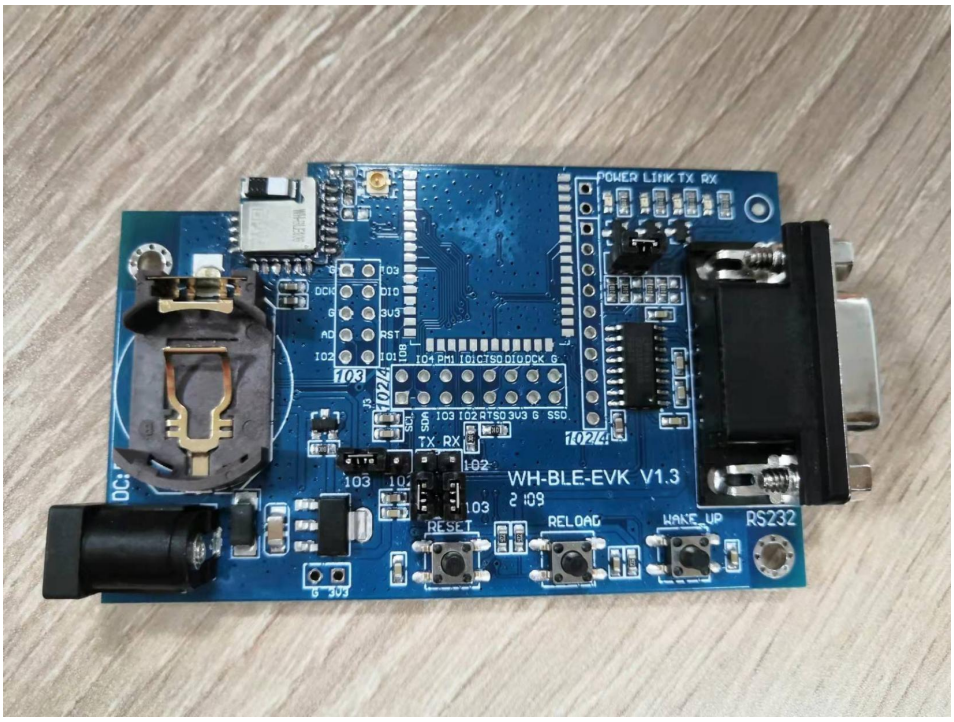
WH-BLE106 User Manual

1. Quick Start

1.1. Introduction

WH-BLE106 module is a BLE5.2 module, which can be used for master-slave or multi-master and multi-slave data transparent transmission and encrypted transmission. Users do not need to care about the transmission protocol, and only need to perform simple settings to communicate. WH-BLE106 supports 4 operation modes: Master mode, Slave mode, iBeacon mode and MultiRole mode. Users can choose different modes according to their needs for point-to-point data transparent transmission, or one-to-many data transparent transmission, or develop APP according to standard BLE protocol to communicate with module. BLE106 supports one-to-many broadcast mode and iBeacon protocol. And also support modifying 16bit/32bit/128bit format UUID to be compatible with other company BLE modules. WH-BLE106 is reliable BLE module with various functions and high compatibility.
If you have bought WH-BLE106, the accessories are as follows:



1.2. Transparent Transmission Test

We can operate like below to achieve the data transmission between master and slave devices.

- Slave device

WH-BLE106 defaults to working in slave mode, do not need to configure.

- Master device

1. Send “+++a” to enter serial AT command mode.
2. Change the working mode to Master mode, the module will restart automatically after changing.
   AT+MODE=M
3. Send “+++a” again to enter serial AT command mode again.
4. Send the Bluetooth scan command:
   AT+SCAN
5. Depending on the scan results, a connection can be initiated in the following two ways:
   AT+SCAN=num (num is the salve ID displayed in the scanning list)
   AT+SCAN=MAC (MAC address of the slave device, can send “AT+MAC” to query in slave device)
6. After connection, send LINK command to query the connection status:
   AT+LINK
7. When the connection is successful, send command to exit AT command mode:
   AT+ENTM

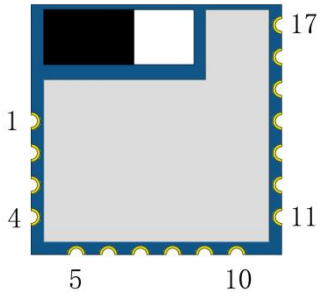
Below is the communication test result between master and slave device:

2. Product Overview

2.1. Basic Parameters

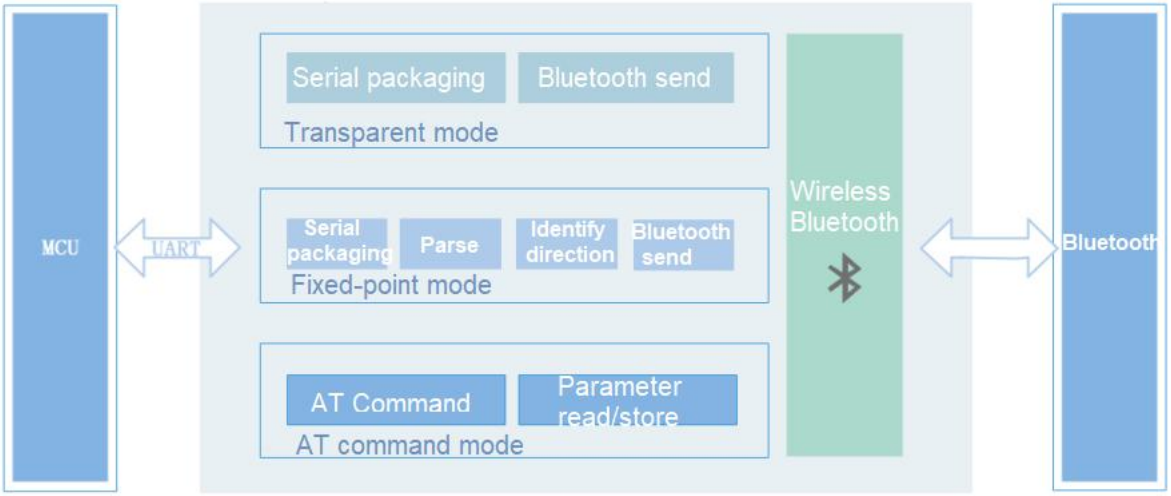
	Item	Parameters
Wireless Parameters	Wireless Standard	802.15.1
	Bluetooth Version	V5.2
	Frequency Range	2.402GHz-2.480GHz
	Transmitting Power	-19dBm~+8dBm
		Users can set through AT commands
	Receiving Sensitivity	≤-96dBm @ 1 Mbps
	Antenna	Built-in antenna
Hardware Parameters	Data Interface	UART: 1200bps~1Mbps
	Operation Voltage	1.7V ~3.6V
	Operation Current	700nA~22mA
	Operation Temperature	-40-85℃
	Storage Temperature	-40-85℃
	Dimensions	10mm x 10mm x 2.2mm
Software Parameters	Equipment Type	Master/Slave/MultiRole
	Security Mechanism	128 bit AES
	Encryption Type	PC1
	Operation Mode	Master, slave, iBeacon, multirole
	Configuration Command	AT+command
	User Configuration	Serial AT command, transparent AT command

