



# **DX-BT33**

# **Multi master multi slave serial port application guide**

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# 1. Introduction

DX-BT33 Bluetooth module is built by SHEN ZHEN DX-SMART TECHNOLOGY CO.,LTD,. for intelligent wireless data transmission. It uses NORDIC nRF52833 chip, the chip architecture is ARM Cortex-M4, the main frequency is 64 MHz, and follows the Bluetooth BLE 5.1 protocol specification. Support AT command, users can change the serial port baud rate, device name and other parameters according to the need, flexible use. This module supports UART, SPI, I2C interface, support IO port control, ADC acquisition, has advantages of low cost, low power consumption and high receiving sensitivity, just with a few peripheral components can realize its powerful function, and can customize according to customer requirements to develop a variety of projects.

## 1.1. A serial port basic parameters

- Module serial default parameters: 9600BPS / 8 / n / 1 (baud rate/data/no calibration/stop bit)
- Module BLE UUID: SERVICE UUID: FFE0  
NOTIFY/ WRITE UUID: FFE1  
The WRITE UUID: FFE2

## 1.2. AT command mode and transparent transmission mode

- The AT command mode: module in delivering instruction "+ + +", is the command mode, can respond to commands.
- Passthrough mode: module connected to the other equipment, and send the instruction "+ + +", namely to passthrough mode, can begin to transmit data at this time.



### 1.3. Module data throughput

Data throughput			
BT33(relay module) ->BT33(4 slave modules)		BT33 (relay module) - > BT33 (4 main module)	
Baud rate	9600	Baud rate	9600
Interconnection time (ms)	15	Interconnection time (ms)	15
APP packet size (bytes)	240	UART packet large (bytes)	240
Sending interval (ms)	300	Sending interval (ms)	300
Throughput (bytes/s)	800	Throughput (bytes/s)	800
Characteristic	Write without Response	Characteristic	Notify
BT33(4 master modules) ->BT33(Relay modules) ->BT33(4 slave modules)			
Baud rate		9600	
Interconnection time (ms)		15	
APP packet size (bytes)		83	
Sending interval (ms)		1000	
Throughput (bytes/s)		83	
Characteristic		Write without Response->BT33->Write without Response	
BT33 from module (4) - > BT33 (relay module) - > BT33 (4) main module			
Baud rate		9600	
Interconnection time (ms)		15	
APP packet size (bytes)		75	
Sending interval (ms)		1000	
Throughput (bytes/s)		75	
Characteristic		Notify->BT33->Notify	
BT33(4 master modules) <-BT33(relay modules) ->BT33(4 slave modules)			
Baud rate		9600	
Interconnection time (ms)		15	
APP packet size (bytes)		120	
Sending interval (ms)		250	
Throughput (bytes/s)		480	
Characteristic		Notify<-BT33->Write without Response	



**Notes:**

The data in the above table is for reference only. This module supports the maximum MTU value of 244. The data throughput is related to the MTU value of the mobile phone Bluetooth and the connection interval, and the data is subject to the actual.

