

HC-08 Bluetooth Serial Port Communication Module User Manual V2.0

HC-08 Bluetooth serial communication module is a new generation of data transmission module based on Bluetooth Specification V4.0BLE protocol. Its wireless working frequency is 2.4GHz ISM and the modulation is GFSK. The maximum transmission power is 4dBm and receiving sensitivity is -93dBm. In an open environment, the Bluetooth module can achieve communication with iPhone over a distance of 80 meter.

Baud rate: 9600

RX	TX	GND
NC	NC	3.3V



Module parameter setting AT command

AT command is used for module parameter setting. This module can perform AT command operation offline, and enter the transparent transmission mode after connection.

It takes about 150ms to turn on the module, so it is recommended to conduct the AT command operation after the module is powered on for 200ms. Besides special situation, the parameter set by AT command will take effect immediately. At the same time, the modification of parameter and function will not lose when the module power down.

If the AT command, except “AT+RX” and “AT+VERSION”, modifies the parameter successfully, “OK” message will be obtained. If not, you will not obtain any message.

(1) Commands

No	AT command (x represents parameter)	Function	Default State	Master/Slave take effects
1	AT	Detect whether the module functions normal	-	M/S
2	AT+RX	Check the basic parameter of the module	-	M/S
3	AT+DEFAULT	reset	-	M/S
4	AT+RESET	Restart the	-	M/S

		module		
5	AT+VERSION	Obtain the version and date of the module	-	M/S
6	AT+ROLE=x	Switch master/slave	S	M/S
7	AT+NAME=xxxxxxxxxx	Modify the Bluetooth name	HC-08	M/S
8	AT+ADDR=xxxxxxxxxx	Modify the Bluetooth address	Hardware address	M/S
9	AT+RFPM=x	Change wireless radio frequency power	0(4dBm)	M/S
10	AT+BAUD=x,y	Modify the serial port baud rate	9600,N	M/S
11	AT+CONT=x	Check whether the connection works	0 (connection works)	M/S
12	AT+MODE=x	Change power dissipation mode	0	S
13	AT+AVDA=xxxxxxxxxx	Change broadcast	-	S

		data		
14	AT+TIME=x	Combination working mode 3 broadcast period	5(s)	S

Note: 1. There is no need to enter and and line feed after the AT command; If there is no special instruction, all AT commands of this module will not be sent in line feed.

2. 11-14 commands are advanced command and must be used in combination to exert the function of BLE low-power Bluetooth. For the usage of low-power Bluetooth, you can refer to the following introduction.

(2) Command introduction

1. Test command

Command: AT

Return: OK

2. Check the current basic parameter

Display the basic information, including Bluetooth name, master/ slave, baud rate, address, password, etc.

Command: AT+RX

Return: Name:HC-08 ----->>>> Bluetooth name is set by the user

Role:Slave ----->>>>Module character (Master/ Slave)

Baud:9600,NONE ----->>>>baud rate,check bit

Addr:xx,xx,xx,xx,xx,xx----->>>>Bluetooth address

PIN :000000 ----->>>>Bluetooth password (password is

generally not required)

3. Restore the factory settings

Command: AT+DEFAULT

Return: OK

The module will restart automatically. Please perform new operation after 200ms!

4. Restart command

Command: AT+ RESET

Return: OK

The module will restart automatically. Please perform new operation after 200ms!

5. Check the software version

Command: AT+ VERSION

Return: HC-08V2.0, 2014-08-22

(HC-08V2.0 is software version and 2014-08-22 is release date)

6. Modify module character

Set command: AT+ROLE=x

Check command: AT+ROLE=?

X is code name of module character. It can set as M (master) or S (slave)

The default character is slave by default.

Send: AT+ROLE=M

Return: OK

The module is set as master successfully and the settings will take effect after restarting the module.

Send: AT+ROLE=?

Return: Master

You can check that the module character is master.

7. Modify Bluetooth name

Set command: AT+ NAME=xxxxxxxxxxxx

Check command: AT+ NAME=?

The default Bluetooth name is LOBOT and you can change its name. Please pay attention that its name should be within 12 characters, and you can enter visual ASCII codes and some escape characters. The module supports entering Chinese, but Android devices must be converted to "UTF8 encoding" to make the Bluetooth name normally displayed. If the characters you send are over 12, only the front 12 characters can be recognized.

The settings will take effect after restarting the module.

For example:

Send: AT+NAME=LOBOT

Return: OKsetNAME

Send: AT+NAME=?

Return: LOBOT

8. Modify Bluetooth address

Set command: AT+ADDR=xxxxxxxxxxxx

Check command: AT+ADDR=?

The address must be a 12-bit 0-F uppercase character, that is, a hexadecimal character.

For example:

Send: AT+ADDR=1234567890AB

Return: OKsetADDR

The settings will take effect after restarting the module.

Send: AT+ADDR=?

Return: 1234567890AB

Send: AT+ADDR=000000000000

Return: OKsetADDR

Send 12 zero, then the module will restore to the default hardware address.

The module will use hardware address by default.

9. Modify radio frequency power

Set command: AT+RFPM=x

Check command: AT+RFPM=?

x is code name of radio frequency power, as the below table shown

Parameter	Radio frequency power
?	Check the current radio frequency power
0	4dBm (factory default value)
1	0dBm
2	-6dBm
3	-23dBm

For example

Send: AT+RFPM=2

Return: OK

Modify the radio frequency power as -6dBm. And the settings will take effect immediately.

Send: AT+RFPM=?

Return: -6dBm

The current radio frequency power is -6dBm.

If the peak current is over 30mA (4dBm) and you are using the button cell battery for powering, please set the radio frequency power as -6dBm or -23dBm because of its small discharge current.

10. Modify serial port baud rate

Set command: AT+BAUD=x (modify serial port baud rate only)

AT+BAUD=x,y (modify serial port rate and check bit)

Check command: AT+BAUD=?

x is code name of serial port baud rate and y is code name of check bit, as the below table shown.

Parameter	Serial port baud rate x	Parameter	Check bit y
?	Check the current baud rate		
1200	1200bps	N	No parity
2400	2400bps	E	Even parity
4800	4800bps	O	Odd parity
9600	9600bps (factory default value)		
19200	19200bps		
38400	38400bps		
57600	57600bps		
115200	115200bps		

For example:

Send: AT+BAUD=19200

Return: OK19200

Modify the serial port baud rate as 19200bps and the check bit remains the same.

Send: AT+BAUD=4800,E

Return: OK4800,EVEN

Modify the baud rate as 4800bps and perform even parity

Send: AT+BAUD=?

Return: 4800,EVEN

Display the current baud rate and check bit.

Note: the settings of serial port baud rate of V2.0 version will take effect immediately and there is no need to re-power on.

When the master and slave are transparently communicating and below 9600bps baud rate, each data packet cannot exceed 500 bytes. When the baud rate is above 19200bps, please refer to the table below for the maximum number of bytes for each data packet. There is a certain time interval between each data packet. The following table is the reference value of the time interval under various communication baud rates:

Baud rate (bps)	1200	2400	4800	9600	19200	38400	57600	115200
Interval of sending 500 bytes (ms)	6800	3600	2000	1000				
Interval of sending 300 bytes (ms)	4200	2400	1200	600	400			

Interval of sending 100 bytes (ms)	1500	800	400	160	100	120		
Interval of sending 80 bytes (ms)	1000	650	320	120	80	60	100	
Interval of sending 60 bytes (ms)	800	500	250	100	60	60	60	100
Interval of sending 20 bytes (ms)	200	100	50	20	20	20	20	20

Note:

- 1、 The above data is measured data. The theoretical fastest total sending and receiving speed of the module is 2500 bytes/sec. It is recommended to control the speed at 2000 bytes/sec.
- 2、 The number of byte for each data packet is an integral multiple of 20.
- 3、 The data sent by the module will be automatically packetized into integral multiples of 20 bytes. That is, a 100-byte data packet is sent, and multiple data packets will be received on the other end. Each data packet is an integral multiple of 20, and the total number of bytes is a complete 100 bytes.

11. set whether the module can be connected

Set parameter: AT+CONT=x

Check parameter: AT+CONT=?

The function of x parameter is as follow

Parameter	Master	Slave
0(Default)	Central	Peripheral

	The module can be connected. It will enter the ordinary transparent transmission mode after connection	The module can be connected. It will enter the ordinary transparent transmission mode after connection
1	<p style="text-align: center;">Observer</p> <p>This module cannot connect to other module or device, but it will automatically scan the broadcast data packet of HC-08 slave and refresh every 2s.</p>	<p style="text-align: center;">Broadcaster</p> <p>The module will not connect to the master, but it will send the broadcast data packet by cooperating with low-power mode 3</p>

For example

Send: AT+CONT=1

Return: OK

The settings will take effect after restarting the module.

Send: AT+CONT=?

Return: Non-Connectable

This command should combine with "AT+MODE", "AT+AVDA" and "AT+TIME" commands.

Note:

1、CONT=1 of Master or Slave is used for sending broadcast data. Slave sends the broadcast data, and the master will receive the corresponding broadcast data and output through serial port.

2、This mode is only for HC-08 module and the users who are with Android development ability or can grab this data packet by themselves.

12. Command of modifying module power consumption mode(only set by Slave)

Set command: AT+MODE=x

Check command: AT+MODE=?