2.2. Hardware Pin Definitions



Pin	Name	Signal type	Function
1	nReload	I	Pull down level 3~10s can restore to factory settings
2	nWake	I	Pull down level more than 1s to wake up module
3	GPIO	IO	Enable pin of serial port upgrade firmware, active in high level. After pulling it high, reset the module to enter serial upgrading mode.
4	ADC	I	Module ADC acquisition pin, reserved.
5	GPIO	IO	GPIO pin, reserved.
6	VBAT	P	Module power input pin, 1.7V~3.6V
7	SWCLK	IO	SWD clock pin
8	SWDIO	IO	SWD data pin
9	UART_TX	IO	UART TX pin
10	UART_RX	IO	UART RX pin
11	Link	IO	Connection status indicator pin
12	nReset	I	Module reset pin, active low level
13	GND	P	Power GND
14	VBAT	P	Power input pin, 1.7V-3.6V
15	GND	P	Power GND
16	ANT	IO	External RF pin (needs to be customized, default to use onboard antenna)
17	GPIO	IO	GPIO pin, reserved.

3. Product Function



3.1. Working Mode

WH-BLE106 supports four working modes: Master mode, Slave mode, Broadcasting mode(iBeacon, custom broadcast) and MultiRole mode.

3.1.1. Master Mode

In this mode, user can control the module to search and find the surrounding slave devices, and quickly connect with them. If you want to achieve transparent data transmission, need to work with our slave device mode module. If you want to connect the module to a secondary device from other manufacturer, two modules must have the same UUID. Our module provides the function of changing the UUID (16bit, 32bit, and 128bit UUID format). Users can change the UUID to connect to a secondary device from different manufacturers. Users do not need to pay attention to the data conversion process between serial port data and wireless data packets. Only need to set simple parameters to realize the transparent data communication between the serial port of the master device and the serial port of the slave device.

There are two ways to connect the master devices to slave devices: scanning connection or automatic connection after power-on.

➢ Here is an example about scanning connection:

1. Send “+++a” to enter serial AT command mode.
2. Change the working mode to Master mode, the device will restart automatically after changing.
   AT+MODE=M
3. Send “+++a” to enter serial AT command mode again.
4. Send BLE scanning command: AT+SCAN
5. Connect according to the scanning result, you can connect via two ways:
   AT+CONN=num (“num” indicates the serial number of the slave device in the scan list)
   AT+CONN=MAC (“MAC” indicates the MAC address of the slave device, you can query via “AT+MAC” in slave devices)
   If you have enabled Multilink function, need to add the number of list (n=1~8, “n” indicates the serial number in the linked list after connected. It supports connecting to up to 8 slave devices)
   AT+CONN=num,n
   AT+CONN=MAC,n
6. After the operation is complete, send command to check if the device is connected successfully, or you can also check if the “Link” indicator light is always on.
   AT+LINK
7. If you have enabled multilink function AT+MULTILINK=ON (restart to take effect), repeat step 5, the master can connect to other slaves.

➢ Here is an example about automatic connection after power-on:

1. Send “+++a” to enter serial AT command mode.
2. Change the working mode to Master mode, the device will restart automatically after changing.
   AT+MODE=M
3. Send “+++a” to enter serial AT command mode again.
4. Configure the MAC address of the slave that needs to be connected:
   AT+CONNADD=MAC
   If you have enabled Multilink function, need to add the number of list (n=1~8, “n” indicates the

serial number in the linked list after connected. It supports connecting to up to 8 slave devices. You can use “AT+MULTILINK=ON” to enable Multilink function).

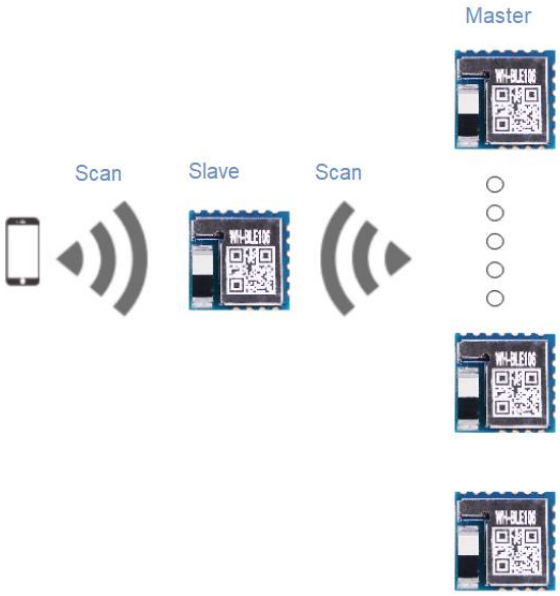
AT+CONNADD=MAC,n

5. After configured parameters, restart the module:
   AT+Z
6. Send “+++a” to enter serial AT command mode.
7. Send LINK command to query if the device is connected successfully or directly check if the LINK indicator light is always on.
   AT+LINK
8. If you need to disconnect the connection, can send below commands:
   AT+DISCONN (Disconnect all the connections)
   AT+DISCONN=n (n=1~8)
   AT+DISCONN=MAC (MAC: MAC of the device that needs to be disconnected)

3.1.2. Slave Mode

WH-BLE106 supports slave mode. Our module supports the modification of UUID (16bit, 32bit, 128bit format), which can be modified by the user to match the specific APP or master device.