## 2. PC tools

### 2.1. Pc-side testing software

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

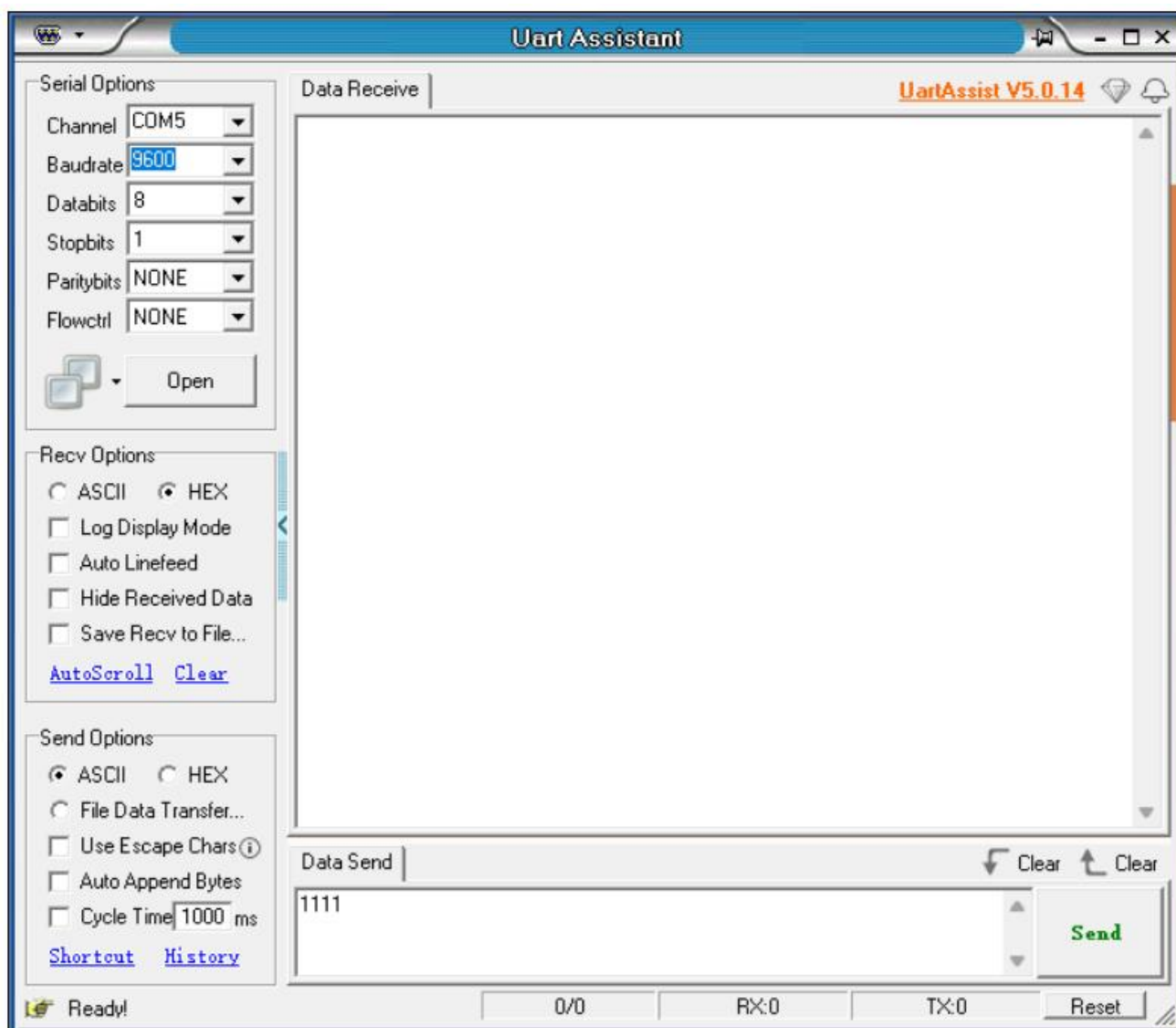


Figure 1: Computer side serial port software diagram



## 3. Serial port usage

### 3.1. Read and write the AT command using the serial port

#### 3.1.1. Module test minimum system

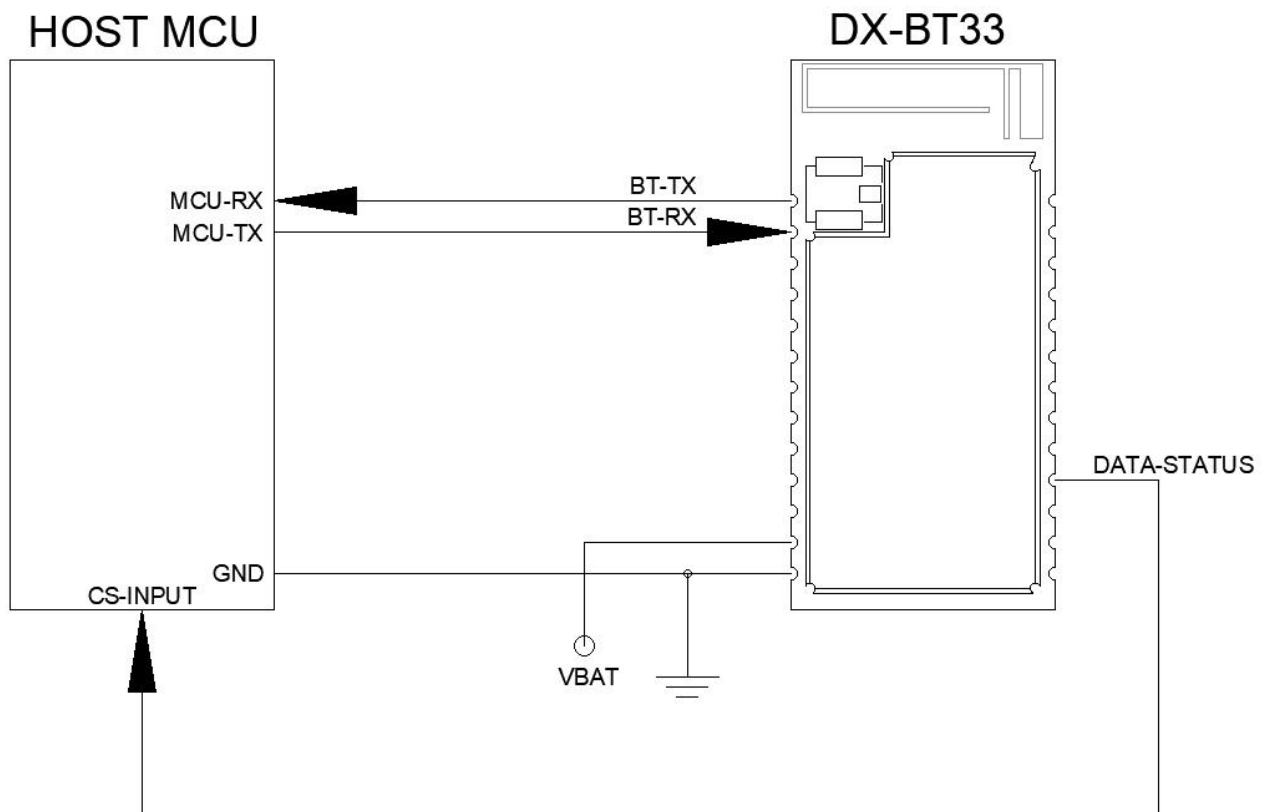


Figure 2: Module minimum system diagram



### 3.1.2. Computer terminal to read and write the AT command processes

Install the serial port assistant software on the computer side, use the USB to TTL serial port cable to connect with the module for communication, refer to the "module test minimum system" for wiring, and then send the AT command to query and configure parameters. Note: the module power supply of 3.3 V.

