

# HC-08 BLUETOOTH UART COMMUNICATION MODULE V3.1 USER MANUAL



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## Version

Software:HC-08 V3.1, Hardware: V2.0

## Date

2017-07-07

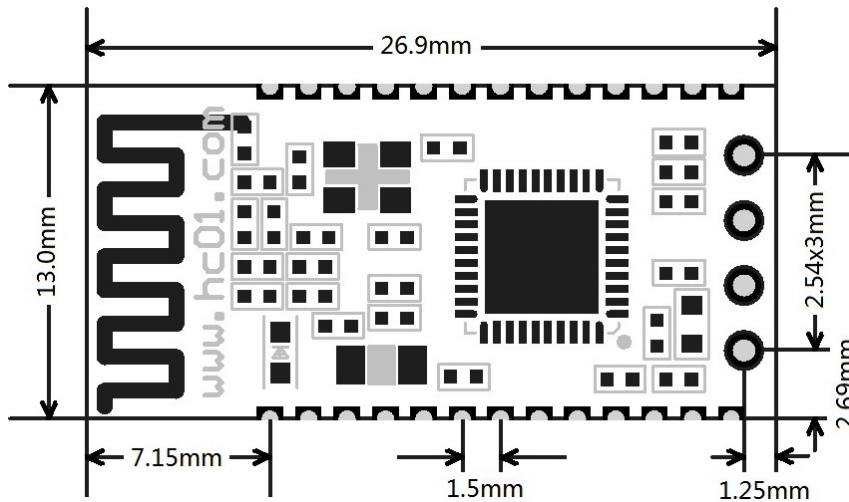
## Product introduction

HC-08 Bluetooth UART communication module is a new generation of Bluetooth specification V4.0 BLE Bluetooth protocol based on the transmission module. Wireless working frequency is 2.4GHz ISM, modulation is GFSK. The maximum transmit power module 4dBm, the receiving sensitivity is -93dBm, and iphone4s can achieve 80 meters of super long distance communication under open environment.

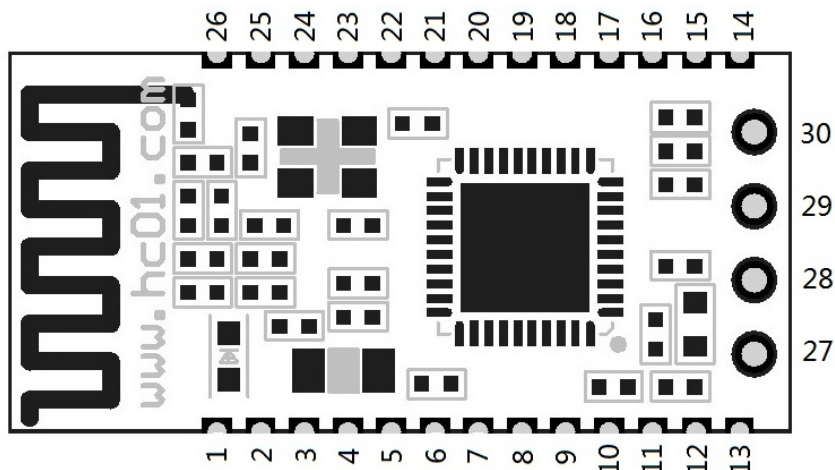
The module uses the stamp hole encapsulation, can patch welding, module size is 26.9mm \* 13mm \* 2.2mm, very convenient to the customer within the embedded application system.

The module uses the CC2540 chip, the configuration of the 256K Byte space, supports AT command, the user can according to need to change role and the serial baud rate, equipment name and other parameters, the use of flexible.

## Product size



## Pin definition



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The HC-08 module has 30 pins, on board PCB antenna, pin specific definitions are listed in the following table:

pin	definition	I/O	explain
1	TXD	output	UART output, 3.3V TTL level
2	RXD	input, weak pull up	UART input, 3.3V TTL level
3	NC		
4	NC		
5	NC		
6	DC	input	Debug clock
7	DD	Input/output	Debug data
8	P2.0	input, weak pull up	NC
9	P1.7	input, weak pull down	NC
10	P1.6	Input, weak pull down	NC
11	nRST	input, pull up	Module reset pin, a low level of not less than 10ms reset
12	VCC	input	Power pin, the requirements of 3.3V DC power supply, the supply current is not less than 100mA
13	GND		Ground
14	LEDCON	input	LED control pin (Note④)
15	P1.4	input, weak pull down	NC
16	P1.3	output	LED output (Note①)
17	P1.1	output	Link indicating (Note②)
18	P1.2	input, weak pull down	The master module clear memory (Note③)
19	P1.0	input, weak pull down	NC
20	P0.7	input, weak pull up	NC
21	USB_D-		NC
22	USB_D+		NC
23	P0.6	input, weak pull up	NC
24	P0.1	input, weak pull up	NC
25	P0.5	input, weak pull down	NC
26	P0.0	input, weak pull up	
27	VCC	input	Power pin, the requirements of 3.3V DC power supply, the supply current is not less than 100mA
28	GND		Ground
29	RXD	input, weak pull up	UART input, 3.3V TTL level
30	TXD	output	UART output, 3.3V TTL level

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**Note①:** Module indicating LED output pin, high level output, please use the resistance and LED connection.

The connection before,

From the slave module address the master module does not record, bright 100ms per second;

From the slave module address master module records, bright 900ms per second;

The slave module, LED light 1second very 2 seconds.

After connection, LED lights always.

**Note②:** Link indicating output pin. Before connection, this pin output low level voltage, after connection, this pin output high level voltage.

**Note③:** Input pin, internal pull-down. This pin is connected with the high level, the master module to clear the slave module address have been recorded.

**Note④:** Input pin, be used to control the LED. If this pin is grounded, LED off. If this pin left hanging, LED on.

### Electrical characteristics:

parameter	test condition		representative value
working voltage	-		DC2.0V~3.6V
working current (not LED)	master	not connected / connection	21mA/9mA
	slave	MODE0, not connected / connection	8.5mA/9mA
		MODE1, not connected / connection	6μA~2.6mA / 1.6mA
		MODE2, not connected / connection	0.4μA/1.6mA

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### AT COMMAND

The AT command to setting module parameter. Connection before, module can operating AT command. Connection after entering serial transparent transmission mode.

Module start is about 150ms, so the best after power on 200ms AT command operation. Unless otherwise indicated, the parameter setting of AT command is effective immediately. At the same time, parameters and functions of modification, the power down will not be lost.

After the success of AT command modify unified returns OK ("AT+RX,AT+VERSION" and so on the view of information command class except), no success does not return any information.

#### (1) AT COMMAND LIST

	<b>AT Command</b> (“x”- parameter)	<b>Function</b>	<b>Default</b>	<b>Role</b>
1	AT	Test command	-	M/S
2	AT+RX	Check the basic parameters	-	M/S
3	AT+DEFAULT	Restore factory setting	-	M/S
4	AT+RESET	Reset the module	-	M/S
5	AT+VERSION	Check version and date	-	M/S
6	AT+ROLE=x	Change master/slave role	S	M/S
7	AT+NAME=xxxxxxxxxxxx	Revise name	HC-08	M/S
8	AT+ADDR=xxxxxxxxxxxx	Revise address	Hardware address	M/S
9	AT+RFPM=x	Revise RF power	0(4dBm)	M/S
10	AT+BAUD=x,y	Revise UART baud	9600,N	M/S
11	AT+CONT=x	Set connect ability	0(Can be connected)	M/S
12	AT+AVDA=xxxxxxxxxxxx	Change the broadcast data	-	S
13	AT+MODE=x	Set working mode	0	S
14	AT+AIN=xx	Change the broadcast interval	320	M/S
15	AT+CINT=xx,y	Change the connection interval	6,12	M/S
16	AT+CTOUT=xx	Change the connection timeout time	200	M/S
17	AT+CLEAR	The master module to clear the slave module address have been recorded.	-	M
18	AT+LED=x	LED ON/OFF	1	M/S
19	AT+LUUID=xxxx	Search UUID	FFF0	M/S
20	AT+SUUID=xxxx	Service UUID	FFE0	M/S

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21	AT+TUUID=xxxx	Characteristic UUID	FFE1	M/S
22	AT+AUST=x	Set the time for automatic sleep	20	S

Note:

1. The AT command behind no newline; if no special instructions, all AT commands are not transmitted using newline.
2. 11~14 this 4 is advanced instruction and must be used in combination, can play its due role BLE Bluetooth low energy. Using a Bluetooth low energy, there will be special instructions and program introduced in the following sections.

### (2) COMMAND EXPLAIN

#### ① Test command

Command: AT

Return: OK。

#### ② Check the basic parameters

View the basic parameters such as Bluetooth name, master/slave role, UART baud rate, address and password.

Command: AT+RX

```
Return: Name: HC-08           ----->>>> Bluetooth name
      Role: Slave           ----->>>> master/slave role
      Baud: 9600,NONE       ----->>>> UART baud rate
      Addr: xx,xx,xx,xx,xx,xx ----->>>> Bluetooth address
      PIN: 000000          ----->>>> Bluetooth password
```

Note: Temporarily does not support change password!

#### ③ Restore factory setting

Command: AT+DEFAULT

Return: OK

The module will automatically restart, please carry out new operation on the restart 200ms!

#### ④ Reset the module

Command: AT+ RESET

Return: OK

The module will automatically restart, please carry out new operation on the restart 200ms!

#### ⑤ Check version and date

Command: AT+ VERSION

Return: HC-08V3.1, 2017-07-07

### ⑥ Change master/slave role

Set command: AT+ROLE=x

Query command :AT+ROLE=?

X: role(M or S), M: master, S: slave。

Default setting is S(slave)。

Send: AT+ROLE=M

Return: OK

Set master role, the module will automatically restart!

Send: AT+ROLE=?

Return: Master

You can view the role is the master module.

### ⑦ Revise name

Set command: AT+ NAME=xxxxxxxxxxxx

Query command: AT+ NAME=?

Default setting is HC-08, you can set the other name (12 characters limit, support the visual ASCII code and part of the escape character. The module supports Chinese, but android devices must be converted to "UTF8 code" to normal display. To send more than 12 characters, then only the first 12 characters). Setup is complete, effective after module automatically reset!

Example:

Send: AT+NAME=HCKJ

Return: OKsetNAME

Send: AT+NAME=?

Return: HCKJ

### ⑧ Revise address

Set command: AT+ADDR=xxxxxxxxxxxx

Query command: AT+ADDR=?

The address must be 12 bit "0~F" uppercase characters, namely hexadecimal characters.

Example:

Send: AT+ADDR=1234567890AB

Return: OKsetADDR

Setup is complete, effective after module automatically reset!

Send: AT+ADDR=?

Return: 1234567890AB

Send: [AT+ADDR=000000000000](#)

Return: OKsetADDR

Send "00000000", module to restore the default hardware address. Module factory default is hardware address.

⑨ **Revise RF power**

Set command: AT+RFPM=x

Query command: AT+RFPM=?

X:RF power, as shown in the following table:

Parameter	RF power
?	View the current RF power
0	4dBm (default)
1	0dBm
2	-6dBm
3	-23dBm

Example:

Send: AT+RFPM=2

Return: OK

RF power modified -6dBm.

Send: AT+RFPM=?

Return:-6dBm

RF power is -6dBm.

The peak current is more than 30mA (when RF power is 4dBm). Because the small discharge current button batteries, such as to use the button battery powered, the best setting for -6dBm or -23dBm.

⑩ **Revise UART baud**

Set command: AT+BAUD=x (Only modified the UART baud rate)

AT+BAUD=x, y (Modify the UART baud rate and parity bit)

Query command: AT+BAUD=?

x: UART baud rate, y: parity bit, As shown in the following table:

Parameter	UART baud :x	Parameter	parity bit :y
?	View the current baud rate		
1200	1200bps	N	No parity
2400	2400bps	E	Even parity
4800	4800bps	O	Odd parity
9600	9600bps (default)		
19200	19200bps		
38400	38400bps		
57600	57600bps		
115200	115200bps		

Example:

Send: AT+BAUD=19200

Return: OK19200

UART baud rate modified for 19200bps.



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Send: AT+BAUD=4800,E

Return: OK4800,EVEN

UART baud rate modified for 4800bps, and even parity.

Send: AT+BAUD=?

Return: 4800,EVEN

View UART baud rate and parity bit.

9600bps baud rate following each packet please do not exceed the maximum number of bytes to 500 bytes, 19200bps baud rate above each packet please refer to the following table, have a certain time interval between data packets. The following table is a variety of communication baud rate, the time interval of reference value:

baud rate (bps)	1200	2400	4800	9600	19200	38400	57600	115200
500 bytes time interval (ms)	6800	3600	2000	1000	/	/	/	/
300 bytes time interval (ms)	4200	2400	1200	600	400	/	/	/
100 bytes time interval (ms)	1500	800	400	160	100	120	/	/
80 bytes time interval (ms)	1000	650	320	120	80	60	100	/
60 bytes time interval (ms)	800	500	250	100	60	60	60	100
20 bytes time interval (ms)	200	100	50	20	20	20	20	20

Note:

1. The above is the measured data, the fastest speed transceiver theory total:2500 bytes/sec, suggested that the speed control in the 2000 bytes/sec.
  2. Bytes of each packet, suggestion is an integer multiple of 20.
  3. Module sends data automatically subcontracting is an integer multiple of 20 bytes.
- Is to send a 100 bytes packet, will receive a plurality of packets at another end, each data packet is an integer multiple of 20, the total number of bytes for the full 100 bytes.

### ⑪ Set connect ability

Set command: AT+CONT=x

Query command: AT+CONT=?

The X parameter functions are as follows:

Parameter	Master role	Slave role
0 (default)	<b>Central</b> Can be connected, the connection after entering ordinary transparent transmission mode	<b>Peripheral</b> Can be connected, the connection after entering ordinary transparent transmission mode
1	<b>Observer</b> The module can not be connected to other device, but will automatic scan the HC-08 from the broadcast data machine package, fixed 2 seconds refresh time.	<b>Broadcaster</b> Not connected with the master role, but can be combined with low power mode 3, the realization of broadcast data packet send.

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Example:

Send: AT+CONT=1

Return: OK

Setup is complete, effective after module automatically reset!

Send: AT+CONT=?

Return: Non-Connectable

The command please with "AT+MODE", "AT+AVDA" and "AT+AINT" command with the use of.

Note:

1. The master/slave module "CONT=1" is masterly used for transmitting broadcast data. From the slave role to send broadcast data, broadcast master module will receive the corresponding data, and through the serial port output.

2. This model is only for the user can grab this broadcast data package yourself.

The specific communication protocol is not described here, the intention to please the following official website consultation online customer service: <http://www.hc01.com/>

### ⑫ Change the broadcast data (Only slave module)

Command: AT+AVDA=xxxxxxxxxxxx

Parameter "xxxxxxxxxxxx" can be any 1~12 bytes user data. If at this point the master module state of AT+CONT=1, then the master module UART port will output the "xxxxxxxxxxxx" data. The broadcast data will not be preserved permanently, will be deleted after the restart.

Example:

Slave role send: AT+AVDA=1234567890AB

Return: OK

If at this point the master module state of AT+CONT=1, UART port will output: 1234567890AB.

### ⑬ Set working mode (Only slaver)

Set command: AT+MODE=x

Query command: AT+MODE=?

Command	Parameter	Return	Function
AT+ MODE	=?	0/1/2	Gets the current mode.
	=0	OK	Full power mode (default), LED open.
	=1		Level 1 power saving mode, LED close. The connection current is determined by the setting of AT+AINT. The connection is mainly determined by AT+CINT. The MODE1 has covered the 2.4 version of MODE3 and is more reasonable.
	=2		Level 2 power saving mode, LED close. No connection the current is 0.4μA. Can not be found, not connected before wake up, after awakening can be connected.

Note:

1. Mode 1 is mainly used for:

A. Used to reduce the power consumption.

B. The slave module send the broadcast data to the master module, can be achieve one to many one-way communication (theory can be from a slave module to infinite master module).

C. As anti-lost alarm, attendance card, heart rate meter or other wireless device.

2. Mode1 and mode2 are available through the UART port to send 1 byte data to wake up, but front few bytes of data may be garbled after wake up. Therefore, we recommend sending 10 bytes hexadecimal code of "0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF" to awaken the module, avoid the front several may be garbled bytes. Since then, modules work on the full speed mode, the UART port can be normal to send and receive data.

In non connected state, module after awakening into full speed mode and maintained for 20 seconds(default setting, can be adjusted by AT command), and then return to the original mode. As long as 20 seconds in the UART has received data, then retiming.

If the module is in the connected state, then after awakening will remain in the full speed mode, before disconnecting, module will return the original power mode.

Example:

Send: AT+MODE=?

Return: 0

View the current mode.

Send: AT+MODE=2

Return: OK

Setting mode 2, effective immediately.

### **⑭ Change the broadcast interval**

Set command: AT+AINT=xx

Query command: AT+AINT=?

Broadcast intervals affect the power loss of unconnected. Each time unit of the broadcast interval is 625 $\mu$ s (if xx equal to 1, the broadcast interval is 625 $\mu$ s; if xx equal to 2, the broadcast interval is 1250 $\mu$ s, etc.)

The unit range of the broadcast interval is 32~16000 (equa to 20ms~10s).

Example:

Send: AT+ AINT =1600

Return: OK+AINT=1600

Broadcast interval modified 1600 (equal to 1000ms).

Send: AT+ AINT =?

Return: OK+AINT=1600

Broadcast interval is 1600 (equal to 1000ms).

### ⑮ **Change the connection interval**

Set command: AT+CINT=xx,yy

Query command: AT+CINT=?

Connection intervals affect the power loss of connection, the master needs to be set at the same time.

In this command, xx is minimum connection interval, yy is maximum connection interval.  $xx \leq \text{actual connection interval} \leq yy$ . A single parameter xx can be entered separately, if the  $yy < xx$  is recorded, at this time, yy will be replaced by xx.

Each time unit of the broadcast interval is 1.25ms, the setting range is 6~3199 (equal to 7.5ms~4s)

Example:

Send: AT+CINT=80

Return: OK+ CINT=80, 80

Connection interval modified 100ms.

Send: AT+CINT=6, 12

Return: OK+ CINT=6, 12

Connection interval modified 7.5~15ms.

Send: AT+CINT=?

Return: OK+ CINT=6, 12

Connection interval is 7.5~15ms.

### ⑯ **Change the connection timeout time**

Set command: AT+CTOUT=xx

Query command: AT+CTOUT=?

Each time unit of the connection timeout time is 10ms. The unit range of the connection timeout time is 10~3200 (equal to 100ms~32s).

This value directly affects the time of disconnection, the time of "accidental disconnection" (active disconnection is not affected by this value).

Example:

Send: AT+ CTOUT=200

Return: OK+ CTOUT=200

Connection timeout time modified 2s.

Send: AT+ CTOUT=?

Return: OK+ CTOUT=200

Connection timeout time is 2s.

### ⑰ **The master module to clear the slave module address have been recorded (Only master)**

Set command: AT+CLEAR

Query command: OK

The master module as long as the connection from the slave module, will remember the last time the connection from the slave module MAC address. If you want to connect to the other slave module, you must remove the current memory. The first way is put the module 18 pin to high level of 200mS, the other way is used the “AT+CLEAR” command.

### ⑱ SET LED ON/OFF

Set command: AT+LED=x

Query command: AT+LED=?

In this command, x is 0 or 1. When x=0, LED is OFF; when x=1, LED is ON.

If LED is OFF, use this command turned on the LED, must reset the module, LED will be bright!

### ⑲ SET Search UUID

Set command: AT+LUUID=xxxx

Query command: AT+LUUID=?

The parameters xxxx must be within the range of 0~F.

Because of the large number of Bluetooth devices, the master (because there is no screen, it is difficult to manually select) set up search UUID filtering. In this case, only the same UUID slave module can be searched.

Example:

Send: AT+LUUID= FFF0

Return: OK+LUUID=FFF0

Search UUID modified FFF0 (0xFFF0).

Send: AT+ LUUID =?

Return: OK+LUUID=FFF0

Search UUID is FFF0 (0xFFF0).

### ⑳ SET Service UUID

Set command: AT+ SUUID=xxxx

Query command: AT+ SUUID=?

The parameters xxxx must be within the range of 0~F.

This service UUID is the basis for the master to find the service, and the characteristic can be found by finding the service.

Example:

Send: AT+SUUID= FFE0

Return: OK+SUUID=FFE0

Service UUID modified FFE0 (0xFFE0).

Send: AT+ SUUID =?

Return: OK+SUUID=FFE0

Service UUID is FFE0 (0xFFE0).

### 21 SET Characteristic UUID

Set command: AT+ TUUID=xxxx

Query command: AT+ TUUID=?

The parameters xxxx must be within the range of 0~F.

The module only one characteristic UUID. The characteristic UUID properties: read, notify, write\_without\_response.

Example:

Send: AT+TUUID= FFE1

Return: OK+TUUID=FFE1

Characteristic UUID modified FFE1 (0xFFE1).

Send: AT+ TUUID =?

Return: OK+TUUID=FFE1

Characteristic UUID is FFE0 (0xFFE1).

### 22 Set the time for automatic sleep

Set command: AT+ AUST=x

Query command: AT+ AUST =?

The time for automatic sleep is 1~300s. The smaller the time it is, the more power is saved.

In the low power mode, if there is no operation after the activation module, x seconds will return the low-power mode set by the user.

Example:

Send: AT+ AUST=20

Return: OK+ AUST=20

The time for automatic sleep modified 20s.

Send: AT+ AUST=?

Return: OK+ AUST=20

The time for automatic sleep is 20s.

Note: the default of AUST is 20 seconds. If it is MODE1 low power mode, since the mode is discoverable and connectable, AUST can be set to a minimum of 1 second in order to save power. If it is MODE2 low power mode, because the mode is not discoverable and can not be connected, it is proposed to set up the AUST to 20 seconds or more to ensure that the module has enough time to connect with other Bluetooth master after the serial port wake-up.

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## Reference schematic

