Bluetooth Programming User Guide

v1.5

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1. Introduction

This document describes the software interface of the Feasycom Bluetooth modules.

The Feasycom Bluetooth modules dedicated for the integration of Bluetooth applications in any system requiring a complete embedded Bluetooth solution. The main target of this software interface is to provide users a high level command set, highly hiding the internal complexity of the Bluetooth function and the variability of its implementations across different devices.

This software interface is based on commands that are sent from an application to the Feasycom Bluetooth module and on events that are sent from the Feasycom Bluetooth module to the host application.

2. Glossary

AT (ATtention) : this two-character abbreviation is always used to start a command line sent by the Host to the module. By extension, the commands/events used in the software interface are called AT commands.

BT (Bluetooth) : Refers to the Bluetooth Standard as specified in [7].

GATT(Generic Attribute Profile):defines a service framework using the Attribute Protocol
.

SDP (Service Discovery Protocol) : protocol where a BT device discovers the services available on another BT device.

SPP (Serial Port Profile) : defines the protocols and procedures that shall be used by devices using Bluetooth for RS232 (or similar) serial cable emulation.

HID (Human Interface Device) : Bluetooth profile that specifies a protocol for devices such as mouse and keyboards.

UART (Universal Asynchronous Receiver Transmitter) : full-duplex asynchronous serial communication between two devices using 2 wires.

3. Software interface

3.1 Command

Format:
AT+Command[=Parameter]<CR><LF>

Description:
❖ Command always start with AT+ and end with <CR><LF>.
❖ <CR> means "carriage return" and corresponds to the hexadecimal value 0x0D.
❖ <LF> means "line feed" and corresponds to the hexadecimal value 0x0A.
❖ Parameter between [ ] may not exist.
❖ Parameter always start with =if exist.

Example :
AT+BDNAME=? <CR><LF> :Query current device's name.
AT+BDPIN=8888 <CR><LF> :Modify current device's pin code to '8888'.
AT+SPPSEND=3,XYZ <CR><LF>:Send 'XYZ' to remote device via SPP profile.
AT+HIDDISC<CR><LF> :Disconnect HID profile.

3.2 Response

Format 1:
<CR><LF>+Response#code<CR><LF>
Format 2:
<CR><LF>+Response[=payload]<CR><LF>

Description:
❖ Response always start with <CR><LF>+ and end with <CR><LF>.
❖ For some commands ,it is necessary to tell the Host about the operation result in format 1, the result code always start with #.
❖ Other data sent from module in format 2,response payload start with = if exist.

Example :
<CR><LF>+HIDSEND#0<CR><LF>:Command AT+HIDSEND executed successfully.
<CR><LF>+SPPCONN#1<CR><LF>:Command AT+SPPCONN executed failed,code=1.
<CR><LF>+PBNAME=Feasycom <CR><LF> :The current device's name 'Feasycom'.
<CR><LF>+SPPSTAT=3 <CR><LF> :The SPP entered 'Connected' status.
<CR><LF>+LESREC=3,123 <CR><LF> :The LE-Server received data '123'.

Result codes:

0: Success.

1: Invalid state.

2: Invalid syntax/parameter.

3: Device is Busy.

3.3 How to read

- Blue : AT commands/responses or indications.
- red : argument names of commands/indications (between '[' and ']').
- *green* : description about the behaviour.
- H : means this is a command send from HOST
- B : means this is a indication send from Bluetooth Module

General Commands

BDNAME

Query/Modify Device Name

Parameter

[?]　　　　　:Query device name [Device Name]:Modify device name

Response

B:+BDNAME=[Device Name]

Example

Case 1: Query device name H:AT+BDNAME=? B:+BDNAME=Feasycom # Case 2: Modify device name H:AT+BDNAME=ABC B:+BDNAME=ABC

BDPIN

Query/Modify Device Pin

Parameter
[?]　　　　　: *Query device PIN* [Device PIN]: *Modify device PIN*
Response
B: +BDPIN=[Device PIN]
Example
Case 1: Query device PIN H: AT+BDPIN=? B: +BDPIN=0000 # *Case 2: Modify device PIN* H: AT+BDPIN=1234 B: +BDPIN=1234

BDBAUD

Query/Modify Device Baudrate

Parameter
[?]   :*Query device baudrate* [Device Baudrate] :*Modify device baudrate*
Response
B: +BDBAUD=[Device Baudrate]
Example
Case 1: Query device baudrate H: AT+BDBAUD=? B: +BDBAUD=115200 # *Case 2: Modify device baudrate* H: AT+BDBAUD=9600 B: +BDBAUD=9600

BDADDR

Query Device Address
Parameter
[?]: *Query device address*
Response
B: +BDADDR=[Device Address]
Example
H: AT+BDADDR=? B: +BDADDR=112233445566

BDVER

Query Device Software and Hardware Version

Parameter
[?]: *Query device software&hardware version*
Response
B: +BDVER=[SW version,HW version]
Example
H: AT+BDVER=? B: +BDVER=1.1,2.0

BDMODE

Switch Device Mode and Pair

Parameter
[0]: *Stay in current mode and enter pairing* [1]: *Switch to SPP mode and enter pairing* [2]: *Switch to HID mode and enter pairing* [3]: *Switch to LE mode and enter pairing*
Response
B: +BDMODE=[Mode]
Example
H: AT+BDMODE=1 B: +BDMODE=1
Note
1 Enter pairing will cause disconnection of current mode 2 Switch to different mode will cause module reset

BDDFU

Device Firmware Upgrade(DFU)
Parameter
None
Response
B: +BDDFU#[Result]
Example
H: AT+BDDFU B: +BDDFU#0

Extended read link quality command

Parameter

[Type]: *0:Read Link quality.*
1:Read RSSI,
For a BR/EDR Controller. The RSSI parameter returns the difference between the measured Received Signal Strength Indication (RSSI) and the limits of the Golden Receive Power Range for a Connection Handle to another BR/EDR Controller. Any positive RSSI value returned by the Controller indicates how many dB the RSSI is above the upper limit, any negative value indicates how many dB the RSSI is below the lower limit. The value zero indicates that the RSSI is inside the Golden Receive Power Range.
Range: -128 to 127 (signed integer) , Units: dB
For an LE transport. The meaning of the RSSI metric is an absolute receiver signal strength value in dBm. If the RSSI cannot be read, the RSSI metric shall be set to 127.
Range: -127 to 20, 127 (signed integer) , Units: dBm
2:Read the absolute RSSI of a BR/EDR connection.

Response

B: +BDRLQE#[Result]
B: +BDRLQE=[Type,Value]

Example

H: AT+BDRLQE=1
B: +BDRLQE#0
B: +BDRLQE=1,F5

BDDPL

Delete paired device list, and perform a module reset
Parameter
None
Response
B: +BDDPL#[Result]
Example
H: AT+BDDPL B: +BDDPL#0

BDQPL

Query paired device list
Parameter
None
Response
B: +QPL[[Index]:[Remote MAC]] B: +BDQPL#[Result]
Example
H: AT+BDQPL B: +QPL[1:112233445566] B: +BDQPL#0

BDEDUT

Enable Device Under Test(DUT) mode, or exit from any test mode, a module reset will be performed if mode changed

Parameter
[Command]: *0:Exit from any test mode* *1:Enable DUT mode*
Response
B: +BDEDUT#[Result]
Example
H: AT+BDEDUT=1 B: +BDEDUT#0

BDETCT

Enable tester continuous Tx

Parameter

[Modulation]:*0x00:CW*
         0x01:GFSK(BR)
 	
         0x02:π/4-DQPSK(2-EDR)
 	
         0x03:8DPSK(3-EDR)
         0x04:BLE
[Test pattern]:*0x00:PN9*
         0x01:PN15
         0x02:5555(0101 0101 0101 0101)
         0x03:All 1
         0x04:All 0
         0x05:F0F0(1111 0000 1111 0000)
         0x06:FF00
[Frequency]:*Range:0-78(decimal).*
         Selects Bluetooth frequency channel for transmission. Frequency channel index(k). Equation:
         Freq = 2402 + 2k, for k=0,1,2,...39
         Freq = 2403 + 2(k-40), for k=40,41,...78
[Power level]:*Range:0x00-0x0F*
         15, Max Output Power
         0, Min Output Power
Note: All the parameters should format to decimal

Response
B: +BDETCT#[Result]

Example
H: AT+BDETCT=1,1,1,1 B: +BDETCT#0

BDETCR

Enable tester continuous Rx

Parameter
[Frequency]:*Range:0-78(decimal).* *Selects Bluetooth frequency channel for* *transmission. Frequency channel index(k).* *Equation:* *Freq = 2402 + 2k, for k=0,1,2,...39* *Freq = 2403 + 2(k-40), for k=40,41,...78* [ADPLL loop mode]:*0x00:Open Loop – Used during Scanning* *Modes,i.e. Inquiry Scan and Page Scan* *0x01:Close Loop – Used during Connection* *Modes,i.e. Active and Sniff Mode* Note: All the parameters should format to decimal

