



**BR2262e BR2266e BR2220e**

## **Programming Manual**

July 3, 2020

V1.8

## VERSION HISTORY

| REVISION | AMENDMENT                                                                                                                                                                                                                                                                       | DATE       | AUTHOR      |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------|
| 1.0      | Initial release                                                                                                                                                                                                                                                                 | 2018-03-01 | Rui Fan     |
| 1.1      | Add Central commands                                                                                                                                                                                                                                                            | 2018-06-01 | Rui Fan     |
| 1.2      | Add channel switch command;<br>Add disconnect command;<br>Modify connect succeeds indication;<br>Remove GPIO disconnect function.                                                                                                                                               | 2018-06-29 | WenQing Qiu |
| 1.3      | Add OTA command and description                                                                                                                                                                                                                                                 | 2018-07-02 | WenQing Qiu |
| 1.4      | Add set adv. data command:<br>AT+ADVDATA                                                                                                                                                                                                                                        | 2018-07-04 | WenQing Qiu |
| 1.5      | Add query adv. data command:<br>AT+ADVDATA?<br>Add scan reply data command:<br>AT+SRDATA<br>Add query config. firmware version command:<br>AT+GCFGVER<br>Add set and query connect parameters command:<br>AT+CONNPARAM<br>Add set target service UUID command:<br>AT+TARGETUUID | 2018-07-13 | WenQing Qiu |
| 1.6      | Writing hex data to FF03(Characteristic) of smart phone's FF00(Service) to make module enter OTA mode. The hex data changes to "64 00 00 00".                                                                                                                                   | 2018-07-24 | WenQing Qiu |

|     |                        |            |           |
|-----|------------------------|------------|-----------|
| 1.7 | Add HID Commend        | 2019-06-15 | Rui Fan   |
| 1.8 | Update document formet | 2019-07-27 | Kaiyue Wu |
| 1.9 | For FCC                | 2020-06-03 | Kaiyue Wu |

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# 1. FCC ID

FCC ID: 2A0XV-BR2262E

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Labeling requirements. This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.                                                                                                                                                                                                                                                    |
| Changes or modification warning. Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.                                                                                                                                                                                                                                                                                                                                                                        |
| This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. |
| If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:<br>-Reorient or relocate the receiving antenna.<br>-Increase the separation between the equipment and receiver.<br>-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.<br>-Consult the dealer or an experienced radio/TV technician for help.     |
| This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End user must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be colocated or operating in conjunction with any other antenna or transmitter.                                                                                                                                                                                                                                               |
| The portable device is designed to meet the requirements for exposure to radio waves established by the Federal Communications Commission (USA).                                                                                                                                                                                                                                                                                                                                                                                                              |
| This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.                                                                                                                                                                                                                                                                           |

Figure 1 FCC warning

## 2. Introduction

- BR2262e, BR2266e, BR2220e module is Bluetooth V5.0 single-mode module, and its firmware only supports GATT application.
- This document introduces module's default setting and AT commands.
- AT command is composed of ASCII characters, and it ends with "\r" (0x0d). Therefore, it should avoid using "\r" (0x0d) in the command. Once "\r" appears, all data following "\r" will be discarded.
- UART default setting: 115200 baud rate, 8bits data, 1bit stop, no parity bit, enable hardware flow control.
- Default device name: BR2262e, BR2266e, BR2220e

### 2.1 Format

#### 2.1.1 Command

##### 1) Test

AT+NAME? \r

## 2) Enquiry

AT+<command>? \r

|           |                            |
|-----------|----------------------------|
| AT+       | Command prefix             |
| <command> | Command. For example: NAME |
| \r        | Command suffix             |

## 3) Setting

AT+<command>=<Parameter1>, [< Parameter2>]\r

|               |                                     |
|---------------|-------------------------------------|
| AT+           | Command prefix                      |
| <command>     | Command. For example: NAME          |
| <Parameter1>  | Parameter 1: at least one parameter |
| < Parameter2> | Parameter 2: one or more parameters |
| \r            | Command suffix                      |

### 2.1.2 Indication

#### 1) Result

\r\n<indication>\r\n

|                |                                 |
|----------------|---------------------------------|
| \r\n           | Indication prefix               |
| < indication > | Indication, For example: OK,ERR |
| \r\n           | Indication suffix.              |

#### 2) Value

\r\n+<indication>:<value>\r\n

|              |                               |
|--------------|-------------------------------|
| \r\n         | Indication prefix             |
| <indication> | Indication, For example: NAME |
| <value>      | Return value                  |
| \r\n         | Indication suffix.            |

## 3. Commands&Indications

### 3.1 Query Firmware Version

|                   |                              |                                                                 |
|-------------------|------------------------------|-----------------------------------------------------------------|
| <b>Command</b>    | AT+GVER\r                    |                                                                 |
| <b>Indication</b> | \r\n<version> \r\n\r\nOK\r\n |                                                                 |
| <b>Parameter</b>  | version                      | Firmware version. For example:<br>IVT_BR2262e_00_20180704_r1745 |
| <b>Note</b>       | N/A                          |                                                                 |

