BM100

BT5.0 Programming User Guide

Version 3.3

Revision History

Version	Data	Notes	Author
1.0	2015/09/10	First Release	Tony
2.0	2016/03/21	Add LE GATT Commands	Jerry
3.0	2016/11/12	Add HID Commands	Navy
3.1	2016/12/13	Add GPIO Indications	Navy
3.2	2019/05/05	Add LE Commands	Navy
3.3	2019/08/08	Add AT+LEADDR、 AT+LENAME	Navy

Contact Us:

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Federal Communications Commission (FCC) Statement

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 of the device.

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:
-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

FCC RF Radiation Exposure Statement
This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

Note: The end product shall has the words "**Contains FCC ID: IRJ-BM100**".

OEM statement
The Original Equipment Manufacturer (OEM) must ensure that the OEM modular transmitter must be labeled with its own FCC ID number. This includes a clearly visible label on the outside of the final product enclosure that displays the contents shown below. If the FCC ID is not visible when the equipment is installed inside another device, then the outside of the device into which the equipment is installed must also display a label referring to the enclosed equipment.
The end product with this module may subject to perform FCC part 15B unintentional emission test requirement and be properly authorized while installation to host(s), and platform, and integrator are obligated to have its manual or instruction with the related compliance warning to end users.
This device is intended for OEM integrator only.
The end product with this module may be subject to re-evaluate RF exposure as per 47CFR §2.1091, and §2.1093 if antenna or usage, including co-located usage of other transmitters, of the subsequent installation are changed.

This radio transmitter has been approved by FCC to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that Have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

No.	Brand	Part number	Type	Connector	Gain (dBi)
1	Walsin Technology Corporation	RFANT5220110A0T	Multilayer ceramic antenna	N/A	2.66

1. Introduction

This specification presents design guidelines for software engineers that use BM100 series modules for Bluetooth requirements.

1.1 Terms

Throughout this specification:

- {} : Content between {…} is optional
- << : Content behind << represents a *COMMAND* sent from Host to Module
- >> : Content behind >> represents a *RESPONSE* sent from Module to Host

1.2 Hardware Interface

- GPIO
- PWM
- UART
- SPI Master
- I2C Master/Slave
- Analog Input/Output

1.3 Supported Bluetooth Profile

- SPP (Serial Port Profile)
- GATT Server (Generic Attribute Profile)
- GATT Client (Generic Attribute Profile)
- HID Keyboard (H uman Interface Profile)

1.4 Command Format

AT+ Command {=Param 1{, Param 2{, Param3…}}} <CR><LF>

- All commands start with "AT", end with <CR><LF>
- <CR> stands for "carriage return", corresponding hex is 0x0D
- <LF> stands for "line feed", corresponding hex is 0x0A
- If command has parameter, parameter keep behind "="
- If command has multiple parameters, parameter must be separated by ","
- If command has response, response start with <CR><LF>, end with <CR><LF>
- Module will always report command's execution result using "OK" for success or

"ERROR" for failure

e.g.

1. Read module's BR/EDR local name
   <<   *AT+NAME*
   >>   *+NAME=Feasycom*
   >>   *OK*

2. Write a baudrate which is not supported
   <<   *AT+BAUD=0*
   >>   *ERROR*

1.5 Indication Format

<CR><LF>+ Indication {=Param 1{, Param 2{, Param 3...}}} <CR><LF>

- All indications start with <CR><LF>, end with <CR><LF>
- If indication has parameter, parameter keep behind "="
- If indication has multiple parameters, parameter must be separated by ","

e.g.