Command	Parameter1	Parameter2	return	Function
AT+ MODE	=	?	0/1/2/3	Obtain the current power dissipation mode
		0	OK	Full power mode(factory default). LED turns on
		1		Level 1 energy saving mode. LED turns off. Without connection, its current is 340 μ A and the connection speed is the same as that of MODE=0
		2		Level 2 energy saving mode. LED turns off. Without connection, its current is 0.4 μ A. Before waking, it cannot be searched and connected. After waking, it can be connected.
		3		Combined power dissipation mode. Key 3 and LED will turn off. Without connection, its current is 1.2 μ A~160 μ A. The default current is 32 μ A. Set the broadcast interval cooperating with the parameter set by "AT+TIME" to reduce the power dissipation. For specific usage, please refer to "AT+TIME" command.

Note:

1、 Combined mode 3 is mainly applicable to

- A、 used to reduce module power consumption
- B、 Slave broadcast the data to master. One slave can conduct one-way communication with multiple masters.
- C、 As a wireless reading device such as anti-lost device, sign-in card, heart rate meter, etc.

In addition, user can use this mode in other ways. Give full play to your imagination.

2、 You can send data over 1 byte through serial port to wake up the power dissipation mode 1/2/3. But the first few bytes of data may be garbled after waking up. Therefore it is recommended to send 10 bytes of hexadecimal code "0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF" to wake up the module, avoiding the first few bytes that may be garbled. After that, the module will work at full pace and the serial port can receive and send the data normally.

When the module is not connected, the module enters full-speed mode after waking up and maintains this working mode for 5 minutes. The error is $\leq 1\%$. At this time the power consumption mode queried by the AT command is still the set power consumption mode. And then returns to the original power consumption mode. As long as the module serial port has received data within 5 minutes, the timing will be restarted.

If the module is connected, it will remains in full--speed mode after waking up , and it will not return back to original power consumption mode until the connection is interrupted.

3、 Except the full-speed mode, other power consumption modes will turn off LED. But after connection, LED will light up.

For example:

Send: AT+MODE=?

Return: 0

Check the current power consumption mode

Send: AT+MODE=2

Return: OK

Set the power consumption mode 2, and the settings will take effect immediately.

13. Update the broadcast data (only the slave can set)

Command: AT+AVDA=xxxxxxxxxxxx

Parameter “xxxxxxxxxxxx” can be any user data of 1~12 bytes. If the master is at the state of AT+CONT=1, the serial port of the master will output “xxxxxxxxxxxx” data. This broadcast data will not save permanently and will be deleted after restart.

For example:

Slave sends: AT+AVDA=1234567890AB

Return: OK

If the master is at the state of AT+CONT=1, its serial port will output.

14. The broadcast period of combined power consumption mode 3

Set command: AT+TIME=x

Check command: AT+TIME=?

The setting range of parameter x is as follow:

x	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Time/sec	1	2	3	4	5 (Default)	6	7	8	9	10	20	30	40	50	60
x	F	G	H	I	J	K									
Time/min	1	2	5	10	30	60									

For example:

Send: AT+TIME=F

Return: OK

Set the broadcast period of combined working mode 3 as 60 seconds, which means that the broadcast data will be sent every 60s.

Send: AT+TIME=?

Return: 60s

Solution for low power (Slave)

1、 when it needs to wake up wirelessly

Input "AT+MODE=1" or lower power consumption "AT+MODE=3", the module will enter the low power consumption mode, until the host requests to connect. The current will be 1.6mA after connection. If there is a data exchange, the module will actively enter the full-speed mode and will not return to the low-power mode until the connection is disconnected.

2、 when it can actively connect

Input "AT+MODE=2" to enter the low power consumption mode2, and the module will enter deep sleep state and cannot be searched by master. You can send any data to wake up the module when you need to connect, and then the module can receive and send data after connection.

Solution for low power consumption broadcast.

Set master first: AT+CONT=1 -> AT+ROLE=M

Set slave next: AT+CONT=1 -> AT+AVDA=1234 (≤12Bytes data) 其
For other commands, you can set or not based your requirement.

Because you have modified the AT+CONT parameter, the module needs to restart. Therefore, it is recommended to modify CONT parameter, and then modify other parameters.

User MCU sends 10 bytes of hexadecimal code "0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF" to the module serial port to wake up the module, and the module enters the full-speed power consumption mode. At this time, the user can make reasonable settings according to the needs, the above "AT+CONT=1, AT+AVDA=xxxx, AT+TIME=5, AT+MODE=3" is set to "broadcast not connectable, broadcast data is xxxx and work consumption

mode 3 with a cycle of 5 seconds. According to the above figure, if the average current is less than $4\mu\text{A}$, TIME needs to be longer than 1 minute. The longer the time, the lower the power consumption.

If you want to transmit the data frequently, it is recommended to enter MODE2 in spare time. And switch back to the corresponding mode when you need to transmit the data.

connection circuit for reference