Response
B:+BDETCR#[Result]

Example
H:AT+BDETCR=1,0 B:+BDETCR#0

BDETPX

Enable tester packet Tx/ Rx

Parameter

[Frequency Mode]:*0x00:Hopping*
0x03:Single frequency

[TX Single Freq]:*Range:0-78(decimal).*
Selects Bluetooth frequency channel for transmission. Frequency channel index(k). Equation:
$Freq = 2402 + 2k$, *for* $k=0,1,2,...39$
$Freq = 2403 + 2(k-40)$, *for* $k=40,41,...78$

[RX Single Freq]:*Range:0-78(decimal),0xFF.*
Selects Bluetooth frequency channel for transmission. Frequency channel index(k). Equation:
$Freq = 2402 + 2k$, *for* $k=0,1,2,...39$
$Freq = 2403 + 2(k-40)$, *for* $k=40,41,...78$
0xFF - Disable Rx (packet Tx only)

[ACL packet type]:

0x00:DM1	*0x06:2-DH1*
0x01:DH1	*0x07:2-DH3*
0x02:DM3	*0x08:2-DH5*
0x03:DH3	*0x09:3-DH1*
0x04:DM5	*0x0A:3-DH3*
0x05:DH5	*0x0B:3-DH5*

[ACL packet data pattern]:*0x00:All 0*
0x01:All 1
0x02:5555(0101 0101 0101 0101)
0x03:F0F0(1111 0000 1111 0000)
0x04:Ordered
0x05:PRBS9 random

[Power level]:*Range:0x00-0x0F*
15, Max Output Power
0, Min Output Power

Note: All the parameters should format to decimal

Response

B: +BDETCR#[Result]

Example

H: AT+BDETCR=1,0
B: +BDETCR#0

SPP Commands

SPPSTAT

Query SPP Status

Parameter
[?]: *Query SPP status*

Response
B: +SPPSTAT=[Status]

Example
H: AT+SPPSTAT=? B: +SPPSTAT=2

SPPCONN

Connect SPP To Remote Device

Parameter
[Address]:*12 bytes ASCII address of remote device*   None:*Inform BT to connect to the last device of which MAC address and link key stored in non-volatile memory.*

Response
B:+SPPCONN#[Result] B:+SPPSTAT=[Status]

Example
Case 1: Connect to device with specified MAC address H:AT+SPPCONN=112233445566 B:+SPPCONN#0 B:+SPPSTAT=2 B:+SPPSTAT=3 # *Case 2: Connect to last device use stored MAC address* H:AT+SPPCONN B:*See case 1*

SPPDISC

Disconnect SPP With Remote Device

Parameter
None
Response
B: +SPPDISC#[Result] B: +SPPSTAT=[Status]
Example
H: AT+SPPDISC B: +SPPDISC#0 B: +SPPSTAT=1

SPPSEND

Send Data To Remote Device Via SPP
Parameter
[Length,Data]: 'Length' bytes of 'Data', The maximum SPP data length is 1000
Response
B: +SPPSEND#[Result]
Example
H: AT+SPPSEND=10,1234567890 B: +SPPSEND#0

HID Commands

HIDSTAT

Query HID Status

Parameter
[?]: *Query HID status*
Response
B: +HIDSTAT=[Status]
Example
H: AT+HIDSTAT=? B: +HIDSTAT=2

HIDCONN

Connect HID To Remote Device

Parameter

[Address]:*12 bytes ASCII address of remote device*
     None:*Inform BT to connect to the last device of which MAC*
          address and link key stored in non-volatile memory.

Response
B: +HIDCONN#[Result] B: +HIDSTAT=[Status]

Example
Case 1: Connect to device with specified MAC address H: AT+HIDCONN=112233445566 B: +HIDCONN#0 B: +HIDSTAT=2 B: +HIDSTAT=3 # *Case 2: Connect to last device use stored address information* H: AT+HIDCONN B: *See case 1*

HIDDISC

Disconnect HID With Remote Device

Parameter
None

Response
B: +HIDDISC#[Result] B: +HIDSTAT=[Status]

Example
H: AT+HIDDISC B: +HIDDISC#0 B: +HIDSTAT=1

HIDSEND

Send Data To Remote Device Via HID

Parameter
[Length,Data]: *'Length' bytes of 'Data', The maximum HID data length is 500*

Response
B: +HIDSEND#[Result]

Example
H: AT+HIDSEND=10,1234567890 B: +HIDSEND#0

HIDOSK

iOS Device On-screen Keyboard Toggle

Parameter
None
Response
B: +HIDOSK=[Result]
Example
H: AT+HIDOSK B: +HIDOSK=0

HIDACEN

Enable or disable HID automatically connect feature

Parameter
[0]: *Disable HID automatically connect feature* [1]: *Enable HID automatically connect feature*
Response
B: +HIDACEN=[Result]
Example
H: AT+HIDACEN=1 B: +HIDACEN=0

BLE Commands

LESSTAT

Query LE-Server Status

Parameter

[?]: *Query LE-server status*

Response

B: +LESSTAT=[Status]

Example

H: AT+LESSTAT=? B: +LESSTAT=2

LESDISC

Disconnect LE-Server With Remote Device

Parameter

None

Response

B: +LESDISC#[Result] B: +LESSTAT=[Status]

Example

H: AT+LESDISC B: +LESDISC#0 B: +LESSTAT=1

LESSEND

Send Data To Remote Device Via BLE GATT

Parameter
[Length,Data]: *'Length' bytes of 'Data', The maximum LE data length is 1000*

Response
B: +LESSEND#[Result]

Example
H: AT+LESSEND=10,1234567890 B: +LESSEND#0

Indications

Miscellaneous
+PWRSTAT=1:   *Power on* +BDPIN=[Device Pin]:   *Device PIN* +BDBAUD=[Device Baudrate]:   *Device baudrate* +BDADDR=[Device Address]:   *12 bytes ASCII local device address* +BDVER=[SW version,HW version]:*Device SW&HW version* +BDNAME=[Device Name]:   *Device name* +SPPCONN#[Result]:   *SPP connect response* +SPPDISC#[Result]:   *SPP disconnect response* +SPPSEND#[Result]:   *SPP send data response* +SPPREC=[Length,Data]:   *'Length' bytes of 'Data' received via SPP* +HIDCONN#[Result]:   *HID connect response* +HIDDISC#[Result]:   *HID disconnect response* +HIDSEND#[Result]:   *HID send data response* +LESCONN#[Result]:   *LE-Server connect response* +LESDISC#[Result]:   *LE-Server disconnect response* +LESSEND#[Result]:   *BLE GATT send data response* +LESREC=[Length,Data]:   *'Length' bytes of 'Data' received via BLE GATT*

Status

Profile Status
+BDMODE=[Mode] [0]: Reserved [1]: SPP [2]: HID [3]: GATT(BLE)
SPP Status
+SPPSTAT=[Status] [0]: Not ready [1]: Ready [2]: Connecting [3]: Connected
HID Status
+HIDSTAT=[Status] [0]: Not ready [1]: Ready [2]: Connecting [3]: Connected
LES Status
+LESSTAT=[Status] [0]: Not ready [1]: Ready [2]: Connecting [3]: Connected

Low Power Status
+LPMODE=[Mode] [0]: *Module is in active mode* [1]: *Module is in low power mode*
GPIO Status
Pin[3]High   (Output): *Connected* Pin[3]Low   (Output): *Not Connected* Pin[4]High   (Input) : *Wakeup Indication* Pin[4]Low   (Input) : *Sleep Indication*

Revision history

Date	Revision	Changes
1-Aug-2014	V1.0	First release
1-Sept-2014	V1.2	Add usage for AT Command "HIDCONN" Add AT Command "BDVER" Add AT Command "HIDOSK" Rename AT Command "PAIR" to "BDMODE"
9-Sept-2014	V1.3	Add AT Command "BDJ2BL" Add AT Command "HIDACEN"
15-Mar-2015	V1.4	Add AT Command "BDRLQE" Add AT Command"BDDPL" Add AT Command"BDQPL" Add AT Command"BDEDUT" Add AT Command"BDETCR" Add AT Command"BDETCT" Add AT Command"BDETPX" Rename AT Command "BDJ2BL"to"BDDFU" Add command bookmarks Modify GPIO Status
20-Mar-2015	V1.5	Modify usage of AT Command "HIDSEND" Modify usage of AT Command "SPPSEND" Modify usage of AT Command "LESSEND" Update Indication, Status chapter