1. Received "1234567890" from mobile phone via SPP profile
   >>   *+SPPDATA=10,1234567890*

1.6 Module Default Settings

Local Name (BR/EDR)	FSC-BT826EN
Local Name (LE)	FSC-BT826EN-LE
Pin Code	0000
Secure Simple Pairing Mode	OFF
Physical UART Baudrate	115200 bps/8/N/1

2. Command Table

2.1 General Commands

2.1.1 UART Communication Test

Format: AT
Response: OK
Description : Test the UART communication between HOST and Module after power on, baudrate changed, etc.
Example: UART communication test *<< AT* *>> OK*

2.1.2 Read Firmware Version

Format: AT+VER
Response: +VER=Param Param: Firmware version (16 Bytes ASCII)
Example: Read module's firmware version *<< AT+VER* *>> +VER=8.3.1,FSC-BT816S* *>> OK*

2.1.3 Read BR/EDR MAC Address

Format: AT+ADDR
Response: +ADDR=Param Param: Module's BR/EDR MAC address (12 Bytes ASCII)

Example: Read Module's BR/EDR MAC address

<<   AT+ADDR

>>   +ADDR=DC0D30123456

>>   OK

2.1.4 Read BLE MAC Address

Format: AT+ LEADDR

Response: +LEADDR=Param
Param: Module's BLE MAC address (12 Bytes ASCII)

Example: Read Module's BLE MAC address

<<   AT+LEADDR

>>   +LEADDR=DD0D30123456

>>   OK

2.1.5 Read/Write BR/EDR Local Name

Format: AT+NAME {=Param1{, Param2}}
Param1: BR/EDR local name (1~31 Bytes ASCII, default: FSC-BT826E)
Param2: MAC address suffix (0/1, default:0)
      (0) Disable suffix
      (1) Enable suffix "-XXXX" (lower 4 bytes of MAC address) after local name

Response: +NAME=Param

Description : Write local name if parameter existence, otherwise read current local name

Example: Read current BR/EDR local name

<<   AT+NAME

>>   +NAME=Feasycom

>>   OK

Example: Change module's BR/EDR local name to "ABC"

<<   AT+NAME=ABC

>>   OK

Example: Change module's BR/EDR local name to "ABC" and enable suffix

<<   *AT+NAME=ABC,1*

>>   *OK*

2.1.6 Read/Write BLE Local Name

Format: AT+LENAME {=Param1{, Param2}}

Param1: BLE local name (1~31 Bytes ASCII, default: FSC-BT826E-LE)

Param2: MAC address suffix (0/1, default:0)

(0) Disable suffix

(1) Enable suffix "-XXXX" (lower 4 bytes of MAC address) after local name

Response: +LENAME=Param

Description : Write local name if parameter existence, otherwise read current local name

Example: Read current BLE local name

<<   *AT+LENAME*

>>   *+LENAME=Feasycom-LE*

>>   *OK*

Example: Change module's BLE local name to "ABC"

<<   *AT+LENAME=ABC*

>>   *OK*

Example: Change module's BLE local name to "ABC" and enable suffix

<<   *AT+LENAME=ABC,1*

>>   *OK*

2.1.7 Read/Write Pin Code

Format: AT+PIN{=Param}

Param: Pin code (4~15 Bytes ASCII, default:0000)

Response: +PIN=Param

Example: Read module's pin code

<<   *AT+PIN*

>>   *+PIN=0000*

>>   *OK*

Example: Change module's pin code to "1234"

<<   *AT+PIN=1234*

>>   *OK*

2.1.8 Turn On/Off Secure Simple Pairing^{<need reboot>}

Format: AT+SSP{=Param}
Param: Simple pairing (0/1, default:1)
      (0) Turn off
      (1) Turn on

Response: +SSP=Param

Description : Pin code input will be bypassed if simple pairing is on in pairing procedure

2.1.9 Read/Write UART Baudrate

Format: AT+BAUD{=Param}
Param: Baudrate (2400/4800/9600/19200/38400/57600/115200/230400/ 256000/ 460800/512000/921600 , default:115200)

Response: +BAUD=Param

Description : Module's baudrate will be changed immediately after received this command

