Bracelet Bluetooth Communication Protocol

Version	Reviser	Time	Revision
V10	Tony	2020.07.07	1.First Version
V11	Tony	2020.07.17	1.add 'Service UUID' in broadcast data 2.add 'Identification' 3.add 'Device name' 4.add 'Device setting': vibration, beep, indicator light, detection interval, detection threshold, departure judged time, OTA enble 5.add 'Instruction set'
V12	Tony	2020.07.18	1.add 'Device power off' 2.'detection interval' range from 1 to 30s
V13	Tony	2020.08.01	1.change length of 'version' 2.'beep' is off by default
V14	Tony	2020.08.07	1.add 'read temperature ADC'
V15	Tony	2020.09.12	1. detection interval value 0 means 1.5 second 2. detection threshold is range from 70 to 96
V16	Zhiming Zhong	2020.10.27	1. Change the beep config to the temperature unit config, includes Celsius and Fahrenheit;

Catalogue

1. Broadcast Data

1.1 Broadcast Data Format

Broadcast data is a combination of multiple data, each of which has a unique identifier, the specific format is as follows:

Function	Byte	Description
packet length	1 Byte	packet identification length(1) + packet data length(N)
packet identification	1 Byte	used to distinguish different types of data
packet data	N Byte	

Bracelets use the following signs:

Identification	Ble Standard	Description
0x01	broadcast type	packet identification length(1) + packet data length(N)
0xFF	manufacturer	user broadcast data

	custom data	
0x09	device name	device name
0x02	service UUID	service UUID

1.2 Broadcast Data Detail Introduction

1.2.1 Broadcast Type

The broadcast type is 0x06, indicating that this device is a BLE device.

Current packet length	Identification	Data
0x02	0x01	0x06

1.2.2 Manufacturer Custom Data

The manufacturer custom data is user broadcast data.

Current packet length	Identification	Data
0x08	0xFF	0x22 + 0x07 + 5 byte variable data

1.2.3 Device Name

The default device name is eBracelet。

Current packet length	Identification	Data
0x0A	0x09	eBracelet

1.2.4 Service UUID

The default UUID is 0xFF00.

Current packet length	Identification	Data
0x03	0x02	0x00 0xFF

2. Service Custom&UUID

The bracelet includes the following services:

Service	UUID	Description
Generic Access	0x1800	Bluetooth specification for indicating device name information
Generic Attribute	0x1801	Bluetooth specification
DIS device info	0x180A	Use to indicate manufacturer, model, firmware version, etc.
BAS battery info	0x180F	Used to indicate battery level
Data transmission	0xFF00	Used to send and receive data between the moblie APP and the bracelet

OTA	0x1911	Used to update the bracelet

2.1 Battery Info Service

The UUID of Battery Info Service is 0x180F, contains a service characteristic value:

Characteristic	Battery Level
uuid	0x2A19
Access	Read & Notify
Description	The battery rating is used to indicate the use of the device's battery, the level range is 0%~100%, 0% indicates that the battery is fully charged and 100% indicates that the battery is fully charged.

2.2 Data Transmission Service

The UUID of Data Transmission Service is 0xFF00, **contains 4 service characteristic values:**

Characteristic	SPP-DATA-ModuleToPhone
uuid	0xFF01
Access	Notify
Description	For sending data to the mobile APP ; Module → Phone The phone APP needs to enable this feature value, then the module can send data to the phone APP

Characteristic	SPP-DATA-PhoneToModule
uuid	0xFF02
Access	Write and Write without response
Description	For sending data to the module ;Phone → Module

3. Communication Format

Data frame is the basic unit of data transmission. Each frame is composed of command code, data length, data field and check code. Each field is composed of several bytes. The specific frame format is as follows:

Field	Code	Bytes	Description
Code	CMD	1	See the following description

Packet length	DLC	1	The byte length of packet data
Packet data	DATA	N	Complete the function with command code, variable length, see the following description
Check code	SUM	1	The sum of all the bytes above