### 3.2 Query Config. Version

|                   |                                     |                       |
|-------------------|-------------------------------------|-----------------------|
| <b>Command</b>    | AT+GCFGVER\r                        |                       |
| <b>Indication</b> | \r\n<config_version> \r\n\r\nOK\r\n |                       |
| <b>Parameter</b>  | config_version                      | Configuration version |
| <b>Note</b>       | N/A                                 |                       |

### 3.3 Query Local Device Name

|                |            |
|----------------|------------|
| <b>Command</b> | AT+NAME?\r |
|----------------|------------|

|                   |                                |                                                         |
|-------------------|--------------------------------|---------------------------------------------------------|
| <b>Indication</b> | \r\n+NAME:<name>\r\n\r\nOK\r\n |                                                         |
| <b>Parameter</b>  | name                           | Device name. Default setting: BR2262e, BR2266e, BR2220e |
| <b>Note</b>       | N/A                            |                                                         |

### 3.4 Set Local Device Name

|                   |                                                     |                                                         |
|-------------------|-----------------------------------------------------|---------------------------------------------------------|
| <b>Command</b>    | AT+NAME=<name>\r                                    |                                                         |
| <b>Indication</b> | Succeed: \r\nOK\r\n<br>Fail: \r\nERR:<err_code>\r\n |                                                         |
| <b>Parameter</b>  | name                                                | Device name. Default setting: BR2262e, BR2266e, BR2220e |
| <b>Note</b>       | The max length of device name is 20 bytes.          |                                                         |

### 3.5 Query Local Bluetooth Address

|                   |                                     |                         |
|-------------------|-------------------------------------|-------------------------|
| <b>Command</b>    | AT+LBDADDR?\r                       |                         |
| <b>Indication</b> | \r\n+LBDADDR:<bdaddr>\r\n\r\nOK\r\n |                         |
| <b>Parameter</b>  | bdaddr                              | Local Bluetooth address |
| <b>Note</b>       | N/A                                 |                         |

### 3.6 Query Baud Rate

|                   |                                |                                    |
|-------------------|--------------------------------|------------------------------------|
| <b>Command</b>    | AT+BAUD?\r                     |                                    |
| <b>Indication</b> | \r\n+BAUD:<baud>\r\n\r\nOK\r\n |                                    |
| <b>Parameter</b>  | baud                           | Baud rate. Default setting: 115200 |
| <b>Note</b>       | N/A                            |                                    |

### 3.7 Set Baud Rate

|                   |                                                     |                                                                                            |
|-------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>Command</b>    | AT+BAUD=<baud>\r                                    |                                                                                            |
| <b>Indication</b> | Succeed: \r\nOK\r\n<br>Fail: \r\nERR:<err_code>\r\n |                                                                                            |
| <b>Parameter</b>  | baud                                                | Supported baud rate: 9600、19200、38400、115200、230400、460800、921600. Default setting: 115200 |
| <b>Note</b>       | N/A                                                 |                                                                                            |

### 3.8 Query ADV

|                   |                              |                                    |
|-------------------|------------------------------|------------------------------------|
| <b>Command</b>    | AT+ADV?\r                    |                                    |
| <b>Indication</b> | \r\n+ADV:<adv>\r\n\r\nOK\r\n |                                    |
| <b>Parameter</b>  | adv                          | 0: not advertising; 1: advertising |
| <b>Note</b>       | N/A                          |                                    |

### 3.9 Set ADV

|                   |                                                     |                                            |
|-------------------|-----------------------------------------------------|--------------------------------------------|
| <b>Command</b>    | AT+ADV=<adv>\r                                      |                                            |
| <b>Indication</b> | Succeed: \r\nOK\r\n<br>Fail: \r\nERR:<err_code>\r\n |                                            |
| <b>Parameter</b>  | adv                                                 | 0: stop advertising; 1: start advertising. |
| <b>Note</b>       | N/A                                                 |                                            |

### 3.10 Query Adv. Parameters

|                |                |  |
|----------------|----------------|--|
| <b>Command</b> | AT+ADVPARAM?\r |  |
|----------------|----------------|--|

|                   |                                              |                                                                                                                                     |
|-------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>Indication</b> | \r\n+ CONNPARAM:<adv_interval>\r\n\r\nOK\r\n |                                                                                                                                     |
| <b>Parameter</b>  | adv_interval                                 | Advertisement interval. Default setting: 2048.<br>Smaller advertisement interval, easier to be found, but larger power consumption. |

### 3.11 Set Adv Parameters

|                   |                                                     |                                                                                                                                     |
|-------------------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>Command</b>    | AT+ADVPARAM=<adv_interval>\r                        |                                                                                                                                     |
| <b>Indication</b> | Succeed: \r\nOK\r\n<br>Fail: \r\nERR:<err_code>\r\n |                                                                                                                                     |
| <b>Parameter</b>  | adv_interval                                        | Advertisement interval. Default setting: 2048.<br>Smaller advertisement interval, easier to be found, but larger power consumption. |