Example: Change the baud rate of Bluetooth module to: 115200.

Install Uart Assistant computer serial port software, open the serial port software and select the corresponding COM port, install the default parameter configuration of the serial port software, that is, 9600bps/8/n/1 (baud rate/data bit/no parity/stop bit), fill in the corresponding command, and be sure to add 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:

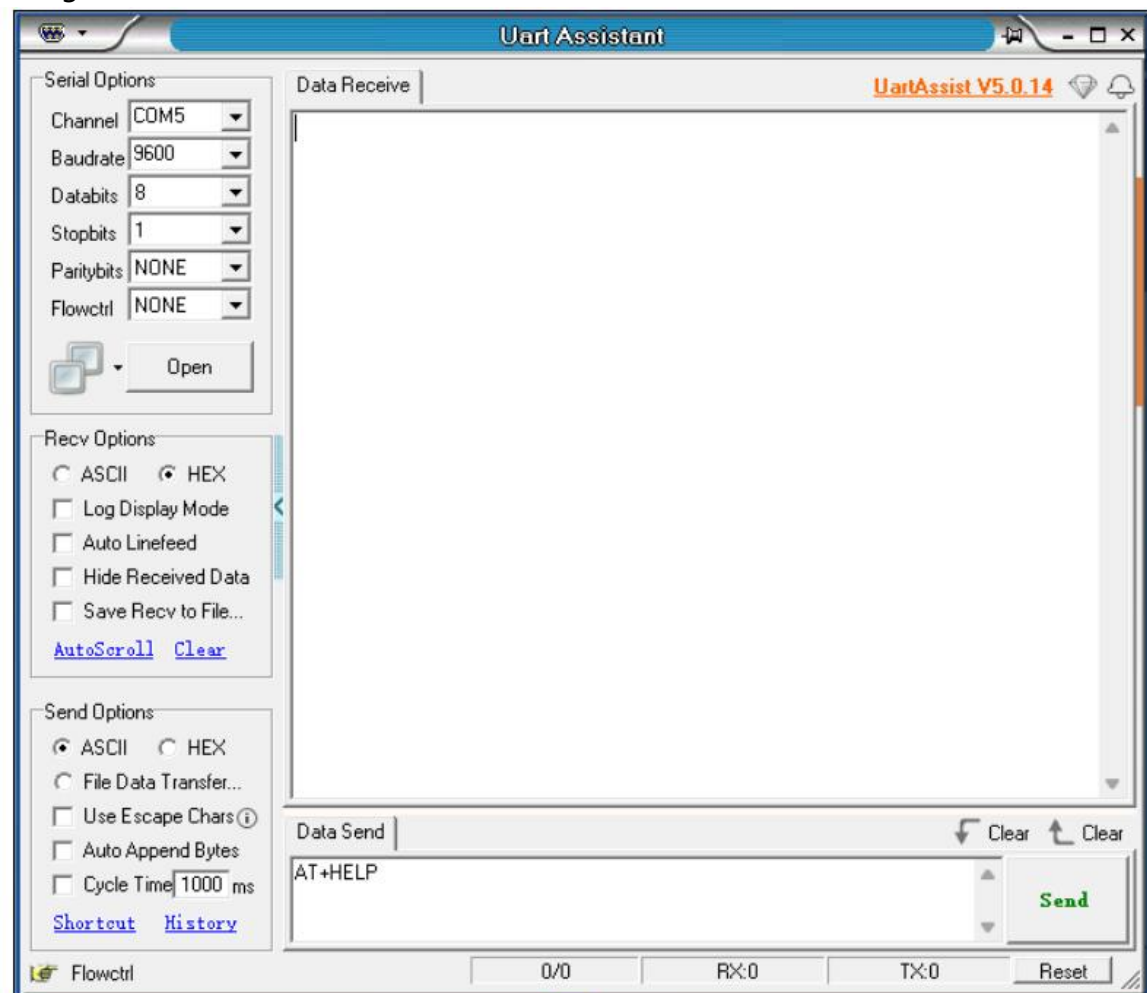


Fig.3: Computer serial port demonstration diagram



### 3.1.3. MCU read and write AT command process

Read and write AT command wiring at MCU side refer to "Module Test Minimum System". For example, modify the baud rate of the module and query the version of the module. Refer to the following figure for the logical flow of the specific instruction program:

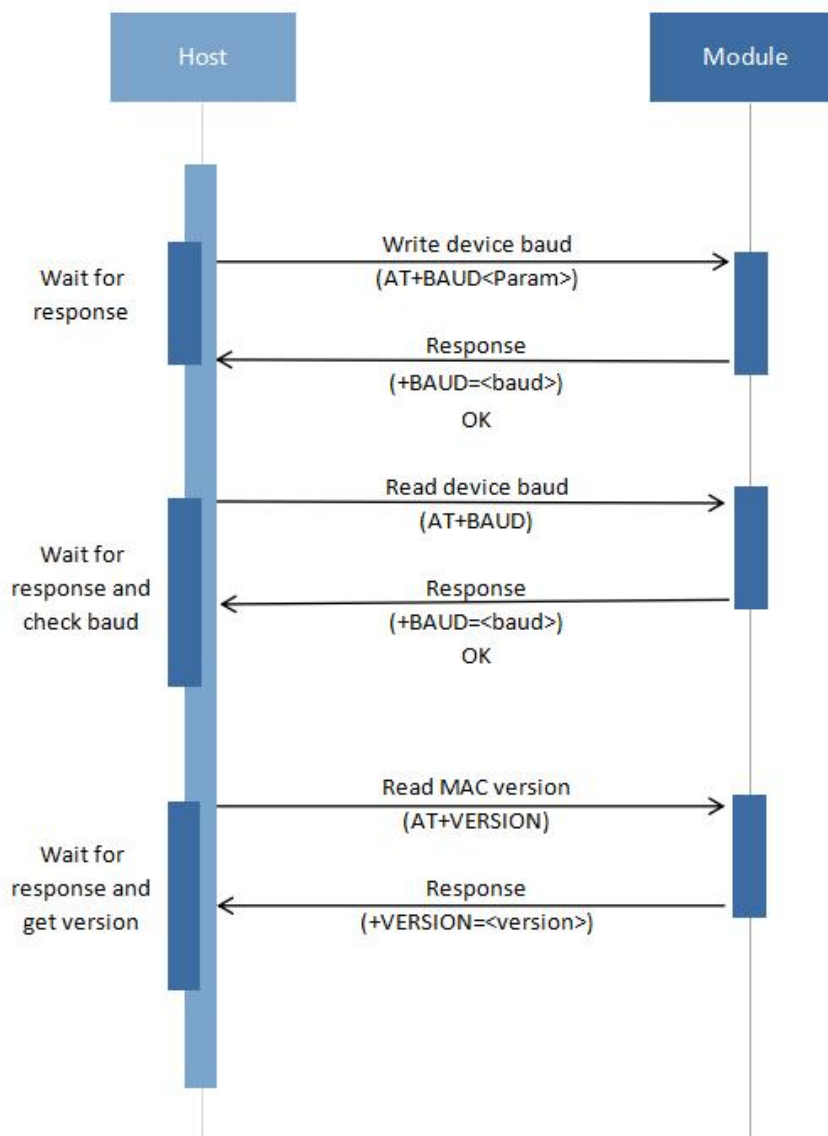


Figure 4: reading and writing the AT command logic reference



## 3.2. Using a serial port communication

### 3.2.1. Use master module to communicate with slave module

Main module and the module connection you need to use the AT command to connect and communications, the process below:

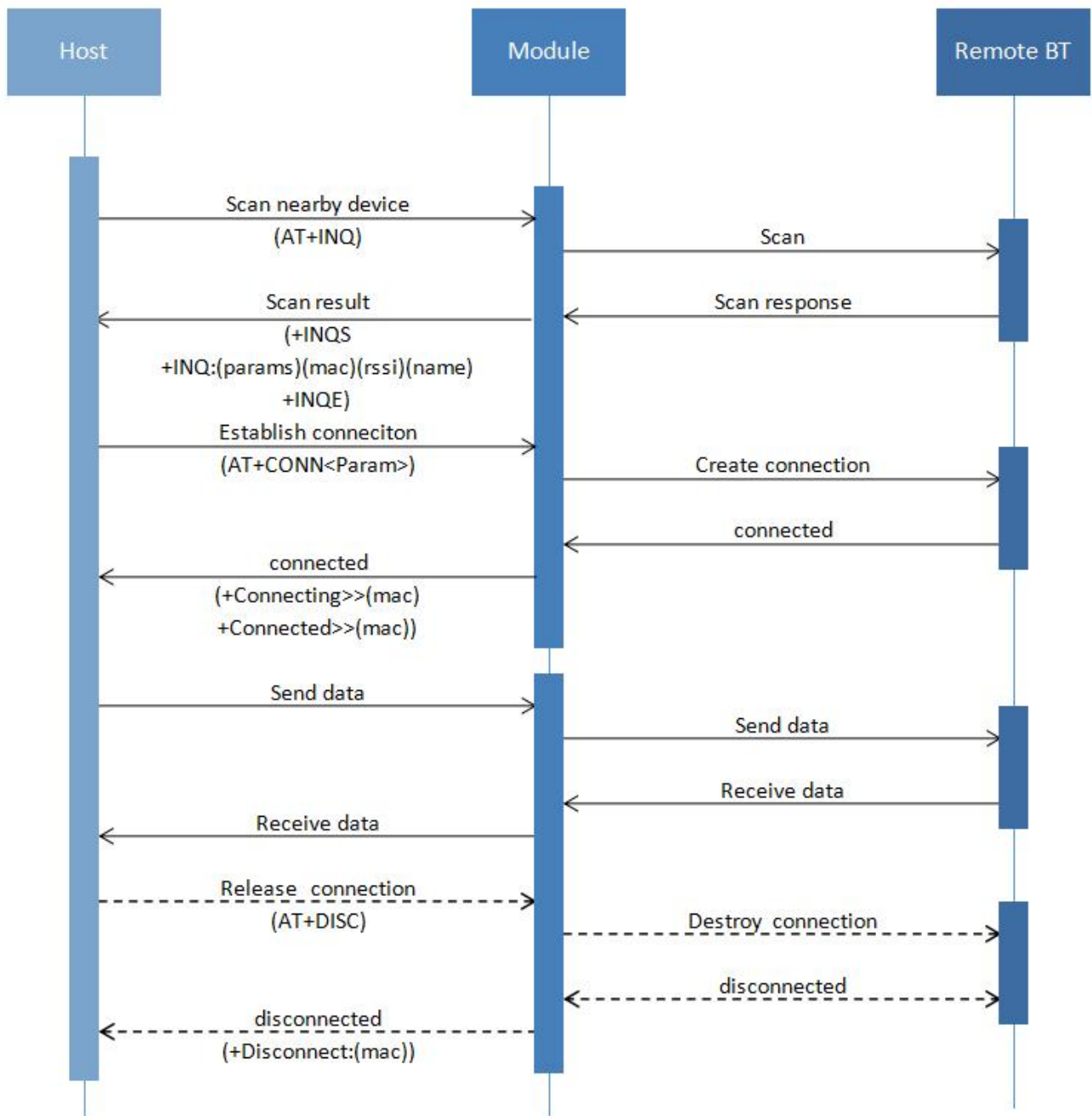


Figure 5: Master and slave module communication flow chart



### 3.2.2. Example of master-slave communication

BT33 can as host and from the machine at the same time, as a host to connect 4 from the machine, as from the machine, the most by four host connection. Here is an example of BT33 communicating with other slaves as a host:

*Note:* a. BT33 as from a machine, unable to specify a host to communicate, send information, all the host receives the data;

B. BT33 as from the machine, send data, need to send "+ + +" into passthrough mode, return to Transfer, you can send data

#### 3.2.2.1. Manually searching for connections

1. Search for slave module: AT+INQ
2. Connect slave module: AT+CONN<param>, <param> is the searched slave serial number, connect multiple slaves can repeat this step
3. To obtain a LIST from module: the AT + LIST
4. Specify the slave to send data: AT+DEVICE<param1><param2>, where param1 is the slave serial number for step 3 and param2 is the data to send
5. Send data to all the slave module: send "+ + +", return Transfer, you can send data
6. Exit transparent transmission mode: send "+ + +" and return AT, indicating that the AT instruction mode has been switched

*Note:* a. If you need to bind the slave address code, you can send the instruction AT+SAVE after step 2

b. After binding the slave address code, the slave can not continue to search, if you need to clear the binding, you can send AT+CLEAR, AT+RESET in turn

C. binding from the machine address code, if the automatic reconnection even failure, can send command AT + RECOVER to reconnect

D. alone as a host module, can be sent AT + CLOSEADV0, closed radio in order to reduce power consumption

#### 3.2.2.2. Automatically search for connections

1. Open automatically search: the AT + AUTOCONN < param >, < param > for the number of connections from the machine, the range of 0 ~ 4
2. Restart module: AT+RESET, instruction AT+AUTOCONN needs to be restarted to take effect
3. To obtain a LIST from machine: the AT + LIST
4. Specify the slave module to send data: AT+DEVICE<param1><param2>, where param1 is the slave serial number for step 3 and param2 is the data to send
5. Send data to all slaves module: send "+ + +" and return Transfer to send data





6. Exit transparent transmission mode: send "+++" and return AT, indicating that the AT instruction mode has been switched

*Note:* a. If you need to connect the specified name slave module, you need to send AT+FILTER1<param> before step 1, <param> is the name of the specified slave

b. You can specify the Bluetooth names of up to 3 slave modules, please refer to instructions 5.3.5 to 5.3.7 for details

c. This mode will bind the address code of the slave. If the automatic connection fails, the command AT+RECOVER can be sent to reconnect

D. if you want to shut down automatically search and remove the binding, can in turn send instructions: AT + AUTOCONN0, AT + CLEAD, AT + RESET

E. alone as a master module, you can send the AT + CLOSEADV0, closed radio in order to reduce power consumption

### 3.2.3. Example of relay communication

#### 3.2.3.1. Relay mode explanation

When BT33 is used as a relay node, it can be connected by up to 4 hosts and connect 4 slaves simultaneously. Hosts and slaves under the same relay node have the following characteristics::

1. Hosts cannot send data to each other; slaves cannot send data to each other. When the host sends data, all slaves receive it. From the slave, all the hosts receive the data

2. When a host sends data, all slaves will receive it; when a slave sends data, all hosts will receive it. Data protection mechanism, relay nodes exist forward interval, the host to send data need to pay attention to send interval, specific relationship is as follows:

3. When the relay node receives data, it will only forward the data and will not output it through the serial port. For  $N=4$ ,  $T=250\text{ms}$

a: Forwarding interval  $T$  and the number of slaves  $N$ :

When  $N=1$ ,  $T=50\text{ms}$ ;

When  $N=2$ ,  $T=100\text{ms}$ ;

When  $N=3$ ,  $T=180\text{ms}$ ;

When  $N=4$ ,  $T=250\text{ms}$ .

b. Transmission interval =  $M \times$  Forwarding interval, where  $M$  is the number of hosts.

For example, when there are 4 slaves and 1 host on the relay node, the host sending interval is 250ms; There are 4 slaves and 4 hosts, The host sending interval is 1000ms

#### 3.2.3.2. Example of relay operation

1. Set to relay mode: AT+MODE1

2. Communicate with the slave: Refer to 3.2.2.1 and 3.2.2.2 for details



## 4. Related AT commands are explained in detail

### 4.1. Command Format Description

**AT+Command<param1, param2, param3> <CR><LF>**

- All of the instructions in the AT the beginning, < CR > < LF > over, in this document to show command and response table, omitted the < CR > < LF >, show only the command and response.
- All AT command characters are uppercase.
- < > for optional content, if there are multiple parameters in command, separated with a comma ", ", actually does not include the brackets in the command.
- <CR> is the carriage return character \r, which is 0X0D in hexadecimal.
- <LF> is the newline character \n, which is 0X0A in hexadecimal.
- If the instruction is executed successfully, the corresponding command is returned with the end of OK, and if it fails, EEROR=<> is returned with the corresponding error code in "<>" (please refer to 5.4).

### 4.2. Response Format Description

**+ Indication < = param1, param2, param3 > < CR > < LF >**

- The response instruction begins with the plus sign "+" and ends with <CR><LF>
- Equals "=" followed by the response argument
- If there are multiple parameters in response to the parameters, you will be separated with a comma ","
-



### 4.3. An example of the AT command

Example: modify the bluetooth device baud rate to 115200

Send: AT+BAUD9

Return: +BAUD=9

OK

### 4.4. List of AT commands

Instructions	Functions	Instructions
AT	Test instructions	Used to test the serial port
AT+VERSION	Query version number	The version will be different depending on the module and custom requirements
AT+NAME	Query Bluetooth name	Default: BT33
AT+STOP	Set \ Query serial port stop bit	Default: 0 (1 stop bit)
AT+PARI	Set \ Query serial port check bits	Default: 0 (no parity)
AT+BAUD	Set \ Query baud rate	Default: 3 (9600)
AT+RESET	Software restart	-
AT+DEFAULT	factory data reset	-
AT+MUUID	Set the UUID	Default: ffe0
AT+MCHAR	Open NOTTYFY	Default value: ffe1
AT+MWRITE	Write UUID	Default: ffe2
AT+SUUID	As the slave set and host communication UUID	Default: ffe0
AT+SCHAR	As slave set and host communication NOTTYFY UUID	Default value: ffe1
AT+SWRITE	WRITE UUID as slave set and host communication	Default: ffe2
AT+LIST	Get the connected list	Connect slave shows name Host does not show name
AT+INQ	A manual search bluetooth devices	-
AT+CONN	Connect your Bluetooth device manually	-



AT+AUTOCONN	Open Auto Connect	Off by default
AT+FILTER1	Filter device name prefix 1	After setting the filter Bluetooth name, the module will only connect Bluetooth devices with that name
AT+FILTER2	Filter device name prefix 2	-
AT+FILTER3	Filter device name prefix 3	-
AT+RECOVER	Recover list connection	-
AT+SAVE	Save existing connection	-
AT+CLEAR	Clear the currently saved connections (all)	-
AT+MODE	Module whether to relay mode after the connection is established	The AT + MODE0 closed relay mode AT+MODE1 turn relay mode on
AT+DISC	Disconnect the designated link connection	-
+++	Switch between AT command mode and data send mode	-
AT+DEVICE	Specify send to a device	-
AT+ADVI	Set broadcast intervals	Default: 5; Range: 0-F
AT+CLOSEADV	Broadcast switch	The AT + CLOSEADV0 radio and shut down The AT + CLOSEADV1 radio on



## 5. The AT command,

### 5.1. Basic instructions

#### 5.1.1. Test instructions

function	Instructions	Response	Instructions
Test instruction	AT	OK	For testing the serial port

#### 5.1.2. Query software version

Features	Instructions	Response	Instructions
Query version number	AT+VERSION	+VERSION=<version>	The < version > software version number The version will be different depending on the module and custom requirements

#### 5.1.3. Settings \ Query Bluetooth device name

function	Instructions	Response	Instructions
Query Bluetooth name	AT+NAME	+NAME=<name>	<name> Bluetooth name, up to 20 bytes long
Set up the bluetooth name	AT+NAME<name>	+NAME=<name> OK	The default name: BT33

**Remark:**

After setting this instruction, it should be restarted to take effect.

#### 5.1.4. Set \ query - stop bit serial port

Features	Instructions	Response	Instructions
Query the serial port stop bit	AT+STOP	+STOP=<param>	< param> sequence number
Set up a serial port stop bit	AT+STOP<param>	+STOP=<param> OK	1:1 stop bit 2:2 stop bit Default: 1

**Notes:**

After setting this instruction, it should be restarted to take effect.

#### 5.1.5. Set \ Query - serial port check bit

function	Instructions	Response	Instructions
Query the serial port check bit	AT+PARI	+PARI=<param>	< param> sequence number 0: No validation
Set the check digit serial port	AT+PARI<param>	+PARI=<param> OK	1: even check Default: 0

**Notes:**

After setting this instruction, it should be restarted to take effect.

#### 5.1.6. Set \ query - a serial port baud rate

function	Instructions	Response	Notes
Query baud rate	AT+BAUD	+BAUD=<baud>	<baud> The baud rate corresponds to the serial number
Set baud rate	AT+BAUD<baud>	+BAUD=<baud>	0:1200 Let 200



OK	1:2400	6:38400
	2:4800	7:56 000
	"600	8:57 600
	4:14,400	But in 5200
	Default value: 3 (9600).	

**Notes:**

After setting this instruction, it should be restarted to take effect.

### 5.1.7. Software to restart

Features	Instructions	Response	Instructions
Software to restart	AT+RESET	Power On	

### 5.1.8. factory data reset

Features	Instructions	Response	Instructions
factory data reset	AT+DEFAULT	OK Power On	

## 5.2. Broadcast packet command

### 5.2.1. Setup \ Query - Host SERVICE SERVICE UUID

Features	Instructions	Response	Instructions
Query the host service UUID	AT+MUUID	+MUUID = <param>	UUID < param > host service
Set the host service UUID	AT+MUUID<param>	+MUUID = <param> OK	The default host service UUID: ffe0

**Notes:**

After setting this instruction, it should be restarted to take effect. If need to change the UUID to 128, please contact our customer service staff custom procedures.

**For example:**

Modify the primary module service UUID to 0xFFE0.

Send: AT + MUUIDffe0

Returns: OK

### 5.2.2. Set \ query - host notifications NOTIFY UUID \ WRITE WRITE UUID

function	Instructions	Response	Notes
Query module notification \ Write UUID	AT+MCHAR	+MCHAR=<param>	< param > notice \ write parameters Default value: ffe1
Set module notice \ writing UUID	AT+MCHAR<param>	+MCHAR=<param> OK	This channel is read-write and can be read or written

**Notes:**

After setting this instruction, it should be restarted to take effect.

### 5.2.3. Settings \ Query - Host writes WRITE UUID

Features	Instructions	Response	Instructions
Query host write UUID	AT+MWRITE	+MWRITE=<param>	<param> Host writes UUID
Set the host writing UUID	AT+MWRITE<param>	+MWRITE=<param> OK	Default value: ffe2

**Notes:**

After setting this instruction, it should be restarted to take effect.

### 5.2.4. Settings \ Query - Slave SERVICE SERVICE UUID

function	Instructions	Response	Notes
----------	--------------	----------	-------





Write UUID queries from the machine	AT+SUUID	+SUUID= <param>	Write UUID < param > host
Write UUID Settings from the machine	AT+SUUID<param>	+SUUID= <param> OK	Default value: ffe0

#### Notes:

After setting this instruction, it should be restarted to take effect. If need to change the UUID to 128, please contact our customer service staff custom procedures.

#### For example:

Modify the slave module service UUID to 0xFFE0.

Send: AT + SUUIDffe0

Returns: OK

### 5.2.5. Settings \ Query - Slave notification NOTIFY UUID

Features	Instructions	Response	Instructions
Query module notifies UUID	AT+SCHAR	+SCHAR= <param>	< param > notice \ write parameters
Set module notification UUID	AT+SCHAR<param>	+SCHAR= <param> OK	Default value: ffe1

#### Notes:

After setting this instruction, it should be restarted to take effect.

### 5.2.6. Set \ query - from machine writing WRITE UUID

function	Instructions	Response	Instructions
Query host write UUID	AT+SWRITE	+SWRITE= <param>	Write UUID < param > host
Set the host writing UUID	AT+SWRITE<param>	+SWRITE= <param> OK	Default value: ffe2



#### Notes:

After setting this instruction, it should be restarted to take effect.

## 5.3. Connection instructions

### 5.3.1. To obtain a list is connected

function	Instructions	Response	Instructions
To obtain a list is connected	AT+LIST	+LIST:	MAC > < : address
		1 <name> <mac>	code
		.....	< name > : device
		8 <name> <mac>	name
		+LIST END:	

#### Remark:

The display name from the machine, the host does not display the name

### 5.3.2. Manually search for Bluetooth devices

function	Instructions	Response	Instructions
Search for bluetooth devices	AT+INQ	OK	
		+INQ:	< param > serial number
		<param> <name> <mac> <rss>	<name> Device name
		<param> <name> <mac> <rss>	<mac> address code
		.....	<rss> signal value
		+INQ END:	

#### Remarks:



The instruction cannot and AT + AUTOCONN used AT the same time.

### 5.3.3. Manually connect a bluetooth device

function	Instructions	Response	Instructions
Connect a bluetooth device	AT+CONN<param>	+Connection>> <mac> +Connected>> <mac>	< param > : the AT + INQ query The module number MAC > < : module address code

For example:

```
Send: AT+INQ
Return: OK
+INQ:
1  BT27      48872d911e22  -34
2  WF24-BLE  48872d00124a  -76
3  CP29-2A48 0022113b2a48  -76
+INQ END:
BT27 to connect...
Send: AT+CONN1
Return: +Connection>>0x48872d911e22
+Connected>>0x48872d911e22
```

### 5.3.4. Settings \ query - automatically connected bluetooth devices

Features	Instructions	Response	Instructions
The query module connection mode	AT+AUTOCONN	+AUTOCONN<param>	< param > : 0 ~ 4 Connect to the number of slave modules
Connection number of set	AT+AUTOCONN<param>	OK	



module

#### Notes:

- 1, open automatically after the connection, the main module will automatically according to the connection number of set up search and connect our from the module. If you have multiple modules, from random connections.
- 2, open automatically after the connection, the main module will live connection of memory from the module of bluetooth address. After the connection is broken, the main module to search connection from the module. After restart or blackout, the main module can initiate connections to the memory of the bluetooth address. If you want to connect the new device can be sent via long press button or a serial port cleaned AT + CLEAD bluetooth address of memory.
3. After setting the command, the device needs to be restarted.

#### For example:

```
Send: AT + AUTOCONN1
Returns: OK
Send: AT + RESET
Returns: the Power on
        +Connection>>0x48872d911e22
        +Connected>>0x48872d911e22
```

### 5.3.5. Set \ query - the connection device 1

function	Instructions	Response	Instructions
Query bluetooth device name	AT+FILTER1	+FILTER1= <name>	<name> : The specified Bluetooth device name Parameters: 1 to 20 Default value: NULL
Setting a bluetooth device name	AT+FILTER1 <name>	OK	

#### Remarks:

- 1、 Example: need to connect to the bluetooth device name is: 1234, set up is completed, the module will automatically connect to the bluetooth device name, if there are multiple same name, will be random connections.
- 2、 This instruction can only be opened in the AT + AUTOCONN.
- 3、 Set the bluetooth name, module connected only the name of a bluetooth device.



- 4、Up to three specified devices can be set.
- 5、Settings take effect after the directive to restart.

**For example:**

```
Send: AT + FILTER11234
Returns: OK
Send: AT + RESET
Returns: the Power on
        +Connection>>0x48872d911e22
        +Connected>>0x48872d911e22
```

### 5.3.6. Set \ query 2 - the connection equipment

function	Instructions	Response	Instructions
Query the Bluetooth device name	AT+FILTER2	+FILTER2= <name>	< name > : specify the bluetooth device name Parameters: 1 to 20 Default value: NULL
Setting a bluetooth device name	AT+FILTER2<name>	OK	

**Notes:**

After setting this instruction, it should be restarted to take effect.

### 5.3.7. Set \ query - the connection device 3

function	Instructions	Response	Instructions
Query bluetooth device name	AT+FILTER3	+FILTER3= <name>	< name > specify the bluetooth device name Parameters: 1 ~ 20 Default value: NULL
Setting a bluetooth device name	AT+FILTER3<name>	OK	

**Notes:**

After setting this instruction, it should be restarted to take effect.

### 5.3.8. Restore the list connection

function	Instructions	Response	Instructions
Restore list connection	AT+RECOVER	OK	Recovery has maintained, equipment of the single connection timeout

### 5.3.9. Save an existing connection

function	Instructions	Response	Instructions
Save an existing connection	AT+SAVE	OK	A manual save an existing connection equipment

**Remark:**

Settings take effect after the directive to restart

### 5.3.10. Query/set - communication mode

function	Instructions	Response	Instructions
Query equipment Communication mode	AT+MODE	+MODE= <param>	< param > serial number 0: closed relay mode 1: open relay mode Default: 0
Set up equipment Communication mode	AT+MODE<param>	+MODE= <param> OK	

**Notes:**

1. Settings take effect immediately after the command module
- 2.

### 5.3.11. To get rid of the current save link (all)



function	Instructions	Response	Instructions
Remove the current connection	AT+CLEAD	OK	Clearance AT + AUTOCONN this instruction after the connection of the bluetooth address

**Remarks:**

After setting this instruction, it should be restarted to take effect.

### 5.3.12. Disconnect the specified link

Features	Instructions	Response	Instructions
Disconnect the specified link connection	AT+DISC<param>	+disconnected>> <mac>	<param> : The number of the disconnected module <mac> : The address code of the module

**Example:**

Send: AT+DISC1

Return: +disconnected>>0x48872d911d82

### 5.3.13. Switch between AT instruction mode and data send mode

Features	Instructions	Response	Instructions
Switch between AT command mode and data send mode	+++	Transfer or AT	Transfer: Enter data transparent transmission mode AT: Enter the AT command mode

### 5.3.14. Specify send to a device

Features	Instructions	Response	Instructions
Specify send to a device	AT+DEVICE<param1> <param2>	-	<param1> : The device you want to send data to <param2> : The data to send

**For example:**

Send: AT+DEVICE112345

Receive from device: 12345

### 5.3.15. Settings \ Query - Broadcast status

Features	Instructions	Response	Instructions
Querying broadcast status	AT+CLOSEADV	+CLOSADV=<param>	<param> sequence number
Set broadcast status	AT+CLOSEADV<param>	OK	0: Turn off broadcast 1: Turn on the broadcast Default: 1

#### Notes:

When OK is returned, it takes effect immediately. When the module restarts, the broadcast state reverts to its default value

### 5.3.16. Set \ query - broadcast time interval

Features	Instructions	Response	Instructions
Inquire about broadcast time intervals	AT+ADVI	+ ADVI =<param>	<param> Parameters: 0 to F
Set the broadcast interval	AT+ADVI<param>	+ ADVI =<param> OK	0:100ms 8:900ms 1:200ms 9:100ms 2:300ms A: 2000ms 3:400ms B: 3000ms 4:500ms C: 4000ms 5:600ms D: 5000ms 6:700ms E: 6000ms 7:800ms F: 7000ms Default value: 5

## 5.4. A list of error codes





The details of error codes in EEROR= <> are as follows:

Return value	Error Message Description
101	Parameter length error
102	Parameter format is wrong
103	Abnormal parameter data
104	Instruction error

## 6. 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 instruction customization, broadcast package customization, etc.
- Module PCB hardware customization, can be customized to customer needs of the hardware requirements.
- A variety of Bluetooth program customization, can be customized according to customer needs, a full set of bluetooth software and hardware solutions.
- A full set of networking solutions customization, can be customized according to customer needs, a full set of networking, gateway solutions.

If you have the above customized requirements, please contact our business personnel directly.