2.1.10 Read/Write Class Of Device ^{<need reboot>}

Format: AT+COD{=Param}
Param: Class of device (6 bytes ASCII, default:240404 Handsfree device)

Response: +COD=Param

2.1.11 Read/Write Run Mode

Format: AT+ MODE{=Param}
Param: Run Mode (1~4, default:4)
 (1) SPP Mode
 (2) HID Mode
 (3) BLE Mode
 (4) SPP+BLE Mode

Response: +MODE=Param

Description : After the command is executed, the BT8XX switches to the new Run Mode

Example: Read current Run Mode
<<   *AT+MODE*
>>   *+MODE=4*
>>   *OK*
Example: Change module's Run Mode to HID Mode
<<   *AT+MODE=2*
>>   *OK*

2.1.12 Read/Clear Paired Record

Format: AT+PLIST{=Param}
Param:(0/(1~8)/12 Bytes MAC address) (0)
 Clear all paired record
 (1~8) Clear specific paired record with index
 (MAC) Clear specific paired record with MAC address

Response1: +PLIST= {
Response2: +PLIST=Param1, Param2
Param1: (1~8) Paired device's index
Param2: (MAC) Paired device's MAC address
Response3: +PLIST=}

Example: Read module's paired record
<<   *AT+PLIST*
>>   *+PLIST= {*
 +PLIST=1,1C5CF226D773

+PLIST=2, A0BC30075421

+PLIST=}

>> *OK*

Example: Clear module's paired record

<< *AT+PLIST=0*

>> *OK*

2.1.13 Turn On/Off Throughput Mode

Format: AT+TPMODE{=Param}
Param: Throughput mode (0/1, default:0)
    (0) Turn Off
    (1) Turn On

Response: +TPMODE=Param

Description : When SPP/HID/GATT profile connected and throughput mode is on, the AT command will be de-active, every byte received via physical UART will be sent to air, vice visa

Example: Read current throughput mode

<< *AT+TPMODE*

>> *+TPMODE=1*

>> *OK*

Example: Turn off throughput mode

<< *AT+TPMODE=0*

>> *OK*

2.1.14 Turn On/Off Low Power Mode

Format: AT+ LPM{=Param}
Param: Low Power Mode (0/1, default:0)
    (0) Turn Off
    (1) Turn On

Response: +LPM=Param

Description : This instruction is only applicable to BT816S module

Example: Read current Low Power Mode

<<   AT+LPM

>>   +LPM=0

>>   OK

Example: Turn on Low Power Mode

<<   AT+LPM=1

>>   OK

2.1.15 Turn On/Off Hardware Flow Control<need reboot>

Format: AT+ FLOWCTL{=Param}

Param: Hardware Flow Control (0/1, default:1)

    (0) Turn Off

    (1) Turn On

Response: +FLOWCTL=Param

2.1.16 Turn On/Off Power On Auto Reconnect <need reboot>

Format: AT+ AUTOCONN{=Param}

Param: Option (0/1, default:1)

    (0) Turn Off

  (1-15) Turn on

Response: +AUTOCONN=Param

Description : Module will attempt to connect last device after power on if set and +MODE=1/+MODE=2

2.1.17 Release All Connections

Format: AT+ DSCA

Description : Module release all Bluetooth connections with remote device

2.1.18 Soft Reboot

Format: AT+REBOOT
Description : Module release all Bluetooth connections with remote device then reboot

2.1.19 Restore Factory Settings

Format: AT+RESTORE
Description : Module restore all factory settings then reboot

2.1.20 Scan Nearby Devices

Format: AT+SCAN =Param1{, Param2{, Param3}}
Param1:(0 ~2)
    (0) Stop scan
    (1) Scan nearby BR/EDR devices
    (2) Scan nearby BLE devices
Param2:(1~48) Scan period. unit:1.28s, default:12.8s

Description : Refer to Chapter 3 for format description of scan result

2.1.21 PIO Function Configuration

Format: AT+ PIOCFG{=Param1,Param2 }	
Param1	0: Disable Command/Transmission mode switch function
	1: Enable Command/Transmission mode switch function
Param2	0: Disable Bluetooth disconnect function 1:
	Enable Bluetooth disconnect function
Response: +PIOCFG=Param1,Param2	

2.2 Bluetooth Serial Commands (BR/EDR SPP)

2.2.1 Read SPP State

Format: AT+SPPSTAT
Response: +SPPSTAT=Param Param: Refer to Chapter 3 for state description

2.2.2 Establish SPP Connection

Format: AT+SPPCONN{=Param} Param: MAC address of target device (12 Bytes ASCII)
Description : If the parameter does not exist, the module will attempt to connect to the last device

2.2.3 Release SPP Connection

Format: AT+SPPDISC
Description : Release current SPP connection with remote device

2.2.4 Send Data Via SPP

Format: AT+SPPSEND=Param1, Param2 Param1 : Payload length (1~180) Param2 : Payload (1~180Bytes UTF8)
Description : If throughput mode is on, this command is de-active
Example: Send data "1234567890" to remote device via SPP *<<   AT+SPPSEND=10,1234567890* *>>   OK*

2.3 Bluetooth Serial Commands (LE Peripheral)

2.3.1 Read LE Peripheral State

Format: AT+GATTSTAT
Response: +GATTSTAT=Param   Param: Refer to Chapter 3 for state description

2.3.2 Send Data Via LE Peripheral

Format: AT+GATTSEND=Param1, Param2   Param1 : Payload length (1~155)   Param2 : Payload (1~155 Bytes UTF8)
Description : If throughput mode is on, this command is de-active
Example: Send data "1234567890" to remote device via LE Peripheral   *<<   AT+GATTSEND=10,1234567890*   *>>   OK*

2.4 Bluetooth Serial Commands (LE Central)

2.4.1 Read LE Central State

Format: AT+LESTAT
Response: +LESTAT=Param   Param: Refer to Chapter 3 for state description

2.4.2 Establish LE Central Connection

Format: AT+LECONN=Param 1{,Param2,Param3,Param4}   Param1: MAC address of target device & MAC address type (13 Bytes ASCII)

Param2: Service-UUID, Support 16 Bit and 128 Bit (4 Bytes/32 Bytes ASCII)

Param3: Write-UUID, Support 16 Bit and 128 Bit (4 Bytes/32 Bytes ASCII)

Param4: Notify-UUID, Support 16 Bit and 128 Bit (4 Bytes/32 Bytes ASCII)

Description : If parameter 2, parameter 3, parameter 4 do not exist, the module will automatically search for the GATT service connected to the remote device

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Example: Specified remote device service connections

<<   AT+LECONN=123456ABCDEF0,FFF0,FFF2,FFF1

>>   OK

2.4.3 Send Data Via LE Central

Format: AT+LESEND=Param1, Param2

Param1 : Payload length (1~180)

Param2 : Payload (1~180 Bytes UTF8)

Description : If throughput mode is on, this command is de-active

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Example: Send data "1234567890" to remote device via LE Central

<<   AT+LESEND=10,1234567890

>>   OK

2.5 Bluetooth Serial Commands (BR/EDR HID)

2.5.1 Read HID State

Format: AT+HIDSTAT

Response: +HIDSTAT=Param

Param: Refer to Chapter 3 for state description

2.5.2 Establish HID Connection

Format: AT+HIDCONN{=Param}

Param: MAC address of target device (12 Bytes ASCII)

Description : If the parameter does not exist, the module will attempt to connect to the last device

2.5.3 Release HID Connection

Format: AT+HIDDISC

Description : Release current HID connection with remote device

2.5.4 Read/Write HID Send Delay

Format: AT+HIDDLY{=Param} Param: HID Send Delay (2~4 Bytes ASCII,Default:10)

Response: +HIDDLY=Param

Description : Different phones may require different delay settings to achieve the best HID transmission speed and stability

Example: Read current HID Send Delay *<<   AT+HIDDLY* *>>   +HIDDLY=10* *>>   OK*

2.5.5 Read/Write HID Transfer Mode

Format: AT+HIDMODE{=Param} Param: HID Mode (0 ~ 10 , Default:1)

Response: +HIDMODE=Param

Description : This command applies to keyboards in multiple countries . Refer to Chapter 3 for format description of hid mode

Example: Read current HID Mode

<<   AT+HIDMODE

>>   +HIDMODE=0

>>   OK

Example: Change module's hid mode to Spain Keyboard

<<   AT+HIDMODE=4

>>   OK

2.5.6 IOS Device On-screen Keyboard Toggle

Format: AT+ HIDOSK

Description : This instruction applies only to the IOS Device

2.5.7 Send Data Via HID

Format: AT+HIDSEND=Param1, Param2

Param1 : Payload length (1~180)

Param2 : Payload (1~180 Bytes UTF8)

Description : If throughput mode is on, this command is de-active

Example: Send data "1234567890" to remote device via HID

<<   AT+HIDSEND=10,1234567890

>>   OK

3. Indication Table

3.1 General Indications

3.1.1 Scan Result

Format: +SCAN =Param1 , Param2 , Param3, Param4 {, Param5 , Param6}

Param1: Index (1~8)

Param2: Device address type (0~2)

      (0)LE public address

      (1)LE random address

      (2)BR/EDR address

Param3 : MAC address (12 Bytes ASCII)

Param4: RSSI (-255 ~ 0)

Param5: Size of Param6 if exist

Param6: Device Name for BR/EDR devices or advertising data for LE devices

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Description : Param5/Param6 may not exist if remote device out of distance

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Example: Scan nearby BR/EDR devices

<<   *AT+SCAN=1*

>>   *OK*

+SCAN={

+SCAN=1,2, DC0D30000003, -32,8, Feasycom

+SCAN=2,2, DC0D30000044, -64,8, Feasycom_1234

+SCAN=3,2, DC0D30000097, -47,8, TESTHID

+SCAN=}

3.2 Bluetooth Serial Indications

3.2.1 SPP State

Format: +SPPSTAT=Param

Param:(0 ~3)

      (0) Unsupported

      (1) Standby

      (2) Connecting

      (3) Connected

3.2.2 LE Peripheral State

Format: +GATTSTAT=Param

Param:(0 ~3)

      (0) Unsupported

      (1) Standby

      (2) Connecting

(3) Connected

3.2.3 LE Central State

Format: +LESTAT=Param
Param:(0 ~3)
      (0) Unsupported
      (1) Standby
      (2) Connecting
      (3) Connected

3.2.4 HID State

Format: +HIDSTAT=Param
Param:(0 ~3)
      (0) Unsupported
      (1) Standby
      (2) Connecting
      (3) Connected

3.2.5 HID Transfer Mode

Format: +HIDMODE=Param
Param:(0 ~10)
      (0) HID Key Value
      (1) English Keyboard
      (2) USA Keyboard
      (3) Turkey Keyboard
      (4) Spain Keyboard
      (5) Portugal Keyboard
      (6) France Keyboard
      (7) Germany Keyboard
      (8) Italy Keyboard
      (9) Czech Keyboard
      (10) Japan Keyboard

3.2.6 HID Send Success

Format: +HIDSEND
Description : HID mode buffer data transmission success indication HIDSEND

3.3 GPIO Indications

3.3.1 LED Pin

PIN 32 (Output)
Low Level   Initializing
Blink in 1Hz   Ready to connecting
High Level   Connected

3.3.2 State Pin

PIN 33 (Output)
Low Level   Disconnected
High Level   Connected