3.0 Instruction Set

Function	Code	Length	Data	Description
get device MAC	0x01	01	01	
get device version	0x02	01	01	
get device battery	0x03	01	01	
get device time	0x04	01	01	
set device time	0x05	04	unix timestamp	
exchange random number	0x06	17	random number	Ssed for identity authentication, random is 8 bytes, the remaining 9 bytes of data are reserved
authentication	0x07	17	authentication data	Authentication data is 16 bytes, the remaining 1 byte of data is reserved
get device name	0x08	01	01	
set device name	0x09	variable	device name	The maximum length of the device name is 17 bytes, using ascii encoding
get device config	0x0A	01	01	get config values such as vibration, beep, indicator light, detection interval, detection threshold, departure judged time, OTA enble
set device config	0x0B	07	config value	set config values such as vibration, beep, indicator light, detection interval, detection threshold, departure judged time, OTA enble
shut down device	0x0C	01	01	
read temperature ADC	0x10	01	01	
statistic offline data	0x11	01	00	
read offline data	0x12	04	start position read count	
clear offline data	0x13	01	00	

3.1 Get Device MAC

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x01
DLC	1	= 0x01
DATA	1	= 0x01
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x81
DLC	1	= 0x06
DATA	6	Device MAC is 6 bytes,high byte is first
SUM	1	Check code, the sum of all the bytes above.

3.2 Get Device Version

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x02
DLC	1	= 0x01
DATA	1	= 0x01
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x82
DLC	1	N(Variable)
DATA	N	Version, ASCII encoding
SUM	1	Check code, the sum of all the bytes above.

3.3 Get Device Battery

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x03
DLC	1	= 0x01
DATA	1	= 0x01
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x83
DLC	1	= 0x03
DATA0	1	Battery voltage high byte, hex
DATA1	1	Battery voltage low byte, hex
DATA2	1	Battery percent, range from 1-100(estimated)
SUM	1	Check code, the sum of all the bytes above.

Note: Battery is 2 hex, unit is mV,

Example: DATA0 = 0x10,DATA1 = 0x23, battery voltage =0x1023 dec value is 4131mV

3.4 Get Device Time

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x04
DLC	1	= 0x01
DATA	1	= 0x01
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x84
DLC	1	= 0x04
DATA	4	unix timestamp, high byte is first, 4 bytes
SUM	1	Check code, the sum of all the bytes above.

3.5 Set Device Time

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x05
DLC	1	= 0x04
DATA	4	unix timestamp, high byte is first, 4 bytes
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x85
DLC	1	= 0x01
DATA	1	= 0x00 Success = 0x01 Fail
SUM	1	Check code, the sum of all the bytes above.

3.6 Exchange Random Number

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x06
DLC	1	= 0x11
DATA0	8	Random random_m, 8 bytes
DATA1	9	Reserved
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x86
DLC	1	= 0x11
DATA0	8	Random random_s, 8 bytes
DATA1	9	Reserved
SUM	1	Check code, the sum of all the bytes above.

3.7 Authentication

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x07
DLC	1	= 0x11
DATA0	16	Authentication data, AuthData
DATA1	1	Reserved
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x87
DLC	1	= 0x11
DATA0	16	Reserved
DATA1	1	= 0x00 Authentication succeed = 0x01 Authentication failed, not exchange random = 0x02 Authentication failed, authentication data is error = 0x03 Authentication failed, the number of errors has exceeded the limit.Please reconnect = 0x04 Authentication is succeed already, no need to authenticate again

SUM	1	Check code, the sum of all the bytes above.

3.8 Get Device Name

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x08
DLC	1	= 0x01
DATA	1	= 0x01
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x88
DLC	1	N(Variable)
DATA	N	Device name, ADCII encoding, the maximum length is 17 bytes
SUM	1	Check code, the sum of all the bytes above.

3.9 Set Device Name

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x09
DLC	1	N(Variable)
DATA	N	Device name, ADCII encoding, the maximum length is 17 bytes
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x89
DLC	1	= 0x01
DATA	1	= 0x00 Success = 0x01 Fail
SUM	1	Check code, the sum of all the bytes above.

3.10 Get Device Config

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x0A

DLC	1	= 0x01
DATA	1	= 0x01
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x8A
DLC	1	= 0x07
DATA0	1	Whether vibrates when detects other bracelets = 0x00 Close = 0x01 Open(default)
DATA1	1	The temperature unit showed on the bracelet uint = 0x00 Celsius(default) = 0x01 Fahrenheit
DATA2	1	Whether lights when detects other bracelets = 0x00 Close = 0x01 Open(default)
DATA3	1	Detection interval, unit: second, range is 0 and 1-30, default is 0. And the 0 is 1.5s, other value is normal correspondence relation
DATA4	1	Detection threshold, unit is dBm, range is 70-96, default is 78
DATA5	1	Departure judged time, unit is second, range is 2-60, default is 5
DATA6	1	OTA enable = 0x00 Close = 0x01 Open(default)
SUM	1	Check code, the sum of all the bytes above.

