



# Ai-WB2-32S-Kit Specification

Version V1.0.1

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## Document resume

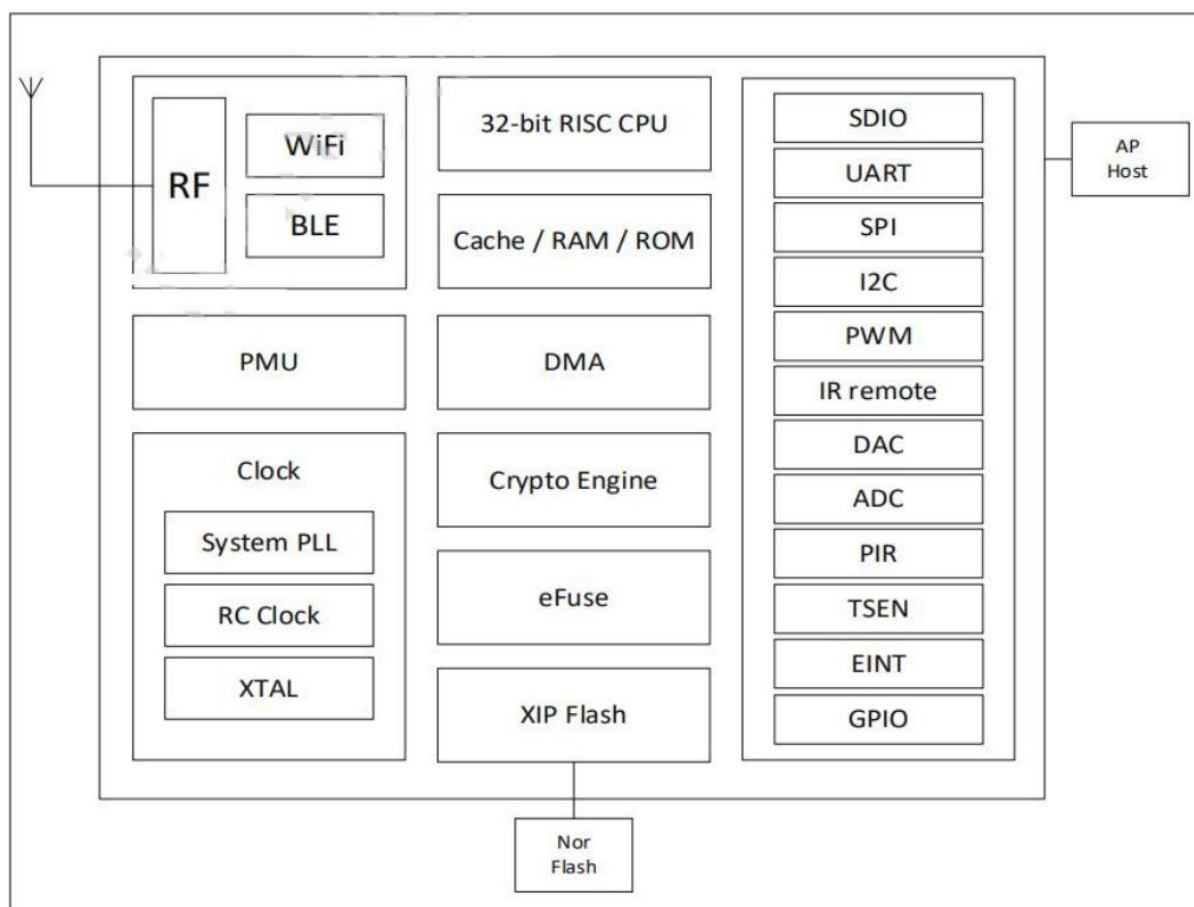
| Version | Date      | Develop/revise content            | Edition   | Approve |
|---------|-----------|-----------------------------------|-----------|---------|
| V1.0.0  | 2022.6.27 | First formulated                  | Cong Chen | Hong Xu |
| V1.0.1  | 2022.7.20 | Rending screen cover part changed | Cong Chen | Hong Xu |
|         |           |                                   |           |         |
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## 1. Product Overview

Ai-WB2-32S-Kit is a development board designed for Ai-WB2-32S modules. Ai-WB2-32S is a Wi-Fi & BT module developed by Shenzhen Ai-Thinker Technology Co., Ltd. The module is equipped with BL602 chip as the core processor and supports Wi-Fi 802.11b/g/n protocol and BLE 5.0 protocol. The BL602 chip has a built-in 32-bit RISC CPU with low power consumption, 276KB RAM, and a wide range of peripheral interfaces, including SDIO, SPI, UART, VDC, IR remote, PWM, ADC, DAC, PIR, and GPIO. It can be widely used in Internet of Things (IoT), mobile devices, wearable electronic devices, smart home and other fields.



**Figure 1 Main chip architecture diagram**

## 1.1. Characteristic

- DIP-38 package
- Supports IEEE 802.11 B/g/n protocol
- Wi-Fi security supports WPS/WEP/WPA/WPA2 Personal/WPA2 Enterprise/WPA3
- Supports 20MHz bandwidth with a maximum speed of 72.2 Mbps
- Bluetooth BLE 5.0, Bluetooth Mesh
- Supports Station + BLE mode, Station + SoftAP + BLE mode
- Supports 32-bit RISC CPU and 276KB RAM
- Secure Startup. Images with ECC-256 signatures are supported
- Supports real-time AES decryption (OTFAD) in QSPI and SPI Flash, and supports AES 128 CTR mode
- Supports AES 128, 192, and 256-bit encryption engines
- Supports SHA-1/224/256
- Real random number generator (TRNG)
- The public key accelerator (PKA) supports large numbers of basic operations. The software provides application interfaces such as signature and verification.
- Supports SDIO, SPI, UART, VDC, IR remote, PWM, ADC, DAC, PIR, and GPIO
- Integrated Wi-Fi MAC/BB/RF/PA/LNA/BT
- Supports multiple sleep modes with a deep sleep current of 12 $\mu$ A
- Quick Start of universal AT commands
- Supports secondary development and integrates Windows and Linux development environments

## 2. Main parameters

**Table 1 main parameters**

|                              |                                                         |
|------------------------------|---------------------------------------------------------|
| <b>Model</b>                 | Ai-WB2-32S-Kit                                          |
| <b>Package</b>               | DIP-38                                                  |
| <b>Size</b>                  | 55.05*25.4(±0.2)mm                                      |
| <b>Antenna</b>               | On-Board PCB antenna                                    |
| <b>Frequency</b>             | 2400 ~ 2483.5MHz                                        |
| <b>Operation temperature</b> | -40°C ~ 85°C                                            |
| <b>Storage environment</b>   | -40°C ~ 125°C, < 90%RH                                  |
| <b>Power supply</b>          | Supply voltage 3.3V or 5V, power supply current ≥ 500mA |
| <b>Interfaces</b>            | UART/GPIO/ADC/PWM/I2C/SPI                               |
| <b>I/O</b>                   | 15                                                      |
| <b>Serial port rate</b>      | Default value: 115200 bps                               |
| <b>Security</b>              | WPS/WEP/WPA/WPA2 Personal/WPA2 Enterprise/WPA3          |
| <b>Flash</b>                 | Default: 4MByte                                         |

### 2.1. Power supply selection

Ai-WB2-32S-Kit supports three power supply modes:

- Type-C interface power supply (recommended)
- 5V and GND pin power supply
- 3V3 and GND pin power supply

### 2.2. Static electricity requirements

Ai-WB2-32S-Kit are electrostatic sensitive equipment, special precautions should be taken during handling.



**Figure 2 ESD anti-static diagram**

## 2.3. Electrical characteristics

**Table 2 Electrical Characteristics Table**

| Parameter                       |      | Conditio | Min.      | Typical value | Max.      | Unit |
|---------------------------------|------|----------|-----------|---------------|-----------|------|
| Interface Power supply (Type-C) |      | VDD      | 4.5       | 5             | 5.3       | V    |
| Power supply voltage (pin)      |      | VDD      | 2.7       | 3.3           | 3.6       | V    |
| I/O                             | VIL  | -        | -         | -             | 0.3*VDDIO | V    |
|                                 | VIH  | -        | 0.7*VDDIO | -             | -         | V    |
|                                 | VOL  | -        | -         | 0.1*VDDIO     | -         | V    |
|                                 | VOH  | -        | -         | 0.9*VDDIO     | -         | V    |
|                                 | IMAX | -        | -         | -             | 15        | mA   |

## 2.4. Wi-Fi RF performance

**Table 3 Wi-Fi RF performance table**

| Description                    | Typical value |               |      | Unit |
|--------------------------------|---------------|---------------|------|------|
| Spectrum Range                 | 2400 - 2483.5 |               |      | MHz  |
| Output power                   |               |               |      |      |
| Model                          | Min.          | Typical value | Max. | Unit |
| 11n mode HT20, PA output power | -             | 16            | -    | dBm  |
| In 11G mode, PA output power   | -             | 17            | -    | dBm  |
| In 11b mode, PA output power   | -             | 19            | -    | dBm  |
| Receiving sensitivity          |               |               |      |      |
| Model                          | Min.          | Typical value | Max. | Unit |
| 11b, 1 Mbps                    | -             | -98           | -    | dBm  |
| 11b, 11 Mbps                   | -             | -90           | -    | dBm  |
| 11g, 6 Mbps                    | -             | -93           | -    | dBm  |
| 11g, 54 Mbps                   | -             | -76           | -    | dBm  |
| 11n, HT20 (MCS7)               | -             | -73           | -    | dBm  |

## 2.5. BLE RF performance

**Table 4 BLE RF performance table**

| Description                   | Typical value |               |      | Unit |
|-------------------------------|---------------|---------------|------|------|
| Spectrum Range                | 2400 - 2483.5 |               |      | MHz  |
| Output power                  |               |               |      |      |
| Rate Mode                     | Min.          | Typical value | Max. | Unit |
| 1Mbps                         | -             | 9             | 15   | dBm  |
| Receiving sensitivity         |               |               |      |      |
| Rate Mode                     | Min.          | Typical value | Max. | Unit |
| 1Mbps sensitivity @ 30.8% PER | -             | -96           | -    | dBm  |

## 2.6. Power

The following power consumption data is based on a 3.3V power supply, an ambient temperature of 25°C, and measured using an internal regulator.

- All measurements are completed at the antenna interface with a filter.
- All emission data are measured in a continuous emission mode based on a 100% duty cycle.

**Table 5 Power Consumption Table**

| Pattern                            | Minimum | Average | Maxim | Comp |
|------------------------------------|---------|---------|-------|------|
| Tx 802.11b, 11Mbps, POUT = + 21dBm | -       | 260     | -     | mA   |
| Tx 802.11g, 54Mbps, POUT = + 18dBm | -       | 245     | -     | mA   |
| Tx 802.11n, MCS7, POUT = + 17dBm   | -       | 230     | -     | mA   |
| Rx 802.11b, 1024 bytes long        | -       | 65      | -     | mA   |
| Rx 802.11g, 1024 bytes long        | -       | 65      | -     | mA   |
| Rx 802.11n, 1024 bytes long        | -       | 65      | -     | mA   |
| Deep-Sleep                         | -       | 12      | -     | μ A  |

### 3. Appearance size

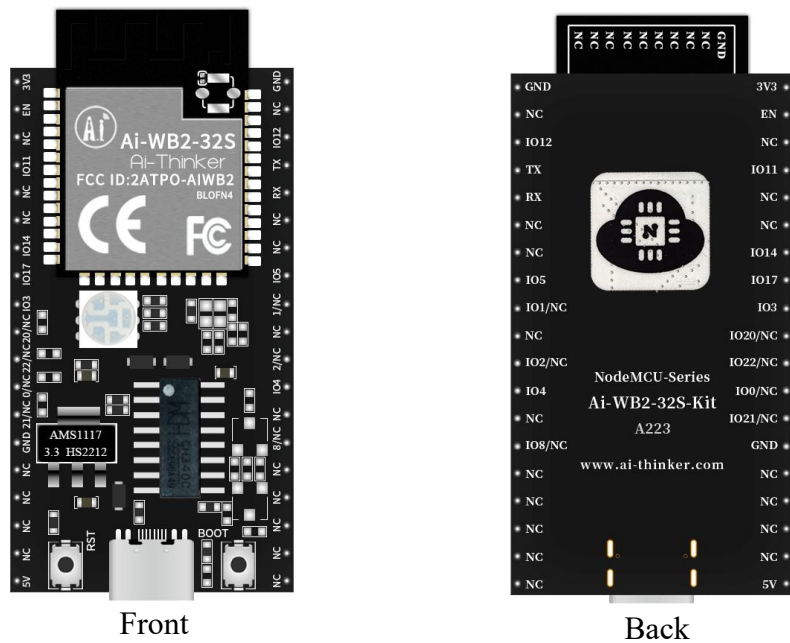


Figure 3 External view (For reference only)

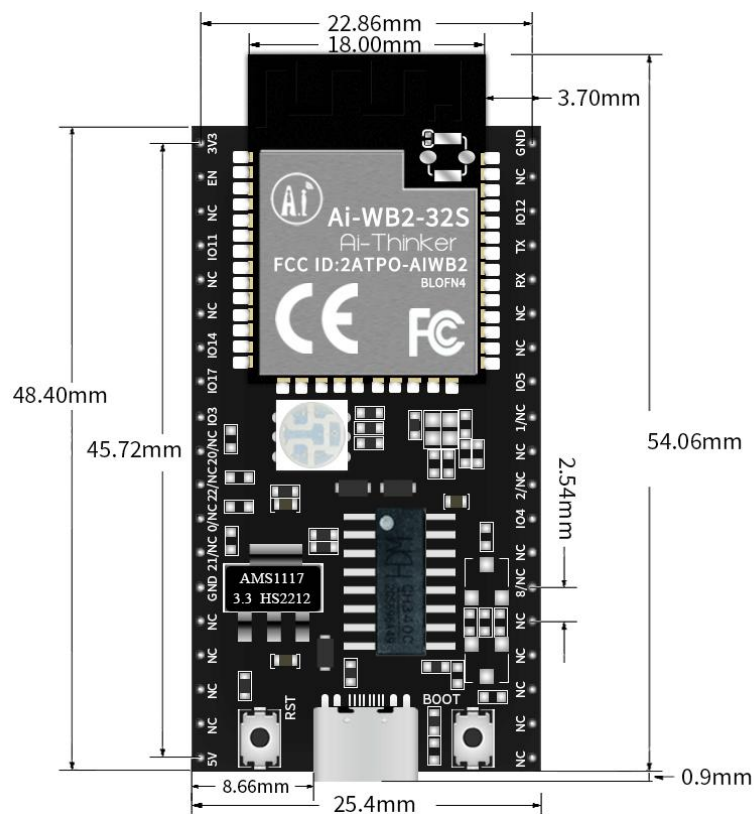
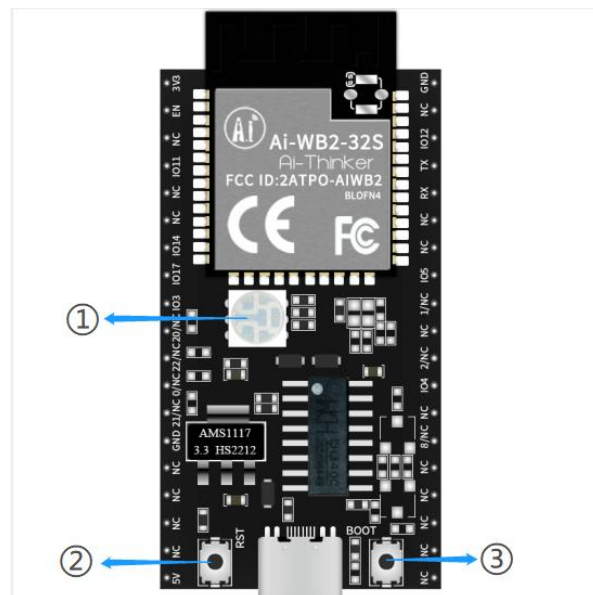


Figure 4 size chart

## 4. Indicator light and button description



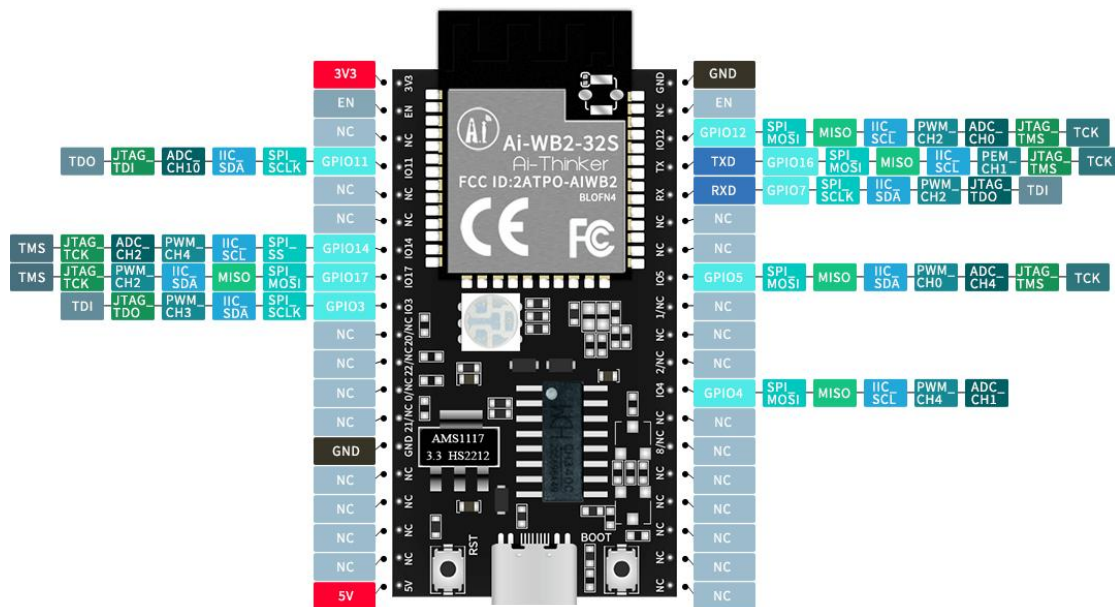
**Figure 5 Ai-WB2-32S-Kit indicator light and key position**

**Table 6 Ai-WB2-32S-Kit indicator light and key position**

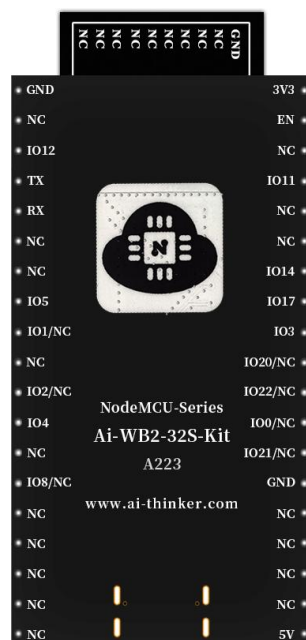
|   |                                                                                                                                    |
|---|------------------------------------------------------------------------------------------------------------------------------------|
| ① | RGB light (red light is connected to IO14, Green Light is connected to IO17, blue light is connected to IO3, high level effective) |
| ② | Reset button                                                                                                                       |
| ③ | To burn the button, you need to press the Burn button and then press the reset button.                                             |

## 5. Pin definition

Ai-WB2-32S-Kit, a total of 38 interfaces are connected, for example, the pin function definition table is the interface definition.



Front



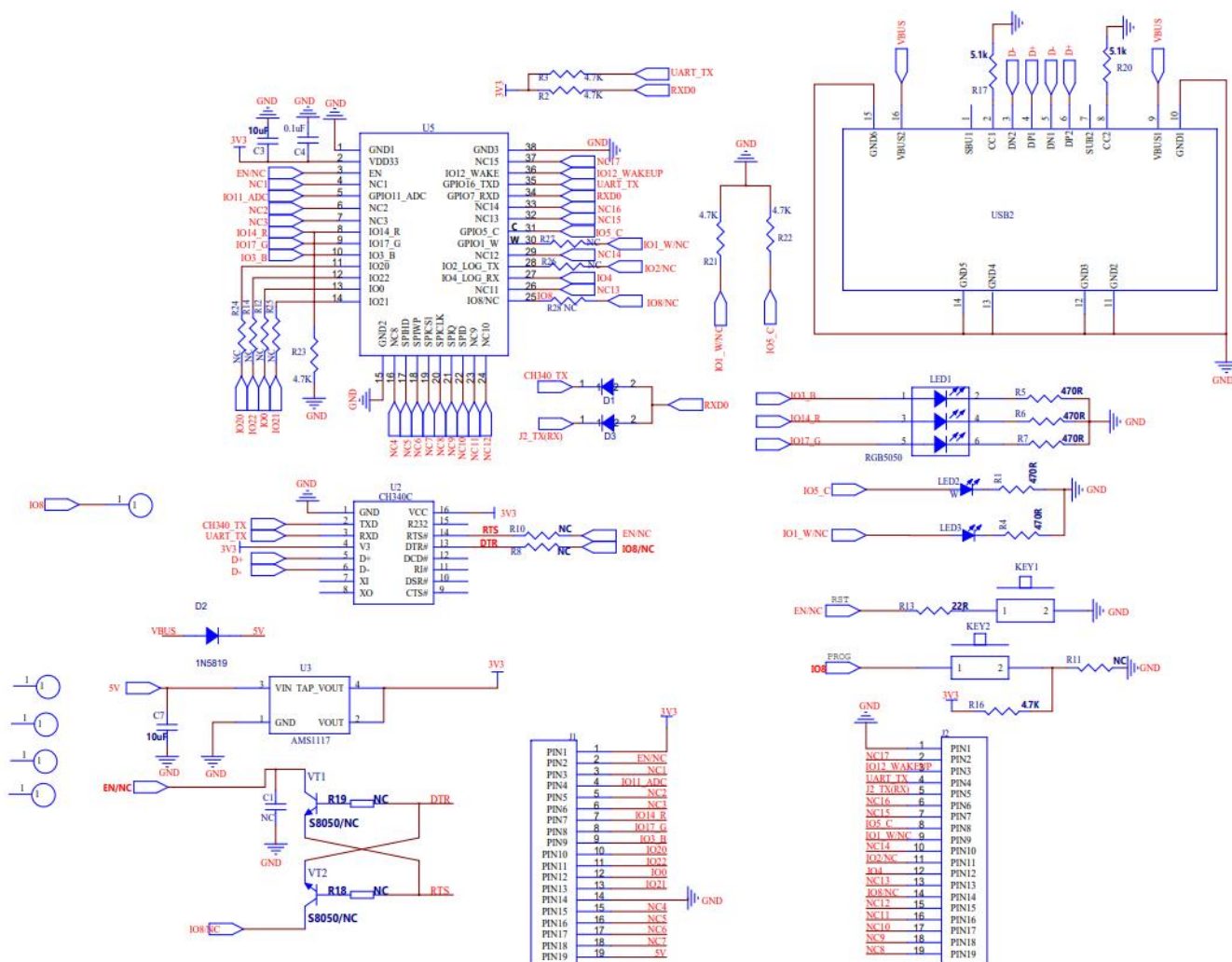
Back

Figure 5 pin diagram

**Table 6 Definition table of pin functions**

| No. | Name       | Function                                                                                            |
|-----|------------|-----------------------------------------------------------------------------------------------------|
| 1   | 3V3        | 3.3V power supply; The output current of the external power supply is recommended to be above 500mA |
| 2   | EN         | By default, it is enabled as a chip, and the high level is effective                                |
| 3   | NC         | Empty feet                                                                                          |
| 4   | IO11       | GPIO11/SPI_SCLK/IIC_SDA/ADC_CH10/JTAG_TDI/TDO                                                       |
| 5   | NC         | Empty feet                                                                                          |
| 6   | Empty feet | Empty feet                                                                                          |
| 7   | IO14       | GPIO14/SPI_SS/IIC_SCL/PWM_CH4/ADC_CH2/JTAG_TCK/TMS                                                  |
| 8   | IO17       | GPIO17/SPI_MOSI/MISO/IIC_SDA/PWM_CH2/JTAG_TCK/TMS                                                   |
| 9   | IO3        | GPIO3/SPI_SCLK/IIC_SDA/PWM_CH3/JTAG_TDO/TDI                                                         |
| 10  | IO20/NC    | The default NC is unavailable                                                                       |
| 11  | IO22/NC    | The default NC is unavailable                                                                       |
| 12  | IO0/NC     | The default NC is unavailable                                                                       |
| 13  | IO21/NC    | The default NC is unavailable                                                                       |
| 14  | GND        | Ground                                                                                              |
| 15  | NC         | Empty feet                                                                                          |
| 16  | NC         | Empty feet                                                                                          |
| 17  | NC         | Empty feet                                                                                          |
| 18  | NC         | Empty feet                                                                                          |
| 19  | 5V         | 5V power supply; External power supply output current is recommended to be above 500mA              |
| 20  | NC         | Empty feet                                                                                          |
| 21  | NC         | Empty feet                                                                                          |
| 22  | NC         | Empty feet                                                                                          |
| 23  | NC         | Empty feet                                                                                          |
| 24  | NC         | Empty feet                                                                                          |
| 25  | IO8/NC     | The default NC is unavailable.                                                                      |
| 26  | NC         | Empty feet                                                                                          |
| 27  | IO4        | GPIO4/SPI_MOSI/MISO/IIC_SCL/PWM_CH4/ADC_CH1                                                         |
| 28  | IO2/NC     | The default NC is unavailable                                                                       |

|    |        |                                                     |
|----|--------|-----------------------------------------------------|
| 29 | NC     | Empty feet                                          |
| 30 | IO1/NC | The default NC is unavailable                       |
| 31 | IO5    | GPIO5/SPI_MOSI/MISO/IIC_SDA/PWM_CH0/ADC_CH4/JTAG_T  |
| 32 | NC     | Empty feet                                          |
| 33 | NC     | Empty feet                                          |
| 34 | RX     | RXD/GPIO7/SPI_SCLK/IIC_SDA/PWM_CH2/JTAG_TDO/TDI     |
| 35 | TX     | TXD/GPIO16/SPI_MOSI/MISO/IIC_SCL/PWM_CH1/JTAG_TMS/T |
| 36 | IO12   | GPIO12/SPI_MOSI/MISO/IIC_SCL/PWM_CH2/ADC_CH0/JTAG_T |
| 37 | NC     | Empty feet                                          |
| 38 | GND    | Ground                                              |



**Figure 6 schematic diagram**

## 7. Product packaging information

Table 9 packing information table

| Packing List   | Packaging method        | Per package<br>(Electrostatic bag) | Per package<br>(Sealed bag) |
|----------------|-------------------------|------------------------------------|-----------------------------|
| Ai-WB2-32S-Kit | Foam+ Electrostatic bag | 1pcs                               | 20pcs                       |

## 8. Contact us

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WeChat mini program



WeChat official account

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# Combo Command List

Version

V4.18P\_3.8.0

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**Revision History**

| Document Version                 | Update time | Updater  | Reviewer                    | Important changes                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------|-------------|----------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DOC - V 0.0.0<br>(Not published) | 2021/8/10   | Yang Bin | Software Department+Xu Hong | Preliminary review of combo v2 version AT command set                                                                                                                                                                                                                                                                                                                                                     |
| DOC-V0.0.1<br>(Not published)    | 2021/8/17   | Yang Bin | Chen Zifeng                 | Add Bluetooth related instructions and modify the format                                                                                                                                                                                                                                                                                                                                                  |
| DOC-V0.0.2<br>(Not published)    | 2021/8/24   | Yang Bin | Chen Zifeng                 | Modified URC data definition<br>Added detailed descriptions of some nouns (no functional changes)<br>Add some error codes<br>AT+WJAP? Change the query encryption mode to string display and delete the execution operation<br>AT+WAUTOCONN deletes the execution operation<br>+EVENT:SocketDown add data option<br>AT+SOCKETDEL Modify the description string<br>Add AT+SOCKETSENDLINE, AT+SOCKETRECVCFG |
| DOC-V1.0.0<br>(combo-v2.0.0)     | 2021/10/8   | Yang Bin | Chen Zifeng                 | Add MQTT, HTTP related instructions, add URC data and error return code                                                                                                                                                                                                                                                                                                                                   |
| DOC-V1.0.0<br>(combo-v2.1.0)     | 2021/11/1   | Yang Bin | Chen Zifeng                 | Added Bluetooth URC data and error codes<br>AT+BLEMODE adds Bluetooth off state<br>Added AT+WCCOUNTRY command<br>Modify the Bluetooth power display content and add the maximum and minimum value display<br>Modify the Bluetooth transparent transmission channel description<br>Modify the AT+BLECONINTV                                                                                                |

|                                  |                  |                               |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------|------------------|-------------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  |                  |                               |             | parameter unit<br>Modify the AT+BLEADVINTV<br>parameter unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| DOC-V1.1.0<br>(combo-v2.<br>2.0) | 2021/11/26       | Yang Bin                      | Chen Zifeng | Added Bluetooth setting<br>precautions description<br>Added Realtek precautions<br>description<br>MQTT adds the Retained option<br>(the previous version was not<br>released so no major version<br>will be updated this time)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| DOC-V1.2.0<br>(combo-v2.<br>3.0) | 2021/12/7        | Yang Bin                      | Chen Zifeng | MQTT adds will message                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| DOC -<br>V1.3.0                  | 2021/ 12 /<br>21 | Xiong<br>Wenqiang             | Chen Zifeng | Simplified I O , serial port , pwm<br>command , synchronous 8258 ,<br>6212 , 6252 series Bluetooth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| DOC-V1.4.0<br>(combo-v2.<br>4.0) | 2021/12/24       | Xiong<br>Wenqiang<br>Yang Bin | Chen Zifeng | 1. Serial port configuration<br>command AT+UARTCFG cancels<br>the flow control setting (the<br>default configuration is no flow<br>control)<br>2. Delete IO read and write<br>commands AT+SYSIOSETCFG<br>AT+SYSIOGETCFG<br>3. The AT+SYSGPIOWRITE<br>command is executed once by<br>default to set the GPIO to<br>output mode.<br>4. The AT+SYSGPIOREAD<br>command is executed once by<br>default and the GPIO is set to<br>floating input mode<br>5.AT+PWMCFG duty cycle use<br>time control<br>6. Added AT+PWMCFGS<br>command (use 100% to indicate<br>duty cycle)<br>7.AT+PWMDUTYSET duty cycle<br>usage time control<br>8. Added AT+PWMDUTYSETS<br>(use duty cycle)<br>9. Modify the AT+WAPDHCP<br>command parameters. Disabling |

|                               |            |                            |             |                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------|------------|----------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                               |            |                            |             | DHCP also requires setting IP information.<br>10. Add AT+BLECONNECT single Bluetooth connection<br>11. Added error codes                                                                                                                                                                                                                   |
| DOC-V1.5.0<br>(combo-v2.5.0)  | 2021/12/31 | Xiong Wenqiang<br>Yang Bin | Chen Zifeng | 1. Bluetooth scanning format correction<br>2. Automatically enter transparent transmission mode after Bluetooth connection<br>3. AT+ BLEIBCNDATA new query command<br>4. AT+PWMCFGS and AT+PWMDUTYSETS command description issues<br>5. Change the Bluetooth query MAC format to lowercase<br>6. Modify the Bluetooth slave broadcast data |
| DOC-V1.6.0<br>(combo-v2.7.0)  | 2022/1/24  | Yang Bin                   | Chen Zifeng | 1. Add mobile phone network configuration instructions<br>2. Serial port configuration command AT+UARTCFG cancels flow control settings (the code was updated last time but the document was not updated)<br>3. AT+WAP? Check the added client list display                                                                                |
| DOC-V1.7.0<br>(combo-v2.8.0)  | 2022/2/9   | Yang Bin                   | Chen Zifeng | 1. Start the log to add the default processing when the MAC and serial number are empty<br>2. Added prompt information when client connection is disconnected in AP mode                                                                                                                                                                   |
| DOC-V1.7.1<br>(combo-v2.8.0)  | 2022/2/21  | Xiong Wenqiang             | Chen Zifeng | 1. Update Bluetooth notes information                                                                                                                                                                                                                                                                                                      |
| DOC-V1.7.2<br>(combo-v2.10.0) | 2022/2/22  | Yang Bin                   | Chen Zifeng | 1. Modify UDP transparent transmission logic, single UDP client and single UDP server support original port transparent transmission mode<br>2. AT+SOCKETTT adds setting                                                                                                                                                                   |

|                                            |            |          |  |                                                                                                                                                                                                                                                   |
|--------------------------------------------|------------|----------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                            |            |          |  | command<br>3. GPIO command pin sorting changed to start from 1 (previously started from 0)<br>4. AT+SOCKET adds SSL server/client options<br>5. New error code type<br>6. Modify the prompt information after the socket connection is successful |
| DOC- V1.7.3<br>(combo-v2.1 1.0)            | 2 022/7/7  | Yang Bin |  | 1. Added AT+MQTTPUBRAM command<br>2. AT+LEDTTEST command adds extended parameters                                                                                                                                                                 |
| DOC- V1.7.4<br>(combo-v2.1 2.2)            | 2 022/8/22 | Yang Bin |  | 1. Fixed the AT+MQTTPUB RAW command writing error<br>2. Delete AT+WCONFIG Note about B W16 only supporting WiFi network configuration                                                                                                             |
| DOC - V1.8.0<br>(combo-v2.1 3.0)           |            | Yang Bin |  | 1. Added Ai -WB2 series module P WM pin restriction description<br>2. AT+SOCKET adds the specified conid option                                                                                                                                   |
| DOC -V4.18P_1.9.0<br>(combo-V4.18_P2.15.0) |            | Yang Bin |  | 1. Delete the AT+GPIOTEST command<br>2. AT+MQTT adds reconnection function<br>3. New error code<br>4. Add unsubscribe command AT+MQTTUNSUB<br>5. Fix some writing errors                                                                          |
| DOC-V4.18P_1.9.1<br>(combo-V4.18_P2.15.0)  |            | Yang Bin |  | 1. AT+RESTORE will reset the MAC settings by default                                                                                                                                                                                              |
| DOC-V4.18P_1.10.0<br>(combo-V4.18_P2.17.0) |            | Yang Bin |  | 1. AT+WCONFIG adds AirKiss network configuration parameters<br>2. AT+SOCKET additional parameter description<br>3. Added AT+SOCKETAUTOTT command                                                                                                  |

|                                             |  |           |  |                                                                                                                                                  |
|---------------------------------------------|--|-----------|--|--------------------------------------------------------------------------------------------------------------------------------------------------|
| DOC-V4.18P_1.11.0<br>(combo-V4.18_P2.18.0)  |  | Yang Bin  |  | 1. Add AT+SSLCRET command                                                                                                                        |
| DOC-V4.18P_1.1 2.0<br>(combo-V4.18_P2.18.0) |  | Lin Qiwei |  | 1.AT +WSACN adds scanning parameters<br>2. Added AT+WSACNOPT command                                                                             |
| DOC-V4.18P_1.13.0<br>(combo-V4.18_P2.19.1)  |  | Yang Bin  |  | 1. Add +EVENT:SocketAutoDel,<ConID> URC data<br>2. AT+WCONFIG adds the network configuration protocol corresponding to the specific module       |
| DOC-V4.18P_1.13.1<br>(combo-V4.18_P2.19.3)  |  | Yang Bin  |  | 1. Add description of Bluetooth UUID corresponding attributes                                                                                    |
| DOC-V4.18P_1.13. 2<br>(combo-V4.18_P2.19.4) |  | Lin Qiwei |  | 1. New command AT+WRSSI                                                                                                                          |
| DOC-V4.18P_1.14.0<br>(combo-V4.18_P2.21.0)  |  | Yang Bin  |  | 1. Modify the sending and receiving rules description of UDP server and client<br>2. Bluetooth network configuration adds custom name parameters |
| DOC-V4.18P_1.15.0<br>(combo-V4.18_P2.22.0)  |  | Yang Bin  |  | 1. AT+SLEEP adds sleep configuration parameters<br>2. URC data WIFI_CONNECTED is changed to WIFI_CONNECT                                         |
| DOC-V4.18P_1.16.0<br>(combo-V4.18_P2.24.0)  |  | Yang Bin  |  | 1. AT+WAUTOCONN adds the function of saving the parameters of reconnecting to WiFi after power-on without verifying the WiFi connection          |
| DOC-V4.18P_1.17.0<br>(combo-V4.18_P2.29.0)  |  | Yang Bin  |  | 1. Added URC data SocketReconnect<br>2. Add SNTP related commands<br>3. MQTT adds SSL connection                                                 |

|                                            |            |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------|------------|----------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                            |            |          |  | support                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| DOC-V4.18P_1.18.0<br>(combo-V4.18_P2.31.0) | 2023/6/28  | Yang Bin |  | <ol style="list-style-type: none"> <li>1. Add IOMap mapping tables for each model</li> <li>2. Add DNS commands AT+WDOMAIN, AT+WDNS</li> </ol>                                                                                                                                                                                                                                                                                                    |
| DOC-V4.18P_1.19.0<br>(combo-V4.18_P2.33.0) | 2023/8/22  | Yang Bin |  | <ol style="list-style-type: none"> <li>1. Added socket ConID data type description</li> <li>2. Fix AT+WDNS title writing error</li> <li>3. Added AT+WDISCONNECT command</li> <li>4. AT+HTTPCLIENTLINE add example</li> </ol>                                                                                                                                                                                                                     |
| DOC-V4.18P_2.0.0<br>(combo-V4.18_P2.38.0)  | 2023/9/25  | Yang Bin |  | <ol style="list-style-type: none"> <li>1. Add AT+BLESENDRAW command</li> <li>2. Add AT+WJEAP command</li> <li>3. AT+TRANSETER Add setting whether to automatically enter transparent transmission configuration</li> <li>4. Add AT+SYSMSG command</li> <li>5. New URC data<br/>+EVENT:WIFI_GOT_IP<br/>+EVENT:WIFI_SCAN_DON</li> <li>6. Fix some writing errors</li> <li>7. Add AT+STAINFO command</li> <li>8. Add AT+HTTTPRAW command</li> </ol> |
| DOC-V4.18P_3.0.0<br>(combo-V4.18_P2.38.4)  | 2023/11/1  | Yang Bin |  | <ol style="list-style-type: none"> <li>1. Add AT+STAINFO example</li> <li>2. AT+WCONFIG adds WPS configuration parameters</li> <li>3. AT+SOCKET modification status definition</li> </ol>                                                                                                                                                                                                                                                        |
| DOC-V4.18P_3.1.0(combo-V4.18_P2.39.0)      | 2023/11/15 | Yang Bin |  | <ol style="list-style-type: none"> <li>1. Added length limit description for AT+SOCKETSENDLINE</li> <li>2. Added description of subscription limit</li> <li>3. Added description of data length that can be cached in socket passive mode</li> <li>4. Added IOMap setting instructions for</li> </ol>                                                                                                                                            |

|                                         |            |           |  |                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------|------------|-----------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                         |            |           |  | <p>Ai-M62-M01L-BLI in the attachment</p> <p>5. Added AT+MQTTVER command</p>                                                                                                                                                                                                                                      |
| DOC-V4.18P_3.2.0(com bo-V4.18_P 2.41.0) | 2023/11/23 | Yang Bin  |  | <p>1. Added IOMap setting instructions for Ai-M61-32S-BLIAI in the attachment</p> <p>2. Add active scanning command AT+WSCANACTIV</p> <p>3. New command AT+SOCKETSENDHEX</p>                                                                                                                                     |
| DOC-V4.18P_3.3.0(com bo-V4.18_P 2.42.3) | 2023/12/8  | Yang Bin  |  | <p>1. AT+SOCKET adds sample code</p> <p>2. AT+SOCKETSENDLINE Add sample code</p> <p>3. AT+SOCKET adds task deletion status</p> <p>4. AT+WCONFIG adds blufi network configuration parameters</p> <p>5. AT+ WCONFIG unified parameters, BL602mode=9 also activates blufi network configuration</p>                 |
| DOC-V4.18P_3.4.0                        |            | Yang Bin  |  | <p>1. Added Bluetooth UUID support for 16-bit mode</p> <p>2. Added Bluetooth UUID mode support list description</p> <p>3. Add AT+MQTTDISCONN command</p> <p>4. New command: AT+MQTTBUF</p> <p>5. Add event +EVENT:MQTT_MALLOC_ERROR</p> <p>6. New command: AT+MQTTKEEPALIVE</p> <p>7. New command AT+WAPINFO</p> |
| DOC-V4.18P_3.4.1                        | 2024/1/9   | Chen Cong |  | <p>1. AT+SLEEP adds GPIO wake-up mode</p>                                                                                                                                                                                                                                                                        |
| DOC-V4.18P_3.5.0                        | 2024/1/31  | Yang Bin  |  | <p>1. Modify the transparent transmission description (SSL does not support transparent</p>                                                                                                                                                                                                                      |

|                    |            |           |  |                                                                                                                                                                |
|--------------------|------------|-----------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |            |           |  | transmission yet)<br>2. Add AT+MQTTCRET command<br>3. New command AT+SOCKET2<br>4. New command AT+FLASHID                                                      |
| DOC-V4.18P_3.5.1   | 2024/2/21  | Yang Bin  |  | 1. New AT+UARTFLOWCONTROL command<br>2. Updated AT+UARTCFG command description                                                                                 |
| DOC-V4.18P_3.6.0   | 2024/3/1   | Yang Bin  |  | 1. BW16 adds support for airkiss network configuration                                                                                                         |
| DOC-V4.18P_3.6.1   | 2024/10/17 | Yang Bin  |  | 1. Modify writing errors (AT+SOCKET2)<br>2. Updated the production test LED test command (AT+LEDTEST) to distinguish between normal combo and middleware combo |
| DOC-V4.18P_3.6.2   | 2024/10/17 | Chen Cong |  | 1. Add AT+TICKLESS command                                                                                                                                     |
| DOC-V4.18P_3.6.3   | 2024/11/28 | Yang Bin  |  | 1. AT+WJEAP adds compatible model description<br>2. Added IOMAP instructions for BW20-12F/07S                                                                  |
| DOC - V4.18P_3.7.0 | 2024/11/29 | Lin Sheng |  | 1. Add AT+BLUFISEND command, + BLUFIDATA event                                                                                                                 |
| DOC - V4.18P_3.8.0 | 2024/12/10 | Yang Bin  |  | 1. AT+ WCONFIG adds web configuration instructions                                                                                                             |

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# 1. Instruction format and default configuration description

## 1.1 Serial port default configuration

If there is no special instruction, the AT command serial port and the download serial port use the same serial port, configured as 115200, 8N1

## 1.2 Startup Information

#####

arch:<chip model>,<chip version serial number> //If there is no serial number, it will be displayed as NULL

company: Ai-Thinker|B&T

ble\_mac:<Bluetooth MAC> //eg: 94c960123456 (lowercase letters) If this line is not present, it will not be printed

wifi\_mac:<WIFI STA MAC> //eg: 94c960123456 (lowercase letters) If this line is not present, it will not be printed.

sdk\_version:<SDK version number> //Chip original SDK version number (displayed according to the original SDK version number)

firmware\_version:<firmware version number> //Firmware version number, format "release/v1.0.0"

If it is a debug version, you need to change release to debug;

Version lowercase v

Three fields of version number

The first one indicates that an interface has been deleted or an existing interface has been changed, and other modifications that may cause compatibility issues (fixing printing errors in published content, adding functions or new response content to existing instructions, and adding URC instructions are all incompatible modifications);

The second version number indicates that content has been added (usually a new instruction has been added), which does not affect compatibility;

The third field indicates that the bug has been fixed or the logic has been optimized, and there is no modification to the command interface (for example, the status displayed by AT+WJAP? is wrong, but after fixing the bug, it can be displayed normally according to the document regulations).

compile\_time: <compile time: month/day/year/hour/minute/second>

ready

#####

Remark:

(1) Use \r\n for line breaks

(2) Customers recommend checking ready to check startup information, and do not recommend checking the firmware version number and compile time (subsequent versions may be updated)

(3) Firmware version number

The firmware version number in the startup information indicates the firmware version number of the module, not the version number of the combo command. The version number of the combo framework needs to be checked through the version query command.

The format is three-part format v major version number.minor version number.iteration number

When the major version number changes, it indicates an incompatible modification (such as deleting an instruction or modifying an existing instruction).

The minor version number indicates that a new interface has been added (new AT commands or backward compatible modifications).

Iterative version numbers indicate bug fixes (does not involve interface modifications)

## 1.3 Instruction Format

The command CMD[opt][param1,param2,...] ends with a carriage return and line feed (\r\n) (the actual detection is the \n end ASCII code 0x0D, the preceding \r will be ignored)

All line breaks are unified using \r\n

|     |                    | describe                                                                                                                                                                                                                                                                    | Example |
|-----|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| CMD |                    | Command name (case insensitive)                                                                                                                                                                                                                                             | AT      |
| opt | NA                 | Without any parameters, the specified command is executed directly.                                                                                                                                                                                                         | AT      |
|     | ?                  | Query Status                                                                                                                                                                                                                                                                | AT?     |
|     | =param1,param2,... | Instructions with parameters, multiple parameters are separated by commas. If a parameter contains a comma, it must be enclosed in double quotes (\n cannot appear in the parameter, and the first and last parameters must be enclosed in double quotes if they are empty) | AT=1    |

## 1.4 Command response format

### 1.4.1 Command execution success response format

`\r\nOK\r\n` //No other messages can be printed in the middle (other messages can be printed in the log port)

### 1.4.2 Command execution error response format

`\r\n+<CMD>:<error_code>\r\nERROR\r\n`  
//errorno indicates the error code (supported by some platforms). The AT serial port cannot print any other error information (other messages can be printed on the log port)

### 1.4.3 Query function execution success response format

`\r\nQuery result` (this is the response field for viewing specific commands, which must be strictly defined and cannot be modified)`\r\nOK\r\n`

### 1.4.4 Unknown command response format

Response when no command is matched

Unknown cmd: <all contents of the serial port input, including parameters>

Eg: For example, if ATAA does not exist, then

Entering ATAA\r\n will return Unknown cmd:ATAA

Entering ATAA=123\r\n will return Unknown cmd:ATAA=123

## 1.5 URC Active Data

//WIFI event  
+EVENT:WIFI\_DISCONNECT //WIFI disconnected  
+EVENT:WIFI\_GOT\_IP //Get IP  
+EVENT:WIFI\_CONNECT //wifi connection  
+EVENT:WIFI\_APCLIENTDISCONNECT:<MAC> //AP mode client disconnects, followed by the MAC address, lowercase without colon  
+EVENT:WIFI\_APCLIENTCONNECTED:<MAC> //AP mode has a new client connection, followed by the MAC address, lowercase without colon  
+EVENT:WIFI\_SCAN\_DONE //WIFI scan is finished  
+BLUFIDATA: <length> ,<data> // Receive custom data for Bluetooth network configuration  
//SOCKET event  
+EVENT:SocketDown,<ConID>,<length>[,<data>] //Receive socket data

```
+ EVENT:Socket Seed , <seed ConID> , <server ConID>      //Receive new client connection
+EVENT:SocketDisssconnect,<ConID>      //socket disconnected
+EVENT:SocketReconnect,<ConID>      //socket disconnected and reconnected successfully
+EVENT:SocketAutoDel,<ConID>  //socket automatically deleted
//MQTT events
+EVENT:MQTT_MALLOC_ERROR  //MQTT malloc error
+EVENT:MQTT_CONNECT      //MQTT connection successful
+EVENT:MQTT_DISCONNECT    //MQTT connection disconnected
+EVENT:MQTT_SUB,<Topic>,<len>,<data>  //Received subscription message
//Bluetooth data
+EVENT:BLE_DISCONNECT  //Bluetooth disconnect status
+EVENT:BLE_CONNECTED   //Bluetooth connection successful
+DATA :<len>,<data> //Receive Bluetooth transparent data in host mode

//Cloud
aliGenie_data      //Data sent by Tmall Genie
+EVENT:CloudDown,<type>,<data>

//Production test
##boot  //Development board button trigger signal
```

## 1.6 errno Error code description

//System framework related error code

0: Success

1: The command is not supported (the combo framework contains the command but the current platform has not transplanted or adapted to support it)

2: The command parameters contain unsupported operations (the current platform only supports some operations on this command)

3: Instruction format error (this refers to the wrong number of parameters, for example, two parameters are required, but only one parameter is entered)

4: Parameter error (the parameter content is wrong, for example, a number from 0 to 9 is required, but 10 or xyz is passed in, which is a parameter error)

5: Parameter length error (the command length exceeds the maximum supported length)

31: The current command has not ended and the status needs to be asynchronously reported. This value is used by the state machine to determine the use of the command and no message is returned.

32: Unknown error (or unhandled error type)

//Common error codes

33: malloc error

34 : Failed to read buf

35 : Failed to write buf

36: Configuration error (the configuration loaded from the memory is wrong. For example, if we set the port for OTA upgrade to -1 and check the port error when executing AT+OTA, a

configuration error will be reported.)

- 37: Failed to create task
- 38: Flash read/write failure
- 39: Serial port configuration error, unsupported baud rate
- 40: Serial port configuration error, unsupported data bit
- 41: Serial port configuration error, unsupported stop bit
- 42: Serial port configuration error, unsupported parity bit
- 43: Serial port configuration error, unsupported flow control
- 44: Serial port configuration failed
- 45: Username/password error
- 46: Low power mode error or unsupported low power mode
- 47: Uninitialized configuration data error (including io mapping data)
- 63: General error code (without other information)

//wifi related error code

- 6 4: Wi-Fi is not initialized or initialization fails
- 6 5: Wi-Fi mode error (unable to connect to Wi-Fi in single AP mode)
- 6 6: Wi-Fi connection failed
- 6 7: Wi-Fi connection successful, error in obtaining IP (DHCP)
- 6 8: Failed to obtain encryption method
- 69 : The specified AP was not scanned.
- 70: WiFi scan startup failed
- 71: Wi-Fi scan timeout
- 72: Failed to open AP hotspot
- 73: Failed to obtain the router's wifi information or the AP information that you enabled yourself
- 74: Network card (STA/AP) is not running
- 75: Wi-Fi country code error (unsupported Wi-Fi country code)
- 76: Current network configuration mode is wrong
- 95 : Wi-Fi connection unknown error

//socket related error code

- 96 : Failed to create socket
- 97 : Socket connection failed
- 98 : DNS failed
- 99 : Socket status error (for example, TCP is not connected yet)
- 100 : Socket type error
- 101 : Socket send failed
- 102 : Socket receive failed
- 103: Socket monitoring thread creation failed
- 104: socket bind error
- 105 : The current connection cannot be transparently linked (wrong socket type or number)
- 106 : PING test failed (all packets lost)
- 107 : PING test has some packet loss
- 108: SSL Config Error
- 109: SSL verification error (usually caused by unsupported SSL encryption type or certificate)

error)

- 127 : Unknown socket error

//GPIO control related error code

- 128: GPIO mode error (for example, input is configured, and then output instruction is executed)
- 129: The IO being operated is not burned into the GPIO mapping table (for example, if the IO mapping of pins 0 to 4 is set, this error will be reported when operating pin 5)
- 130: NC pin, cannot be controlled (for example, serial port, VCC, GND, etc. are controlled by AT commands)
- 131: Pin mode setting error or unsupported mode
- 132: Error in setting GPIO pull-up or pull-down mode is not supported)
- 133: PWM period not supported by hardware
- 159: GPIO operation unknown error

//HTTP(S) related error codes

- 160: HTTP(S) response header format error
- 191: HTTP(S) request unknown error

//MQTT related

- 192: MQTT connection mode error
- 193: MQTT connection failed
- 194: MQTT configuration error
- 195: Failed to publish MQTT message
- 196: The MQTT message subscription list is full
- 197: MQTT did not receive a response
- 198: MQTT is busy or the connection has timed out
- 199: MQTT unsubscribe failed
- 224: MQTT unknown error

//BLE Bluetooth related

- 225: Bluetooth startup or shutdown error
- 226: Failed to set Bluetooth MAC (226: Set Bluetooth MAC; 237: Failed to get Bluetooth MAC)
- 227: Modifying Bluetooth MAC is not supported
- 228: Unsupported state or the operation being performed is not allowed in the current state
- 229: Bluetooth disconnection failed
- 230: Bluetooth MTU setting failed (236 Failed to obtain MTU)
- 231: Bluetooth data sending failed
- 232: Set the Bluetooth slave broadcast status
- 233: Bluetooth host scan failed
- 234: The specified Bluetooth was not scanned.
- 235: Bluetooth connection failed
- 236: Failed to obtain MTU (230 Failed to set MTU)
- 237: Failed to obtain Bluetooth MAC (226: Set Bluetooth MAC; 237: Failed to obtain Bluetooth MAC)
- 255: Unknown Bluetooth error

## 2. Basic instructions

### 2.1 AT test command

|                                 |                                                                   |
|---------------------------------|-------------------------------------------------------------------|
| AT                              |                                                                   |
| describe                        | Instructions to test whether the AT framework is working properly |
| response                        | OK                                                                |
| Example                         | AT<br>OK                                                          |
| Description information in HELP |                                                                   |
| response                        | Test cmd                                                          |

### 2.2 AT+HELP View AT command set

|                                 |                                                                   |
|---------------------------------|-------------------------------------------------------------------|
| AT+HELP                         |                                                                   |
| describe                        | Query AT command set list                                         |
| response                        | <command name>:<comment><br>...<br><command name>:<comment><br>OK |
| Example                         |                                                                   |
| Description information in HELP |                                                                   |
| response                        | Show cmd list                                                     |

### 2.3 AT+RST module restart command

|                                 |                |
|---------------------------------|----------------|
| AT+RST                          |                |
| describe                        | Restart module |
| response                        | OK             |
| Example                         |                |
| Description information in HELP |                |
| response                        | Soft restart   |

### 2.4 AT+RESTORE restores factory settings

|            |                                                                                             |
|------------|---------------------------------------------------------------------------------------------|
| AT+RESTORE |                                                                                             |
| describe   | Restore to factory mode and erase configuration information (except triplet and IO mapping) |

|                                 |                                                            |
|---------------------------------|------------------------------------------------------------|
| response                        | OK                                                         |
| Remark                          | Automatically restart after success<br>Default parameters: |
| Example                         |                                                            |
| Description information in HELP |                                                            |
| response                        | Restore setting                                            |

## 2.5 ATE1 turns on echo

|                                 |                                                               |
|---------------------------------|---------------------------------------------------------------|
| ATE1                            |                                                               |
| describe                        | Turn on echo                                                  |
| response                        | OK                                                            |
| Example                         | ATE1<br>OK                                                    |
| Description information in HELP |                                                               |
| response                        | Enable echo                                                   |
| Notes                           | P B series default echo is on<br>TB series default echo is on |

## 2.6 ATE0 turns off the echo

|                                 |               |
|---------------------------------|---------------|
| ATE0                            |               |
| describe                        | Turn off echo |
| response                        | OK            |
| Example                         | ATE0<br>OK    |
| Description information in HELP |               |
| response                        | Disable echo  |

## 2.7 AT+SYSMMSG query or set system prompt information

|             |                                                              |
|-------------|--------------------------------------------------------------|
| AT+SYSMMSG? |                                                              |
| describe    | Query URC data printing mask                                 |
| response    | +SYSMMSG:<br><mode1>,<mask1><br>...<br><modeN>,<maskN><br>OK |

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Example                             | AT+SYSMSG?<br>+SYSMSG:<br>1,FFFFFFF<br>OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| AT+SYSMSG=<mode>,<mask>,<saveFlash> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| describe                            | Set URC data printing mask                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| parameter                           | <p>mode: specifies the mode in which the mask needs to be set</p> <p>1: Transparent transmission mode (including socket transparent transmission and Bluetooth transparent transmission)</p> <p>mask: print mask, this is a hexadecimal data of u32 (string length is 8), each bit represents a message, 0 means prohibit printing, 1 means allow printing</p> <p>Bit0: +EVENT:WIFI_DISCONNECT<br/> Bit1: +EVENT:WIFI_CONNECT<br/> Bit2: +EVENT:WIFI_APCLIENTDISCONNECT:&lt;MAC&gt;<br/> Bit3: +EVENT:WIFI_APCLIENTCONNECTED:&lt;MAC&gt;<br/> Bit4: +EVENT:SocketDown,&lt;ConID&gt;,&lt;length&gt;[,&lt;data&gt;]<br/> Bit5: +EVENT:SocketSeed,&lt;seed ConID&gt;,&lt;server ConID&gt;<br/> Bit6: +EVENT:SocketDisssconnect,&lt;ConID&gt;<br/> Bit7: +EVENT:SocketReconnect,&lt;ConID&gt;<br/> Bit8: +EVENT:SocketAutoDel,&lt;ConID&gt;<br/> Bit9: +EVENT:MQTT_CONNECT<br/> Bit10: +EVENT:MQTT_DISCONNECT<br/> Bit11: +EVENT:MQTT_SUB,&lt;Topic&gt;,&lt;len&gt;,&lt;data&gt;<br/> Bit12: +EVENT:BLE_DISCONNECT<br/> Bit13: +EVENT:BLE_CONNECTED<br/> Bit14: +DATA:&lt;len&gt;,&lt;data&gt;<br/> Bit15: +EVENT:WIFI_GOT_IP<br/> Bit16: +EVENT:WIFI_SCAN_DON</p> <p>saveFlash:</p> <p>0: effective this time, not saved to flash<br/> 1: This time it takes effect and is saved to flash</p> |
| Example                             | AT+SYSMSG=1,2468abcd,0<br>OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Description information in HELP     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| response                            | Query and set system message                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## 2.8 AT+GMR query version information

|          |                                                                                                  |
|----------|--------------------------------------------------------------------------------------------------|
| AT+GMR   |                                                                                                  |
| describe | Query version information                                                                        |
| response | <at version:>: AT version information (combo version)<br><sdk version:>: SDK version information |

|                                 |                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------|
|                                 | <firmware version:>: Firmware version<br>OK                                                             |
| Example                         | AT+GMR<br>at version:release/v2.0.0<br>sdk version:amebaD-6.2c<br>firmware version:release/v1.2.3<br>OK |
| Description information in HELP |                                                                                                         |
| response                        | Show version info                                                                                       |

## 2.9 AT+FLASHID query FLASH ID

|                                 |                                                                                         |
|---------------------------------|-----------------------------------------------------------------------------------------|
| AT+FLASHID                      |                                                                                         |
| describe                        | Query FLASH ID                                                                          |
| response                        | Flash Manufacturer ID:0xXX<br>Flash Device ID:0xXX<br>Flash Capacity ID:0xXX(XMB)<br>OK |
| Example                         |                                                                                         |
| Description information in HELP |                                                                                         |
| response                        | Query FLASH ID                                                                          |
| Remark                          | Compatible models<br>BW16                                                               |

## 2.10 AT+SLEEP sleep mode

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SLEEP=<mode>[,<wakeup source>,<param1>,<param2>] |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| describe                                            | Set Sleep Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| parameter                                           | Mode:<br>0: Enter light sleep mode, power on and do not enter light sleep mode automatically<br>1: Enter light sleep, automatically enter light sleep when powered on<br>2: Enter deep sleep state<br>3: Normal mode<br>wakeup source:<br>Set the wakeup source (valid only when mode=0/1/2)<br>0: Timer wake-up<br>2: GPIO wake-up<br>param1:<br>Only valid when wakeup source=0/2<br>When wakeup source=0, it indicates the use of timed wakeup. This parameter indicates the timer time in ms. |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | <p>wakeup source=2 means using GPIO for wakeup. This parameter indicates the sequence number of the wakeup pin (counterclockwise from the upper left corner of the module, the pin number starts from 1)</p> <p>Param2:</p> <p>Only valid when wakeup source=2, indicating the wakeup level when GPIO wakes up</p> <p>0: Low level wake-up</p> <p>1: High level wake-up</p> <p>2: Falling edge wake-up</p> <p>3: Rising edge wake-up</p> <p>4: Double edge wake-up</p> |
| response                        | OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Remark                          | Wake up the module by sending arbitrary data to the serial port                                                                                                                                                                                                                                                                                                                                                                                                        |
| Example                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| response                        | Set low power mode                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Notes                           | <p>P B series is 3, normal mode</p> <p>The default mode of TB series is 3, normal mode</p> <p>Ai-WB2 series supports mode 2/3, the default is 3</p> <p>Note: When configuring the GPIO wake-up of the Ai-WB2 series, the pin specified by param1 is not mapped, that is, the actual pin of the chip, and only supports the IO7 pin (IO7 is the RX pin, so for serial port wake-up, we generally set the IO7 low level environment, that is, AT+SLEEP=2,2,7,0)</p>      |

## 2.11 AT+UARTCFG serial port setting command

|                                                      |                                                                                                                                                                                        |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+UARTCFG?                                          |                                                                                                                                                                                        |
| describe                                             | Query AT serial port configuration                                                                                                                                                     |
| response                                             | +UARTCFG: <baudrate>,<databits>,<stopbits>,<parity><br>OK                                                                                                                              |
| Example                                              |                                                                                                                                                                                        |
| AT+UARTCFG=<baudrate>,<databits>,<stopbits>,<parity> |                                                                                                                                                                                        |
| describe                                             | <p>Set AT serial port configuration command, 6 212 , 6 252 , 8 258 only support baudrate</p> <p>Flow control is off by default, use "AT+UARTFLOWCONTROL" to set</p>                    |
| parameter                                            | <p>baudrate : serial port baud rate</p> <p>databits: data bits</p> <p>5: 5 data bits</p> <p>6: 6 data bits</p> <p>7: 7 data bits</p> <p>8: 8 data bits</p> <p>stopbits : stop bits</p> |

|       |                                                                                                                     |
|-------|---------------------------------------------------------------------------------------------------------------------|
|       | 1 : 1 stop bit<br>2 : 1.5 bit stop bit<br>3 : 2 stop bits<br>parity : check digit<br>0: None<br>1 : Odd<br>2 : Even |
| Notes | PB series only supports baudrate<br>TB series only supports baudrate                                                |

## 2.12 AT+UARTFLOWCONTROL serial port flow control settings

|                                  |                                                                                                                                                                                          |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+UARTFLOWCONTROL?              |                                                                                                                                                                                          |
| describe                         | Query AT serial port flow control configuration                                                                                                                                          |
| response                         | + UARTFLOWCONTROL : <flowcontrol><br>OK                                                                                                                                                  |
| Example                          | AT+UARTFLOWCONTROL?<br><br>+UARTFLOWCONTROL:0<br>OK                                                                                                                                      |
| AT+UARTFLOWCONTROL=<flowcontrol> |                                                                                                                                                                                          |
| describe                         | Set AT serial port flow control                                                                                                                                                          |
| parameter                        | flowcontrol: flow control<br>0: No flow control<br>1: Enable RTS<br>2: Enable CTS<br>3: Enable RTS and CTS at the same time                                                              |
| response                         | OK<br>//Note that the OK message is only sent after the setting is successful. If flow control is enabled, the receiving end also needs to configure flow control before receiving data. |
| Example                          | AT+UARTFLOWCONTROL=3<br><br>OK                                                                                                                                                           |
| Notes                            | Compatible models<br>BW16 Series (RTS:PA_14/CTS:PA_15)                                                                                                                                   |

## 2.13 AT+SETDOWNLOADMODE enters download mode

|                                 |                                             |
|---------------------------------|---------------------------------------------|
| AT+SETDOWNLOADMODE=<mode>       |                                             |
| describe                        | Enter download mode                         |
| parameter                       | Mode:<br>1: Enter serial port download mode |
| response                        | OK                                          |
| Example                         |                                             |
| Description information in HELP |                                             |
| response                        | Set download mode                           |

## 2.14 AT+OTA online upgrade command

|                                                       |                                                                                                                                                                                                                                                            |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+OTA                                                |                                                                                                                                                                                                                                                            |
| describe                                              | Start an OTA upgrade<br>Note: The upgrade is asynchronous. The OK message only indicates that the startup task is successful, not that the upgrade is successful. After the upgrade is successful, the module will restart and switch to the new firmware. |
| response                                              | OK                                                                                                                                                                                                                                                         |
| Example                                               |                                                                                                                                                                                                                                                            |
| AT+OTA?                                               |                                                                                                                                                                                                                                                            |
| describe                                              | Query OTA parameters                                                                                                                                                                                                                                       |
| response                                              | +OTA:<Mode> , < Host_name > , < P ort > , <R oute ><br>OK<br>//Status description reference setting parameters                                                                                                                                             |
| Example                                               |                                                                                                                                                                                                                                                            |
| AT + OTA = <Mode> , <Host_name> , < P ort > , <Route> |                                                                                                                                                                                                                                                            |
| describe                                              | Set OTA related parameters                                                                                                                                                                                                                                 |
| parameter                                             | Mode : Download method<br>1: HTTP<br>2: HTTPS<br>Host_name : Server domain name<br>Port : Server port number<br>R oute : the resource address to be downloaded                                                                                             |
| response                                              | OK                                                                                                                                                                                                                                                         |
| Example                                               |                                                                                                                                                                                                                                                            |
| Description information in HELP                       |                                                                                                                                                                                                                                                            |
| response                                              | Firmware OTA                                                                                                                                                                                                                                               |

## 2.15 AT+TICKLESS queries or sets the interval for listening to AP beacons in light sleep mode

|                        |                                                                                                                                                           |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+TICKLESS?           |                                                                                                                                                           |
| describe               | Query the interval for entering light sleep mode to monitor AP beacons                                                                                    |
| response               | + TICKLESS : <tickless><br>OK                                                                                                                             |
| Example                | AT+TICKLESS?<br><br>+TICKLESS:10<br>OK                                                                                                                    |
| AT+TICKLESS=<tickless> |                                                                                                                                                           |
| describe               | Set the interval for entering light sleep mode to monitor AP beacons                                                                                      |
| parameter              | The interval for listening to AP beacons when entering light sleep mode . The unit is AP beacon interval . The default value is 10. The range is [1,100]. |
| response               | OK                                                                                                                                                        |
| Example                | AT+TICKLESS=10<br><br>OK<br>AT+SLEEP=0,2,22,2<br><br>OK                                                                                                   |
| Notes                  | 1. Compatible models<br>BL616/618 Series Modules<br>2. Need to be used with AT+SLEEP command                                                              |

## 3. IO control instructions

### 3.1 AT+SYSIOMAP queries or sets the IO mapping table

|               |                                                                                                    |
|---------------|----------------------------------------------------------------------------------------------------|
| AT+ SYSIOMAP? |                                                                                                    |
| describe      | Query the IO pin mapping table                                                                     |
| response      | + SYSIOMAP:PinNumber:<PinNumber>,PinMap:< pin 1 >,<pin 2 > ,... ,<pin N ><br>//Status introduction |

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                              | PinNumber: indicates how many groups of data there are in the current mapping table                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Example                                                      | #AT+SYSIOMAP?<br><br>+SYSIOMAP:PinNumber:6,PinMap:NC,5,20,NC,15,NC<br>OK                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| AT+ SYSIOMAP = <PinNumber>,< pin 1 >,<pin 2 > ,... ,<pin N > |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| describe                                                     | Set IO pin mapping                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| parameter                                                    | pinNumber: The total number of IOs to be set<br>pin xx: The chip pin number corresponding to the module IO pin (counterclockwise from the upper left corner of the module, the pin number starts from 1) (1~254, this can be determined according to the pin number in the chip manual)<br>If the module does not have a corresponding chip pin, set it to NC                                                                                                                                                                       |
| response                                                     | OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Example                                                      | #AT+SYSIOMAP=4,3,5,NC,1<br><br>OK<br>This instruction means<br>A total of 4 IO mapping relationships are set<br>Pin 1 of the module corresponds to pin 3 of the chip;<br>Pin 2 of the module corresponds to pin 5 of the chip;<br>Pin 3 of the module is not connected to the chip or the pin is prohibited from being controlled by AT commands.<br>Pin 4 of the module corresponds to pin 1 of the chip<br>For the IOMap mapping table of each model, please refer to <a href="#">Appendix 1 IOMap table of each model module</a> |
| Description information in HELP                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| response                                                     | Query and set IO map                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## 3.2 AT+SYSGPIOWRITE sets the GPIO output level

|                                 |                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SYSGPIOWRITE=<pin>,<level>   |                                                                                                                                                                        |
| describe                        | Set the GPIO output level. The level is 1 , which is pulled up by default . The level is 0, which is pulled down by default.                                           |
| parameter                       | pin: module IO pin number (sorted counterclockwise from the upper left corner of the module, the pin number starts from 1)<br>level :<br>0: Low level<br>1: High level |
| response                        | OK                                                                                                                                                                     |
| Example                         |                                                                                                                                                                        |
| Description information in HELP |                                                                                                                                                                        |

|          |                    |
|----------|--------------------|
| response | Set GPIO out level |
|----------|--------------------|

### 3.3 AT+SYSGPIOREAD reads GPIO level

|                      |                                                                                                                                                                                                                                                      |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SYSGPIOREAD=<pin> |                                                                                                                                                                                                                                                      |
| describe             | Read GPIO level, floating by default                                                                                                                                                                                                                 |
| parameter            | pin: module IO pin number (sorted counterclockwise from the upper left corner of the module, the pin number starts from 1)                                                                                                                           |
| response             | +SYSGPIOREAD:<pin>,<level><br>OK<br>Status Field Description<br>pin: module IO pin number (sorted counterclockwise from the upper left corner of the module, the pin number starts from 1)<br>level: the level read<br>0: Low level<br>1: High level |
| Example              |                                                                                                                                                                                                                                                      |
| AT+ SYSGPIOREAD =?   |                                                                                                                                                                                                                                                      |
| response             | Get GPIO level                                                                                                                                                                                                                                       |
| Example              |                                                                                                                                                                                                                                                      |

### 3.4 AT+PWMCFG configures PWM function

|                                      |                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+PWMCFG=<pin> , < c ycle> , <duty> |                                                                                                                                                                                                                                                                                                                                                                                   |
| describe                             | Configuring P WM Function                                                                                                                                                                                                                                                                                                                                                         |
| Notice                               | Ai -WB2 series modules have 5 P WMs in total . When they are enabled at the same time, it is important to note that the I O numbers of the chip pins cannot be repeated modulo 5, otherwise only one will take effect. For example, if I O1/2/6 is set , only I O2/6 will take effect, and I O1 will be covered by I O6 .                                                         |
| parameter                            | pin: The pin on the module (counterclockwise from the upper left corner of the module, starting from 1)<br>cycle : pwm cycle<br>duty: duty cycle time                                                                                                                                                                                                                             |
| response                             | OK                                                                                                                                                                                                                                                                                                                                                                                |
| Example                              |                                                                                                                                                                                                                                                                                                                                                                                   |
| Description information in HELP      |                                                                                                                                                                                                                                                                                                                                                                                   |
| response                             | Set PWM config                                                                                                                                                                                                                                                                                                                                                                    |
| Remark                               | The unit of this command setting is the chip's cycle register. The same parameter may have different effects on different modules. If the accuracy can meet the requirements, it is recommended to use AT+PWMCFGs setting. The effect of the same parameter of this command on different modules will be basically consistent (different chips may have a difference of a few us) |

### 3.5 AT+P WMCFGS configures the PWM function

|                                         |                                                                                                                                                                                                       |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+PWMCFG S =<pin> , < c ycle> , <duty> |                                                                                                                                                                                                       |
| describe                                |                                                                                                                                                                                                       |
| Notice                                  | Refer to <a href="#">AT+PWMCFG to configure the PWM function</a> Notes                                                                                                                                |
| parameter                               | pin: The pin on the module (counterclockwise from the upper left corner of the module, starting from 1)<br>cycle : pwm cycle, unit: us<br>duty: integer 0~100 represents the percentage of duty cycle |
| response                                | OK                                                                                                                                                                                                    |
| Example                                 |                                                                                                                                                                                                       |
| Description information in HELP         |                                                                                                                                                                                                       |
| response                                | Set PWM config                                                                                                                                                                                        |

### 3.6 AT+PWMSTOP turns off the PWM function

|                                 |                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------|
| AT+PWMSTOP=<pin>                |                                                                                                         |
| describe                        | Disable PWM function                                                                                    |
| parameter                       | pin: The pin on the module (counterclockwise from the upper left corner of the module, starting from 1) |
| response                        | OK                                                                                                      |
| Example                         |                                                                                                         |
| Description information in HELP |                                                                                                         |
| response                        | Stop PWM function                                                                                       |

### 3.7 AT+PWMDUTYSET updates the PWM duty cycle

|                                 |                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| AT+PWMDUTYSET=<pin>,<duty>      |                                                                                                                                            |
| describe                        | Update the PWM duty cycle of the specified pin                                                                                             |
| parameter                       | pin: The pin on the module (counterclockwise from the upper left corner of the module, starting from 1)<br>duty: duty cycle time, unit: us |
| response                        | OK                                                                                                                                         |
| Example                         |                                                                                                                                            |
| Description information in HELP |                                                                                                                                            |
| response                        | Update PWM duty                                                                                                                            |

## 3.8 AT+PWMDUTYSET S Update PWM duty cycle

|                                 |                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+PWMDUTYSET S =<pin>,<duty>   |                                                                                                                                                                        |
| describe                        | Update the PWM duty cycle of the specified pin                                                                                                                         |
| parameter                       | pin: The pin on the module (counterclockwise from the upper left corner of the module, starting from 1)<br>duty: integer 0~100 represents the percentage of duty cycle |
| response                        | OK                                                                                                                                                                     |
| Example                         |                                                                                                                                                                        |
| Description information in HELP |                                                                                                                                                                        |
| response                        | Update PWM duty                                                                                                                                                        |

# 4. WIFI Instructions

## 4.1 Basic instructions

### 4.1.1 AT+WMODE query or set WIFI working mode

|                                |                                                                                                                                                                    |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+WMODE?                      |                                                                                                                                                                    |
| describe                       | Query WIFI working mode                                                                                                                                            |
| response                       | +WMODE:<MODE><br>OK                                                                                                                                                |
| Example                        |                                                                                                                                                                    |
| AT+WMODE= <MODE> ,<save_flash> |                                                                                                                                                                    |
| describe                       | Set the WiFi working mode                                                                                                                                          |
| parameter                      | MODE: WiFi working mode<br>0: Wi-Fi is not initialized or turned off<br>1: STA<br>2: AP<br>3: AP+STA<br>save_flash:<br>0: Do not save to flash<br>1: Save to flash |
| response                       | OK                                                                                                                                                                 |

|                                 |                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Example                         |                                                                                                                                                                                                                                                                                                                                                              |
| Notice                          | <p>If Realtek series (BW16/BW15) has multiple wireless types enabled, they need to be enabled in the specified order.</p> <p>If you enable AP+STA+Bluetooth triple mode, or AP+STA mixed mode, you need to turn on AP first, then connect STA and Bluetooth (there is no requirement for the order of Bluetooth and STA, but AP must be turned on first)</p> |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                              |
| response                        | Query an set WIFI mode                                                                                                                                                                                                                                                                                                                                       |
| Notes                           | <p>BW16</p> <p>When save_flash==1, MODE does not support 0 (turn off WIFI) when saving falsh</p>                                                                                                                                                                                                                                                             |

### 4.1.2 AT+WDISCONNECT disconnects the Wi-Fi connection

|                                 |                                                                                                                                                                                                                                                      |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+WDISCONNECT                  |                                                                                                                                                                                                                                                      |
| describe                        | <p>Disconnect the wifi connection. This command will turn off the wifi first and then start it again.</p> <p>It is equivalent to executing AT+WMODE=0,0 first and then AT+WMODE=x,0 (x indicates the wifi status before the command is executed)</p> |
| response                        | OK                                                                                                                                                                                                                                                   |
| Description information in HELP |                                                                                                                                                                                                                                                      |
| response                        | Disconnect wifi connect                                                                                                                                                                                                                              |

### 4.1.3 AT+WSCAN scan WIFI list

|            |                                                                                                                                                                                                                                                                                                          |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+WSCAN ? |                                                                                                                                                                                                                                                                                                          |
| describe   | Scan WIFI list                                                                                                                                                                                                                                                                                           |
| response   | <p>+WSCAN:index SSID,CH,SECURITY,RSSI,BSSID</p> <p>&lt;index&gt; &lt;SSID&gt;,&lt;CH&gt;,&lt;SECURITY&gt;,&lt;RSSI&gt;,&lt;BSSID&gt;</p> <p>...</p>                                                                                                                                                      |
| Example    | <p>AT+WSCAN</p> <p>+WSCAN:index SSID,CH,SECURITY,RSSI,BSSID</p> <p>1 IoT-Connect,9,WPA/WPA2 Mixed,-19,cc:81:da:1f:45:80</p> <p>2 IoT-Connect_5G,44,WPA/WPA2 Mixed,-30,cc:81:da:1f:45:88</p> <p>3 super_2G,1,WPA/WPA2 AES,-32,54:75:95:4f:74:5e</p> <p>4 guo123,11,WPA/WPA2 AES,-34,cc:08:fb:eb:f1:28</p> |

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                          | 5 super_5G,157,WPA/WPA2 AES,-38,54:75:95:4f:74:60<br>6 aiot@xuhongv,3,WPA/WPA2 Mixed,-41,d8:c8:e9:05:c4:d8<br>7 MR4519,1,WPA/WPA2 AES,-43,94:d9:b3:20:3f:7f<br>8 HAP_D96015182,11,WPA2 AES,-44,ec:9c:32:2e:e6:13<br>9 aiot@xuhongv_5G,36,WPA/WPA2 Mixed,-44,d8:c8:e9:05:c4:e0<br>10 Aithinker-Visitor1,11,WPA/WPA2 AES,-45,6c:e8:73:aa:2b:e0<br>11 RAK7258_1A77,6,Open,-46,ac:1f:09:05:1a:77<br>12 FAE@Seahi,6,WPA/WPA2 AES,-46,b8:f8:83:0d:9e:2a<br>13 AIOT@FAE,1,WPA/WPA2 Mixed,-47,9c:9d:7e:59:3e:83<br>14 zifeng,6,WPA/WPA2 Mixed,-48,ec:41:18:4f:fe:d5<br>15 B&T,1,WPA/WPA2 Mixed,-50,f8:8c:21:b4:4a:38<br>16 123456789,11,WPA2 AES,-50,2a:3a:4d:88:7e:51<br>17 AXK,11,WPA/WPA2 Mixed,-50,80:8f:1d:b5:ab:b1<br>18 xiaomi,11,WPA/WPA2 Mixed,-56,28:6c:07:3c:49:0d<br>19 MR4519_5G,149,WPA/WPA2 AES,-56,94:d9:b3:20:3f:81<br>20 B&T,48,WPA/WPA2 Mixed,-58,f8:8c:21:b4:4a:39<br>21 ChinaNet-HHZm,2,WPA/WPA2 AES,-59,48:a0:f8:46:b2:bd<br>22 aiDM_LB02K_E7DD,6,Open,-60,3c:71:bf:18:e7:dd<br>23 MEETING,149,WPA/WPA2 Mixed,-62,ee:26:ca:94:c5:e8<br>24 Aithinker-Visitor3,6,WPA/WPA2 Mixed,-63,bc:d1:77:4a:b1:56<br>25 xiaomi,157,WPA/WPA2 Mixed,-64,28:6c:07:3c:49:0e<br>26 PADS 9.5,13,WPA/WPA2 AES,-65,38:3e:5b:0d:b3:5c<br>27 PADS 9.5,56,WPA/WPA2 AES,-66,3a:3e:5b:8d:b3:5c<br>28 ChinaNet-4tcm,1,WPA/WPA2 Mixed,-67,f0:92:b4:84:d2:a1<br>29 LIU5,153,WPA/WPA2 Mixed,-68,00:90:4c:32:64:d2<br>30 ChinaNet-JuME,11,WPA/WPA2 AES,-69,6c:38:45:75:66:5d<br>31 ChinaNet-uL5X,1,WPA/WPA2 Mixed,-71,ca:50:e9:8b:5a:0c<br><br>OK<br># |
| Exam<br>ple                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Description information in HELP          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| respo<br>nse                             | Scan WIFI list                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| AT+WSCAN=[<ssid>,<mac>,<channel>,<rssi>] |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| descr<br>ibe                             | WIFI scan with filter parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| para<br>mete<br>r                        | illustrate:<br>1, empty means skipping the parameter.<br>2. Can be used in combination with AT+WSCANOPT.<br><br>ssid: scan the specified SSID<br>mac: scan the specified mac address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

|          |                                                                                                                                                                                                                                                                               |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | channel: scan the specified channel number<br>rssi: filter out APs whose signal strength is lower than the rssi parameter value, unit: dBm, default value: -100, range: [-100,40]                                                                                             |
| response | +WSCAN:index SSID,CH,SECURITY,RSSI,BSSID<br><index> <SSID>,<CH>,<SECURITY>,<RSSI>,<BSSID><br>...                                                                                                                                                                              |
| Example  | AT+WSCAN=AXK<br><br>+WSCAN:index,SSID,CH,SECURITY,RSSI,BSSID<br>1,AXK,149,WPA/WPA2 Mixed,-50,f8:8c:21:b4:40:22<br>2,AXK,48,WPA/WPA2 Mixed,-57,f8:8c:21:b4:4a:39<br>3,AXK,161,WPA/WPA2 Mixed,-75,f8:8c:21:b4:3f:62<br>4,AXK,157,WPA/WPA2 Mixed,-84,f8:8c:21:b4:2d:89<br><br>OK |

#### 4.1.4 AT+WSCANACTIVE scans the specified SSID in active mode

|                         |                                                                                                                                                                                                                             |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+ WSCANACTIVE =<ssid> |                                                                                                                                                                                                                             |
| describe                | Active mode scans the specified SSID                                                                                                                                                                                        |
| parameter               | ssid: SSID to be scanned                                                                                                                                                                                                    |
| response                | +WSCANACTIVE: SSID,CH,SECURITY,RSSI,BSSID<br>...<br>OK<br>Response meaning<br>SSID : The scanned SSID<br>CH : Scan the specified channel number<br>SECURITY: Encryption method<br>RSSI : Signal strength<br>BSSID: AP's MAC |
| Example                 | AT+WSCANACTIVE=test<br><br>+WSCANACTIVE:test,44,WPA/WPA2 TKIP,-31, 11 : 22 : 33 : 44 : 55 : 66<br>OK                                                                                                                        |
| Remark                  | Compatible models<br>BW16                                                                                                                                                                                                   |

### 4.1.5 AT+WSDHCP queries or sets DHCP parameters in STA mode

|                                          |                                                                                                                                                                                                                                                                             |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+WSDHCP?                               |                                                                                                                                                                                                                                                                             |
| describe                                 | Query DHCP settings in STA mode (information will be saved to flash)                                                                                                                                                                                                        |
| response                                 | +WSDHCP:<MODE>[,<IP>,<MASK>,<GATEWAY>]<br>OK                                                                                                                                                                                                                                |
| Example                                  | #AT+WSDHCP?<br><br>+WSDHCP:0,192.168.31.199,255.255.255.0,192.168.31.1                                                                                                                                                                                                      |
| AT+WSDHCP=<MODE>[,<IP>,<MASK>,<GATEWAY>] |                                                                                                                                                                                                                                                                             |
| describe                                 | Set DHCP parameters in STA mode                                                                                                                                                                                                                                             |
| parameter                                | MODE: IP acquisition mode<br>0: Disable DHCP and use static IP<br>1: Use DHCP to obtain an IP address<br>IP: IP address of the module, which needs to be set for static IP<br>MASK: Subnet mask, required for static IP<br>GATEWAY: Gateway, needs to be set when static IP |
| response                                 | OK                                                                                                                                                                                                                                                                          |
| Example                                  | //Set static IP<br>#AT+WSDHCP=0,192.168.31.199,255.255.255.0,192.168.31.1<br><br>OK                                                                                                                                                                                         |
| Description information in HELP          |                                                                                                                                                                                                                                                                             |
| response                                 | Query and set STA DHCP                                                                                                                                                                                                                                                      |

### 4.1.6 AT+WJAP connects to AP

|                                                                                                                                 |                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| AT+WJAP? (It is recommended to use AT+STAINFO query. If there is a comma in the SSID or password, it will cause parsing errors) |                                                                                                                                |
| describe                                                                                                                        | Query wifi network information (this is the current status obtained from the hardware, not directly reading our setting value) |
| response                                                                                                                        | +WJAP: <status>, <ssid>, <pwd>, <bssid>, <Security>, <MAC>, <ch>, <IP>, <gateway><br>OK                                        |

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | <p>Parameter Introduction</p> <p>status: connection status</p> <p>0: Not connected to Wi-Fi (initial state or STA mode is not enabled)</p> <p>1: Connecting to Wi-Fi or reconnecting to Wi-Fi</p> <p>2: Connected to wifi, but no IP is obtained</p> <p>3: Connect to wifi and obtain IP</p> <p>4: Wi-Fi connection failed (exceeded the number of reconnections and still failed to connect)</p> <p>s sid , bssid , pwd: refer to the setting parameter description</p> <p>Security: Encryption method</p> <p>Open //Open network</p> <p>WEP</p> <p>WPA-TKIP</p> <p>WPA AES</p> <p>WPA Mixed</p> <p>WPA2 AES</p> <p>WPA2 TKIP</p> <p>WPA2 Mixed</p> <p>WPA/WPA2 TKIP</p> <p>WPA/WPA2 AES</p> <p>WPA/WPA2 Mixed</p> <p>WPA2 Enterprise</p> <p>WPA/WPA2 Enterprise</p> <p>WPA3-AES AES</p> <p>UnknownType //Unknown type</p> <p>MAC: Wi-Fi module MAC address (lowercase characters, separated by colons)</p> <p>ch: connection channel</p> <p>IP: module IP (dot notation)</p> <p>gateway: Gateway address (dot-part format)</p> |
| Example   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|           | AT+WJAP=<ssid>,<pwd>[,<bssid>]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| describe  | Connect to a specific AP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| parameter | <p>ssid: SSID of the connected AP</p> <p>pwd: connection password</p> <p>bssid: mac address of the connected AP, in lowercase hexadecimal, separated by colons (when there are multiple SSIDs with the same name, bssid can be used to distinguish them, eg: 94:c9:60:12:34:56)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| response  | OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Example   | <p># AT+WJAP=super_2G,123456798</p> <p>OK</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|           | Description information in HELP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

|              |         |
|--------------|---------|
| respo<br>nse | Join AP |
|--------------|---------|

### 4.1.7 AT+STAINFO? Query wifi connection information

| AT+STAINFO?  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| descr<br>ibe | Query wifi network information (this is the current status obtained from the hardware, not directly reading our setting value)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| respo<br>nse | <p>+ STAINFO : &lt;status&gt;<br/> SSID: &lt;ssid&gt;<br/> Password:&lt;pwd&gt;<br/> &lt;bssid&gt; ,&lt;Security&gt;,&lt;MAC&gt;,&lt;ch&gt;,&lt;IP&gt;,&lt;gateway&gt;<br/> OK</p> <p>Parameter Introduction</p> <p>status: connection status</p> <ul style="list-style-type: none"> <li>0: Not connected to Wi-Fi (initial state or STA mode is not enabled)</li> <li>1: Connecting to Wi-Fi or reconnecting to Wi-Fi</li> <li>2: Connected to wifi, but no IP is obtained</li> <li>3: Connect to wifi and obtain IP</li> <li>4: Wi-Fi connection failed (exceeded the number of reconnections and still failed to connect)</li> </ul> <p>ssid: SSID of the connected AP</p> <p>pwd: connection password</p> <p>bssid: mac address of the connected AP, in lowercase hexadecimal, separated by colons (when there are multiple SSIDs with the same name, bssid can be used to distinguish them, eg: 94:c9:60:12:34:56)</p> <p>Security: Encryption method</p> <ul style="list-style-type: none"> <li>Open //Open network</li> <li>WEP</li> <li>WPA-TKIP</li> <li>WPA AES</li> <li>WPA Mixed</li> <li>WPA2 AES</li> <li>WPA2 TKIP</li> <li>WPA2 Mixed</li> <li>WPA/WPA2 TKIP</li> <li>WPA/WPA2 AES</li> <li>WPA/WPA2 Mixed</li> <li>WPA2 Enterprise</li> <li>WPA/WPA2 Enterprise</li> <li>WPA3-AES AES</li> <li>UnknownType //Unknown type</li> </ul> <p>MAC: Wi-Fi module MAC address (lowercase characters, separated by colons)</p> |

|          |                                                                                                                                                     |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
|          | ch: connection channel<br>IP: module IP (dot notation)<br>gateway: Gateway address (dot-part format)                                                |
| Example  | AT+STAINFO?<br>+STAINFO:3<br>SSID:test<br>Password:123456789<br>e1:f9:8a:aa:fc:4f,WPA/WPA2 TKIP,b2:e3:41:c2:b3:42,5,192.168.3.125,192.168.3.1<br>OK |
| response | Query Sta info                                                                                                                                      |

### 4.1.8 AT+WJEAP connects to enterprise authentication hotspot

|                                         |                                                                                                                                                            |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+WJEAP=<type>,<ssid>,<identity>,<pwd> |                                                                                                                                                            |
| description                             | Connect to a specific AP                                                                                                                                   |
| parameter                               | type: EAP encryption method<br>1: PEAP<br>2: TLS<br>3: TTLS<br>4: FAST<br>ssid: SSID of the connected AP<br>identity: login username<br>pwd: user password |
| response                                | OK                                                                                                                                                         |
| Example                                 | AT+WJEAP=1,EAP TEST,test,test<br>+EVENT:WIFI_CONNECT<br>+EVENT:WIFI_GOT_IP<br>OK                                                                           |
| Description information in HELP         |                                                                                                                                                            |
| response                                | Join EAP                                                                                                                                                   |
| Adapted platform                        | BW16: Adaptive encryption method 1: PEAP, 2: TLS, 3: TTLS, 4: FAST<br>BW20: Adaptive encryption method 1: PEAP, 2: TLS, 3: TTLS, 4: FAST                   |

## 4.1.9 AT+WAUTOCONN Automatically reconnect to wifi after power on

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+WAUTOCONN?                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| describe                                     | Check whether the power-on automatic connection function is enabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| response                                     | +WAUTOCONN:<status> //0: do not connect automatically, 1: connect automatically<br>OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Example                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| AT+WAUTOCONN=<status>[,<ssid>,<pwd>,<bssid>] |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| describe                                     | Enable/disable the power-on auto-connect function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| parameter                                    | <p>status</p> <p>0: Disable</p> <p>1: Enable</p> <p>ssid: SSID of the connected AP</p> <p>pwd: connection password</p> <p>bssid: mac address of the connected AP, in lowercase hexadecimal, separated by colons (when there are multiple SSIDs with the same name, bssid can be used to distinguish them, eg: 94:c9:60:12:34:56)</p> <p>Note: The wifi specified by this command does not check the connection. Even if the information is wrong, it will be automatically saved as automatic connection on power-on. It is generally recommended to use AT+WJAP to successfully connect, verify the connection information is correct, and then use AT+WAUTOCONN=1 to set automatic connection instead of directly saving the connection information.</p> |
| response                                     | OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Example                                      | <p>//Configure the last successfully connected wifi information to automatically connect on power on</p> <p>AT+WAUTOCONN=1</p> <p>//Save SSID and password for automatic reconnection on power on</p> <p>AT+WAUTOCONN=1,test01,12345678</p> <p>//Save SSID and password for automatic reconnection on power on</p> <p>AT+WAUTOCONN=1,test01,12345678,94:c9:60:12:34:56</p>                                                                                                                                                                                                                                                                                                                                                                                 |
| AT+WAUTOCONN=?                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| response                                     | Set WIFI auto connect                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

### 4.1.10 AT+WAPDHCP query or set DHCP parameters in AP mode

|                                                 |                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+WAPDHCP?                                     |                                                                                                                                                                                                                                                                                              |
| describe                                        | Query the DHCP settings of AP mode (the information will be saved to flash)                                                                                                                                                                                                                  |
| response                                        | +WAPDHCP:<MODE>[,<start_ip>,<end_ip>,<GATEWAY>]<br>OK                                                                                                                                                                                                                                        |
| Example                                         |                                                                                                                                                                                                                                                                                              |
| AT+WAPDHCP=<MODE>,<start_ip>,<end_ip>,<GATEWAY> |                                                                                                                                                                                                                                                                                              |
| describe                                        | Set DHCP parameters in AP mode                                                                                                                                                                                                                                                               |
| parameter                                       | MODE:<br>0: Disable DHCP<br>1: Enable DHCP<br><br>start_ip: DHCP starting address. Eg: 192.168.43.100<br>end_ip: DHCP end address. Eg: 192.168.43.200<br>GATEWAY: Gateway IP (the module IP is the gateway IP when using DHCP), which needs to be set when DHCP is enabled. Eg: 192.168.43.1 |
| response                                        | OK                                                                                                                                                                                                                                                                                           |
| Example                                         |                                                                                                                                                                                                                                                                                              |
| AT+WAPDHCP=?                                    |                                                                                                                                                                                                                                                                                              |
| response                                        | Query and set AP DHCP<br>OK                                                                                                                                                                                                                                                                  |
| Example                                         |                                                                                                                                                                                                                                                                                              |

### 4.1.11 AT+WAP queries or sets AP mode WiFi parameters

|          |                                                                                                                                                                                                                                                                                                                                                    |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+WAP?  |                                                                                                                                                                                                                                                                                                                                                    |
| describe | Query AP parameter information (this is the current status obtained from the hardware, not directly reading our setting value)                                                                                                                                                                                                                     |
| response | +WAP:<ssid>,<pwd>,<security>,<channel>,<max conn>,<ssid hidden>,<mac>,<IP>,<Gateway><br><br>Client Num: <client number> //Number of client connections (the query result will be accurate only after AP is turned on, otherwise the query may be wrong)<br>Client <id> MAC:<xx:xx:xx:xx:xx:xx> //Client ID and MAC address (lowercase separated by |

|                                                        |                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                        | colon) (The query result will be accurate only after AP is turned on, otherwise the query may be wrong)<br>OK<br>//Response description<br>Security: Encryption method, refer to AT+WJAP command<br>Mac: The MAC address of the network card that the module uses to open the AP hotspot<br>IP: module's own IP (in dot notation)<br>Gateway: Gateway IP (dot-notation format) |
| Exam<br>ple                                            |                                                                                                                                                                                                                                                                                                                                                                                |
| AT+WAP=<ssid>,<pwd>,<channel>,<max conn>,<ssid hidden> |                                                                                                                                                                                                                                                                                                                                                                                |
| descr<br>ibe                                           | Set AP parameters                                                                                                                                                                                                                                                                                                                                                              |
| para<br>mete<br>r                                      | ssid : Wi-Fi name<br>pwd: wifi password, an empty string means no password<br>channel: channel<br>max conn: Maximum number of connections (default is 3 if not specified)<br>ssid hidden: whether to hide the SSID , 0 is not hidden, 1 is hidden                                                                                                                              |
| respo<br>nse                                           | OK                                                                                                                                                                                                                                                                                                                                                                             |
| Exam<br>ple                                            |                                                                                                                                                                                                                                                                                                                                                                                |
| Description information in HELP                        |                                                                                                                                                                                                                                                                                                                                                                                |
| respo<br>nse                                           | Query and set AP config                                                                                                                                                                                                                                                                                                                                                        |

#### 4.1.12 AT+WAPINFO query or set AP information

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+WAPINFO?  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| descr<br>ibe | Query AP parameter information (this is the current status obtained from the hardware, not directly reading our setting value)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| respo<br>nse | +WAP:<ssid>,<pwd>,<security>,<channel>,<max conn>,<ssid<br>hidden>,<mac>,<IP>,<Gateway><br>Client Num: <client number><br>Client <id> MAC:<xx:xx:xx:xx:xx:xx>,IP:<xxx.xxx.xxx.xxx><br>OK<br>//Response description<br>Security: Encryption method, refer to AT+WJAP command<br>Mac: The MAC address of the network card that the module uses to open the AP hotspot<br>IP: module's own IP (dot notation)<br>Gateway: Gateway IP (dot-notation format)<br>client number: the number of client connections (the query result will be accurate only after the AP is turned on, otherwise the query may be wrong) |

|                                 |                                                                                                                                                                                                                                                     |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | Id: Client ID<br>MAC: MAC address (lowercase letters separated by colons) (This query result will be accurate only after the AP is turned on, otherwise the query may be wrong)<br>IP: Client IP, this is only valid in DHCP mode, not in static IP |
| Example                         |                                                                                                                                                                                                                                                     |
| Description information in HELP |                                                                                                                                                                                                                                                     |
| response                        | Query AP info                                                                                                                                                                                                                                       |
| Notes                           | This directive is added to the middleware repository                                                                                                                                                                                                |

### 4.1.13 AT+PING: Ping operation

|                                 |                                                                                                                                                      |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+PING=<addr> [,<count>]       |                                                                                                                                                      |
| description                     | Ping                                                                                                                                                 |
| parameter                       | addr : IP or domain name<br>Count: ping times, the default is 3 times, loop means pinging does not return (the only option is to restart the module) |
| response                        | //success<br>+PING: <time><br>OK<br>//fail<br>+PING:TIMEOUT<br>ERROR<br><br>//Return value description<br>time: average delay                        |
| Example                         |                                                                                                                                                      |
| Description information in HELP |                                                                                                                                                      |
| response                        | Ping test                                                                                                                                            |

### 4.1.14 AT+CIPSTAMAC\_DEF query and modify the wifi station MAC address

AT+CIPSTAMAC\_DEF

|                                 |                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------|
| descr<br>ibe                    | Same as AT+CIPSTAMAC_DEF?                                                                              |
| AT+CIPSTAMAC_DEF?               |                                                                                                        |
| descr<br>ibe                    | Query the MAC address of the WiFi station                                                              |
| respo<br>nse                    | +CIPSTAMAC_DEF:<MAC> //MAC format 84f3ebdd9e63 (lowercase without separator)<br>OK                     |
| Exam<br>ple                     |                                                                                                        |
| AT+CIPSTAMAC_DEF=<MAC>          |                                                                                                        |
| descr<br>ibe                    | Set the MAC address of the wifi station (not supported yet)                                            |
| para<br>mete<br>r               | MAC: The MAC address to be set. The MAC format is 84f3ebdd9e63 (lowercase letters without separators). |
| respo<br>nse                    | OK                                                                                                     |
| Exam<br>ple                     |                                                                                                        |
| Description information in HELP |                                                                                                        |
| respo<br>nse                    | Query and set WIFI station MAC                                                                         |

#### 4.1.15 AT+WCCOUNTRY query or set the WiFi country code

|                                 |                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+WCCOUNTRY?                   |                                                                                                                                                                                                             |
| descr<br>ibe                    | Query the configured country code                                                                                                                                                                           |
| respo<br>nse                    | + WCCOUNTRY :< country_code ><br>OK                                                                                                                                                                         |
| Exam<br>ple                     |                                                                                                                                                                                                             |
| AT+ WCCOUNTRY =< country_code > |                                                                                                                                                                                                             |
| descr<br>ibe                    | Set country code (effective after restart)                                                                                                                                                                  |
| para<br>mete<br>r               | country_code: country code<br>0 : // Do not specify a country code, use the SDK default configuration<br>1: JP Japan<br>2: American Samoa<br>3: CA Canada<br>4: US<br>5: CN China<br>6: HK Hong Kong, China |

|                                 |                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | 7 : TW Taiwan<br>8: MO Macau , China<br>9: IL Israel<br>10: Singapore<br>11: KR Korea<br>12: TR Turkey<br>13: AU Australia<br>14: ZA South Africa<br>15: BR Brazil |
| response                        | OK                                                                                                                                                                 |
| Example                         |                                                                                                                                                                    |
| Description information in HELP |                                                                                                                                                                    |
| response                        | Query and set WIFI country code                                                                                                                                    |

#### 4.1.16 AT+WCONFIG turns on/off mobile phone network configuration

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+WCONFIG?                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| describe                          | Query the network status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| response                          | + WCONFIG :< status ><br>OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Example                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| AT+ WCONFIG =< status > [,<name>] |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| describe                          | Set the mobile phone network configuration status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| parameter                         | status:<br>0 : Disable mobile phone network configuration task<br>1: Enable WiFi network configuration once (network configuration is successful/network configuration timeout will automatically return to the closed state)<br>2: Enable Bluetooth network configuration once (network configuration is successful/network configuration timeout will automatically return to the closed state)<br>3: Enable AirKiss network configuration<br>9: Enable blufi network configuration<br>10: WPS network configuration<br>name:<br>This is used to customize the network broadcast name. Currently only the esp BluFi protocol supports this parameter. |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | Network distribution protocol<br>middleware<br>1: smartconfig<br>2: Blufi<br>3: AirKiss<br>4: Web network configuration<br>Non-middleware<br>BW16<br>1: Realtek Simple Config<br>2: Realtek WiFi Config<br>3: WeChat AirKiss network configuration<br>9: Blufi network configuration<br>10: WPS network configuration<br>Ai-WB2<br>1: WiFi network configuration (esp touch)<br>2: Bluetooth network configuration (esp BluFi)<br>3: WeChat AirKiss network configuration<br>9: Blufi network configuration |
| response                        | OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Example                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| response                        | Query and set WIFI config                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

#### 4.1.17 AT+WSCANOPT filters WIFI scan display information

|                      |                                                                                                                                                                                           |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+ WSCANOPT ?       |                                                                                                                                                                                           |
| description          | Query the set WIFI scan display information                                                                                                                                               |
| response             | +WSCANOPT:<option><br>OK                                                                                                                                                                  |
| Example              | AT+WSCANOPT?<br><br>+WSCANOPT:0xff<br>OK                                                                                                                                                  |
| AT+WSCANOPT=<option> |                                                                                                                                                                                           |
| description          | Set WIFI scan display information                                                                                                                                                         |
| parameter            | option : Whether the WIFI scan result displays the following parameters, default value: 0xFF, if a bit is set to 1, the corresponding parameter will be displayed, if it is set to 0, the |

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| r        | corresponding parameter will not be displayed. There are two ways to input option (hexadecimal 0xXY format and decimal format). <ul style="list-style-type: none"> <li>bit 0: whether to display &lt;ssid&gt;</li> <li>bit 1: whether to display &lt;channel&gt;</li> <li>bit 2: whether to display &lt;security&gt;</li> <li>bit 3: whether to display &lt;rssi&gt;</li> <li>bit 4: whether to display &lt;MAC&gt;</li> </ul> |
| response | +WSCANOPT:<option><br>OK                                                                                                                                                                                                                                                                                                                                                                                                       |
| Example  | AT+WSCANOPT=15<br><br>+WSCANOPT:0x0f<br>OK<br><br>AT+WSCANOPT=0x0f<br><br>+WSCANOPT:0x0f<br>OK                                                                                                                                                                                                                                                                                                                                 |

#### 4.1.18 AT+WRSSI query wifi connection signal strength

| AT+ WRSSI or AT+ WRSSI? |                                        |
|-------------------------|----------------------------------------|
| describe                | Query Wi-Fi connection signal strength |
| response                | +WRSSI :<rssi><br>OK                   |
| Example                 | AT+WRSSI<br><br>+WSCANOPT:-50<br>OK    |

#### 4.1.19 AT+BLUFISEND sends Bluetooth network configuration custom data

| AT+BLUFISEND = <length> |                                                                        |
|-------------------------|------------------------------------------------------------------------|
| describe                | Send Bluetooth network configuration custom data                       |
| response                | > //After receiving this character, start entering the data to be sent |

|             |                                                                                                                                                     |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| nse         | OK // When the specified byte data is received, the data will be sent (it can be any data) , and OK will be displayed when the sending is completed |
| Exam<br>ple | AT+BLUFISEND=5<br><br>><br>hello<br>OK                                                                                                              |

## 4.2 TCP-IP Instructions

### 4.2.1 +EVENT:SocketDown sends data through the socket

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| +EVENT:SocketDown,<ConID>,<length>[,<date>] |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| descr<br>ibe                                | This is URC active data, indicating that the data sent by SOCKET has been received.                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| para<br>mete<br>r                           | ConID: The connection ID obtained after creating a SOCKET connection (note that the TCPServer connection cannot send or receive data, and can only send or receive data through the seed created after the client connects to the TCPServer; the UDP Client can only send data, not receive data)<br>length: received data length<br>date: If the socket is in active reading mode, the received data will be printed directly. In passive reading, no data will be printed. Active reading is required to obtain data. |
| Exam<br>ple                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

### 4.2.2 +EVENT:SocketSeed When TCPServer receives a new connection, it will print this data

|                                                    |                                                                                                                                              |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| + EVENT:Socket Seed ,<seed ConID> , <server ConID> |                                                                                                                                              |
| descr<br>ibe                                       | This is URC active data. When the TCP server connects to a new client, it will receive this message.                                         |
| para<br>mete<br>r                                  | seed ConID: ConID of the newly connected client connection)<br>Server ConID: This refers to the server ConID corresponding to the seed ConID |
| Exam<br>ple                                        | ##+Seed:2,                                                                                                                                   |

### 4.2.3 AT+SOCKET creates a socket connection

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SOCKET                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| descr<br>ibe                                                     | Same as AT+SOCKET?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| AT+SOCKET?                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| descr<br>ibe                                                     | Query the created socket link information                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| respo<br>nse                                                     | <p>&lt;ConID&gt; ,&lt;type&gt;, &lt;status&gt;, &lt; remote host &gt;,&lt;remote port&gt;,&lt;local port&gt; ,&lt;server ConID &gt;<br/>           OK<br/>           //Status details<br/>           Type :<br/>               1: UDP Server<br/>               2: UDPClient<br/>               3: TCP Server<br/>               4: TCPClient<br/>               5: TCPSeed (TCPSeed created locally. When other users connect to it using tcpclient, a TCPSeed will be generated)<br/>               6: SSLServer<br/>               7: SSLClient<br/>               8: SSLSeed (an SSLSeed is created when a client connects to the module's SSL server)<br/>           Status:<br/>               0: Not connected/disconnected<br/>               1: Connecting<br/>               3: Connection successful<br/>               4: Connection failed<br/>               127: Connection being deleted<br/>           remote host: The remote address of the client mode connection. The server mode is not set yet.<br/>           remote port : The remote port for client mode connection. The server mode is not set yet, and the default value -1 is displayed.<br/>           local port : server mode displays the local listening port. Client mode is not set yet, and the default value -1 is displayed.<br/>           server ConID: When type is TCPSeed, this indicates which TCP server the connection was created from. For other types, the default value is -1</p> |
| Exam<br>ple                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| AT+SOCKET=<type>[,<remote host>],<port>[,<keep alive> ,<conID> ] |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| descr<br>ibe                                                     | Create a socket connection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| para<br>mete                                                     | type: socket type<br>1: UDPServer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| r                               | 2: UDPClient<br>3: TCPServer<br>4: TCPClient<br>5: TCPSeed (placeholder type, unavailable. This type is generated when the client connects to the module TCP server and cannot be created actively)<br>6: SSLServer<br>7: SSLClient<br>8: SSLSeed (placeholder type, unavailable, this type is generated when the client connects to the module SSL server and cannot be created actively)<br>remote host: When type is client, this parameter is mandatory, indicating the domain name or IP of the server to be connected. It does not need to be set when it is server (skip directly, eg: AT+SOCKET=3,10086)<br>port: When type is client, it indicates the port number of the server to connect to; when type is server, it indicates the port number that the local server needs to listen to.<br>keep alive: TCP keep-alive interval, 0 means disabled, 1~7200 means detection interval, unit: seconds (reserved function, not implemented yet)<br>conID : specifies the Con ID of the new connection . The value is u32 type data. |
| response                        | connect success ConID=<ConID><br>OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Example                         | <pre>//Connect to wifi AT+WJAP=specter,12345678909  +EVENT:WIFI_CONNECT  OK  +EVENT:WIFI_GOT_IP //Create UDPServer AT+SOCKET=1,10086  connect success ConID=1 OK //Create UDPClient AT+SOCKET=2,192.168.3.10,10086 connect success ConID=1 OK //Use the domain name to create a tcp client connection //Use IP to create a tcp client connection</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| response                        | Create socket                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## 4.2.4 AT+SOCKET2 creates a socket connection

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SOCKET2                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| descr<br>ibe                                                                      | Same as AT+SOCKET?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| AT+SOCKET2?                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| descr<br>ibe                                                                      | Same as AT+SOCKET?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| AT+SOCKET2=<type>,<remote host>,<remotePort>[,<localPort>,<keep alive> ,<conID> ] |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| descr<br>ibe                                                                      | Create a socket connection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| para<br>mete<br>r                                                                 | <p>type: socket type</p> <p>1: Placeholder</p> <p>2: UDPClient</p> <p>3: Placeholder</p> <p>4: TCPClient</p> <p>5: Placeholder</p> <p>6: Placeholder</p> <p>7: Placeholder</p> <p>8: Placeholder</p> <p>remote host: the domain name or IP of the server to be connected</p> <p>remotePort: The port number of the remote server to connect to</p> <p>localPort: The local port number that needs to be bound. If no binding is required, set it to -1 (randomly bind the local port number)</p> <p>keep alive: TCP keep-alive interval, 0 means disable, 1~7200 means detection interval, unit: second (this parameter is invalid in UDP mode)</p> <p>conID : specifies the Con ID of the new connection . The value is u32 type data.</p> |
| respo<br>nse                                                                      | <p>connect success ConID=&lt;ConID&gt;</p> <p>OK</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Exam<br>ple                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Description information in HELP                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| respo<br>nse                                                                      | Create socket                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## 4.2.5 AT+SOCKETSEND sends data through socket (long data mode)

|                                |                                                                                        |
|--------------------------------|----------------------------------------------------------------------------------------|
| AT+SOCKETSEND=<ConID>,<length> |                                                                                        |
| descr                          | Send data to the specified connection. When the command is executed, a ">" symbol will |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ibe                             | <p>appear in the second line. After this symbol appears, you can start entering data (you can enter any data, regardless of the data content). When length bytes of data are received, it will stop receiving and start sending (if the length exceeds the maximum length of a single packet, the data will be divided into packets. By default, the data will be divided into packets when it exceeds 1024 bytes)</p> <p>Features: This mode can send data of any length (if it is too long, it will be divided into packets), and can receive any characters</p>                                                                                                         |
| parameter                       | <p>ConID: The connection ID obtained after creating a SOCKET connection (note that TCPServer connections cannot be sent, and data can only be sent to the seed created after the client connects to TCPServer; the UDP server must first receive client data before it can send, and the sending object is the object that receives data for the first time)</p> <p>length: the length of the data to be sent</p> <p>After the command is executed, a "&gt;" will be displayed. After receiving this symbol, you can start to enter the data to be sent (you can enter any HEX data, not limited to strings). After receiving length data, it will start to send data.</p> |
| response                        | OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Example                         | AT+SOCKETSEND=1,3<br>>123<br>OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| response                        | Socket send data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## 4.2.6 AT+SOCKETSENDLINE sends data through socket (single line mode)

|                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SOCKETSENDLINE=<ConID>,<length>,<data> |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| description                               | <p>Send data to the specified connection</p> <p>Features: This mode is relatively simple to use, but the length is limited (the maximum length of an AT command is limited). If there are special characters, the entire parameter needs to be enclosed in double quotes. If there are double quotes in the parameter, escape characters need to be added.</p>                                                                                 |
| parameter                                 | <p>ConID: The connection ID obtained after creating a SOCKET connection (note that TCPServer connections cannot be sent, and data can only be sent to the seed created after the client connects to TCPServer; the UDP server must first receive client data before it can send, and the sending object is the object that receives data for the first time)</p> <p>length: the length of the data to be sent</p> <p>data: data to be sent</p> |
| response                                  | OK                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|                                 |                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| nse                             |                                                                                                                                                                                                                                                                                                                                             |
| Exam<br>ple                     | <pre>//Connect to wifi AT+WJAP=specter,12345678909  +EVENT:WIFI_CONNECT  OK  +EVENT:WIFI_GOT_IP //Create UDPClient AT+SOCKET=2,192.168.3.10,10086 connect success ConID=1 OK //Send data to ConID1 AT+SOCKETSENDLINE=1,5,12345  OK</pre>                                                                                                    |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                             |
| respo<br>nse                    | Socket sends data in one line                                                                                                                                                                                                                                                                                                               |
| Exam<br>ple                     |                                                                                                                                                                                                                                                                                                                                             |
| Note<br>s                       | <p>The length of data sent in single-line mode is limited, and the total length of the instruction cannot exceed the total length limit of one instruction.</p> <p>The total length of a command is 1023 by default. When ConID is a single digit, the total length of data that can be sent is 1023-26 command format data = 997 bytes</p> |

### 4.2.7 AT+SOCKETSENDHEX sends HEX data through socket single-line mode

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SOCKETSENDHEX=<ConID>,<length>,<data> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| descr<br>ibe                             | Send data to the specified connection                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| para<br>mete<br>r                        | <p>ConID: The connection ID obtained after creating a SOCKET connection (note that TCPServer connections cannot be sent, and data can only be sent to the seed created after the client connects to TCPServer; the UDP server must first receive client data before it can send, and the sending object is the object that receives data for the first time)</p> <p>length: the length of the data to be sent</p> <p>data: data to be sent (the data is hex data in string form)</p> |
| respo<br>nse                             | OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Exam<br>ple                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| respo<br>nse                    | Socket send data in one line by hex                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Exam<br>ple                     | AT+WJAP=test,12345678<br><br>+EVENT:WIFI_CONNECT<br><br>+EVENT:WIFI_GOT_IP<br><br>OK<br>AT+SOCKET=4,192.168.3.10,10086<br>connect success ConID=1<br>OK<br>//Send 2 bytes of hex data 0x31 0x32 to conid 1<br>AT+SOCKETSENDHEX=1,2,3132<br><br>OK                                                                                                                                                                                                             |
| Note<br>s                       | <p>The length of data sent in single-line mode is limited, and the total length of the instruction cannot exceed the total length limit of one instruction.</p> <p>The total length of a command is 1023 by default. When ConID is a single digit, the total length of data that can be sent is 1023-26 instruction format data = 997 bytes. Two bytes of hex string represent one hex data, so the maximum length of data that can be sent is 997/2=498.</p> |

## 4.2.8 AT+SOCKETREAD reads data from the socket

|                                 |                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SOCKETREAD=<ConID>           |                                                                                                                                                                                                                                                                                                                                                                    |
| descr<br>ibe                    | Read data from the specified connection<br>Note: When reading, it is read by package, one package of data is read at a time                                                                                                                                                                                                                                        |
| para<br>mete<br>r               | ConID: The connection ID obtained after creating a SOCKET connection (note that the TCPServer connection cannot send or receive data, and can only send or receive data to the seed created after the client connects to the TCPServer; the UDP Client needs to send data once before the server obtains the local port before it can send data to the UDP client) |
| respo<br>nse                    | +SOCKETREAD:<ConID>,<len>,<data><br>OK                                                                                                                                                                                                                                                                                                                             |
| Exam<br>ple                     |                                                                                                                                                                                                                                                                                                                                                                    |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                                    |
| respo                           | Socket read data                                                                                                                                                                                                                                                                                                                                                   |

|     |  |
|-----|--|
| nse |  |
|-----|--|

## 4.2.9 AT+SOCKETDEL deletes the specified socket connection

| AT+SOCKETDEL=<ConID>            |                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| descr<br>ibe                    | Delete the specified socket connection<br>Note: Since the seed is initiated by the client, the server cannot reconnect, so you need to manually delete the connection after the seed is disconnected (the received data will also be cleared after deleting the connection) |
| para<br>mete<br>r               | ConID: The connection ID to be deleted                                                                                                                                                                                                                                      |
| respo<br>nse                    | OK                                                                                                                                                                                                                                                                          |
| Exam<br>ple                     | #AT+SOCKETDEL=9<br>OK                                                                                                                                                                                                                                                       |
| Description information in HELP |                                                                                                                                                                                                                                                                             |
| respo<br>nse                    | Delete socket                                                                                                                                                                                                                                                               |

## 4.2.10 AT+SOCKETRECVCFG sets the socket receiving mode

| AT+SOCKETRECVCFG=<mode>         |                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| descr<br>ibe                    | Set the print mode of the socket receiving data                                                                                                                                                                                                                                                                          |
| para<br>mete<br>r               | mode:<br>0: Passive mode (default). In this mode, after receiving data, only the prompt +EVENT:SocketDown,<ConID>,<length> is printed without printing the data content.<br>1: Active mode. In this mode, the received socket data is directly printed in the following format +EVENT:SocketDown,<ConID>,<length>,<date> |
| respo<br>nse                    | OK                                                                                                                                                                                                                                                                                                                       |
| Exam<br>ple                     |                                                                                                                                                                                                                                                                                                                          |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                          |
| respo<br>nse                    | Set socket recive mode                                                                                                                                                                                                                                                                                                   |
| Note<br>s                       | The data that can be cached in passive mode is stored in RAM in the form of a linked list. If it is not read, it will occupy the memory. When the memory is insufficient, the data cannot be cached anymore and the newly received data will be discarded.                                                               |

## 4.2.11 AT+SOCKETTT enters socket transparent transmission mode

| AT+SOCKETTT                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| describe                    | Enter SOCKET transparent mode<br>Note: The default transparent transmission object of the UDP server is the client of the first communication                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| response                    | > // Receiving this means that transparent transmission is turned on and data can be sent and received<br>OK // Enter three plus signs in succession to exit transparent transmission. When exiting transparent transmission, print \r\nOK\r\n                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Remark                      | To enter transparent mode, one of the following conditions must be met:<br>Currently there is only one client connection (through client transparent transmission)<br>There is only one server and one seed connection (the seed generated by the client connecting to the module server can be transparently transmitted. This mode must be entered manually and cannot be entered automatically)<br>Only one UDPClient<br>There is only one UDPServer (note that it is not recommended to use UDP server in transparent transmission mode. The default transparent transmission object is the first connected client. If other connections initiate communication with the module, subsequent transparent transmission objects may fail.)<br>After entering +++, you can exit the transparent transmission mode and enter the AT command mode |
| Example                     | #AT+WJAP= test ,123456789 //Connect to wifi<br><br>OK<br>#AT+SOCKET=4,192.168.31.98,18 //Create tcp client<br>connect success ConID=1<br>OK<br>#AT+SOCKETTT //Enter transparent transmission mode<br>>send to module //The data sent at this time will be transparently transmitted to the target, and the data sent by the target will be transparently transmitted to the local<br>OK // Exit transparent transmission mode after entering three consecutive plus signs<br>#                                                                                                                                                                                                                                                                                                                                                                  |
| AT+SOCKETTT=UDPServerTTMode |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| describe                    | Set the UDP server transparent mode and enter the transparent mode. The current setting mode is only valid when there is only one UDP server.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| parameter                   | UDPServerTTMode: Set the UDP server transparent transmission mode<br>0: The target of transparent transmission is fixed to the client of the first communication, and the communication target will not be changed if there are other clients communicating later.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

|                                 |                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | 2: The transparent transmission object will be dynamically modified to the client of the last communication                                                                                                                                  |
| response                        | > // Receiving this means that transparent transmission is enabled and data can be sent and received<br>OK // Enter three plus signs in succession to exit transparent transmission. When exiting transparent transmission, print \r\nOK\r\n |
| Example                         |                                                                                                                                                                                                                                              |
| Description information in HELP |                                                                                                                                                                                                                                              |
| describe                        | Start socket transparent transmission                                                                                                                                                                                                        |

## 4.2.12 AT+SOCKETAUTOTT automatically enters socket transparent transmission configuration

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SOCKETAUTOTT  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| descr<br>ibe     | Same as AT+SOCKETAUTOTT?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| AT+SOCKETAUTOTT? |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| descr<br>ibe     | Query the current automatic transparent transmission configuration information                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| respo<br>nse     | +SOCKETAUTOTT: <type> , < remote host >,<remote port><br>OK<br>//Status details<br>Type :<br>0: Disable automatic entry into transparent mode<br>1: Automatically enter UDPServer transparent transmission mode<br>2: Automatically enter UDPClient transparent transmission mode<br>3: Placeholder type, unavailable<br>4: Automatically enter TCPClient transparent transmission mode<br>5: Placeholder type, unavailable<br>6: Placeholder type, unavailable<br>7: Placeholder type, unavailable<br>8: Placeholder type, unavailable<br>remote host: The remote address of the client mode connection, which is not set for server mode.<br>remote port : The remote port for client mode connection. The server mode is not set yet, and the default value -1 is displayed.<br>local port : server mode displays the local listening port. Client mode is not set yet, and the default value -1 is displayed.<br>server ConID: When type is TCPSeed, this indicates which TCP server the connection was created from. For other types, the default value is -1 |
| Exam             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ple               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                   | AT+SOCKETAUTOTT=<type>[,<remote host>],<port>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| descr<br>ibe      | <p>Automatically enter transparent mode after creating the corresponding socket connection</p> <p>After this command is set, it needs to be used with AT+WAUTOCONN. After the configuration is completed, reset to take effect</p> <p>Automatically connect to wifi after power on (AT+WAUTOCONN configuration)</p> <p>After the Wifi connection is successful, a socket connection is automatically created. After the socket is successfully created, it automatically enters the transparent transmission mode (this command sets it)</p>                                                                                                                                                                                                                                                                                                                                                                                             |
| para<br>mete<br>r | <p>type: socket type</p> <p>0: Disable automatic entry into transparent mode</p> <p>1: Automatically enter UDPServer transparent transmission mode</p> <p>2: Automatically enter UDPClient transparent transmission mode</p> <p>3: Placeholder type, unavailable</p> <p>4: Automatically enter TCPClient transparent transmission mode</p> <p>5: Placeholder type, unavailable</p> <p>6: Placeholder type, unavailable</p> <p>7: Placeholder type, unavailable</p> <p>8: Placeholder type, unavailable</p> <p>remote host: When type is client, this parameter is mandatory, indicating the domain name or IP of the server to be connected. It does not need to be set when it is server (skip this parameter, eg: AT+SOCKETAUTOTT=1,10086)</p> <p>port: When type is client, it indicates the port number of the server to connect to; when type is server, it indicates the port number that the local server needs to listen to.</p> |
| respo<br>nse      | OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Exam<br>ple       | AT+SOCKETAUTOTT=4,www.baidu.com,80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                   | Description information in HELP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| respo<br>nse      | Set socket auto transparent transmission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

### 4.2.13 AT+SSLCRET query and set SSL certificate

|              |                                                                                                                                                                                                                                                                                                                                  |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | AT+SSLCRET=<type>[,<length>]                                                                                                                                                                                                                                                                                                     |
| descr<br>ibe | <p>Query and set SSL certificate</p> <p>When there is only one parameter, it means to query the content of the currently set certificate. When there are two parameters, it means that the certificate needs to be set. When the certificate is empty, the client does not load the certificate and obtains it automatically</p> |
| para<br>mete | <p>type: the certificate type of the operation</p> <p>1: CA root certificate</p>                                                                                                                                                                                                                                                 |

|                                 |                                                                                                                                                                                                                                                 |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| r                               | 2: Client public key<br>3: Client private key<br>length: certificate length. When this parameter is omitted, it means querying the corresponding certificate. When this parameter is changed, it means the length of the certificate to be set. |
| response                        | Query Mode<br>+SSLCRET:<type>,<length>,<certificate content><br>OK<br>Setting Mode<br>> //Receiving this symbol means you can start writing the certificate<br>OK                                                                               |
| Example                         | Setting up certificates<br>AT+SSLCRET=1,10<br>>1234567890<br>OK<br>Check certificate<br>AT+SSLCRET=1<br><br>+SSLCRET:1,10,1234567890<br>OK                                                                                                      |
| Description information in HELP |                                                                                                                                                                                                                                                 |
| response                        | Query and set SSL Cret                                                                                                                                                                                                                          |

#### 4.2.14 AT+WDOMAIN domain name resolution

|                                 |                                                           |
|---------------------------------|-----------------------------------------------------------|
| AT+WDOMAIN=<server name>        |                                                           |
| description                     | DNS resolves domain name                                  |
| response                        | +WDOMAIN:<IP><br>OK                                       |
| Example                         | AT+WDOMAIN=www.baidu.com<br>+WDOMAIN:14.119.104.189<br>OK |
| Description information in HELP |                                                           |
| response                        | Input host name to get IP                                 |

#### 4.2.15 AT+WDNS sets the DNS server

|             |                             |
|-------------|-----------------------------|
| AT+WDNS?    |                             |
| description | Query DNS resolution server |

|                                   |                                                            |
|-----------------------------------|------------------------------------------------------------|
| ibe                               |                                                            |
| respo<br>nse                      | +WDNS:<DNS IP1>,<DNS IP2><br>OK                            |
| Exam<br>ple                       | AT+WDNS?<br>+WDNS:192.168.3.1,0.0.0.0<br>OK                |
| AT+WDNS=<"DNS IP1">[,<"DNS IP2">] |                                                            |
| descr<br>ibe                      | Set up DNS domain name resolution server                   |
| para<br>mete<br>r                 | DNS IP1/DNS IP2: Domain name resolution server             |
| respo<br>nse                      | +WDNS:<DNS IP1>[,DNS IP2]<br>OK                            |
| Exam<br>ple                       | AT+WDNS=114.114.114.114<br><br>+WDNS:114.114.114.114<br>OK |
| Description information in HELP   |                                                            |
| respo<br>nse                      | Query and set DNS Server                                   |

## 4.3 MQTT Commands

### 4.3.1 AT+MQTT MQTT configuration and connection

|              |                                                                                                                                                                                                                                                                                 |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+ MQTT     |                                                                                                                                                                                                                                                                                 |
| descr<br>ibe | Connecting MQTT<br>Note: You need to set the MQTT parameters before executing the connection. If the current MQTT task has been started, it will reconnect if it is executed again (if you change the server, it is recommended to delete all subscriptions and then reconnect) |
| respo<br>nse | OK<br>Note: This is an asynchronous connection. The OK display only means that the MQTT task has started. The connection status needs to be queried via AT+MQTT? or by waiting for the receipt of URC data "+EVENT:MQTT_CONNECT"                                                |
| Exam<br>ple  | AT+MQTT=1,192.168.202.10 //Set domain name<br><br>OK<br>#AT+MQTT=2,1883 //Set the port number<br><br>OK                                                                                                                                                                         |

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | #AT+MQTT=3,1 //Set the connection mode<br><br>OK<br>#AT+MQTT=4,client_id //Set user ID<br><br>OK<br>#AT+MQTT=5,admin //Set MQTT username<br><br>OK<br>#AT+MQTT=6,public //Set the MQTT password<br><br>OK<br>#AT+MQTT? //Query MQTT connection and configuration<br><br>+MQTT:0,192.168.202.10,1883,1,client_id,admin,public<br>OK<br>#AT+MQTT //Connect to MQTT<br><br>OK<br>#<br>+EVENT:MQTT_CONNECT //MQTT connection successful                                                                                                                                                   |
|              | AT+MQTT?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| descr<br>ibe | Query MQTT parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| respo<br>nse | +MQTT:<MQTT_status> , <Host_name> , <Port> ,<br><scheme>,<client_id>,<username>,<password>,<LWT_topic>,<LWT_qos>,<LWT_Retained>,<LWTpayload><br>OK<br>//Status description<br>MQTT_status: MQTT connection status<br>0: Initial state<br>1: Connecting<br>2: Subscribing to messages<br>3: Connection successful<br>Host_name : Server domain name<br>Port : Server port number<br>scheme: connection method<br>1: TCP connection<br>2: SSL connection<br>client_id: MQTT user ID<br>Username: MQTT username<br>password: MQTT password<br>LWT_topic: Will topic<br>LWT_qos: Will QOS |

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | LWT_Retained: Will retained<br>LWTPayload: Will message content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Example   | #AT+MQTT? //Query MQTT connection and configuration<br><br>+MQTT:0,192.168.202.10,1883,1,client_id,admin,public,LWTTOPIC,0,1,123456<br>OK                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|           | AT+MQTT=<key>,<data>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| describe  | Setting MQTT parameters<br>Note: Different keys have different settings, so you need to perform multiple settings to set all the parameters.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| parameter | key:<br>1: Set the domain name or IP to connect to<br>2: Set the server port number<br>3: Set the connection mode (1: Use TCP connection; 2: Use SSL connection)<br>4: Set the client ID<br>5: Set the user name (maximum length 63 bytes)<br>6: Set password (maximum length 63 bytes)<br>7: Set the will message, the format is<br>AT+MQTT=7,<LWT_topic>,<LWT_qos>,<LWT_Retained>,<LWTPayload><br>LWT_topic: Will topic (no will is required, set this to "" )<br>LWT_qos: Will QOS (0/1/2)<br>LWT_Retained: Will retained(0/1)<br>LWTPayload: Will message content<br>data: the value to be set |
| response  | OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Example   | AT+MQTT=1,192.168.202.10 //Set domain name<br><br>OK<br>#AT+MQTT=2,1883 //Set the port number<br><br>OK<br>#AT+MQTT=3,1 //Set the connection mode<br><br>OK<br>#AT+MQTT=4,client_id //Set user ID<br><br>OK<br>#AT+MQTT=5,admin //Set MQTT username<br><br>OK<br>#AT+MQTT=6,public //Set the MQTT password<br><br>OK                                                                                                                                                                                                                                                                               |

|                                 |                                                                                                                                                                                                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | #AT+MQTT=7,"LWTTOPIC",0,1,"123456" //Set the will topic LWTTOPIC, qos0, enable retained, and the load message is 123456; Note: If you do not want a will message, set it to AT+MQTT=7,"",0,0,""<br><br>OK |
| Description information in HELP |                                                                                                                                                                                                           |
| response                        | Config and connect MQTT                                                                                                                                                                                   |
| Notes                           | The default MQTT version is MQTT3.1                                                                                                                                                                       |

### 4.3.2 AT+MQTTVER Query and set the MQTT version

|                                 |                                         |
|---------------------------------|-----------------------------------------|
| AT+MQTTVER?                     |                                         |
| description                     | Query the current MQTT version          |
| response                        | +MQTTVER:<version><br>OK                |
| Example                         | AT+MQTTVER?<br><br>+MQTTVER:3<br>+OK    |
| AT+MQTTVER=<version>            |                                         |
| description                     | Setting the MQTT version                |
| parameter                       | version:<br>3: MQTT 3.1<br>4: MQTT3.1.1 |
| response                        | OK                                      |
| Example                         | AT+MQTTVER=4<br><br>OK                  |
| Description information in HELP |                                         |
| response                        | Query and set MQTT version              |

### 4.3.3 AT+MQTTBUF Query and set the MQTT send and receive buf size

|             |
|-------------|
| AT+MQTTBUF? |
|-------------|

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| descr<br>ibe                             | Query the MQTT buf size (MQTT needs to be restarted to take effect after modification)                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| respo<br>nse                             | +MQTTBUF:<sendBufSize>,<reciveBufSize><br>OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Exam<br>ple                              | AT+MQTTBUF?<br>+MQTTBUF:2048,2048<br>+OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| AT+MQTTBUF=<sendBufSize>,<reciveBufSize> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| descr<br>ibe                             | Set the MQTT send and receive buf size<br>Notice:<br>This parameter will take effect the next time you connect (if you are currently connected, you need to disconnect and reconnect before it takes effect)<br>This command only sets the size of buf and does not take effect immediately. It will be allocated when the MQTT connection is executed later. Therefore, it should be set reasonably according to the memory. Otherwise, the MQTT task cannot be started due to insufficient memory even after the setting is successful. |
| para<br>mete<br>r                        | sendBufSize: MQTT send buf size, in bytes<br>reciveBufSize: MQTT receive buf size, in bytes                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| respo<br>nse                             | OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Exam<br>ple                              | AT+MQTTBUF=1024,4096<br>OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Description information in HELP          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| respo<br>nse                             | Query and set MQTT buffer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

### 4.3.4 AT+MQTTKEEPALIVE queries and sets the MQTT heartbeat interval

|                                                                   |                                                                                                          |
|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| AT+MQTTKEEPALIVE?                                                 |                                                                                                          |
| descr<br>ibe                                                      | Query the current MQTT heartbeat interval (MQTT needs to be restarted to take effect after modification) |
| respo<br>nse                                                      | +MQTTKEEPALIVE:<mqtKeepAliveInterval>,<mqtTcpKeepAliveInterval><br>OK                                    |
| Exam<br>ple                                                       | AT+MQTTKEEPALIVE?<br>+MQTTKEEPALIVE:60,10<br>+OK                                                         |
| AT+MQTTKEEPALIVE=<mqtKeepAliveInterval>,<mqtTcpKeepAliveInterval> |                                                                                                          |
| descr<br>ibe                                                      | Set the MQTT heartbeat interval (MQTT needs to be restarted to take effect after modification)           |
| para                                                              | mqtKeepAliveInterval: MQTT heartbeat interval, unit s                                                    |

|                                 |                                                                   |
|---------------------------------|-------------------------------------------------------------------|
| meta                            | mqttTcpKeepAliveInterval: MQTT socket heartbeat interval, unit: s |
| response                        | OK                                                                |
| Example                         | AT+MQTTKEEPALIVE=120,5<br>OK                                      |
| Description information in HELP |                                                                   |
| response                        | Query and set MQTT keepalive                                      |

### 4.3.5 AT+MQTTCRET query and set MQTT SSL certificate

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+MQTTCRET=<type>[,<length>] |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| describe                      | <p>Query and set MQTT SSL certificate</p> <p>Notice:</p> <ol style="list-style-type: none"> <li>1. The modification is only saved in RAM and will become invalid after the module is restarted if it is not saved in flash.</li> <li>2. After the modification, you need to restart MQTT to take effect</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| parameter                     | <p>When there is only one parameter, it means to query the content of the currently set certificate. When there are two parameters, it means that the certificate needs to be set. If the certificate is empty, length needs to be set to 0. The client does not load the certificate and obtains it automatically.</p> <p>type: the certificate type of the operation</p> <ol style="list-style-type: none"> <li>1: CA root certificate</li> <li>2: Client public key</li> <li>3: Client private key</li> </ol> <p>length: certificate length. When this parameter is omitted, it means querying the corresponding certificate. When this parameter is added, it means the length of the certificate to be set. A length of 0 means clearing the current certificate.</p> |
| response                      | <p>Query Mode</p> <p>+MQTTCRET:&lt;type&gt;,&lt;length&gt;,&lt;certificate content&gt;</p> <p>OK</p> <p>Setting Mode</p> <p>&gt; //Receiving this symbol means you can start writing the certificate</p> <p>OK // OK will be returned after the input length is sufficient</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Example                       | <p>Check certificate</p> <p>AT+MQTTCRET=1</p> <p>+MQTTCRET:1,1758,-----BEGIN CERTIFICATE-----</p> <p>.....</p> <p>-----END CERTIFICATE-----</p> <p>OK</p> <p>Setting up certificates</p> <p>AT+MQTTCRET=1,1758</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

|                                 |                                                                                                                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | <p>&gt; //&gt; can send data after it appears</p> <p>-----BEGIN CERTIFICATE-----</p> <p>...</p> <p>-----END CERTIFICATE-----</p> <p>OK //OK will be returned after receiving</p> |
| Description information in HELP |                                                                                                                                                                                  |
| response                        | Query and set MQTT Cret                                                                                                                                                          |

### 4.3.6 AT+MQTTDISCONN Disconnect MQTT connection

| AT+ MQTTDISCONN |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| description     | Disconnect MQTT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| response        | OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Example         | <p>AT+MQTT=1,192.168.202.10 //Set domain name</p> <p>OK</p> <p>#AT+MQTT=2,1883 //Set the port number</p> <p>OK</p> <p>#AT+MQTT=3,1 //Set the connection mode</p> <p>OK</p> <p>#AT+MQTT=4,client_id //Set user ID</p> <p>OK</p> <p>#AT+MQTT=5,admin //Set MQTT username</p> <p>OK</p> <p>#AT+MQTT=6,public //Set the MQTT password</p> <p>OK</p> <p>#AT+MQTT? //Query MQTT connection and configuration</p> <p>+MQTT:0,192.168.202.10,1883,1,client_id,admin,public</p> <p>OK</p> <p>#AT+MQTT //Connect to MQTT</p> <p>OK</p> <p>#</p> |

|  |                                                  |
|--|--------------------------------------------------|
|  | +EVENT:MQTT_CONNECT //MQTT connection successful |
|--|--------------------------------------------------|

### 4.3.7 AT+MQTTPUB publishes MQTT message

|                                               |                                                                                                                                                                                                      |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+MQTTPUB=<topic>,<qos>,<Retained>,<payload> |                                                                                                                                                                                                      |
| descr<br>ibe                                  | Publishing MQTT messages                                                                                                                                                                             |
| para<br>mete<br>r                             | topic: the topic to be published<br>qos: qos level (0,1,2)<br>Retained : Whether it is a retained message. 0 indicates a normal message. 1 indicates a retained message.<br>payload: payload message |
| respo<br>nse                                  | OK                                                                                                                                                                                                   |
| Exam<br>ple                                   | AT+MQTTPUB=testtopic,1, 0, 456<br><br>OK                                                                                                                                                             |
| Description information in HELP               |                                                                                                                                                                                                      |
| respo<br>nse                                  | Publish MQTT message                                                                                                                                                                                 |

### 4.3.8 AT+MQTTPUB RAW publishes an MQTT message of a specified length

|                                                   |                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+MQTTPUB RAW =<topic>,<qos>,<Retained>,<length> |                                                                                                                                                                                                                                                                                                      |
| descr<br>ibe                                      | Publishing MQTT messages                                                                                                                                                                                                                                                                             |
| para<br>mete<br>r                                 | topic: the topic to be published<br>qos: qos level (0,1,2)<br>Retained : Whether it is a retained message. 0 indicates a normal message. 1 indicates a retained message.<br>length: the length of the data to be sent                                                                                |
| respo<br>nse                                      | OK                                                                                                                                                                                                                                                                                                   |
| Exam<br>ple                                       | AT+MQTTPUBRAW=testtopic,1, 0, 10 // Send 10 bytes of data to testtopic<br>> // After receiving this character, start entering the data to be sent<br>OK // When 10 bytes of data are received , the data will be sent (can be any data ) , and<br>OK will be displayed when the sending is completed |
| Description information in HELP                   |                                                                                                                                                                                                                                                                                                      |
| respo                                             | Publish long MQTT message                                                                                                                                                                                                                                                                            |

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### 4.3.9 AT+MQTTSUB Subscribe to MQTT messages

|                                 |                                                                                                                                                                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+MQTTSUB?                     |                                                                                                                                                                                                                                                                                       |
| descr<br>ibe                    | Query subscribed topics and topic status                                                                                                                                                                                                                                              |
| respo<br>nse                    | <status>,<Topic><br>...<br>OK<br>//Status description<br>status: Subscription status<br>0: Initialization state<br>1: Subscribing (first subscription)<br>2: Subscribing (re-subscribe after disconnection and reconnection)<br>3: Subscription successful<br>Topic: Subscribed topic |
| Exam<br>ple                     | #AT+MQTTSUB=testtopic0,0<br><br>OK<br>#AT+MQTTSUB=testtopic1,1<br><br>OK<br>#AT+MQTTSUB?<br><br>3,testtopic0<br>3,testtopic1<br><br>OK                                                                                                                                                |
| AT+MQTTSUB=<topic>,<qos>        |                                                                                                                                                                                                                                                                                       |
| descr<br>ibe                    | Subscribe to a Topic                                                                                                                                                                                                                                                                  |
| para<br>mete<br>r               | topic: the topic to subscribe to<br>qos: qos level (0,1,2)                                                                                                                                                                                                                            |
| respo<br>nse                    | OK                                                                                                                                                                                                                                                                                    |
| Exam<br>ple                     | AT+MQTTSUB=testtopic0,0<br><br>OK                                                                                                                                                                                                                                                     |
| Description information in HELP |                                                                                                                                                                                                                                                                                       |
| respo                           | Subscribe to MQTT Topic                                                                                                                                                                                                                                                               |

|      |                                                                                                                             |
|------|-----------------------------------------------------------------------------------------------------------------------------|
| nse  |                                                                                                                             |
| Note | The default maximum number of topics that can be subscribed is 5, and each subscription consumes about 100 bytes of memory. |

### 4.3.10 AT+MQTTUNSUB Unsubscribe from MQTT messages

|                                 |                                 |
|---------------------------------|---------------------------------|
| AT+MQTTUNSUB=<topic>            |                                 |
| descr<br>ibe                    | Unsubscribe from a topic        |
| para<br>mete<br>r               | topic: the topic to be canceled |
| respo<br>nse                    | OK                              |
| Exam<br>ple                     | AT+MQTTSUB=testtopic0<br><br>OK |
| Description information in HELP |                                 |
| respo<br>nse                    | Unsubscribe MQTT Topic          |

## 4.4 HTTP Directives

### 4.4.1 AT+HTTPCLIENTLINE Send HTTP/HTTPS request (single line mode)

|                                                                                       |                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+HTTPCLIENTLINE=<transport_type>,<opt>,<content-type>,<host>,<port>,<path>[,<data>] |                                                                                                                                                                                                                                                                  |
| descr<br>ibe                                                                          | Make an HTTP request                                                                                                                                                                                                                                             |
| para<br>mete<br>r                                                                     | transport_type:<br>1: HTTP<br>2: HTTPS<br><br>opt:<br>2: GET<br>3: POST<br><br>content-type: (valid only for POST, not for GET, can be any string, reference type is as follows)<br>application/x-www-form-urlencoded<br>application/json<br>multipart/form-data |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | t ext/xml<br>text/ html<br>host: server domain name or IP (eg: www.baidu.com or 192.168.1.100)<br>port: port number (HTTP default value is 80, HTTPS default value is 443)<br>path: HTTP(S) path, default value is "/"<br>data: data carried in the request<br>When opt is GET, this is carried in the patch, and the format complies with the http format requirements (?key1=value1&key2=value2 ...)<br>When opt is POST, this is the body carried by POST |
| response                        | Response length:<len> //response body data length<br><response> //Get the response data<br>OK //Request successful                                                                                                                                                                                                                                                                                                                                           |
| Example                         | http get<br>AT+HTTPCLIENTLINE=1,2,,www.baidu.com,,<br>https get<br>AT+HTTPCLIENTLINE= 2,2 ,,www.baidu.com,,<br>http post<br>AT+HTTPCLIENTLINE=1,3,,192.168.2.253,8080,/ test ,{"\"OTP\":" test \""}                                                                                                                                                                                                                                                          |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| response                        | Initiate an http or https request                                                                                                                                                                                                                                                                                                                                                                                                                            |

## 4.4.2 AT+HTTPRAW sends HTTP/HTTPS request (long data mode)

| AT+HTTPRAW=<transport_type>,<opt>,<content-type>,<host>,<port>,<path>,<len> |                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| description                                                                 | Make an HTTP request                                                                                                                                                                                                                                                                                                                                                           |
| parameter                                                                   | transport_type:<br>1: HTTP<br>2: HTTPS<br>opt:<br>2: GET (not supported yet)<br>3: POST<br>content-type: (valid only for POST, not for GET, can be any string, reference type is as follows)<br>application/x-www-form-urlencoded<br>application/json<br>multipart/form-data<br>t ext/xml<br>text/ html<br>host: server domain name or IP (eg: www.baidu.com or 192.168.1.100) |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | port: port number (HTTP default value is 80, HTTPS default value is 443)<br>path: HTTP(S) path, default value is "/"<br>Len: The length of the data to be received<br>data: data carried in the request<br>When opt is GET, this is carried in the patch, and the format complies with the http format requirements (?key1=value1&key2=value2 ...)<br>When opt is POST, this is the body carried by POST |
| response                        | > // After receiving this character, start entering the data to be sent<br><response> //Response data<br>OK //Request successful                                                                                                                                                                                                                                                                         |
| Example                         | http post<br>AT+HTTPRAW=1,3,"application/json",192.168.1.199,8080,/ test , 5<br>> hello // Input 5 bytes of data<br>Test ack //Get response<br><br>OK //Get completed                                                                                                                                                                                                                                    |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                                                                          |
| response                        | Initiate an http or https request                                                                                                                                                                                                                                                                                                                                                                        |

## 4.5 SNTP Commands

### 4.5.1 AT+SNTPTIME Query SNTP time

|              |                                                                                                                                                                                                                                                          |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SNTPTIME  |                                                                                                                                                                                                                                                          |
| description  | Same as AT+SNTPTIME?                                                                                                                                                                                                                                     |
| AT+SNTPTIME? |                                                                                                                                                                                                                                                          |
| description  | Query SNTP time<br>Note: SNTP is not enabled by default. You need to connect to the Internet and use AT+SNTPTIMECFG to enable it. When it is not enabled, the local RTC time is queried.                                                                 |
| response     | +SNTPTIME:<week> <month> <day> <HH>:<mm>:<ss> <yyyy><br>OK<br>week: Week [Mon,Tue,Wed,Thu,Fri,Sat,Sun]<br>month: month [Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec]<br>day: day<br>HH: hours<br>mm: minutes<br>ss: seconds<br>yyyy: year |
| Example      | AT+SNTPTIMECFG=1,8 // Enable SNTP                                                                                                                                                                                                                        |

|                                 |                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------|
| ple                             | OK<br>AT+SNTPTIME? //Query time after successful synchronization<br><br>+SNTPTIME:Wed May 03 10:49:41 2023<br>OK |
| Description information in HELP |                                                                                                                  |
| respo<br>nse                    | Query SNTP time                                                                                                  |
| Note<br>s                       | Supported models<br>Ai-WB2 Series                                                                                |