Note: When the device is in slave mode and multilink function is enabled, the amount of data in a single packet should not exceed 300 bytes for eight connections. If you want to send a large amount of data, you need to reduce the number of connections (800 bytes per packet, with a maximum of 4 connections).



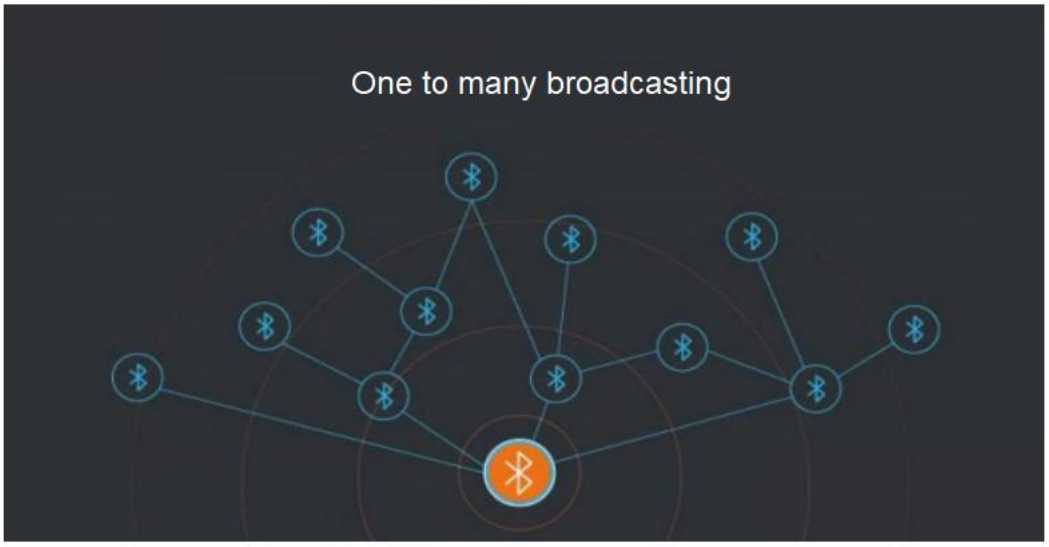
Here is an example about how to configure the device to slave mode:

1. Send “+++a” to enter serial AT command mode.
2. Change the working mode to slave mode, the device will restart automatically after changing.
   AT+MODE=S
3. Send “+++a” to enter serial AT command mode again.
4. When the master device is connected, send command to query the connection status:
   AT+LINK

5. Exit serial AT command mode.
6. If you need to disconnect the connection, can send below commands:
   AT+DISCONN (Disconnect all the connections)
   AT+DISCONN=n (n=1~8)
   AT+DISCONN=MAC (MAC: MAC of the device that needs to be disconnected)

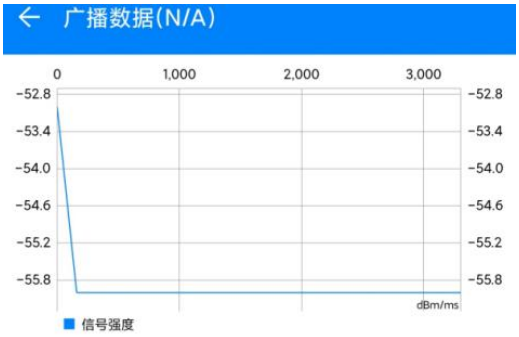
3.1.3. Broadcasting Mode

In this mode, user can set the module to broadcast a small amount of data. In APP development, users need to obtain data via BLE standard interface, and using AT commands to configure data. BLE106 module can only send broadcast data but cannot receive broadcast data.



Here is an example about how to broadcast iBeacon data:

1. Send “+++a” to enter serial AT command mode.
2. Change the working mode to broadcast mode, the module will restart automatically after changing.
   AT+MODE=B
3. Send “+++a” to enter serial AT command mode again.
4. Configure the broadcast data via AT command. (HEX data, up to 32 bytes, for broadcast format please refer to iBeacon protocol)
   AT+ IBEACON = B9407F30F5F8466EAFF925556B57FE6D,12,06,56
5. Restart the device to take the parameters effect.
   AT+Z



原始数据: 复制

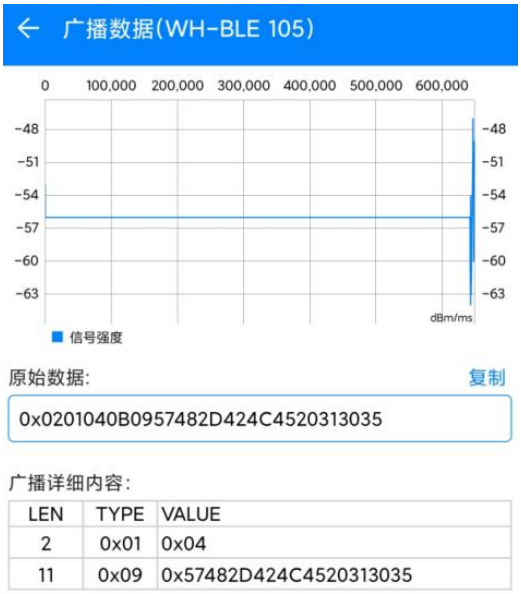
0x0201041AFF4C000215B9407F30F5F8466EAFF925556B57FE6D000C000638

广播详细内容:

LEN	TYPE	VALUE
2	0x01	0x04
26	0xFF	0x4C000215B9407F30F5F8466EAFF925556B57FE6D000C000638

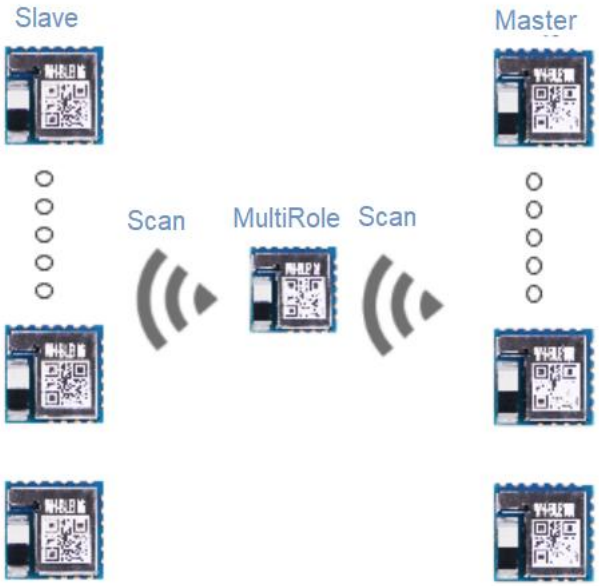
Here is an example about how to configure to broadcast custom data:

1. Send “+++a” to enter serial AT command mode.
2. Change the working mode to broadcast mode, the module will restart after changing.
   AT+MODE=B
3. Send “+++a” to enter serial AT command mode again.
4. Configure the broadcast data via AT command.
   AT+ADVDATA=NAME (After setting to NAME, the broadcast data content is the module name)
   AT+ADVDATA=MAC (After setting to MAC, the broadcast data content is the 2 bytes 0XFFFF+ MAC address of the module)
   AT+ADVDATA=RAW1,DATA (RAW1 is the traditional broadcast mode, the broadcast data content is the HEX string ranging from 1 to 26 bytes)
   AT+ADVDATA=RAW2,DATA (RAW2 is the extended broadcast mode, the broadcast data content is the HEX string ranging from 1 to 64 bytes)
5. Restart the module to take the parameters effect.
   AT+Z



3.1.4. MultiRole Mode

In this mode, BLE106 can work as a master connecting to other slave devices, and can also work as a slave to be connected by other master device. In multirole mode, the module is default in multilink mode and it cannot be changed (AT+MULTILINK is not valid in this mode).



Here is an example about how to enter multirole mode:

1. Send “+++a” to enter serial AT command mode.
2. Change the working mode to MultiRole mode, the module will restart automatically after changing.
   AT+MODE=U
3. Send “+++a” to enter serial AT command mode again.
4. Scan the surrounding slave devices, it can be connected via “scanning connection” or “automatic connection after power-on” in master mode. Here we take scanning connection as an example:

AT+SCAN

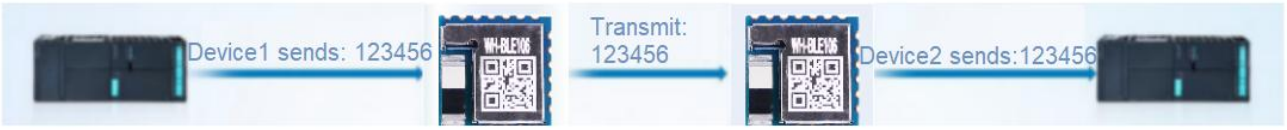
5. Connect according to the scanning result, you can connect via two ways:
   AT+CONN=num,n (n=1~8, “n” indicates the serial number in the linked list after connected. If “n” is omitted, it will default in the first one of the linked list, supports connecting to up to 8 slave devices)
   AT+CONN=MAC,n (n=1~8, “n” indicates the serial number in the link list after connected. If “n” is omitted, it will default in the first one of the linked list, supports connecting to up to 8 slave devices)
6. It can also be connected by surrounding master device. After the master device is connected, the free position of the link list is filled in from small to large.
7. After connected, send command to check if the connection is successful.
   AT+LINK

3.2. Transmission Mode

WH-BLE106 supports two transmission modes: transparent transmission, fixed-point transmission.
Note: The package length of a single serial port packet is variable. Compare the MTU obtained through Bluetooth with the PKLEN set by the commands, the smaller one is valid. Default to 200 bytes.

3.2.1. Transparent Transmission

Transparent transmission means that the data transmission process does not affect the content of the data.



Here take the master/slave mode as example to show how to configure the module to transparent mode:

- Slave mode

1. Send “+++a” to enter serial AT command mode.
2. Change the working mode to salve mode, the module will restart automatically after changing.
   AT+MODE=S
3. Set the transmission mode to transparent mode.
   AT+WMODE=0
4. After configuring the parameters, exit AT command mode.
   AT+ENTM

- Master mode

1. Send “+++a” to enter serial AT command mode.
2. Change the working mode to master, the module will restart automatically after changing.
   AT+MODE=M
3. Send “+++a” to enter serial AT command mode again.
4. Configure the transmission mode to transparent mode.
   AT+WMODE=0
5. Send scan command
   AT+SCAN
6. Connect according to the scanning result, you can connect via two ways:

AT+CONN=num (“num” indicates the serial number of the slave device in the scan list)

AT+CONN=MAC (“MAC” indicates the MAC address of the slave device, you can query via “AT+MAC” in slave devices)

7. Check if the connection is successfully.

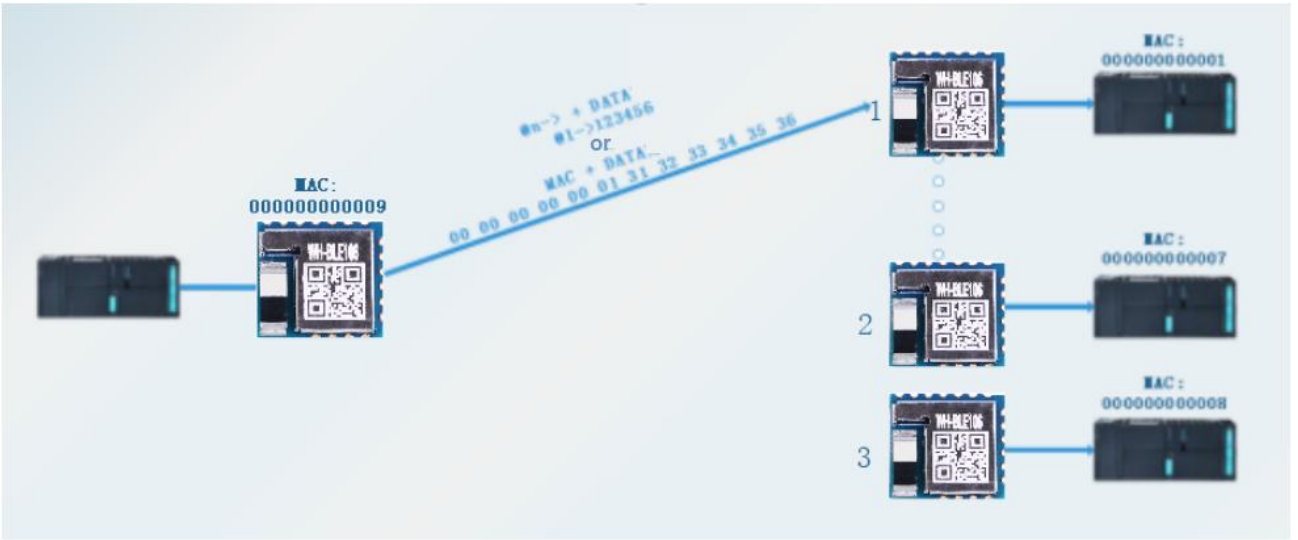
   AT+LINK

8. If the connection is successful, exit AT command mode, then can achieve the serial data transparent transmission.

   AT+ENTM

3.2.2. Fixed-Point Transmission

On the basis of transparent transmission, the fixed-point transmission protocol adds a protocol header before the data to be sent, and the module can send the data at a fixed point according to the content of the protocol header. The advantage of the fixed-point transmission protocol is that the target device can be flexibly changed when the data is sent.



There are four fixed-point transmission modes. For details, see the example flow. The following example uses one master and multiple slave as an example to explain how to configure the module to fixed-point transmission mode.

(1) When “WMODE=1”, the “@n->” protocol header is added before the data is sent, and the protocol header is automatically added before the data is received. For details, see the screenshot of the example.

- Slave mode

1. Send “+++a” to enter serial AT command mode.
2. Change the working mode to slave, the module will automatically restart after changing.
   AT+MODE=S
3. Configure the transmission mode to fix-point.
   AT+WKMOD=1
4. Exit AT command mode.
   AT+ENTM

- Master mode

1. Send “+++a” to enter serial AT command mode.
2. Enable multilink mode.
   AT+MULTILINK=ON
3. Change the working mode to master, the module will automatically restart after changing.
   AT+MODE=M
4. Send “+++a” to enter serial AT command mode again.
5. Configure the transmission mode to fixed-point.
   AT+WMODE=1
6. Send scan command.
   AT+SCAN
7. Connect according to the scanning result, you can connect via two ways:
   AT+CONN=num (“num” indicates the serial number of the slave device in the scan list)
   AT+CONN=MAC (“MAC” indicates the MAC address of the slave device, you can query via “AT+MAC” in slave devices)
8. Repeat Step 7 to connect all slave devices to be connected. After the connection is complete, send the link command to check whether the connection is successful:
   AT+LINK
9. After connected successfully, send command to exit AT command mode.
   AT+ENTM

(2) When “WMODE=2”, the “@n->” protocol header is added before data is sent, but there is no header before received data.

Refer to step (1), change to WMODE=2, below is the test result.

(3) When “WMODE=3”, you need to add the 6-byte MAC address before data is sent, and this MAC header will be added before received data.

Refer to step (1), change to WMODE=3, below is the test result.

(4) When “WMODE=4”, you need to add the MAC header before data is sent, but there is no MAC header before received data.

Refer to step (1), change to WMODE=4, below is the test result.

3.3. Advanced Features

3.3.1. Packaging Mechanism

Low power Bluetooth module is positioned for the transmission of small amounts of data. According to different serial port baud rate, BLE connection interval and different packet sending interval, the module will have different data handling capacity. The serial port of WH-BLE106 can receive packets of up to 1200 bytes at a time, it will automatically unpack and send according to the size of the packets. When Bluetooth connects to MTU for interaction, the module will compare MTU with the recommended length of single packet PKLEN set by the commands, and the smaller value will be used as the packaging length of subsequent packets. If our module is used for data transmission, the default package length is 200 bytes. The specific command is set as follows:

AT+PKLEN=20

The serial port packing time can also be set by using the AT command. The default serial port packing time is 3ms, which can be set by users according to the requirements. A reasonable packing time can reduce the occurrence of sticky packets (see the command AT+UARTFT for details). The setting method is as follows:

AT+UARTFT=3

If the amount of data is too large and the sending time is too short, the serial port cache overflow may cause data loss. In this case, you can increase the Bluetooth connection rate to increase the data sending speed.

AT+SPD=MIDDLE

When the serial port uses large data packets of more than 200 bytes and less than 1200 bytes, the serial port data can be received at one time. However, you need to reserve the time for the module to send data through Bluetooth. Otherwise, packet collision may occur (At the receive side, the first packet from the serial port has not finished output, and then the second packet of data arrives, it cannot distinguish the number of received data packets).

For versions below Android 5.0, the bottom layer limits the maximum transmission size per packet to 20 bytes, and for IOS, the maximum transmission size per packet is 182 bytes, and the maximum number of bytes per packet for communication with our devices is 155 bytes. When sending data from mobile to the module, please unpack firstly.

The Bluetooth handshake interval is 12.5ms~90ms. It is recommended that the sending interval be longer than this time, because data transmission and reception will only be performed during the Bluetooth handshake. If the sending interval is less than the handshake interval, packet loss or packet collision will occur. The advantage of a long interval is a significant reduction in power consumption, while the advantage of a short interval is that data can be sent and received faster. Customers need to choose between the two, which can be adjusted by AT+SPD. The handshake interval we set is biased to reduce power consumption.

3.3.2. iBeacon Protocol

WH-BLE106 uses BLE broadcast technology to send its own unique ID to the surrounding, and the application software that receives the ID will take some actions according to the ID. For example, if the iBeacon communication module is set up in the store, an information notification server can be run on the iPhone and iPad, or the server can send discount coupons and store credits to customers. In addition, iBeacon can be used to send information to the app when the appliance malfunctions or stops working.

iBeacon protocol has four parameters, UUID, Major, Minor, TX power.
UUID can distinguish beacon from different devices. For example, a certain area of a shop is distributed by a network of beason. It is used to provide specific services to customers. The beason in the network has the same UUID.
Major number: used to identify related beacon as a group. For example, beason in same shop will have same major number.
Minor grade: used to identify specific beason devices. In this way, you will know where the customer is in the store.
TX power: used to determine the distance between you and beason, which is the signal intensity value (RSSI) measured from the device 1m. The received signal becomes weaker, that is, the distance is far away. According to the RSSI distance of 1 meters and the current RSSI, the distance can be calculated.

iBeacon of WH-BLE106 can be set with simple commands:

1. Send “+++a” to enter serial AT command mode.
2. Change the working mode to broadcast, the device will automatically restart after changing.
   AT+MODE=B
3. Set the iBeacon parameters.
   AT+IBEACON=B9407F30F5F8466EAFF925556B57FE6D,1,1,175
4. Restart the take the parameters effect.
   AT+Z

Note: Due to the fluctuation of the signal and the complex environmental factors of the physical space, the distance measurement of the iBeacon is not very accurate. Apple also puts the results in a probability range and divides them into immediate (less than 1 meter), Near (about 1 meter to 3 meters), Far (farther), Unknown (unknown, usually in the startup phase, or because of some other reason cannot be judged), the data provided by Apple found that the positioning is more accurate within 3 meters.

3.3.3. Low Power Mode

WH-BLE106 has a variety of low power mode, which can provide longer battery life for battery powered users.

(1) Autosleep mode, using AT command setup the sleep time, when without connection, serial port has no data, or after reaching the set time, the module automatically enters sleep mode. In this mode, the normal broadcasting of Bluetooth can be connected, and the serial data can be waken up at any time. You can configure via below AT command:
AT+AUTOSLEEP=ON,4

(2) Deepsleep mode, enter by AT command, the module can be broadcast and connected in this mode. The connection or wake up pins can be used to wake up the module. The power consumption of this mode is 155uA, and most slave machines work in this mode. You can configure via below AT command:
AT+DEEPSLEEP
Note: The default Bluetooth connection interval is 45ms.

(3) Hibernate mode, enter by AT command, module will not work in this mode, wake up pins can be used to wake up the modules. The power consumption of this mode is 0.7uA.
AT+HIBERNATE

Low Power Mode	Consumption (Typical value)	Wake-up	Features that works properly
AUTOSLEEP	4.6mA	Serial port Wake-up pins Connection	Broadcast normally, establish connection, and respond to AT commands
DEEPSLEEP	250uA	Wake-up pins Connection	Normal broadcast, establish connection, do not respond to AT command (Connection interval is 45ms, broadcast interval is 100ms)
HIBERNATE	0.7uA	Wake-up pins	Module stops working and does not respond to AT commands

Note: Low power mode only applies to slave and broadcast mode.

When using the pin to wake up the module, the serial port will print the Wake UP message. If Wake UP information is printed, it means that the module wakes up normally. If Wake UP information is not printed, it means that the module does not wake up normally. Please perform the pin wake-up operation again.

3.3.4. Password Pairing Verification

In order to ensure the security of the device, WH-BLE106 provides a password pairing mechanism, which needs to be enabled using AT commands. When this function is turned on, if the mobile phone and other devices search for the module and connect it, you need to write a 6-digit password in the "Write" and "Write without response" services of "Service" within 10 seconds before it can be maintained connection and data transfer.

If the password is entered incorrectly, it will continue to wait for the password to be entered until it times out and the device will be disconnected. If we use our master device to connect our slave device, we only need to start communication after sending a 6-digit password through the serial port of the master device after the connection is established.

WH-BLE106 also supports the Bluetooth standard pairing method. After it is turned on, the mobile phone device at that time will prompt whether to perform password pairing after the connection operation. If pairing is selected, the Bluetooth data communication will automatically transfer to the encrypted channel for transmission (not data transmission encryption function, the encryption here refers to the encrypted channel after the Bluetooth protocol is paired successfully).

User-defined password pairing can be enabled via below command:

AT+PASSEN=ON

Configure the pairing password via below command:

AT+PASS=123456

Note: Default pairing password is 000000.

The standard pairing mode of Bluetooth can be enabled as follows:

AT+PAIR=ON

3.3.5. Data Transmission Encryption

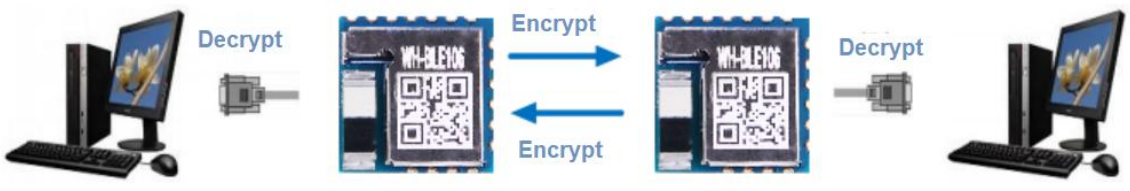
For the security of data transmission, data can be chosen for plaintext transmission and encrypted transmission. Enable by AT command, serial data will be encrypted by PCI, the module receives data with the same password can decrypt the data, ensure the security of data transmission. If customers use our modules for one-master-slave data transparent transmission, they only need to configure two modules like below:

AT+TRENC=ON

Configure two modules to the same password:

AT+KEY=30313233343536373839414243444546

In this way, when two modules establish a connection for data transmission, the data received by the serial port will be encrypted, and the data will be decrypted before output to the serial port to prevent the data from being acquired during the transmission.



3.3.6. Auto Reconnection

In order to ensure the stability of the module connection and prevent possible power outages and other abnormal phenomena, WH-BLE106 has designed a auto reconnection mechanism. The user can turn on the auto-connection function through the AT command. If the connection between the modules is disconnected due to abnormal phenomena such as power failure or signal interference, when the abnormal interference disappears and the working environment of the module returns to normal, the master module will automatically search for the slave that has just been disconnected. When the slave module is found, master will automatically perform the connection operation to reduce the loss of data as much as possible and improve the stability of the system.

Enable auto reconnection command:

AT+AUTOCONN=ON

If the environmental signal interference is strong or there are too many Bluetooth signals, you can increase the auto re-connection success rate by increasing the scan time:

AT+ACONTIM=n (1~100)

The auto reconnection mechanism exists in the master mode or the multirole mode. When the user only uses our module as a slave, this mechanism is meaningless as the slave cannot actively connect to the master.

Note:

1. When both parties use AT+DISCONN to actively disconnect, they will not reconnect. If power-on automatic connection and auto-connection are enabled at the same time, power-on automatic connection takes precedence. The vacant position that is automatically connected after power-on is reconnected according to the MAC saved from the last disconnection.
2. When the multirole mode and master mode enable multilink function, and then turn on auto-connection function or automatic connection to MAC after power-on , it is recommended to set the value greater than 20 to increase the probability of successful connection.

3.3.7. Auto Connection to MAC

WH-BLE106 supports the function of automatically connecting to the MAC when powered on. This function is mainly used in the master or multirole mode. When the user wants the module to automatically connect to a slave device with a fixed MAC every time it is powered on, it can be configured through +CONNADD command. After the setting is completed, the device can scan and connect according to the set MAC every time it is powered on. When the target MAC broadcast appears within the scanning range, it can be connected. If multiple masters connect to a slave at the same time, the first connection may fail, and the master will try to connect again after 3.5 seconds.

You can enable this function in a master or multirole device via below commands:

1. Configure the MAC address that need to connect.
   AT+CONNADD=00112233445566 (Master mode settings for single connection)
   AT+CONNADD=00112233445566,n (Multilink or multirole mode settings, n:1~8）
2. Restart the device.
3. After restart, the module will scan and connect automatically, you can query the connection status via AT commands:
   “+++a” to enter AT command mode.

AT+LINK

Note:

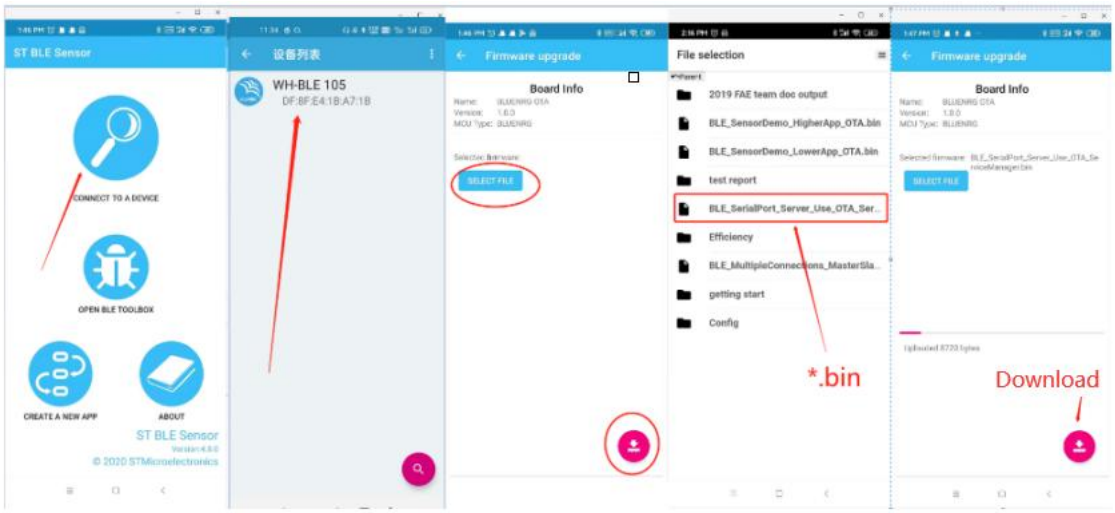
1. When the power-on automatic connection to the MAC is set in multirole mode, after the MAC is successfully set at the corresponding location, the location is reserved. Even if the set MAC is not connected, the location can no longer be connected by the master.
2. If you want to connect other slaves at the location where the MAC is set (the premise is that the slave that automatically connects to the MAC is not successfully connected when the location is powered on), the connection can be actively scanned through AT+SCAN, but when the power is turned on again, the set MAC is still the first priority connection.
3. If the user wants to allow this module to be connected by other masters in the set MAC position, needs to first set the power-on automatic connection MAC command position to full FF (AT+CONNADD=FFFFFFFFFFFF,n), and then connect after restarting.
4. When the multirole mode and master mode enable multilink function, and then turn on auto-connection function or automatic connection to MAC after power-on , it is recommended to set the value greater than 20 to increase the probability of successful connection.

3.3.8. OTA Upgrade

WH-BLE106 supports OTA to upgrade the firmware of the module. There are two ways to enter OTA mode. If there is no connection within 30s after entering OTA mode, it will automatically exit. OTA upgrade operation is as follows:

1. There are two ways to enter OTA mode:
   - Press and hold the “Reload” button, reset or re-power the module. When the LINK indicator is flashing, release the “Reload” button, enter OTA mode.
   - Send “+++a” to enter AT command mode, send “AT+OTA” from serial port to enter OTA mode.
2. Download and install below software:

3. Select the device with the corresponding MAC address to connect according to the screenshot below, select the upgrade file, and click “Download” to upgrade (only the devices that support OTA upgrade will be displayed)



Note: This module also supports serial upgrading, for details, please consult technical support services.

3.3.9. Indicator Status

There is a “Link” indicator in the module, and it has different status in different working mode of the module. Please check below:

Module Status	Indicator Status
Master mode	Rollover every 340ms
Slave mode	Rollover every 1s
Broadcast mode	Rollover every 340ms
MultiRole mode	Rollover every 340ms
Establish connection	Pin output low level
Low power mode	Pin output high level
OTA upgrading	Rollover every 100ms

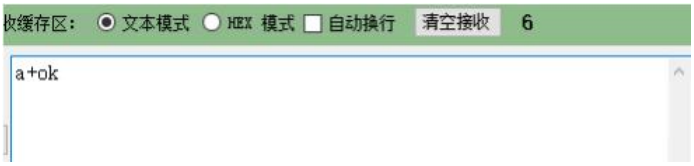
4. Product Configuration

4.1. AT Command Configuration

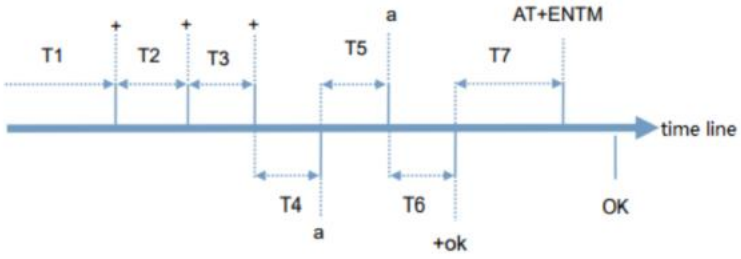
After the module is started successfully, the module can be set by UART.
UART parameters: baud rate 57600, parity bit none, data bit 8, stop bit 1.

4.1.1. Serial AT Commands

WH-BLE106 support multiple working modes, users can use serial port command make the module work at AT command mode.
Steps to switch from other modes to command mode:
1. Send +++ from serial port to module, when module receives “+++”, it will return “a”;
2. After serial port receives “a”, send another “a” to module within 3s, module will return”+OK”. When receives it, then enter AT command mode.



Instruction:
Entering "+++" and "a" needs to be completed within a certain period of time:



Requirement:
T1>packaging interval, T2,T3<=300ms, T5<=3s.
To switch from the command mode to the transparent mode, you need to use the “AT+ENTM” command. In the command mode, enter “AT+ENTM” and end with a carriage return to switch to the transparent mode.

4.1.2. Transparent AT commands

WH-BLE106 supports transparent AT command mode, in this mode, you can use phone APP or connection module to set parameters, add 6 bit password and command to the module. e.g. 000000, AT+CIVER? {CR}{LF} . You can set up and query parameters without entering the command mode.

4.1.3. AT Command Overview

AT commands can be input directly through serial port debug software such as CRT, can also be input through programmed. AT command uses the command line based on ASCII code. The format is as follows:

1. Format Description
   < >: Indicate the part that must be included.
   [ ]: Indicate the detailed parameters.
2. Command Message
   AT+<CMD>[OP][para-1,para-2,para-3,para-4…]<CR><LF>
   AT+: Command message prefix
   [OP]: The command operator is specified as parameter setting or query.
   "=": Indicates setup parameter
   "?": Indicates query parameter
   NULL: Indicates that the command only executes operations, without setting and query operations.
   [para-n]: Used only when parameters are set, indicating input.
   <CR>: Terminator, carriage return, ASCII code 0X0D
   <LF> : Terminator, line break, ASCII code 0x0A
3. Response Message
   <CR><LF>+<CMD><RSP>[para-1,para-2,para-3,para-4…]<CR><LF>
   +: Response message prefix
   <CMD>: Command echo
   <RSP>: Response string, including:
   "OK": Success
   "ERR": Fail
   [para-n]: Returns a parameter or error code when querying.
4. Error code

Error Code	Description
ERR-1	Invalid command format
ERR-2	Invalid command
ERR-3	Invalid operator
ERR-4	Invalid parameter
ERR-5	Operation fail

4.1.4. AT Command Set

No.	Command	Description
1	NAME	Query/Set module name
2	MODE	Query/Set working mode
3	MAC	Query module MAC
4	CIVER	Query firmware version
5	TPL	Query/Set module transmit power
6	PASS	Query/Set module password
7	PASSEN	Query/Set if enable password pairing
8	UART	Query/Set module serial parameters
9	UARTFT	Query/Set serial packaging time
10	AUTOSLEEP	Query/Set auto sleep mode
11	DEEPSLEEP	Set to deepsleep mode
12	HIBERNATE	Set to hibernate mode
13	HELLO	Query/Set welcome message
14	ENTM	Exit AT command mode
15	RELOAD	Restore to factory settings
16	Z	Restart the module
17	OTA	Set to OTA upgrading mode
18	LINK	Query module connection status
19	SCAN	Scan surrounding slaves
20	CONN	Quickly establish a connection by searching to the number
21	CONNADD	Query/Set the module MAC address default connected when the device is powered on
22	DISCONN	Set to disconnect current connections
23	PAIR	Query/Set if enable pairing
24	ADPTIM	Query/Set the custom broadcast interval
25	AUTOCONN	Query/Set the auto connection function
26	ACONTIM	Query/Set automatic connection after power-on/auto connection scanning time
27	TRENC	Query/Set data transmission encryption
28	IBEACON	Query/Set iBeacon function
29	ADVDATA	Quer/Set broadcast data
30	UUID	Query/Set module UUID
31	MULTILINK	Query/Set multilink function of master or slave mode
32	WMODE	Query/Set module data transmission mode
33	SCANNAME	Query/Set whether the scan result contains the slave name
34	NOTIFY	Query/Set module connection prompt
35	SPD	Query/Set the connection interval level

36	KEY	Query/Set the transmission encryption password
37	PKLEN	Query/Set the serial port package length (the final length is compared with the negotiated MTU and the set length, whichever is smaller will take effect)
38	PHY	Query/Set BLE physical layer transmission rate

5. Contact Us

Company: Jinan USR IOT Technology Limited
Address : Floor 12 and 13, CEIBS Alumni Industrial Building, No. 3 Road of Maolingshan, Lixia District, Jinan, Shandong, China
Official website: https://www.pusr.com
Official shop: https://shop.usriot.com
Technical support: http://h.usriot.com/
Email: sales@usriot.com
Tel: +86-531-88826739
Fax: +86-531-88826739-808