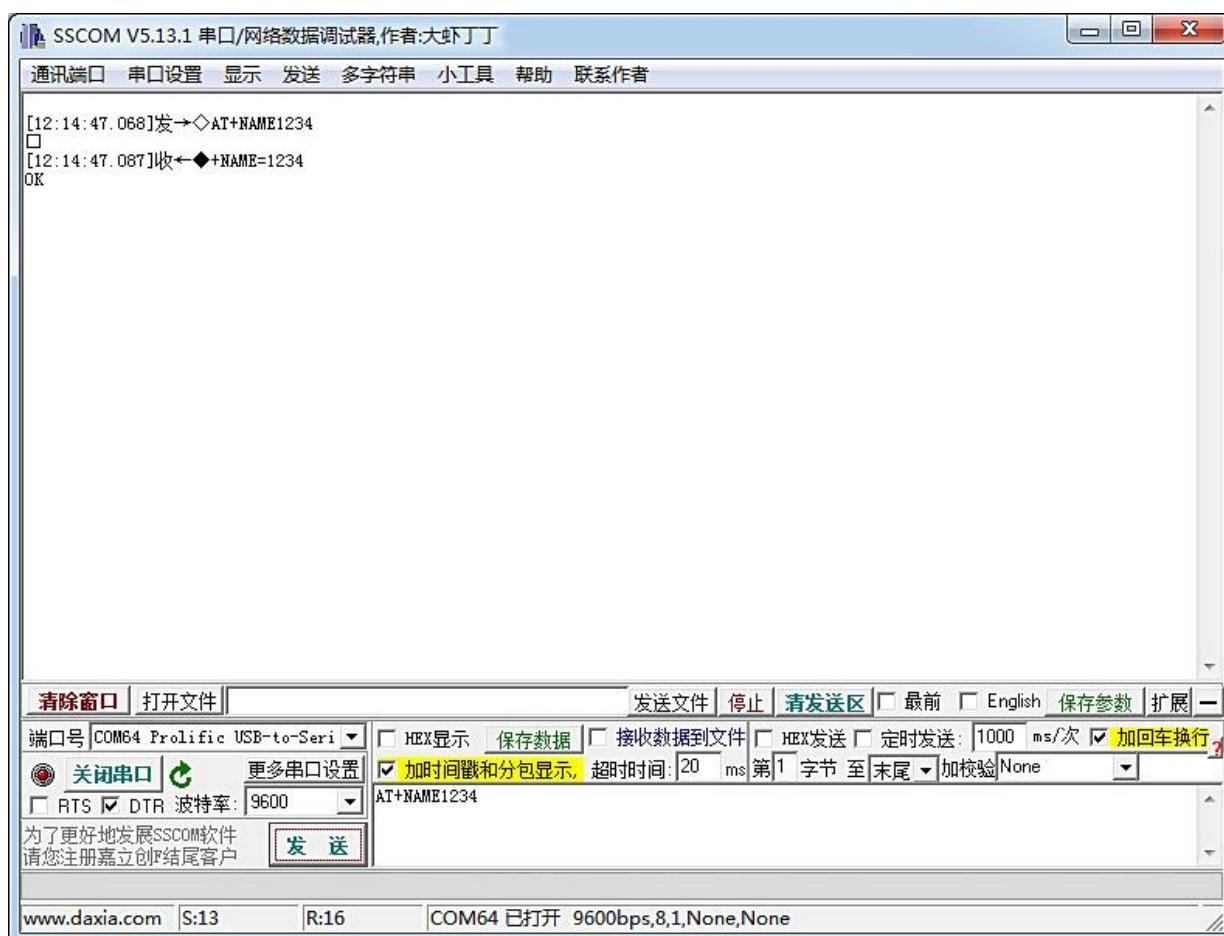


Figure 3: Demonstration diagram of computer serial port



2.1.3. MCU Read And Write AT Command Process

For the wiring of MCU reading and writing AT commands, please refer to "Module Test Minimum System". For example, modify the Bluetooth name and query the Bluetooth address code. The specific instruction program logic flow refers to the following figure:

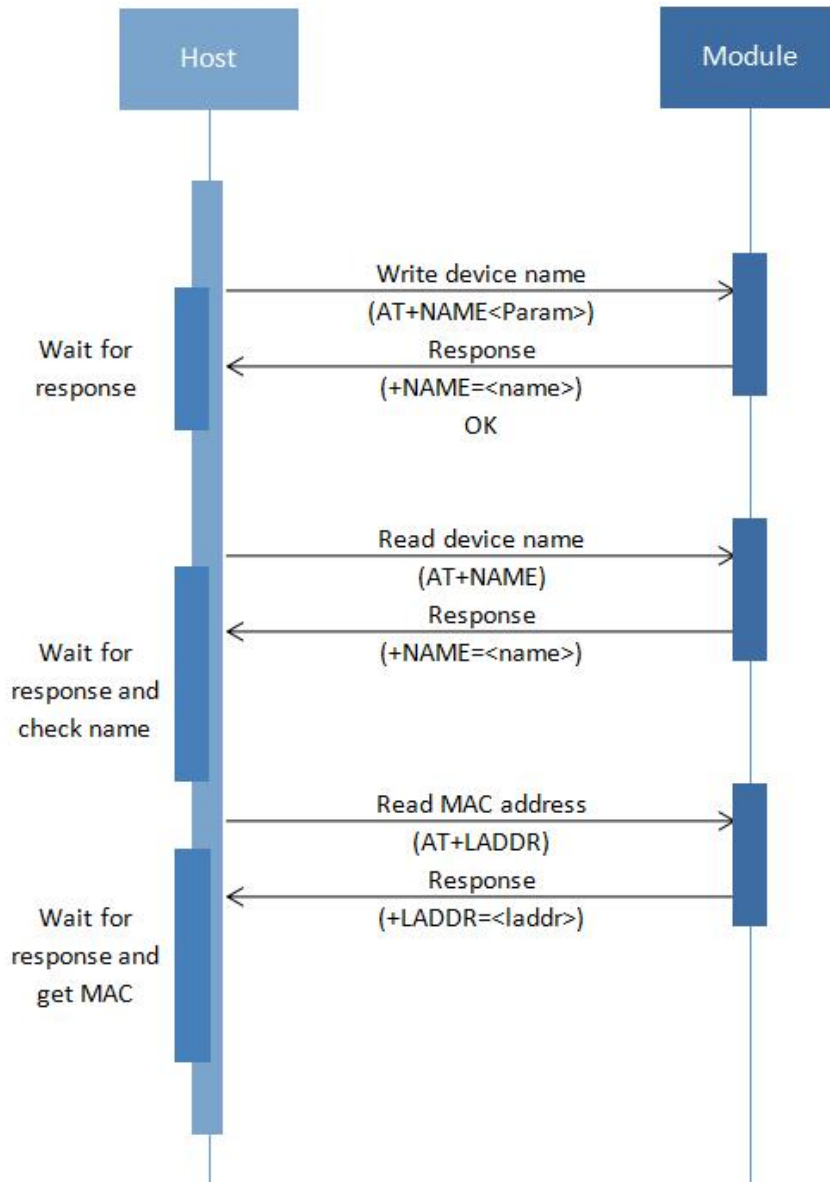


Figure 4: Read and write AT command logic reference diagram



2.2. Use Serial Communication

2.2.1. Use Master Bluetooth To Communicate With Slave Modules

The connection between the master module and the slave module needs to use AT commands to connect and communicate. The process is as follows:

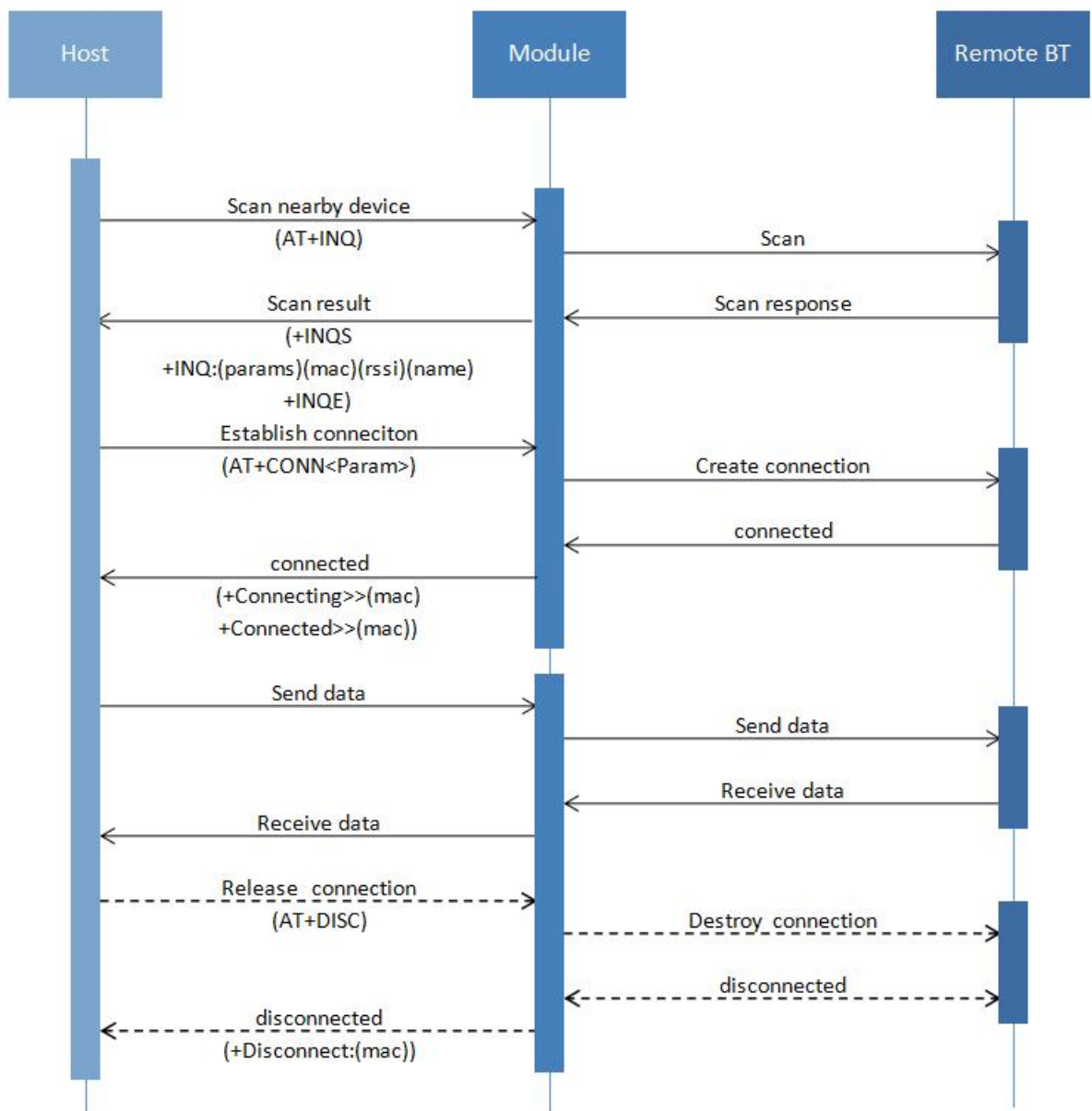


Figure 5: Master-slave module communication flow chart



2.2.2. How To Make Master-Slave Modules Match In Pairs

The master module is BT24, the slave module is BT24, and the two modules are used in pairs.

Example: Use pairing mode to quickly connect the slave module. The pairing mode is to facilitate the master module to connect with the specified slave quickly and accurately when there are multiple slaves in the surrounding area.

- Use the AT command to set the main module mode to mode 2, that is, send AT+MODE2, and then set the module to automatic connection, that is, send AT+AUTOCONN1.
- Let the slave module enter the pairing mode, that is, pull down the KEY pin of the slave module for at least 100ms until it is connected to the master module and then release it. Or send the pairing mode command, that is, send AT+SEADV534d4152542d00 to let the module enter the pairing mode. To exit pairing mode, send AT+CLEARADV to clear.
- After the main module is connected to the slave module, the main module will bind the bluetooth address code of the slave module. Even after power failure or disconnection, the main module will automatically connect to the slave module. To clear the binding, send AT+CLEAR or use the key to clear.

3. Detailed Explanation Of Related AT Commands

3.1. Command Format Description

AT+Command<param1, param2, param3> <CR><CF>

- All commands start with AT , end with <CR><LF> , In the table showing commands and responses in this document, <CR><LF> is omitted, and only commands and responses are displayed.



- All AT command characters are uppercase.
- <>The content inside is optional, If there are multiple parameters in the command, Separate by comma ",", The angle brackets are not included in the actual command.
- <CR>stands for "carriage return" \r, corresponding hex is 0X0D.
- <LF>stands for "line feed" \n, corresponding hex is 0X0A.
- The command is executed successfully, the corresponding command is returned and ends with OK, and EEROR=<> if it fails, The content of "<>" is the corresponding error code (Please refer to 4.3.)

3.2. Indication Format

+Indication<=param1, param2, param3><CR><CF>

- All Indication starts with plus sign "+", ends with <CR><CF>
- "=" is followed by the indication parameter
- If indication has multiple parameters, parameters must be separated by ",", "

3.3. Examples Of AT Commands

Example: Modify the name of the Bluetooth device to 1234

Send: AT+NAME1234

Return: +NAME=1234

OK

4. AT Command

4.1. Basic Commands

4.1.1. Test Command

Function	Command	Response	Description
Test command	AT	OK	Test uart communication

4.1.2. Read Firmware Version

Function	Command	Response	Description
Read version	AT+VERSION	+VERSION= <version>	<version >firmware version According to different modules and customized requirements version will be different

4.1.3. Read MAC Address

Function	Command	Response	Description
Read MAC address	AT+LADDR	+LADDR= <laddr>	<laddr>MAC address

4.1.4. Read/Write Local Name

Function	Command	Response	Description
Read Bluetooth name	AT+NAME	+NAME= <name>	<name>Bluetooth name The maximum length is 28 bytes Default name: BT24
Write Bluetooth name	AT+NAME<name>	+NAME= <name> OK	

Remark:

After setting this command, it needs to restart to take effect.

4.1.5. Set/Query—Serial-port Stop Bit

Function	Command	Response	Description
Query stop bit	AT+STOP	+STOP= <param>	< param>Serial number
Set stop bit	AT+STOP<param>	+STOP= <param>	0: 1 stop bit

OK

1: 2 stop bit

Defaults: 0

Remark:

After setting this command, it needs to restart to take effect.

4.1.6. Set/Query—Serial-port Parity Bit

Function	Command	Response	Description
Query parity bit	AT+PARI	+PARI=<param>	< param>Serial number
Set parity bit	AT+PARI<param>	+PARI=<param> OK	0: No Parity 1: Odd parity 2: Even parity Defaults: 0

Remark:

After setting this command, it needs to restart to take effect.

4.1.7. Set/Query—UART Baudrate

Function	Command	Response	Description
Read Baudtate	AT+BAUD	+BAUD=<baud>	<baud>serial number of Baudrate
Write Baudtate	AT+BAUD<baud>	+BAUD=<baud> OK	1:2400 5: 38400 2:4800 6: 57600 3:9600 7:115200 4: 19200 Defaults: 3(9600)

Remark:

After setting this command, it needs to restart to take effect.

4.1.8. Disconnect Bluetooth

Function	Command	Response	Description
Disconnect	AT+DISC		

Remark:

This command can only be used in transparent transmission mode, and can only be sent by the serial port, and is invalid when sent by the mobile phone. It is also possible to disconnect by pressing a key.

If the automatic search and automatic connection functions are turned on, after the main module is disconnected, the module will wait 5 seconds before reconnecting to the memorized Bluetooth address. The purpose of this action is to give the main module time to respond to the command.

4.1.9. Software Reset

Function	Command	Response	Description
Software Reset	AT+RESET	+RESET OK Power On	

4.1.10. Restore Factory Settings

Function	Command	Response	Description
Restore factory settings	AT+DEFAULT	+DEFAULT OK Power On	

4.2. Connect Instruction

4.2.1. Set/Query—Module Search Mode

Function	Command	Response	Description
Query module search mode	AT+MODE	+ MODE<Param>	<param>(0、1、2、3)

Set module search mode	AT+MODE<Param>	+ MODE<Param> OK	0: normal mode
			1: Filter manufacturer information
			2: pairing mode
			3: Get IBEACON information schema
			Defaults: 0

Remark:

- Normal mode: All BLE Bluetooth devices around can be searched. (Note: Only our slave modules can be connected, other devices cannot be connected.)
- Filter manufacturer information: Only modules in the broadcast package with our company's manufacturer information can be searched.
- Pairing mode: Only slave devices with pairing mode turned on can be searched.
- Get IBEACON information schema: After this mode is turned on, you can scan to obtain surrounding IBeacon broadcast packet information.
IBeacon search returns the format as: INQ:<param>,<uuid>,<rssi>,<name>,<mac>
Example of IBeacon search:
+INQS
+INQ:1,1a4c0215fda5693a4e24fb1afcfc6eb76478251527c04cc5,-62,BT24,202105211ad7
+INQE
Devices Found 1

4.2.2. Set/Query—Filter Signal Strength

Function	Command	Response	Description
Query filter signal strength	AT+SCANRSSI	+SCANRSSI<rssi>	<rssi>signal strength1-100(decimal)
Set filter signal strength	AT+SCANRSSI<rssi>	OK	Defaults: 100

Remark:

After setting the signal strength, the master module can only search for the slave modules whose signal strength is less than or equal to the set value.

4.2.3. Set/Query—Search Time Length

Function	Command	Response	Description
Query search time length	AT+TIMEINQ	+TIMEINQ<time>	<time>time (1-200) *100ms
Set search time length	AT+TIMEINQ<time>	OK	Defaults: 10

4.2.4. Manually Search For Bluetooth Devices

Function	Command	Response	Description
Search for bluetooth devices	AT+INQ	OK	
		+INQS	<param>serial number
		+INQ:<param>,<mac>,<rss>,<name>	<mac>address code
		+INQ:<param>,<mac>,<rss>,<name>	<rss>Signal value
		<name>set name
		+INQE	<x>number(up to 8)
		Devices Found <x>	

4.2.5. Manually Connect A Bluetooth Device

Function	Command	Response	Description
Connect Bluetooth device	AT+CONN<param>	+Connecting>> <mac>	<param>serial number
		+Connected>> <mac>	<mac>address code

Remark:

Example

Send: AT+INQ

Return: OK

+INQS

+INQ:1,98dac032a6dd,-49,BT04-A

+INQ:2,202105211ad7,-59,BT24

+INQE

Devices Found 2

Need to connect BT24

Send: AT+CONN2

Return: +Connecting>>0x202105211ad7

+Connected>>202105211ad7

4.2.6. Connect To The Specified Address Bluetooth

Function	Command	Response	Description
Connect Bluetooth device	AT+CONA<mac>	+Connecting>><mac> +Connected>><mac>	<mac> address code

Remark:

Example, Connect to the remote specified Bluetooth device address: 112233AABBCC

Send: AT+CONA112233AABBCC

Return: +Connecting>> 0x112233aabbcc

+Connected>>112233aabbcc

4.2.7. Set/Query—Bind Bluetooth Address

Function	Command	Response	Description
Query bind bluetooth address	AT+BIND	+BAND<mac>	<mac> address code
Set bind bluetooth address	AT+BIND<mac>	OK	

Remark:

Example, The binding Bluetooth device address is: 112233AABBCC

Send: AT+BIND112233AABBCC

Return: OK

After binding the Bluetooth address, the module will automatically search and connect the device every time it is powered on. If you need to clear the binding, you can send AT+CLEAR to clear it. It can also be cleared by pressing the key.

4.2.8. Set/Query—Automatically Connect To Bluetooth Devices

Function	Command	Response	Description
Query module	AT+AUTOCONN	+AUTOCONN<param>	<param> (0, 1)

connection mode			0: Turn off
Set module connection mode	AT+AUTOCONN<param>	OK	1: Turn on Defaults: 0

Remark:

- 1、 After setting this command, it needs to restart to take effect.
- 2、 Set to automatic connection, after the master module is connected to the slave device, the master module will remember the Bluetooth address of the slave module, and the master module will automatically connect to the slave module after disconnection or reconnection. If you need to connect a new device, you can clear the memory Bluetooth address by pressing the button or AT+CLEAR.
- 3、 Set to automatic connection, if in AT+MODE0, AT+MODE1 mode, the module will automatically randomly search and connect peripheral slave devices. If in AT+MODE2 mode, the module only connects to the slave device that is in pairing state. If multiple modules go into pairing state, they will connect to slave devices randomly. This command is invalid in AT+MODE3 mode.

4.2.9. Clear Connection Memory

Function	Command	Response	Description
clear connection memory	AT+CLEAR	OK	

Remark:

This command can be used to clear the Bluetooth address code that the module automatically reconnects after the automatic search connection is turned on. You can also use the button to clear, please refer to the button status description in the Bluetooth technical manual for details.

4.3. List Of Error Codes

The detailed information of the error code in ERROR=<> is listed as follows:

Return Value	Error Message
101	Parameter length error
102	Parameter format error
103	Abnormal parameter data



5. Value-added Services

In order to meet the various functional requirements of customers, our company can provide the following technical value-added services:

- Module program customization, such as: IO function port customization, AT command customization, broadcast package customization, etc.
- Module PCB hardware customization, Can be customized to customer's hardware requirements.
- Various Bluetooth solutions can be customized, and a complete set of Bluetooth software and hardware solutions can be customized according to customer needs.
- A complete set of networking solutions can be customized, and a complete set of networkable and gateway solutions can be customized according to customer needs.

If you have the above customization requirements, please contact our sales staff directly.