## 4.5.2 AT+SNTPTIMECFG Query and set SNTP time zone and server

|                                                                                   |                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SNTPTIMECFG                                                                    |                                                                                                                                                                                                                                                                    |
| descr<br>ibe                                                                      | Same as AT+SNTPTIMECFG?                                                                                                                                                                                                                                            |
| AT+SNTPTIMECFG?                                                                   |                                                                                                                                                                                                                                                                    |
| descr<br>ibe                                                                      | Query the SNTP service status                                                                                                                                                                                                                                      |
| respo<br>nse                                                                      | +SNTPTIMECFG:<enable>,<timezone>[,<SNTP server1>,<SNTP server2>,<SNTP server3>]<br>OK<br>enable: Whether the SNTP refresh service is enabled; 0: not running; 1: running<br>timezone: time zone, value range: -12~+14<br>SNTP server1/2/3: SNTP server domain name |
| Exam<br>ple                                                                       | AT+SNTPTIMECFG?<br><br>+SNTPTIMECFG:1,8,"cn.ntp.org.cn","ntp.sjtu.edu.cn","us.pool.ntp.org"<br>OK                                                                                                                                                                  |
| AT+SNTPTIMECFG=<enable>,<timezone>[,<SNTP server1>,<SNTP server2>,<SNTP server3>] |                                                                                                                                                                                                                                                                    |
| descr<br>ibe                                                                      | Setting SNTP Configuration                                                                                                                                                                                                                                         |
| para<br>mete<br>r                                                                 | enable: SNTP refresh service status setting; 0 to disable; 1 to enable<br>timezone: time zone, value range: -12~+14<br>SNTP server1/2/3: SNTP server domain name. If the default setting is "cn.ntp.org.cn", "ntp.sjtu.edu.cn", "us.pool.ntp.org"                  |
| respo<br>nse                                                                      | OK                                                                                                                                                                                                                                                                 |
| Exam<br>ple                                                                       | AT+SNTPTIMECFG=1,8,cn.ntp.org.cn<br><br>OK                                                                                                                                                                                                                         |

|                                 |                                   |
|---------------------------------|-----------------------------------|
| Description information in HELP |                                   |
| response                        | Query and set SNTP config         |
| Notes                           | Supported models<br>Ai-WB2 Series |

### 4.5.3 AT+SNTPINTV query and set SNTP refresh interval

|                                 |                                                                                |
|---------------------------------|--------------------------------------------------------------------------------|
| AT+SNTPINTV                     |                                                                                |
| description                     | Same as AT+SNTPINTV?                                                           |
| AT+SNTPINTV?                    |                                                                                |
| description                     | Query the SNTP service refresh interval                                        |
| response                        | +SNTPINTV:<interval second><br>OK<br>interval second: refresh interval, unit S |
| Example                         | AT+SNTPINTV?<br><br>+SNTPINTV:3600<br>OK                                       |
| AT+SNTPINTV=<interval second>   |                                                                                |
| description                     | Set the SNTP service refresh interval                                          |
| parameter                       | interval second: refresh interval, unit S, value 15~4294967                    |
| response                        | OK                                                                             |
| Example                         | AT+SNTPINTV=15<br><br>OK                                                       |
| Description information in HELP |                                                                                |
| response                        | Query and set SNTP refresh interval                                            |
| Notes                           | Supported models<br>Ai-WB2 Series                                              |

## 5. BLE proprietary commands

### 5.1 Basic instructions

#### 5.1.1 AT+BLEMAC Set and query Bluetooth MAC address

|                                 |                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------|
| AT+BLEMAC?                      |                                                                                                       |
| descr<br>ibe                    | Query Bluetooth MAC address                                                                           |
| respo<br>nse                    | +BLEMAC:<MAC><br>OK                                                                                   |
| Exam<br>ple                     |                                                                                                       |
| AT+BLEMAC=<MAC>                 |                                                                                                       |
| descr<br>ibe                    | Set Bluetooth MAC address (effective after restart)                                                   |
| para<br>mete<br>r               | MAC: The Bluetooth MAC address to be set, in lowercase format without separators, eg:<br>ab5f8d9ebb01 |
| respo<br>nse                    | OK                                                                                                    |
| Exam<br>ple                     |                                                                                                       |
| Description information in HELP |                                                                                                       |
| respo<br>nse                    | Query and set BLE MAC                                                                                 |

#### 5.1.2 AT+BLEMODE query and set Bluetooth mode

|                   |                                                                                                                                                                                                                |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+BLEMODE?       |                                                                                                                                                                                                                |
| descr<br>ibe      | Query working mode                                                                                                                                                                                             |
| respo<br>nse      | +BLEMODE : <mode><br>OK                                                                                                                                                                                        |
| Exam<br>ple       |                                                                                                                                                                                                                |
| AT+BLEMODE=<mode> |                                                                                                                                                                                                                |
| descr<br>ibe      | Set Bluetooth working mode<br>Note: After setting the Bluetooth mode, it will be executed immediately. If you want to start Bluetooth, you need to set the Bluetooth parameters first and then start Bluetooth |

|                                 |                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| parameter                       | mode:<br>0: Slave mode<br>1: Host mode<br>2: iBeacon mode<br>9: Bluetooth off                                                                                                                                                                                                                                                                         |
| response                        | OK                                                                                                                                                                                                                                                                                                                                                    |
| Example                         |                                                                                                                                                                                                                                                                                                                                                       |
| Notice                          | If Realtek series (BW16/BW15) has multiple wireless types enabled, they need to be enabled in the specified order.<br><br>If you enable AP+STA+Bluetooth triple mode, or AP+STA mixed mode, you need to turn on AP first, then connect STA and Bluetooth (there is no requirement for the order of Bluetooth and STA, but AP must be turned on first) |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                       |
| response                        | Query and set BLE mode                                                                                                                                                                                                                                                                                                                                |
| Notes                           | PB series is 0, slave mode<br>The default mode of TB series is 0, slave mode                                                                                                                                                                                                                                                                          |

### 5.1.3 AT+BLERFPWR Bluetooth settings or query transmission power

|                     |                                                                                                                                                                                                                                                                                                                                                      |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+BLERFPWR?        |                                                                                                                                                                                                                                                                                                                                                      |
| description         | Query Bluetooth transmission power                                                                                                                                                                                                                                                                                                                   |
| response            | +BLERFPWR: MAX:<max_power> MIN:<min_power> CURRENT:<cur_power><br>OK<br>//Parameter description<br>max_power: The maximum Bluetooth transmission power supported by the current module<br>min_power: The minimum Bluetooth transmission power supported by the current module<br>cur_power: Bluetooth transmission power currently set by the module |
| Example             |                                                                                                                                                                                                                                                                                                                                                      |
| AT+BLERFPWR=<power> |                                                                                                                                                                                                                                                                                                                                                      |
| description         | Set the Bluetooth transmission power (need to be set when Bluetooth is turned off)                                                                                                                                                                                                                                                                   |
| parameter           | power: Bluetooth transmission power, the value is an integer, MAX (maximum transmission power), MIN (minimum transmission power)                                                                                                                                                                                                                     |

|                                 |                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| response                        | OK                                                                                                                                           |
| Example                         |                                                                                                                                              |
| Description information in HELP |                                                                                                                                              |
| response                        | Query and set BLE RF power                                                                                                                   |
| Notes                           | the PB series is the maximum transmit power of 10<br>The default current transmit power of the TB series is the maximum transmit power of 10 |

### 5.1.4 AT+BLESTATE to query the connection status

|                                 |                                             |
|---------------------------------|---------------------------------------------|
| AT+BLESTATE?                    |                                             |
| description                     | Query Bluetooth connection status           |
| response                        | + BLESTATE:< status ><br>OK                 |
| parameter                       | status:<br>0: Not connected<br>1: Connected |
| Example                         |                                             |
| Description information in HELP |                                             |
| response                        | Query BLE connection status                 |

### 5.1.5 AT+BLEDISCON disconnects Bluetooth connection

|                                 |                      |
|---------------------------------|----------------------|
| AT+BLEDISCON                    |                      |
| description                     | Disconnect Bluetooth |
| response                        | OK                   |
| Example                         |                      |
| Description information in HELP |                      |
| response                        | Disconnect BLE       |

### 5.1.6 AT+BLEMTU query or set MTU

|                                 |                                                                    |
|---------------------------------|--------------------------------------------------------------------|
| AT+BLEMTU?                      |                                                                    |
| describe                        | Query Bluetooth MTU                                                |
| response                        | +BLEMTU: <MTU><br>OK                                               |
| Example                         |                                                                    |
| AT+BLEMTU=<mtu>                 |                                                                    |
| describe                        | Setting Bluetooth MTU                                              |
| parameter                       | mtu: Set the Bluetooth MTU, the value range is 23~250              |
| response                        | OK                                                                 |
| Example                         |                                                                    |
| Description information in HELP |                                                                    |
| response                        | Query and set BLE MTU                                              |
| Notes                           | The default MTU of the P B series is 23<br>MTU of TB series is 247 |

### 5.1.7 AT+BLESEND sends data to the Bluetooth transparent channel

|                                 |                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| AT+BLESEND=<len>,<data>         |                                                                                                                             |
| describe                        | Send data to the Bluetooth transparent UUID channel                                                                         |
| parameter                       | len: the length of the data to be sent, in bytes<br>data: data content to be sent, the length should be consistent with len |
| response                        | OK                                                                                                                          |
| Example                         |                                                                                                                             |
| Description information in HELP |                                                                                                                             |
| response                        | Send by BLE transparent transmission                                                                                        |

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### 5.1.8 AT+BLESENDRAW sends data to the Bluetooth transparent channel (supports hex data)

|                                 |                                                                                                                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+BLESEND RAW =<len>           |                                                                                                                                                                                                                               |
| describer                       | Send data to the Bluetooth transparent UUID channel                                                                                                                                                                           |
| parameter                       | len: the length of the data to be sent, in bytes                                                                                                                                                                              |
| response                        | > //After receiving this character, start entering the data to be sent<br>OK // When the specified byte data is received, the data will be sent (it can be any data) , and OK will be displayed when the sending is completed |
| Example                         |                                                                                                                                                                                                                               |
| Description information in HELP |                                                                                                                                                                                                                               |
| response                        | Send by BLE transparent transmission                                                                                                                                                                                          |

### 5.1.9 AT+BLESERUUID query or set service UUID

|                      |                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+BLESERUUID?       |                                                                                                                                                                                                                                                                                                                                                                    |
| describer            | Query the UUID of the Bluetooth transparent transmission service                                                                                                                                                                                                                                                                                                   |
| response             | +BLESERUUID: <UUID><br>OK                                                                                                                                                                                                                                                                                                                                          |
| Example              |                                                                                                                                                                                                                                                                                                                                                                    |
| AT+BLESERUUID=<UUID> |                                                                                                                                                                                                                                                                                                                                                                    |
| describer            | Set the Bluetooth transparent transmission service UUID (Bluetooth name can only be set when Bluetooth is turned off)                                                                                                                                                                                                                                              |
| parameter            | UUID: supports two modes: 16-bit and 128-bit mode<br>128-bit mode (the default is 128-bit mode)<br>String length 32 bits eg:00112233445566778899aabbccddeeff<br>16-bit mode<br>When the 128-bit UII is 0000XXXX00001000800000805F9B34FB, bits 17 to 32 will be set to the 16-bit UUID. Eg: 0000FFF100001000800000805F9B34FB means the 16-bit UUID is set to 0XFFF1 |
| response             | OK                                                                                                                                                                                                                                                                                                                                                                 |

|                                 |                                                                                                                                         |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| nse                             |                                                                                                                                         |
| Exam<br>ple                     |                                                                                                                                         |
| Description information in HELP |                                                                                                                                         |
| respo<br>nse                    | Query and set BLE TT server UUID                                                                                                        |
| Note<br>s                       | Default primary service UUID:55535343fe7d4ae58fa99fafd205e455<br>Mode support<br>BW16:<br>128-bit mode<br>WB2 Series<br>16/128 bit mode |

### 5.1.10 AT+BLETXUUID query or set Bluetooth TX UUID

|                                 |                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+BLETXUUID?                   |                                                                                                                                                                                                                                                                                                                                                                    |
| descr<br>ibe                    | Query the UUID of the Bluetooth transparent transmission service TX characteristic                                                                                                                                                                                                                                                                                 |
| respo<br>nse                    | +BLETXUUID: <UUID><br>OK                                                                                                                                                                                                                                                                                                                                           |
| Exam<br>ple                     |                                                                                                                                                                                                                                                                                                                                                                    |
| AT+BLETXUUID=<UUID>             |                                                                                                                                                                                                                                                                                                                                                                    |
| descr<br>ibe                    | Set the Bluetooth transparent transmission service TX characteristic UUID (Bluetooth name can only be set when Bluetooth is turned off)                                                                                                                                                                                                                            |
| para<br>mete<br>r               | UUID: supports two modes: 16-bit and 128-bit mode<br>128-bit mode (the default is 128-bit mode)<br>String length 32 bits eg:00112233445566778899aabbccddeeff<br>16-bit mode<br>When the 128-bit UUI is 0000XXXX00001000800000805F9B34FB, bits 17 to 32 will be set to the 16-bit UUID. Eg: 0000FFF100001000800000805F9B34FB means the 16-bit UUID is set to 0XFFF1 |
| respo<br>nse                    | OK                                                                                                                                                                                                                                                                                                                                                                 |
| Exam<br>ple                     |                                                                                                                                                                                                                                                                                                                                                                    |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                                    |
| respo<br>nse                    | Query and set BLE TX UUID                                                                                                                                                                                                                                                                                                                                          |
| Note<br>s                       | Default TX UUID:49535343884143f4a8d4ecbe34729bb3<br>The Bluetooth service attribute corresponding to TX is NOTIFY<br>Mode support<br>BW16:                                                                                                                                                                                                                         |

|  |                                               |
|--|-----------------------------------------------|
|  | 128-bit mode<br>WB2 Series<br>16/128 bit mode |
|--|-----------------------------------------------|

### 5.1.11 AT+BLERXUUID query or set Bluetooth RX UUID

|                                 |                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+BLERXUUID?                   |                                                                                                                                                                                                                                                                                                                                                                    |
| describe                        | Query the RX characteristic UUID of the Bluetooth transparent transmission service                                                                                                                                                                                                                                                                                 |
| response                        | + BLERXUUID : <UUID><br>OK                                                                                                                                                                                                                                                                                                                                         |
| Example                         |                                                                                                                                                                                                                                                                                                                                                                    |
| AT+BLERXUUID=<UUID>             |                                                                                                                                                                                                                                                                                                                                                                    |
| describe                        | Set the Bluetooth transparent transmission service RX characteristic UUID (Bluetooth name can only be set when Bluetooth is turned off)                                                                                                                                                                                                                            |
| parameter                       | UUID: supports two modes: 16-bit and 128-bit mode<br>128-bit mode (the default is 128-bit mode)<br>String length 32 bits eg:00112233445566778899aabbccddeeff<br>16-bit mode<br>When the 128-bit UUI is 0000XXXX00001000800000805F9B34FB, bits 17 to 32 will be set to the 16-bit UUID. Eg: 0000FFF100001000800000805F9B34FB means the 16-bit UUID is set to 0XFFF1 |
| response                        | OK                                                                                                                                                                                                                                                                                                                                                                 |
| Example                         |                                                                                                                                                                                                                                                                                                                                                                    |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                                    |
| response                        | Query and set BLE RX UUID                                                                                                                                                                                                                                                                                                                                          |
| Notes                           | Default RX UUID:495353431e4d4bd9ba6123c647249616<br>The Bluetooth attribute corresponding to RX is WRITE<br>Mode support<br>BW16:<br>128-bit mode<br>WB2 Series<br>16/128 bit mode                                                                                                                                                                                 |

## 5.1.12 AT+TRANSETER enters Bluetooth transparent transmission mode

|                                      |                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+TRANSETER                         |                                                                                                                                                                                                                                                                                                                                                                  |
| describe                             | Enter Bluetooth transparent mode                                                                                                                                                                                                                                                                                                                                 |
| response                             | OK                                                                                                                                                                                                                                                                                                                                                               |
| Remark                               | After entering +++, you can exit the transparent transmission mode and enter the AT command mode                                                                                                                                                                                                                                                                 |
| Example                              |                                                                                                                                                                                                                                                                                                                                                                  |
| AT+TRANSETER=<autoEntry>,<saveFlash> |                                                                                                                                                                                                                                                                                                                                                                  |
| describe                             | Configuring automatic connection configuration                                                                                                                                                                                                                                                                                                                   |
| parameter                            | autoEntry: whether to automatically enter transparent transmission mode after connecting<br>0: Do not automatically enter transparent mode after Bluetooth connection<br>1: Automatically enter transparent transmission mode after Bluetooth connection<br>saveFlash: Whether to save the configuration to flash<br>0: Do not save to flash<br>1: Save to flash |
| response                             | OK                                                                                                                                                                                                                                                                                                                                                               |

## 5.2 Slave Instructions

### 5.2.1 + Receive Bluetooth transparent data in DATA host mode

|                      |                                                                                                                       |
|----------------------|-----------------------------------------------------------------------------------------------------------------------|
| +DATA : <len>,<data> |                                                                                                                       |
| describe             | In host mode, data sent from the Bluetooth transparent UUID channel is received                                       |
| parameter            | len: received data length, in bytes<br>data: received data content, the length should be consistent with len          |
| Remark               | This command is only valid in AT mode. In transparent transmission mode, the original data will be received directly. |
| Example              |                                                                                                                       |

## 5.2.2 AT+ BLENAME sets the Bluetooth device name

|                                 |                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| AT+BLENAME?                     |                                                                                                                          |
| descr<br>ibe                    | Query Bluetooth name                                                                                                     |
| respo<br>nse                    | +BLENAME : <ble name ><br>OK                                                                                             |
| Exam<br>ple                     |                                                                                                                          |
| AT+BLENAME=< ble name >         |                                                                                                                          |
| descr<br>ibe                    | Set the Bluetooth device name (Bluetooth name can only be set when Bluetooth is turned off)<br>Default name "ai-thinker" |
| para<br>mete<br>r               | ble name: Bluetooth name (UTF-8 format, supports Chinese)                                                                |
| respo<br>nse                    | OK                                                                                                                       |
| Exam<br>ple                     |                                                                                                                          |
| Description information in HELP |                                                                                                                          |
| respo<br>nse                    | Query and set BLE name                                                                                                   |
| Note<br>s                       | Default Bluetooth name: ai-thinker                                                                                       |

## 5.2.3 AT+BLECONINTV query or set the Bluetooth connection interval

|                                                                   |                                                                                                                                                |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+BLECONINTV?                                                    |                                                                                                                                                |
| descr<br>ibe                                                      | Query Bluetooth connection interval                                                                                                            |
| respo<br>nse                                                      | +BLECONINTV: <min_interval>,< max_interval>,<latency>,< timeout><br>OK                                                                         |
| Exam<br>ple                                                       |                                                                                                                                                |
| AT+BLECONINTV=<min_interval>,< max_interval>,<latency>,< timeout> |                                                                                                                                                |
| descr<br>ibe                                                      | Set the Bluetooth connection interval (only allowed when Bluetooth is turned off)                                                              |
| para<br>mete                                                      | min_interval: minimum connection interval , ranging from 6 to 3200 (the actual time is minInterval*1.25ms, and the requirement is 7.5ms to 4s) |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| r                               | <p>max_interval: Maximum connection interval , ranging from 6 to 3200 (the actual time is minInterval*1.25ms, required to be between 7.5ms and 4s)</p> <p>Latency: delay (how many times the connection can be skipped), required to be between 0 and 499</p> <p>Timeout: timeout , the value range is 10~3200, the actual time is Timeout *10ms, that is, 100ms~32*1000ms and Timeout *10&gt;(1+ Latency )* max_interval *1.25</p> |
| response                        | OK                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Example                         |                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| response                        | Query and set BLE connect interval                                                                                                                                                                                                                                                                                                                                                                                                  |
| Notes                           | <p>P B series default parameters: +BLECONINTV:6,12,0,200</p> <p>TB series default parameters: +BLECONINTV: 8 , 8 , 99 , 4 00</p>                                                                                                                                                                                                                                                                                                    |

## 5.2.4 AT+BLEAUTH query or set Bluetooth pairing code

|                                 |                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------|
| AT+BLEAUTH?                     |                                                                                                |
| describe                        | Query Bluetooth pairing code                                                                   |
| response                        | <p>+BLEAUTH: &lt;pind&gt;</p> <p>OK</p>                                                        |
| Example                         |                                                                                                |
| AT+BLEAUTH=<pind>               |                                                                                                |
| describe                        | Set Bluetooth pairing code (can only be set when Bluetooth is turned off)                      |
| parameter                       | <p>pind: Enable pairing code, set 6 digits eg: 123456</p> <p>Disable pairing codeDISENABLE</p> |
| response                        | OK                                                                                             |
| Example                         |                                                                                                |
| Description information in HELP |                                                                                                |
| response                        | Query and set BLE PIN code                                                                     |
| Notes                           | Not enabled by default                                                                         |

## 5.2.5 AT+BLEADVINTV Query or set the Bluetooth broadcast interval

|                                 |                                                                                                 |
|---------------------------------|-------------------------------------------------------------------------------------------------|
| AT+BLEADVINTV?                  |                                                                                                 |
| descr<br>ibe                    | Query Bluetooth broadcast interval                                                              |
| respo<br>nse                    | +BLEADVINTV: <intv><br>OK                                                                       |
| Exam<br>ple                     |                                                                                                 |
| AT+BLEADVINTV=<intv>            |                                                                                                 |
| descr<br>ibe                    | Set the Bluetooth broadcast interval (only allowed when Bluetooth is turned off)                |
| para<br>mete<br>r               | <intv>: broadcast interval, the unit value is 160~16384, the broadcast interval is iNtv*0.625ms |
| respo<br>nse                    | OK                                                                                              |
| Exam<br>ple                     |                                                                                                 |
| Description information in HELP |                                                                                                 |
| respo<br>nse                    | Query and set BLE broadcast time                                                                |
| Note<br>s                       | P B default parameter 320<br>TB default parameter 800                                           |

## 5.2.6 AT+BLEADVDATA queries or sets Bluetooth broadcast data

|                      |                                                                                                                                                                                                  |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+BLEADVDATA?       |                                                                                                                                                                                                  |
| descr<br>ibe         | Query the currently set Bluetooth broadcast data<br>The default broadcast data is 8 bytes, the first 6 bytes are the Bluetooth MAC address + the first two bytes of the transparent service UUID |
| respo<br>nse         | +BLEADVDATA: <data><br>OK                                                                                                                                                                        |
| Exam<br>ple          |                                                                                                                                                                                                  |
| AT+BLEADVDATA=<data> |                                                                                                                                                                                                  |
| descr                | Set the Bluetooth broadcast data content (only allowed to perform settings when                                                                                                                  |

|                                 |                                                                                                                                        |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| ibe                             | Bluetooth is turned off)                                                                                                               |
| parameter                       | data: Bluetooth data set<br>(This is hex data in string form, with a maximum length of 32 bytes, eg: 00112233445566778899aabbccddeeff) |
| response                        | OK                                                                                                                                     |
| Example                         |                                                                                                                                        |
| Description information in HELP |                                                                                                                                        |
| response                        | Query and set BLE broadcast data                                                                                                       |
| Notes                           | Default parameters: MAC+55e4 ( the first four digits of the primary service uuid ), for example: 40154641871855e4                      |

## 5.2.7 AT+BLEADVEN Bluetooth settings or query broadcast enable

|                                 |                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------|
| AT+BLEADVEN?                    |                                                                                              |
| description                     | Check whether Bluetooth broadcast is enabled                                                 |
| response                        | +BLEADVEN: <status><br>O K                                                                   |
| Example                         |                                                                                              |
| AT+BLEADVEN=<status>            |                                                                                              |
| description                     | Start and stop Bluetooth broadcast (settings can only be performed in Bluetooth slave state) |
| parameter                       | status: 0 closed, 1 open                                                                     |
| response                        | OK                                                                                           |
| Example                         |                                                                                              |
| Description information in HELP |                                                                                              |
| response                        | Query and set BLE broadcast status                                                           |
| Notes                           | Enabled by default                                                                           |

## 5.3 Host Commands

### 5.3.1 AT+BLESCAN initiates a scan in Bluetooth host mode

| AT+BLESCAN                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| describe                        | Initiate scanning in Bluetooth host mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| response                        | <p>OK //Note that this OK only means that the command was sent successfully, and the scan is not actually completed.</p> <p>Devices Found:id/total //index/total indicates the serial number of the currently scanned Bluetooth device and the total number of scanned devices</p> <p>name:&lt;name&gt; //Bluetooth name, if not available, displays N/A</p> <p>MAC:&lt;MAC&gt; //lowercase without colon</p> <p>rssi:&lt;rssi&gt;</p><br><p>Devices Found:&lt;id/total&gt;</p> <p>name:&lt;name&gt;N/A</p> <p>MAC:&lt;MAC&gt;</p> <p>rssi:&lt;rssi&gt;</p> <p>.....</p> |
| Example                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| response                        | Start BLE scan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Notes                           | <p>the P B series is 5 seconds, the scan interval is 230*0.625 mSec, and the scan window is 160* 0.625 mSec.</p> <p>The default scanning time of TB series is 2 seconds, the scanning interval is 160 * 0.625 mSec, and the scanning window is 160 * 0.625 mSec.</p>                                                                                                                                                                                                                                                                                                     |

### 5.3.2 AT+BLECONNECT The host initiates a connection

| AT+BLECONNECT= <MAC> |                                                                                                                                                                                                                                                                                        |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| describe             | <p>Connect to the specified Bluetooth (connection is only allowed in Bluetooth host state)</p> <p>Note: This is only a one-time connection. It will not automatically reconnect after a connection failure, and it will not automatically reconnect after a successful connection.</p> |
| parameter            | MAC: connection target mac address (eg: A4C13812505C)                                                                                                                                                                                                                                  |
| response             | <p>Connecting... ...</p> <p>OK</p>                                                                                                                                                                                                                                                     |

|                                 |                 |
|---------------------------------|-----------------|
| Exam<br>ple                     |                 |
| Description information in HELP |                 |
| respo<br>nse                    | Set BLE connect |

### 5.3.3 AT+BLEAUTOCON Set the host to automatically connect to the slave parameters

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+BLEAUTOCON=< MAC>,<UUID>,<save_flash> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| descr<br>ibe                             | Connect to the specified Bluetooth (connection is only allowed in Bluetooth host state)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| para<br>mete<br>r                        | <p>MAC: connection target mac address (eg: A4C13812505C)</p> <p>UUID: If you need to connect to a specific UUID, set it to the last two digits of the target UUID (eg: E455)</p> <p>Note: Either MAC or UUID can be used to connect (both can be set), if there is no restriction, set it to FALSE. If both MAC and UUID are set to FALSE, automatic connection will be disabled.</p> <p>save_flash: whether to save to flash and set automatic connection at startup, 0 means not to save and only connect this time, 1 means to save to flash and automatically connect next time you start</p> |
| respo<br>nse                             | <p>+EVENT:BLE_CONNECTED //If the connection is successful, this message will be displayed</p> <p>+BLEAUTOCON:Wait connect //If the specified Bluetooth is not currently scanned, this message will be displayed (the background will automatically scan and automatically connect when the specified connection is scanned)</p> <p>OK</p>                                                                                                                                                                                                                                                         |
| Exam<br>ple                              | <p>AT+BLEMODE=1</p> <p>OK</p> <p>AT+BLEAUTOCON=112233445566,FALSE,1</p> <p>OK</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Description information in HELP          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| respo<br>nse                             | Set BLE auto connect                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Note<br>s                                | After the first successful connection, it will continue to actively connect                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

### 5.3.4 AT+BLEDISAUTOCON cancels automatic scanning connection

| AT+BLEDISAUTOCON                |                                                |
|---------------------------------|------------------------------------------------|
| descr<br>ibe                    | Cancel automatic scanning to connect Bluetooth |
| respo<br>nse                    | OK                                             |
| Exam<br>ple                     |                                                |
| Description information in HELP |                                                |
| respo<br>nse                    | Turn off BLE auto connect                      |

## 5.4 BLE iBeacon Commands

### 5.4.1 AT+ BLE IBCNUUID Query or set Bluetooth iBeacon UUID

| AT+BLEIBCNUUID?                 |                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------|
| descr<br>ibe                    | Query the iBeacon UUID of the current Bluetooth setting                                                        |
| respo<br>nse                    | +BLEIBCNIUD: <iBeacon><br>OK                                                                                   |
| Exam<br>ple                     |                                                                                                                |
| AT+BLEIBCNUUID=<iBeacon>        |                                                                                                                |
| descr<br>ibe                    | Set the Bluetooth iBeacon UUID (only allowed when Bluetooth is turned off)                                     |
| para<br>mete<br>r               | iBeacon: UUID to set<br>(16 bytes in length, 32 bits in string length eg:<br>00112233445566778899aabbccddeeff) |
| respo<br>nse                    | OK                                                                                                             |
| Exam<br>ple                     |                                                                                                                |
| Description information in HELP |                                                                                                                |
| respo<br>nse                    | Query and set BLE iBeacon UUID                                                                                 |

## 5.4.2 AT+ BLEIBCNDATA sets Bluetooth iBeacon data

|                                                       |                                                                                                                                                                                                  |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+ BLEIBCNDATA?                                      |                                                                                                                                                                                                  |
| descr<br>ibe                                          | Query Ibeacon data                                                                                                                                                                               |
| respo<br>nse                                          | +BLEIBCNDATA:<companyID>,<major>,<minor>,<power> //The data is in the form of hexadecimal string<br>OK                                                                                           |
| Exam<br>ple                                           | AT+BLEIBCNDATA?<br>+BLEIBCNDATA:4c00,2774,6b74,c5<br>OK                                                                                                                                          |
| AT+ BLEIBCNDATA =<company ID>,<MAJOR>,<MINOR>,<POWER> |                                                                                                                                                                                                  |
| descr<br>ibe                                          | Set Bluetooth iBeacon data (only allowed when Bluetooth is turned off)                                                                                                                           |
| para<br>mete<br>r                                     | companyID (2-byte hexadecimal data, eg: 11aa )<br>MAJOR (2 bytes of hexadecimal data, eg: 11aa ),<br>MINOR (2 bytes of hexadecimal data, eg: 11aa ),<br>POWER (1 byte hexadecimal data, eg: aa ) |
| respo<br>nse                                          | OK                                                                                                                                                                                               |
| Exam<br>ple                                           |                                                                                                                                                                                                  |
| Description information in HELP                       |                                                                                                                                                                                                  |
| respo<br>nse                                          | Set BLE iBeacon data                                                                                                                                                                             |

## 5.5 BLE MESH Commands

### 5.5.1 SIG-MESH instructions

#### 5.5.1.1 AT+PROVISION Bluetooth settings start the network configuration function

|              |                                                                                                                                                                               |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+PROVISION |                                                                                                                                                                               |
| descr<br>ibe | Bluetooth settings start the network configuration function                                                                                                                   |
| Rema<br>rk   | When the node is in the unProvisioning state, that is, it has not been provisioned, no broadcast is sent, and the gateway cannot scan this device and connect. If you need to |

|                                 |                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | connect, you need to use the AT+PROVISION command to enable the node so that the device can be scanned and connected. When the device is in the Provisioning state, that is, it has been provisioned with the gateway, there is no need to enable the node, and the node automatically connects to the mesh network that has been provisioned. |
| response                        | OK                                                                                                                                                                                                                                                                                                                                             |
| Example                         |                                                                                                                                                                                                                                                                                                                                                |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                |
| response                        | Start provision                                                                                                                                                                                                                                                                                                                                |

### 5.5.1.2 AT+MESHSEND SIG-MESH sends data

|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+MESHSEND=<addr>,<opcode>,<data> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| description                        | SIG-MESH sends data                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| parameter                          | addr: the address of the target<br>opcode: Operation code<br>The current opcodes for esp32 gateway are as follows<br>1: set instruction, operation code opcode is D18888<br>2: get instruction, operation code opcode is D08888<br>3: ACK instruction, operation code opcode is D38888<br>4: Delete node instruction opcode is D28888<br>data: data example:<br>{"mesh_data_vendor" : { "daddr" : 3 , "saddr" : 2 , "opcode" : d38888 , "data_len" : 2 , "data" : 0101 (hex string) ret : 1 }} |
| response                           | OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Example                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Description information in HELP    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| response                           | SIG-MESH send data                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

### 5.5.1.3 AT+MESHADDR query node address

|             |                        |
|-------------|------------------------|
| AT+MESHADDR |                        |
| description | Query node address     |
| response    | +MESHADDR:<addr><br>OK |

|                                 |                     |
|---------------------------------|---------------------|
| Exam<br>ple                     |                     |
| Description information in HELP |                     |
| respo<br>nse                    | Query SIG-MESH addr |

#### 5.5.1.4 AT+MESHSTATE checks whether the network configuration is successful

|                                 |                                                       |
|---------------------------------|-------------------------------------------------------|
| AT+MESHSTATE                    |                                                       |
| descr<br>ibe                    | Check whether the network configuration is successful |
| respo<br>nse                    | +MESHSTATE:<status> //0: failed; 1: successful<br>OK  |
| Exam<br>ple                     |                                                       |
| Description information in HELP |                                                       |
| respo<br>nse                    | Query Mesh status                                     |

### 5.5.2 ALI-MESH Commands

#### 5.5.2.1 aliGenie\_data Tmall Genie sends data

|               |                                                                                                                                                                                                                                                                                    |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| aliGenie_data |                                                                                                                                                                                                                                                                                    |
| descr<br>ibe  | Tmall Genie sends data                                                                                                                                                                                                                                                             |
| Form<br>at    | { "aliGenie_data" : { "daddr" : %x , "saddr" : %x , "opcode" : %x , "data_len" : %d ,<br>"data" : %s }}<br>// The data format is json string<br>d addr : destination address<br>saddr : source address<br>opcode : Operation code<br>data_len : data length<br>data : data content |
| Exam<br>ple   |                                                                                                                                                                                                                                                                                    |

### 5.5.2.2 AT+AliGenie sets the Tmall Genie triplet

|                                             |                                                                                                                                                         |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+AliGenie= < pid > , < mac > , < secret > |                                                                                                                                                         |
| descr<br>ibe                                | Set Tmall Genie triplet                                                                                                                                 |
| para<br>mete<br>r                           | pid : triplet product ID (8 digits)<br>mac : triplet physical address (12 bits)<br>secret : triplet key (32 bits)<br>Note: All are hexadecimal strings. |
| respo<br>nse                                | OK                                                                                                                                                      |
| Exam<br>ple                                 |                                                                                                                                                         |
| Description information in HELP             |                                                                                                                                                         |
| respo<br>nse                                | Set Ali key                                                                                                                                             |

### 5.5.2.3 AT+SEND2ALI reports data

|                                 |                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------|
| AT+SEND2ALI=<opcode>,<param>    |                                                                                                             |
| descr<br>ibe                    | Report data to the Tmall Genie platform                                                                     |
| para<br>mete<br>r               | o pcode : Operation code, length 6 bits/4 bits<br>param : Report parameter, maximum length is 20 characters |
| respo<br>nse                    | OK                                                                                                          |
| Exam<br>ple                     | AT+SEND2ALI=8204,01 reporting status is open                                                                |
| Description information in HELP |                                                                                                             |
| respo<br>nse                    | Send data to Ali                                                                                            |

## 6. Production test instructions

### 6.1 Standard instructions

#### 6.1.1 ##boot development board button trigger signal

|                |                                                                                                                   |
|----------------|-------------------------------------------------------------------------------------------------------------------|
| \r\n##boot\r\n |                                                                                                                   |
| descr<br>ibe   | When the development board test is enabled, if the key is triggered, this data will be printed on the serial port |
| Exam<br>ple    |                                                                                                                   |

#### 6.1.2 AT+NodeMCUTEST development board test enable

|                                 |                                            |
|---------------------------------|--------------------------------------------|
| AT+NodeMCUTEST=<start>          |                                            |
| descr<br>ibe                    | Enable the development board test function |
| para<br>mete<br>r               | start:<br>0: Off<br>1: On                  |
| respo<br>nse                    | OK                                         |
| Exam<br>ple                     |                                            |
| Description information in HELP |                                            |
| respo<br>nse                    | Set development board test function        |

#### 6.1.3 AT+LEDTEST development board LED test command

##### 6.1.3.1 Old combo frame instructions

|                                                                |                                         |
|----------------------------------------------------------------|-----------------------------------------|
| AT+LEDTEST=<start> [<ledLev>,<ledNum>,<ledPin1>,...,<ledPinN>] |                                         |
| descr<br>ibe                                                   | Development board LED test instructions |
| para                                                           | start:                                  |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| met<br>r                        | 0: Turn off the marquee<br>1: Start the marquee (red, green, blue, yellow, and white switch, each light for 1000ms)<br>ledLev : LED effective level (supported by some modules )<br>0 : Low level lights up<br>1: High level lights up<br>ledNum : (supported by some modules )<br>How many LEDs are there in total ?<br>ledPinX : (supported by some modules )<br>PIO number corresponding to the LED , multiple pins are separated by commas |
| respo<br>nse                    | OK                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Exam<br>ple                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Description information in HELP |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| respo<br>nse                    | Start test board LED test                                                                                                                                                                                                                                                                                                                                                                                                                      |

### 6.1.3.2 Middleware version instruction format

|                                       |                                                                                                                                                                                                                                                                                                        |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+LEDTEST=<start> [,< module name >] |                                                                                                                                                                                                                                                                                                        |
| descr<br>ibe                          | Development board LED test instructions                                                                                                                                                                                                                                                                |
| para<br>mete<br>r                     | start:<br>0: Turn off the marquee<br>1: Start the marquee (red, green, blue, yellow, and white switch, each light for 1000ms)<br>module name: (supported by some modules )<br>Configure the module model supported, which is the same as the name in the system<br>Supported module models<br>BW20-12F |
| respo<br>nse                          | OK                                                                                                                                                                                                                                                                                                     |
| Exam<br>ple                           |                                                                                                                                                                                                                                                                                                        |
| Description information in HELP       |                                                                                                                                                                                                                                                                                                        |
| respo<br>nse                          | Start test board LED test                                                                                                                                                                                                                                                                              |

## 7. appendix

### 7.1 Appendix 1 IOMap table of each model module

#### Ai-M61-01-BLO

AT+SYSIO MAP=48,NC,0,1,NC,3,NC,NC,NC,NC,NC,NC,10,11,12,NC,13,14,15,NC,NC,18,19,NC,NC,NC,NC,NC,NC,NC,20,21,22,23,24,25,26,NC,27,28,29,30,31,32,33,34,NC

#### Ai-M61-32S-BLIAI

AT+SYSIO MAP=40,NC,NC,NC,0,1,16,17,12,14,15,18,19,10,13,11,NC,20,4,5,6,7,8,9,NC,NC,23,NC,24,28,26,25,30,30,32,NC,29,NC

#### Ai-M61-32S-BLO

#### Ai-M61-32SU-BLO

AT+SYSIO MAP=40,NC,NC,NC,0,1,16,17,12,14,15,18,19,10,13,11,NC,20,NC,NC,NC,NC,NC,NC,NC,23,NC,24,28,26,25,23,32,32,31,NC

#### Ai-M61-32S-BLOOD

#### Eye-M61-32SU-BLOOD

AT+SYSIO MAP=40,NC,NC,NC,0,1,16,17,12,14,15,18,19,10,13,11,NC,20,NC,NC,NC,NC,NC,NC,NC,NC,NC,NC,NC,24,28,26,25,27,32,29,NC30

#### Ai-M62-12F-BLI

AT+SYSIO MAP=22,NC,20,NC,17,29,0,1,NC,15,14,11,12,NC,NC,NC,28,3,NC,30,27,NC,NC

#### Eye-M62-12F-BLIJ

AT+SYSIO MAP=22,NC,20,NC,17,10,0,1,NC,15,14,11,12,NC,NC,NC,13,3,NC,30,27,NC,NC

#### The M62-13-BLI

AT+SYSIO MAP=18,NC,NC,1,30,0,28,17,NC,NC,29,NC,NC,NC,27,NC,3,20,NC

#### Ai-M62-32S-BLI

AT+SYSIO MAP=38,NC,NC,NC,NC,3,11,12,1,30,0,13,14,15,16,NC,NC,NC,NC,NC,NC,NC,NC,NC,NC,NC,NC,10,28,17,NC,27,29,NC,NC,NC,NC,20

#### Ai-M62-M01L-BLI

AT+SYSIO MAP=33,0,3,20,12,NC,13,14,NC,15,10,2,11,17,16,NC,NC,NC,NC,NC,NC,NC,NC,NC,NC,1,30,NC,27,NC,NC,29,28

#### I-M62-M2-I-BLI

AT+SYSIO MAP=31,16,17,11,NC,12,13,14,15,NC,NC,NC,NC,20,NC,NC,NC,27,28,29,30,NC,NC,NC,NC,0,1,3,10,NC,NC

**Ai-WB2-01F-BLI**

AT+SYSIO MAP=18,NC,NC,11,NC,12,14,3,17,20,22,NC,5,1,NC,NC,NC,NC,NC

**Ai-WB2-01M-BLI**

AT+SYSIO MAP=18,NC,NC,NC,NC,NC,20,12,14,NC,NC,4,3,2,22,21,17,11,1,0

**Eye-WB2-01M-THE**

AT+SYSIO MAP=18,NC,NC,NC,NC,NC,20,12,14,8,NC,4,3,2,22,21,17,11,1,0

**I-WB2-01N-BLI**

AT+SYSIO MAP=14,NC,3,NC,20,NC,4,NC,14,21,NC,22,8,1,2

**The WB2-01S-BLI**

AT+SYSIO MAP=8,NC,4,NC,NC,NC,NC,NC,NC,NC

**Eye-WB2-01S-THE**

AT+SYSIO MAP=8,NC,4,8,NC,NC,NC,NC,NC,NC

**The WB2-01S-BLO**

AT+SYSIO MAP=8,NC,4,NC,NC,NC,NC,NC,NC,NC

**Ai-WB2-01S-BLOA**

AT+SYSIO MAP=8,NC,4,8,NC,NC,NC,NC,NC,NC

**I-WB2-05W-BLI**

AT+SYSIO MAP=22,NC,NC,NC,8,11,16,7,14,NC,17,20,21,22,NC,0,1,2,3,4,5,12,NC

**Eye-WB2-05W-THE**

AT+SYSIO MAP=22,NC,NC,NC,NC,11,16,7,14,NC,17,20,21,22,NC,0,1,2,3,4,5,12,NC

**Ai-WB2-12F-BLI**

AT+SYSIO MAP=22,NC,11,NC,12,14,17,3,NC,22,0,NC,NC,20,21,NC,4,2,NC,5,1,NC,NC

**Eye-WB2-12F-BLIA**

AT+SYSIO MAP=22,NC,11,NC,12,14,17,3,NC,22,0,NC,NC,20,21,NC,4,2,8,5,1,NC

**Ai-WB2-12F-BLO**

AT+SYSIO MAP=22,NC,11,NC,12,14,17,3,NC,NC,NC,NC,NC,NC,NC,NC,4,NC,NC,5,NC,NC,NC

**Ai-WB2-12F-BLOA**

AT+SYSIO MAP=22,NC,11,NC,12,14,17,3,NC,NC,NC,NC,NC,NC,NC,NC,4,NC,8,5,NC,NC,NC

**Ai-WB2-07S-BLI**

**The WB2-12S-BLI**

AT+SYSIO MAP=16,NC,11,NC,12,14,17,3,NC,NC,4,2,NC,5,1,NC,NC

**Eye-WB2-07S-THE****Eye-WB2-12S-THE**

AT+SYSIO MAP=16,NC,11,NC,12,14,17,3,NC,NC,4,2,8,5,1,NC,NC

**Ai-WB2-07S-BLO****The WB2-12S-BLO**

AT+SYSIO MAP=16,NC,11,NC,12,14,17,3,NC,NC,4,NC,NC,5,NC,NC,NC

**Ai-WB2-07S-BLOA****The WB2-12S-BLOA**

AT+SYSIO MAP=16,NC,11,NC,12,14,17,3,NC,NC,4,NC,8,5,NC,NC,NC

**Eye-WB2-12S-BLIA-J**

AT+SYSIO MAP=16,NC,11,NC,12,14,17,3,NC,NC,8,4,NC,5,1,NC,NC

**Ai-WB2-12S-BLI-J**

AT+SYSIO MAP=16,NC,11,NC,12,14,17,3,NC,NC,NC,4,NC,5,1,NC,NC

**Ai-WB2-12S-BLOA-J**

AT+SYSIO MAP=16,NC,11,NC,12,14,17,3,NC,NC,8,4,NC,5,NC,NC,NC

**Ai-WB2-12S-BLO-J**

AT+SYSIO MAP=16,NC,11,NC,12,14,17,3,NC,NC,NC,4,NC,5,NC,NC,NC

**The WB2-13-BLI****WB2-13U-BLI**

AT+SYSIO MAP=18,NC,NC,14,17,3,4,2,NC,NC,5,NC,NC,NC,1,NC,11,12,NC

**Eye-WB2-13-THE****Eye-WB2-13U**

AT+SYSIO MAP=18,NC,NC,14,17,3,4,2,8,NC,5,NC,NC,1,NC,11,12,NC

**The WB2-13-BLO****The WB2-13U-BLO**

AT+SYSIO MAP=18,NC,NC,14,17,3,4,NC,NC,NC,5,NC,NC,NC,NC,11,12,NC

**WB2-13-BLOA****The WB2-13U-BLOA**

AT+SYSIO MAP=18,NC,NC,14,17,3,4,NC,8,NC,5,NC,NC,NC,NC,11,12,NC

**Ai-WB2-32S-BLI**

AT+SYSIO MAP=38,NC,NC,NC,NC,11,NC,NC,14,17,3,20,22,0,21,NC,NC,NC,4,2,NC,1,5,NC,NC,NC,NC,  
12,NC,NC

**Eye-WB2-32S-THE**

AT+SYSIO MAP=38,NC,NC,NC,NC,11,NC,NC,14,17,3,20,22,0,21,NC,NC,NC,NC,NC,NC,NC,NC,NC,NC,NC,  
8,NC,4,2,NC,1,5,NC,NC,NC,NC,12,NC,NC

**Ai-WB2-32S-BLO**

AT+SYSIO MAP=38,NC,NC,NC,11,NC,NC,14,17,3,NC,NC,NC,NC,NC,NC,NC,4,NC,NC,NC,5,NC,NC,NC,  
NC,12,NC,NC

**Ai-WB2-32S-BLOA**

AT+SYSIO MAP=38,NC,NC,NC,NC,11,NC,NC,14,17,3,NC,NC,NC,NC,NC,NC,NC,NC,NC,NC,NC,NC,NC,  
NC,8,NC,4,NC,NC,5,NC,NC,NC,NC,12,NC,NC

**I-WB2-M1-BLI****WB2-M1-I-BLI**

AT+SYSIO MAP=31,NC,NC,NC,NC,4,14,NC,NC,NC,NC,NC,2,11,NC,NC,12,NC,17,3,22,21,20,NC,0,NC,  
1,5,NC,NC,NC,NC

**Eye-WB2-M1-BLIA****Eye-WB2-M1**

AT+SYSIO MAP=31,NC,NC,NC,NC,4,14,NC,NC,NC,NC,NC,2,11,NC,NC,12,NC,17,3,22,21,20,8,0,NC,1,  
5,NC,NC,NC,NC

**PWM-A01-1-BLO**

AT+SYSIO MAP=38,NC,NC,NC,NC,NC,NC,NC,17,NC,NC,NC,NC,NC,NC,NC,4,NC,NC,NC,NC,NC,NC,NC,  
12,NC,NC

**BW15**

AT+SYSIO MAP=16,17,18,NC,2,15,4,19,NC,NC,20,16,0,3,1,NC,NC

**BW16**

AT+SYSIO MAP=16,21,34,NC,23,NC,26,29,NC,NC,30,NC,22,27,20,NC,NC

**BW20-12F****BW20-07S**

AT+SYSIO MAP=22,49,50,NC,51,NC,52,53,NC,8,12,13,16,NC,NC,NC,26,NC,27,30,31,NC,NC