### 3.12 Query Adv Data

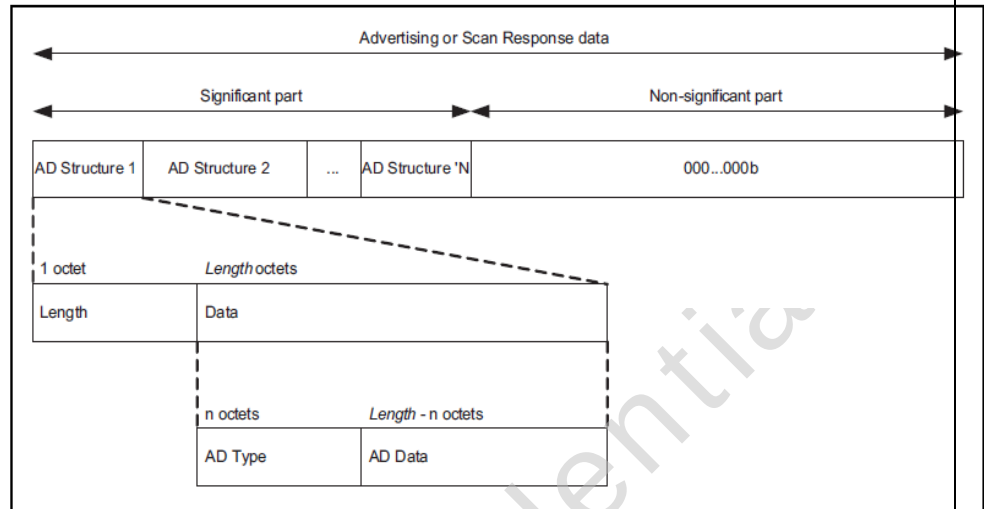
|                   |                                                                    |                                                    |
|-------------------|--------------------------------------------------------------------|----------------------------------------------------|
| <b>Command</b>    | AT+ADVDATA?\r                                                      |                                                    |
| <b>Indication</b> | Succeed: \r\n +ADVDATA :<data>\r\n<br>Fail: \r\nERR:<err_code>\r\n |                                                    |
| <b>Parameter</b>  | data                                                               | Advertisement data. Data length less than 31 bytes |

### 3.13 Set Adv. Data

|                   |                                                     |                                                                                                                                    |
|-------------------|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Command</b>    | AT+ADVDATA=<data>\r                                 |                                                                                                                                    |
| <b>Indication</b> | Succeed: \r\nOK\r\n<br>Fail: \r\nERR:<err_code>\r\n |                                                                                                                                    |
| <b>Parameter</b>  | data                                                | Data length less than 31 bytes<br>1. It must include data: 020105<br>2. Setting advertisement data will lead Bluetooth device name |

to change. Querying advertisement data at the first and then add self-defined data after queried data to keep Bluetooth device name unchangeable.

Advertisement data format as follows:



The definition of AD Type and AD Data as follows:

**Note**

| Data Type Value | Data Type Name                                  | Reference for Definition                                                                                                                                                                   |
|-----------------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0x01            | «Flags»                                         | Bluetooth Core Specification:Vol. 3, Part C, section 8.1.3 (v2.1 + EDR, 3.0 + HS and 4.0)Vol. 3, Part C, sections 11.1.3 and 18.1 (v4.0)Core Specification Supplement, Part A, section 1.3 |
| 0x02            | «Incomplete List of 16-bit Service Class UUIDs» | Bluetooth Core Specification:Vol. 3, Part C, section 8.1.1 (v2.1 + EDR, 3.0 + HS and 4.0)Vol. 3, Part C, sections 11.1.1 and 18.2 (v4.0)Core Specification Supplement, Part A, section 1.1 |
| 0x03            | «Complete List of 16-bit Service Class UUIDs»   | Bluetooth Core Specification:Vol. 3, Part C, section 8.1.1 (v2.1 + EDR, 3.0 + HS and 4.0)Vol. 3, Part C, sections 11.1.1 and 18.2 (v4.0)Core Specification Supplement, Part A, section 1.1 |
| 0x04            | «Incomplete List of 32-bit Service Class UUIDs» | Bluetooth Core Specification:Vol. 3, Part C, section 8.1.1 (v2.1 + EDR, 3.0 + HS and 4.0)Vol. 3, Part C, section 18.2 (v4.0)Core Specification Supplement, Part A, section 1.1             |

|      |                                                  |                                                                                                                                                                                            |
|------|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0x05 | «Complete List of 32-bit Service Class UUIDs»    | Bluetooth Core Specification:Vol. 3, Part C, section 8.1.1 (v2.1 + EDR, 3.0 + HS and 4.0)Vol. 3, Part C, section 18.2 (v4.0)Core Specification Supplement, Part A, section 1.1             |
| 0x06 | «Incomplete List of 128-bit Service Class UUIDs» | Bluetooth Core Specification:Vol. 3, Part C, section 8.1.1 (v2.1 + EDR, 3.0 + HS and 4.0)Vol. 3, Part C, sections 11.1.1 and 18.2 (v4.0)Core Specification Supplement, Part A, section 1.1 |
| 0x07 | «Complete List of 128-bit Service Class UUIDs»   | Bluetooth Core Specification:Vol. 3, Part C, section 8.1.1 (v2.1 + EDR, 3.0 + HS and 4.0)Vol. 3, Part C, sections 11.1.1 and 18.2 (v4.0)Core Specification Supplement, Part A, section 1.1 |
| 0x08 | «Shortened Local Name»                           | Bluetooth Core Specification:Vol. 3, Part C, section 8.1.2 (v2.1 + EDR, 3.0 + HS and 4.0)Vol. 3, Part C, sections 11.1.2 and 18.4 (v4.0)Core Specification Supplement, Part A, section 1.2 |
| 0x09 | «Complete Local Name»                            | Bluetooth Core Specification:Vol. 3, Part C, section 8.1.2 (v2.1 + EDR, 3.0 + HS and 4.0)Vol. 3, Part C, sections 11.1.2 and 18.4 (v4.0)Core Specification Supplement, Part A, section 1.2 |
| 0x0A | «Tx Power Level»                                 | Bluetooth Core Specification:Vol. 3, Part C, section 8.1.5 (v2.1 + EDR, 3.0 + HS and 4.0)Vol. 3, Part C, sections 11.1.5 and 18.3 (v4.0)Core Specification Supplement, Part A, section 1.5 |
| 0x0D | «Class of Device»                                | Bluetooth Core Specification:Vol. 3, Part C, section 8.1.6 (v2.1 + EDR, 3.0 + HS and 4.0)Vol. 3, Part C, sections 11.1.5 and 18.5 (v4.0)Core Specification Supplement, Part A, section 1.6 |
| 0x0E | «Simple Pairing Hash C»                          | Bluetooth Core Specification:Vol. 3, Part C, section 8.1.6 (v2.1 + EDR, 3.0 + HS and 4.0)Vol. 3, Part C, sections 11.1.5 and 18.5 (v4.0)                                                   |
| 0x0E | «Simple Pairing Hash C-192»                      | Core Specification Supplement, Part A, section 1.6                                                                                                                                         |
| 0x0F | «Simple Pairing Randomizer R»                    | Bluetooth Core Specification:Vol. 3, Part C, section 8.1.6 (v2.1 + EDR, 3.0 + HS and 4.0)Vol. 3, Part C, sections 11.1.5 and 18.5 (v4.0)                                                   |

|      |                                                 |                                                                                                                                    |
|------|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 0x0F | «Simple Pairing<br>Randomizer R-192»            | Core Specification Supplement, Part A, section 1.6                                                                                 |
| 0x10 | «Device ID»                                     | Device ID Profile v1.3 or later                                                                                                    |
| 0x10 | «Security Manager TK<br>Value»                  | Bluetooth Core Specification:Vol. 3, Part C, sections 11.1.7 and 18.6<br>(v4.0)Core Specification Supplement, Part A, section 1.8  |
| 0x11 | «Security Manager Out<br>of Band Flags»         | Bluetooth Core Specification:Vol. 3, Part C, sections 11.1.6 and 18.7<br>(v4.0)Core Specification Supplement, Part A, section 1.7  |
| 0x12 | «Slave Connection<br>Interval Range»            | Bluetooth Core Specification:Vol. 3, Part C, sections 11.1.8 and 18.8<br>(v4.0)Core Specification Supplement, Part A, section 1.9  |
| 0x14 | «List of 16-bit Service<br>Solicitation UUIDs»  | Bluetooth Core Specification:Vol. 3, Part C, sections 11.1.9 and 18.9<br>(v4.0)Core Specification Supplement, Part A, section 1.10 |
| 0x15 | «List of 128-bit Service<br>Solicitation UUIDs» | Bluetooth Core Specification:Vol. 3, Part C, sections 11.1.9 and 18.9<br>(v4.0)Core Specification Supplement, Part A, section 1.10 |
| 0x16 | «Service Data»                                  | Bluetooth Core Specification:Vol. 3, Part C, sections 11.1.10 and<br>18.10 (v4.0)                                                  |
| 0x16 | «Service Data - 16-bit<br>UUID»                 | Core Specification Supplement, Part A, section 1.11                                                                                |
| 0x17 | «Public Target Address»                         | Bluetooth Core Specification:Core Specification Supplement, Part A,<br>section 1.13                                                |
| 0x18 | «Random Target<br>Address»                      | Bluetooth Core Specification:Core Specification Supplement, Part A,<br>section 1.14                                                |
| 0x19 | «Appearance»                                    | Bluetooth Core Specification:Core Specification Supplement, Part A,<br>section 1.12                                                |

|      |                                             |                                                                                  |
|------|---------------------------------------------|----------------------------------------------------------------------------------|
| 0x1A | «Advertising Interval»                      | Bluetooth Core Specification:Core Specification Supplement, Part A, section 1.15 |
| 0x1B | «LE Bluetooth Device Address»               | Core Specification Supplement, Part A, section 1.16                              |
| 0x1C | «LE Role»                                   | Core Specification Supplement, Part A, section 1.17                              |
| 0x1D | «Simple Pairing Hash C-256»                 | Core Specification Supplement, Part A, section 1.6                               |
| 0x1E | «Simple Pairing Randomizer R-256»           | Core Specification Supplement, Part A, section 1.6                               |
| 0x1F | «List of 32-bit Service Solicitation UUIDs» | Core Specification Supplement, Part A, section 1.10                              |
| 0x20 | «Service Data - 32-bit UUID»                | Core Specification Supplement, Part A, section 1.11                              |
| 0x21 | «Service Data - 128-bit UUID»               | Core Specification Supplement, Part A, section 1.11                              |
| 0x22 | «LE Secure Connections Confirmation Value»  | Core Specification Supplement Part A, Section 1.6                                |
| 0x23 | «LE Secure Connections Random Value»        | Core Specification Supplement Part A, Section 1.6                                |
| 0x24 | «URI»                                       | Bluetooth Core Specification:Core Specification Supplement, Part A, section 1.18 |
| 0x25 | «Indoor Positioning»                        | Indoor Positioning Service v1.0 or later                                         |

|      |                                 |                                                                                                                                                                                             |
|------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      | Data»                           |                                                                                                                                                                                             |
| 0x27 | «LE Supported Features»         | Core Specification Supplement, Part A, Section 1.19                                                                                                                                         |
| 0x28 | «Channel Map Update Indication» | Core Specification Supplement, Part A, Section 1.20                                                                                                                                         |
| 0x29 | «PB-ADV»                        | Mesh Profile Specification Section 5.2.1                                                                                                                                                    |
| 0x2A | «Mesh Message»                  | Mesh Profile Specification Section 3.3.1                                                                                                                                                    |
| 0x2B | «Mesh Beacon»                   | Mesh Profile Specification Section 3.9                                                                                                                                                      |
| 0x3D | «3D Information Data»           | 3D Synchronization Profile, v1.0 or later                                                                                                                                                   |
| 0xFF | «Manufacturer Specific Data»    | Bluetooth Core Specification:Vol. 3, Part C, section 8.1.4 (v2.1 + EDR, 3.0 + HS and 4.0)Vol. 3, Part C, sections 11.1.4 and 18.11 (v4.0)Core Specification Supplement, Part A, section 1.4 |

### 3.14 Query Scan Reply Data

|                   |                                                                  |                                |
|-------------------|------------------------------------------------------------------|--------------------------------|
| <b>Command</b>    | AT+SRDATA?\r                                                     |                                |
| <b>Indication</b> | Succeed: \r\n+SRDATA :<data>\r\n<br>Fail: \r\nERR:<err_code>\r\n |                                |
| <b>Parameter</b>  | data                                                             | Data length less than 31 bytes |

### 3.15 Set Scan Reply Data

|                   |                                                     |  |
|-------------------|-----------------------------------------------------|--|
| <b>Command</b>    | AT+SRDATA=<data>\r                                  |  |
| <b>Indication</b> | Succeed: \r\nOK\r\n<br>Fail: \r\nERR:<err_code>\r\n |  |

|                  |                               |                                |
|------------------|-------------------------------|--------------------------------|
| <b>Parameter</b> | data                          | Data length less than 31 bytes |
| <b>Note</b>      | Refer to: AT+ADVDATA=<data>\r |                                |

### 3.16 Query Connect Parameters

| Command    | AT+CONNPARAM?\r                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |       |  |          |                                                                                                                                                                                                                                                                                                                                    |       |                       |          |                                                                                                                                                                                                                                    |       |                       |         |                                                                                                 |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------|--|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------|---------|-------------------------------------------------------------------------------------------------|
| Indication | \r\n+ CONNPARAM:<intervalMin>,<intervalMax>,<connLatency>,<connTimeout>\r\n\r\nOK\r\n                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |       |  |          |                                                                                                                                                                                                                                                                                                                                    |       |                       |          |                                                                                                                                                                                                                                    |       |                       |         |                                                                                                 |
| Parameter  | <p>Default setting:</p> <p>intervalMin, 24</p> <p>intervalMax, 48</p> <p>connLatency, 0</p> <p>connTimeout, 400</p> <p>Refer to settings defined in Bluetooth core specifications:</p> <p><i>intervalMin: (2 octets)</i></p> <table><tr><th>Range</th><th></th></tr><tr><td>6 - 3200</td><td>Defines minimum value for the connection event interval in the following manner:<br/><br/>connIntervalMin = Interval Min * 1.25 ms. Interval Min range: 6 to 3200 frames where 1 frame is 1.25 ms and equivalent to 2 BR/EDR slots. Values outside the range are reserved. Interval Min shall be less than or equal to Interval Max.</td></tr></table> <p><i>intervalMax: (2 octets)</i></p> <table><tr><th>Range</th><th>Parameter Description</th></tr><tr><td>6 - 3200</td><td>Maximum value for the connection event interval. This shall be greater than or equal to <i>intervalMin</i>.<br/><br/>Range: 0x0006 to 0x0C80<br/><br/>Time = <i>intervalMax</i> * 1.25 msec<br/><br/>Time Range: 7.5 msec to 4 seconds.</td></tr></table> <p><i>connLatency: (2 octets)</i></p> <table><tr><th>Range</th><th>Parameter Description</th></tr><tr><td>0 - 499</td><td>Slave latency for the connection in number of connection events.<br/><br/>Range: 0x0000 to 0x01F3</td></tr></table> |  | Range |  | 6 - 3200 | Defines minimum value for the connection event interval in the following manner:<br><br>connIntervalMin = Interval Min * 1.25 ms. Interval Min range: 6 to 3200 frames where 1 frame is 1.25 ms and equivalent to 2 BR/EDR slots. Values outside the range are reserved. Interval Min shall be less than or equal to Interval Max. | Range | Parameter Description | 6 - 3200 | Maximum value for the connection event interval. This shall be greater than or equal to <i>intervalMin</i> .<br><br>Range: 0x0006 to 0x0C80<br><br>Time = <i>intervalMax</i> * 1.25 msec<br><br>Time Range: 7.5 msec to 4 seconds. | Range | Parameter Description | 0 - 499 | Slave latency for the connection in number of connection events.<br><br>Range: 0x0000 to 0x01F3 |
| Range      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |       |  |          |                                                                                                                                                                                                                                                                                                                                    |       |                       |          |                                                                                                                                                                                                                                    |       |                       |         |                                                                                                 |
| 6 - 3200   | Defines minimum value for the connection event interval in the following manner:<br><br>connIntervalMin = Interval Min * 1.25 ms. Interval Min range: 6 to 3200 frames where 1 frame is 1.25 ms and equivalent to 2 BR/EDR slots. Values outside the range are reserved. Interval Min shall be less than or equal to Interval Max.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |       |  |          |                                                                                                                                                                                                                                                                                                                                    |       |                       |          |                                                                                                                                                                                                                                    |       |                       |         |                                                                                                 |
| Range      | Parameter Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |       |  |          |                                                                                                                                                                                                                                                                                                                                    |       |                       |          |                                                                                                                                                                                                                                    |       |                       |         |                                                                                                 |
| 6 - 3200   | Maximum value for the connection event interval. This shall be greater than or equal to <i>intervalMin</i> .<br><br>Range: 0x0006 to 0x0C80<br><br>Time = <i>intervalMax</i> * 1.25 msec<br><br>Time Range: 7.5 msec to 4 seconds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |       |  |          |                                                                                                                                                                                                                                                                                                                                    |       |                       |          |                                                                                                                                                                                                                                    |       |                       |         |                                                                                                 |
| Range      | Parameter Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |       |  |          |                                                                                                                                                                                                                                                                                                                                    |       |                       |          |                                                                                                                                                                                                                                    |       |                       |         |                                                                                                 |
| 0 - 499    | Slave latency for the connection in number of connection events.<br><br>Range: 0x0000 to 0x01F3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |       |  |          |                                                                                                                                                                                                                                                                                                                                    |       |                       |          |                                                                                                                                                                                                                                    |       |                       |         |                                                                                                 |

|  |                                |                                                                                                                                              |
|--|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
|  | <i>connTimeout: (2 octets)</i> |                                                                                                                                              |
|  | <b>Range</b>                   | <b>Parameter Description</b>                                                                                                                 |
|  | 10 - 3200                      | Supervision timeout for the LE Link.<br>Range: 0x000A to 0x0C80<br>Time = <i>connTimeout</i> * 10 msec<br>Time Range: 100 msec to 32 seconds |

### 3.17 Set Connect Parameters

| <b>Command</b>    | AT+CONNPARAM=<intervalMin>,<intervalMax>,<connLatency>,<connTimeout>\r                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |  |          |                                                                                                                                                                                                                                                                                                                                    |       |                       |          |                                                                                                                                                                                                                        |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Indication</b> | Succeed: \r\nOK\r\n<br>Fail: \r\nERR:<err_code>\r\n                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |  |          |                                                                                                                                                                                                                                                                                                                                    |       |                       |          |                                                                                                                                                                                                                        |
| <b>Parameter</b>  | <p>Default setting:</p> <p>intervalMin, 24</p> <p>intervalMax, 48</p> <p>connLatency, 0</p> <p>connTimeout, 400</p> <p>Refer to settings defined in Bluetooth core specifications:</p> <p><i>intervalMin: (2 octets)</i></p> <table> <tr> <th>Range</th><th></th></tr> <tr> <td>6 - 3200</td><td>Defines minimum value for the connection event interval in the following manner:<br/><br/>connIntervalMin = Interval Min * 1.25 ms. Interval Min range: 6 to 3200 frames where 1 frame is 1.25 ms and equivalent to 2 BR/EDR slots. Values outside the range are reserved. Interval Min shall be less than or equal to Interval Max.</td></tr> </table> <p><i>intervalMax: (2 octets)</i></p> <table> <tr> <th>Range</th><th>Parameter Description</th></tr> <tr> <td>6 - 3200</td><td>Maximum value for the connection event interval. This shall be greater than or equal to <i>intervalMin</i>.<br/>Range: 0x0006 to 0x0C80<br/>Time = <i>intervalMax</i> * 1.25 msec<br/>Time Range: 7.5 msec to 4 seconds.</td></tr> </table> | Range |  | 6 - 3200 | Defines minimum value for the connection event interval in the following manner:<br><br>connIntervalMin = Interval Min * 1.25 ms. Interval Min range: 6 to 3200 frames where 1 frame is 1.25 ms and equivalent to 2 BR/EDR slots. Values outside the range are reserved. Interval Min shall be less than or equal to Interval Max. | Range | Parameter Description | 6 - 3200 | Maximum value for the connection event interval. This shall be greater than or equal to <i>intervalMin</i> .<br>Range: 0x0006 to 0x0C80<br>Time = <i>intervalMax</i> * 1.25 msec<br>Time Range: 7.5 msec to 4 seconds. |
| Range             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |  |          |                                                                                                                                                                                                                                                                                                                                    |       |                       |          |                                                                                                                                                                                                                        |
| 6 - 3200          | Defines minimum value for the connection event interval in the following manner:<br><br>connIntervalMin = Interval Min * 1.25 ms. Interval Min range: 6 to 3200 frames where 1 frame is 1.25 ms and equivalent to 2 BR/EDR slots. Values outside the range are reserved. Interval Min shall be less than or equal to Interval Max.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |       |  |          |                                                                                                                                                                                                                                                                                                                                    |       |                       |          |                                                                                                                                                                                                                        |
| Range             | Parameter Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |  |          |                                                                                                                                                                                                                                                                                                                                    |       |                       |          |                                                                                                                                                                                                                        |
| 6 - 3200          | Maximum value for the connection event interval. This shall be greater than or equal to <i>intervalMin</i> .<br>Range: 0x0006 to 0x0C80<br>Time = <i>intervalMax</i> * 1.25 msec<br>Time Range: 7.5 msec to 4 seconds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |  |          |                                                                                                                                                                                                                                                                                                                                    |       |                       |          |                                                                                                                                                                                                                        |

| <b>connLatency: (2 octets)</b> |                                                                                                                                              |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Range                          | Parameter Description                                                                                                                        |
| 0 - 499                        | Slave latency for the connection in number of connection events.<br>Range: 0x0000 to 0x01F3                                                  |
| <b>connTimeout: (2 octets)</b> |                                                                                                                                              |
| Range                          | Parameter Description                                                                                                                        |
| 10 - 3200                      | Supervision timeout for the LE Link.<br>Range: 0x000A to 0x0C80<br>Time = <i>connTimeout</i> * 10 msec<br>Time Range: 100 msec to 32 seconds |

### 3.18 Scan BLE Devices

|                   |                                                                                                                                              |                                     |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>Command</b>    | AT+SCAN=<scan>\r                                                                                                                             |                                     |
| <b>Indication</b> | Succeed:<br>\r\Ndev_addr, addr_type, rssi<br>\r\nUUID:dev_uuid<br>\r\nNAME:dev_name<br>\r\nMANU:manu_data<br>Fail:<br>\r\nERR:<err_code>\r\n |                                     |
| <b>Parameter</b>  | <b>Scan</b>                                                                                                                                  | 1: start scanning; 0: stop scanning |
| <b>Note</b>       | UUID, NAME, MANU are only shown when they are included in advertisement package.                                                             |                                     |

### 3.19 Set Target Service

|                   |                                                |                                                       |
|-------------------|------------------------------------------------|-------------------------------------------------------|
| <b>Command</b>    | AT+TARGETUUID=< service_uuid >\r               |                                                       |
| <b>Indication</b> | Succeed: \r\nOK\r\n<br>Fail: \r\nERR: err_code |                                                       |
| <b>Parameter</b>  | service_uuid                                   | Connected service UUID. Only support 16bits UUID. For |

|  |  |                                                                                                                                                                                        |
|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  | 128bits service UUID, choose its UUID's 12~13bytes.<br><br>16 bits: FF00<br><br>AT+TARGETUUID=FF00\r<br><br>128 bits: 49535343-FE7D-4AE5-8FA9-9FAFD205E455<br><br>AT+TARGETUUID=5343\r |
|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 3.20 Connect

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Command</b>    | AT+CONN=< bdaddr >\r                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                              |
| <b>Indication</b> | Succeed:<br>\r\nOK\r\n<br>\r\nIM_CONN:<cid>\r\n<br>Fail:<br>\r\nERR: err_code                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                              |
| <b>Parameter</b>  | bdaddr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Connected device mac address |
| <b>Note</b>       | <p>Only supports the specified Service (set by AT+TARGETUUID), requires the service to have at least two Characteristic, one is Notify in the attribute, and one attribute contains Write or Write Without Response. If the above conditions are not met, the connection will be automatically disconnected. If there are multiple Characteristics in the service that meet the above criteria, the module will select the first one as the Characterization for data transfer.</p> <p>Service and Characteristic refer to chapter <a href="#">6</a></p> |                              |

## 3.21 Disconnect

|                   |                                                      |  |
|-------------------|------------------------------------------------------|--|
| <b>Command</b>    | AT+DISC=<cid>\r                                      |  |
| <b>Indication</b> | Succeed:<br>\r\nOK\r\n<br>Fail:<br>\r\nERR: err_code |  |

|                  |     |                                                                                                                                                                                            |
|------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameter</b> | cid | <p>Channel ID,</p> <p>8: passive connection (connect in) channel</p> <p>0-7: active connection (connect out) channel</p> <p>Channel ID is reported when the connection is established.</p> |
|------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 3.22 Channel Switch

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                          |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Command</b>    | AT>< cid >\r                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                          |
| <b>Indication</b> | <p>Succeed:</p> <p>\r\nOK\r\n</p> <p>Fail:</p> <p>\r\nERR: err_code</p>                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                          |
| <b>Parameter</b>  | cid                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>Channel ID,</p> <p>9: AT commands channel</p> <p>8: passive connection (connect in) channel</p> <p>0-7: active connection (connect out) channel</p> <p>Channel ID is reported when the connection is established.</p> |
| <b>Note</b>       | <p>Channel switch strategy:</p> <p>After the connection is established, it automatically switches to the channel set in the command.</p> <p>Once receiving data from one channel, it automatically switches to the channel set in the command.</p> <p>After the connection is released, it automatically switches to the AT command channel.</p> <p>Once receiving the command: "AT&gt;x\r" via UART, it automatically switches to x channel.</p> |                                                                                                                                                                                                                          |

### 3.23 Report HID button

|                |                                                                 |
|----------------|-----------------------------------------------------------------|
| <b>Command</b> | AT+KBRPT=<FuncKey>,<KEY1>,<KEY2>,<KEY3>,<KEY4>,<KEY5>,<KEY6>,\r |
|----------------|-----------------------------------------------------------------|

| Indication | Command indication |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parameter  | FuncKey            | --bit0: Whether the Left Control button is pressed, press 1<br> --bit1: Whether the Left Shift button is pressed, press 1<br> --bit2: Whether the Left Alt button is pressed, press 1<br> --bit3: Whether the Left GUI(Windows key) button is pressed, press 1<br> --bit4: Whether the Right Control button is pressed, press 1<br> --bit5: Whether the Right Shift button is pressed, press 1<br> --bit6: Whether the Right Alt button is pressed, press 1<br> --bit7: Whether the Right GUI button is pressed, press 1 |
|            | KEY1---KEY6        | HID button value (refer to HID Usage Tables specification for key values)<br>Up to 6 buttons can be sent at the same time.                                                                                                                                                                                                                                                                                                                                                                                               |
| Note       | Report HID button  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

### 3.24 Report CONSUMER button

|            |                        |                                                                           |
|------------|------------------------|---------------------------------------------------------------------------|
| Command    | AT+FUNCRPT=<FuncKey>\r |                                                                           |
| Indication | Command indication     |                                                                           |
| Parameter  | FuncKey                | HID button value (refer to HID Usage Tables specification for key values) |
| Note       | N/A                    |                                                                           |

### 3.25 OTA

|            |                                                       |
|------------|-------------------------------------------------------|
| Command    | AT+OTA\r                                              |
| Indication | Succeed:<br>\r\nOK\r\n<br>Fail:<br>\r\nERR:<err_code> |

## 4. Indication

### 4.1 Ready Status

|                   |                                                                                      |
|-------------------|--------------------------------------------------------------------------------------|
| <b>Indication</b> | \r\n IM_READY\r\n                                                                    |
| <b>Parameter</b>  | N/A                                                                                  |
| <b>Note</b>       | Initialization completes, The module is in working mode where GATT can be connected. |

### 4.2 Connect Succeed

|                   |                        |                                                                                                                                                                         |
|-------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Indication</b> | \r\n IM_CONN:<cid>\r\n |                                                                                                                                                                         |
| <b>Parameter</b>  | cid                    | Channel ID,<br>8: passive connection (connect in) channel<br>0-7: active connection (connect out) channel<br>Channel ID is reported when the connection is established. |
| <b>Note</b>       | N/A                    |                                                                                                                                                                         |

### 4.3 Disconnect

|                   |                         |                                                                                                                                                                         |
|-------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Indication</b> | \r\n IM_DISC:[cid] \r\n |                                                                                                                                                                         |
| <b>Parameter</b>  | cid                     | Channel ID,<br>8: passive connection (connect in) channel<br>0-7: active connection (connect out) channel<br>Channel ID is reported when the connection is established. |
| <b>Note</b>       | N/A                     |                                                                                                                                                                         |

## 5. PIO Control

PB0 always outputs low level when the module is in working status.

PB1 periodically outputs 500ms high level and 500ms low level during advertising; it always outputs low level when connected.

Pulling up PA7 to make module enter sleep mode (module cannot receive data via UART); Pulling down PA7 and module is unable to enter sleep mode.

## 6. Bluetooth Knowledge

### 6.1 Service

Service, GATT protocol performs Bluetooth data exchange through service, provides service from device, master device connects slave device, and accesses its service. Each service contains multiple characteristic values (Characteristics), and each specific feature value is the main body of GATT communication. The master device can write data to the feature values of the slave device, and can also read the feature value data. The master device can also subscribe to the feature values of the slave device so that when the slave device feature value data changes, the data is notified to the master device.

### 6.2 Characteristic

Characteristic. The communication between the BLE master and slave is realized by Characteristic. It can be understood as a label through which the desired content can be obtained or written.

### 6.3 UUID

Universally Unique Identifier. All services and characteristics have unique UUID to identify.

## 7. Company Profile

Barrot Technology – Barrot is a world leading one-stop chipset level solution provider who offers wireless connectivity and audio intelligent hardware solutions featuring with own IPs. The company is an associated member of The Bluetooth SIG, and it is the only one who contributes to Bluetooth specification definition in Greater China. Barrot owns three high-tech IPs: Bluetooth RF, Bluetooth stack and Acoustic algorithms, so Barrot offers most integrated, robust, reliable, and easy-to-use wireless

turn-key solutions for IOT, Automotive and Wireless audio applications.

Barrot devotes itself to being the most reliable short distance wireless technologies' solution provider in the world.

## 8. Contact Information

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