3.11 Set Device Config

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x0B
DLC	1	= 0x07
DATA0	1	Whether vibrates when detects other bracelets = 0x00 Close = 0x01 Open = 0xFF No change
DATA1	1	The temperature unit showed on the bracelet uint = 0x00 Celsius(default) = 0x01 Fahrenheit
DATA2	1	Whether lights when detects other bracelets = 0x00 Close

		= 0x01 Open = 0xFF No change
DATA3	1	Detection interval, unit: second, range is 0 and 1-30, default is 0. 0 is 1.5s, 0xFF means no change
DATA4	1	Detection threshold, unit is dBm, range is 70-96, default is 78. 0xFF means no change
DATA5	1	Departure judged time, unit is second, range is 2-60, default is 5, 0xFF means no change
DATA6	1	OTA enable = 0x00 Close = 0x01 Open = 0xFF No change
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x8B
DLC	1	= 0x01
DATA	1	= 0x00 Success = 0x01 Fail
SUM	1	Check code, the sum of all the bytes above.

3.12 Shut Down Device

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x0C
DLC	1	= 0x01
DATA	1	= 0x01
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x8C
DLC	1	= 0x01
DATA	1	= 0x01 Power down device in one second
SUM	1	Check code, the sum of all the bytes above.

3.13 Read Temperature ADC

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x10
DLC	1	= 0x01
DATA	1	= 0x01
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x90
DLC	1	= 0x02
DATA0	1	Temperature ADC high byte, hex
DATA1	1	Temperature ADC low byte, hex
SUM	1	Check code, the sum of all the bytes above.

3.14 Statistic Offline Data

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x11
DLC	1	= 0x01
DATA	1	= 0x00
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x91
DLC	1	= 0x04
DATA0	1	Number of saved offline data, high byte, hex
DATA1	1	Number of saved offline data, low byte, hex
DATA2	1	Number of remained offline data, high byte, hex
DATA3	1	Number of remained offline data, low byte, hex
SUM	1	Check code, the sum of all the bytes above.

3.15 Read Offline Data

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x12
DLC	1	= 0x04
DATA0	1	Start position of offline data, high byte, hex
DATA1	1	Start position of offline data, low byte, hex
DATA2	1	Read count of offline data, high byte, hex

DATA3	1	Read count of offline data, low byte, hex
SUM	1	Check code, the sum of all the bytes above.

Note: DATA0=0x00, DATA1=0x00, DATA2=0xFF, DATA3=0xFF, is reading all offline data.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x92
DLC	1	= 0x0F
DATA0	1	= 0 no more offline data = 1 more offline data
DATA1	1	Read count of offline data, high byte, hex
DATA2	1	Read count of offline data, low byte, hex
DATA3	1	Current No. of offline data, high byte, hex
DATA4	1	Current No. of offline data, low byte, hex
DATA5	4	unix timestamp, high bytes, 4 bytes
DATA6	6	Target MAC, high byte is first, 6 bytes
SUM	1	Check code, the sum of all the bytes above.

Note: Module send one offline data by one packet

3.16 Clear Offline Data

Phone → Module

Code	Byte Count	Description
CMD	1	= 0x13
DLC	1	= 0x01
DATA	1	= 0x00
SUM	1	Check code, the sum of all the bytes above.

Module → Phone

Code	Byte Count	Description
CMD	1	= 0x93
DLC	1	= 0x01
DATA	1	= 0x00 Success = 0x01 Fail
SUM	1	Check code, the sum of all the bytes above.

4. Authentication

In order to prevent device parameters from being modified illegally, it is necessary to authenticate before modifying device parameters. Only after successful authentication, the following operation can be done: Set device time, Set devcie name, Set device config, Shut down device, Clear offline data.

Identity authentication uses AES encryption(ECB mode, PKCS7Padding), first the APP and the bracelet exchange random numbers (random_m and random_s), then the APP merges the 2 random

numbers, and perform AES calculation to obtain identity authentication data: AuthData=AES（devicekey,random_m + random_s）, the devicekey is the preset key(Please contact the manufacturer to get the devicekey). The same calculation is done on the device side, if the authentication data is consistent, the authentication is successful.

Identity authentication process: