Fenda wristband Protocol

Release History

Version	Date	Change reason
V0.0.1	2017/12/5	The original version
V0.0.2	2017/12/29	Establish data synchronization protocol.
V0.0.3	2018/1/14	Add data to send automatically.
V0.0.4	2018/2/3	Add the message transmission service
V0.0.5	2018/4/3	Fix some problems
V0.0.6	2018/4/9	Add the member ID
V0.0.9	2018/5/10	Add the rowing data in the “Current data”. Add the state of the motion in the detail data of the workout.
V0.1.0	2018/5/15	Add the “Data collection service”
V0.1.2	2018/6/12	Add the sleep total in the daily
V0.1.3	2018/7/18	Add control the workout Modify current data Add HR percent to workout summary
V0.1.4	2018/7/19	Add alarm on/off in alarm Add workout status in workout control
V0.1.5	2018/7/24	Delete pause workout Add device reset

V0.1.6	2018/8/13	Add OTF mode in workout
V0.1.7	2018/8/17	Add pair bound key Add open pair window
V0.1.8	2018/8/21	Add get history data
V0.1.9	2018/8/22	Add binding request

1. The list of the service

- Device information service
- Battery service
- Heart rate service
- Device setting service
- Data sync service
- Message transmission service (All day PPG only)
- Data collection service(just for the data collection)

2. Service introduce

2.1 Device Information Service

2.1.1 Service description

DIS is a standard service, specification is provided by Bluetooth organization

2.1.2 Characteristics

Manufacturer Name String - shall represent the name of the manufacturer of the device. Model Number String - shall represent the model number that is assigned by the device vendor.

Serial Number String - shall represent the serial number for a particular instance of the device. Hardware Revision String - shall represent the hardware revision of the device

Firmware Revision String - shall represent the firmware revision of the device.

Software Revision String - shall represent the software revision of the device.

System ID - shall represent a structure containing an Organizationally Unique Identifier (OUI) followed by a manufacturer-defined identifier and is unique for each individual instance of the product.

Manufacturer Name String : Fenda
Model Number String : To be defined
Hardware Revision String : To be defined
Firmware Revision String : To be defined
Software Revision String : To be defined
System ID : To be defined

2.2 Battery service

BAS is a standard service, specification is provided by Bluetoothorganization.

2.3 Heart rate service

HRS is a standard service, specification is provided by Bluetooth organization.

2.4Device setting service:

2.4.1 Service description

Device setting service defines how to change the device setting and personal information to the device.

2.4.2 Characteristics

2.4.2.1 Characteristics list

Personal setting information	Write , notify
Device setting	Write , notify

2.4.2.2 Personal setting information Command:

1’Set the personal body information:

Type of command : command

Characteristics: Personal setting information(write)							
Command type	Height	Weight	Sex	Birthday			Reserved
				month	day	year	
1 type	1 byte	2 byte	1byte	1byte	1 byte	2byte	11 byte

Command type: 0x01;
Height: 0 ~ 250 (cm);
Weight: 0 ~ 1000 (kg);
Sex: male – 0, female - 1;
Birthday: MM/DD/YYYY.

2’ Get the personal body information:

Type of command : request	
Characteristics: Personal setting information(write)	
Command type	Reserved
1 type	19 byte

Command type: 0x81;

Respond:

Type of command : respond							
Characteristics: Personal setting information(notify)							
Command type	Height	Weight	Sex	Birthday			Reserved
				month	day	year	
1 type	1 byte	2 byte	1byte	1 byte	1byte	2byte	11 byte

Command type: 0x01;
Height: 0 ~ 250 (cm);
Weight: 0 ~ 1000 (kg);
Sex: male – 0, female 1;
Birthday: MM/DD/YYYY.

3’Set the workout target:

Type of command : command						
Characteristics: Personal setting information (write)						
Command type	Step	Calorie	Distance	Splat pts	Number of workout	Reserved
1 type	3 byte	3 byte	3 byte	2	1	7byte

Commandtype: 0x02;

Step target: 0 ~0xffffff ;
Calorie target: 0 ~ 0xffffff (cal.)
Distance: 0 ~ 0xffffff (cm);
Splat pts: 0~0xffff;

4’ Get the workout target:

Type of command : request	
Characteristics: Personal setting information (write)	
Command type	Reserved
1 type	19 byte

Command type: 0x82;

Respond:

Type of command : respond						
Characteristics: Personal setting information (notify)						
Command type	Step	Calorie	Distance	Splat pts	Number of workout	Reserved
1 type	3 byte	3 byte	3 byte	2	1	7 byte

Command type: 0x02;
Step target: 0 ~ 0xffffff ;
Calorie target: 0 ~ 0xffffff (cal.)
Distance: 0 ~ 0xffffff (cm);

2.4.2.3Device setting Command:

1’Set the current time:

Type of command : command			
Characteristics: Device setting(write)			
Command type	UTC	Time offset	Reserved
1 type	4 byte	2 byte	13 byte

Command type: 0x01;
UTC: It is the value of UTC;
Time offset:0-0xffff (minute)

2’ Get the current time:

Type of command : request	
Characteristics: Device setting(write)	
Command type	Reserved
1 type	19 byte

Command type: 0x81;

Respond:

Type of command : respond			
Characteristics: Device setting(notify)			
Command type	UTC	Time offset	Reserved
1 type	4 byte	2 byte	13 byte

Command type: 0x01;

UTC: It is the value of UTC;

Time offset;

3'Set the alarm:

Type of command :command				
Characteristics:Device setting (write)				
Command type	Alarm 1	Alarm 2	Alarm 3	Reserved
1 type	3 byte	3 byte	3 byte	10byte

Command type: 0x02;

The max number of the alarm is 3:

Alarm value		
Hour	Min	Frequency
1 byte	1 byte	1 byte

Frequency:

Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	On/off

For example:

Bit 0: if Monday set 1, the bell rings every Monday of the week;

Bit 7: if on/off set 1, alarm on. If on/off set 0,alarm off.

4'Get the alarm setting:

Type of command : request	
Characteristics: Device setting (write)	
Command type	Reserved
1 type	19 byte

Command type: 0x82;

Respond:

Type of command :respond				
Characteristics: Device setting (notify)				
Command type	Alarm 1	Alarm 2	Alarm 3	Reserved
1 type	3 byte	3 byte	3 byte	10byte

Command type: 0x02;

The max number of the alarm is 3:

Alarm value		
Hour	Min	Frequency
1 byte	1 byte	1 byte

Frequency:

Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

5’ Set the display setting:

Type of command : command						
Characteristics: Device setting (write)						
Command type	Time format	Date format	Watch face	Unit	Language	Reserved
1 type	1 byte	1 byte	1 byte	1 byte	1 byte	14 byte

Command type: 0x03;

Time format:

Value	Meaning
0	24 h
1	12 h

Dime format:

Value	Meaning
0	Month/Day
1	Day/Month

Watch face:

The user selects Main page to display

Value		Meaning
0~7		Index of the watch face

Value:

0:TIME_STYLE1;

1:TIME_STYLE2;

2:TIME_STYLE3;

3:TIME_STYLE4;

4:TIME_STYLE5;

5:TIME_STYLE6;

6:TIME_STYLE7;

7:TIME_STYLE8;

Unit :

Value	Meaning
0	Metric
1	Imperial

Language:

Value	Meaning
0	English
1	Spanish
2	Arabic (standard)
3	Hebrew
4	Chinese
5	Japanese
6	Cantonese
7	French
8	French Canadian
9	German
10	Hindi

6’ Get the display setting:

Type of command : request	
Characteristics: Device setting (write)	
Command type	Reserved
1 type	19 byte

Command type: 0x83;

Respond:

Type of command : respond						
Characteristics: Device setting (write)						
Command type	Time format	Date format	Watch face	Unit	Language	Reserved
1 type	1 byte	1 byte	1 byte	1 byte	1 byte	14 bytes

Command type : 0x03;

Note: Date meaning is same as"Set the display setting" command.

8' Set the notification setting:

Type of command : command		
Characteristics: Device setting (write)		
Command type	On/Off switch	Reserved
1 type	1 byte	18 bytes

Command type: 0x04;

On/Off switch :

Value	Meaning
0	Enable the notification.
1	Disable the notification.

9' Get the notification setting:

Type of command : request		
Characteristics: Device setting (write)		
Command type	On/Off switch	Reserved
1 type	1 byte	18 bytes

Command type: 0x84;

Respond:

Type of command : respond		
Characteristics: Device setting (notify)		
Command type	On/Off switch	Reserved
1 type	1 byte	18 bytes

Command type: 0x04;

On/Off switch:

Value	Meaning
0	Enable the notification.
1	Disable the notification.

10’ Factory reset:

Type of command : command	
Characteristics: Device setting (write)	
Command type	Reserved
1 type	19 bytes

Command type: 0x05;

Respond:

Type of command : respond	
Characteristics: Device setting (notify)	
Command type	Reserved
1 type	19 bytes

Command type: 0x05;

11’ Start OTA:

Type of command : command	
Characteristics: Device setting (write)	
Command type	Reserved
1 type	19 bytes

Command type: 0x06;

Respond:

Type of command : respond	
Characteristics: Device setting (notify)	
Command type	Reserved
1 type	19 bytes

Command type: 0x06;

12’Set the Member ID:

Type of command : command		
Characteristics: Device setting (write)		
Command type	Member ID	Reserved
1 type	5 byte	14 byte

Command type: 0x07;

13’ Get the Member ID

Type of command : request	
Characteristics: Device setting (write)	
Command type	Reserved
1 type	19 byte

Command type: 0x87;

Respond:

Type of command : respond		
Characteristics: Device setting (notify)		
Command type	Member ID	Reserved
1 type	5 byte	14 byte

Command type: 0x07;

14’ Start/Active Workout

Type of command : request	
Characteristics: Device setting (write)	
Command type	Reserved
1 type	19 byte

Command type: 0x0C;

Respond:

Type of command : respond		
Characteristics: Device setting (notify)		
Command type	Workout status	Reserved
1 type	On/off	18 bytes

Command type: 0x8C;
If workout status set 1, workout on. Else workout off

15’ Stop/Inactive Workout

Type of command : request	
Characteristics: Device setting (write)	
Command type	Reserved
1 type	19 byte

Command type: 0x0D;
Respond:

Type of command : respond		
Characteristics: Device setting (notify)		
Command type	Workout status	Reserved
1 type	On/off	18 bytes

Command type: 0x8D;
If workout status set 1, workout on. Else workout off

16’ device reset

Type of command : request	
Characteristics: Device setting (write)	
Command type	Reserved
1 type	19 byte

Command type: 0x0E;
Respond:

Command type	Reserved
1 type	18 bytes

Command type: 0x0E;
17’ pair bound key

Type of command : request		
Characteristics: Device setting (write)		
Command	Key data	Reserved

type		
1 type	6byte	13 byte

Command type: 0x12;

Respond:

Command type	Pair status	Reserved
1 type	1type	18 bytes

Command type: 0x12;

Pair status, if it is 0,pair fail, else success.

18’ open pair window

Type of command : request	
Characteristics: Device setting (write)	
Command type	Reserved
1 type	19 byte

Command type: 0x13;

Respond:

Command type	Reserved
1 type	19 bytes

Command type: 0x13;

18’ binding request

Type of command : request	
Characteristics: Device setting (write)	
Command type	Reserved
1 type	19 byte

Command type: 0x14;

Respond:

Command type	Reserved
1 type	19 bytes

Command type: 0x14;

2.6 Data Sync service

2.6.1 Service description

Data synchronization shows daily activity and workout sport session stored in a device. This section is to describe the whole synchronization routine.

2.6.2 Characteristics

2.6.2.1 Characteristicslist

Daily activity	notify
Workout mode	notify
Current data	notify
Command data	Write, notify

2.6.2.2 Daily activity Command

1'Get the daily activity data:

When the Daily activity characteristics is enable, the device would upload the daily activity data.

A. Daily data structure

Daily data summary	Include total steps, total calorie ,total distance, Splat pts
Detail data	Include heart rate ,step, distance

B. Daily data format

Daily data summary(first package):

Type of command : Data update(Daily data summary)						
Characteristics: Daily activity (notify)						
Command type	Date	Total step	Total cal	Total distance	Total Splat pts	Total move
1 byte	4 byte	4 byte	4 byte	4 byte	2 byte	1 byte

Command type: 0x01;

Date: UTC time(the beginning time of the day);

Total step:0 ~ 0xffffffff;

Total cal : 0 ~ 0xffffffff(calroie);

Splat pts: 0 ~ 0xffff;

Total Distance:0~0xffffffff(cm)

move：0~0xff

Daily data summary(second package):

Type of command : Data update(Daily data summary)		
Characteristics: Daily activity (notify)		
Command type	Total sleep time	Reserved
1 byte	2 byte	17byte

Command type: 0x02;

Total sleep time:0~0xffff(minute);

Detail data:

Type of command : Data update(Detail data)			
Characteristics: Daily activity (notify)			
Command type	Time	Type of the data	Value
1 type	4 byte	1 byte	14 byte

Command type: 0x03;

Time : UTC;

Type of the data:

Value	Meaning
0x01	Node data
0x02	HR test
0x03	Stress test
0x04	Sleep data

Value:

Node data

Step	Distance	Calorie	Heart rate	Stress test	Reserved
2 byte	2 byte	2 byte	1 byte	1 byte	6byte

Note: Every 1 minutes, the device would create a data point, every 5 minutes the device would do the heartrate test. every 10 minutes the device would do the stress test. In the data point, if the device did not do the stress test, the value of the stress test should be 0xff.

HR test

HR	Reserved
1 byte	13 byte

Note: HR test got correct data after 30s

Stress test

Stress lever	Reserved
1 byte	13 byte

Note: Stress test got correct data after 60s

Sleep data

Sleep value	Reserved
1 byte	13 byte

Sleep value:

0x00: other

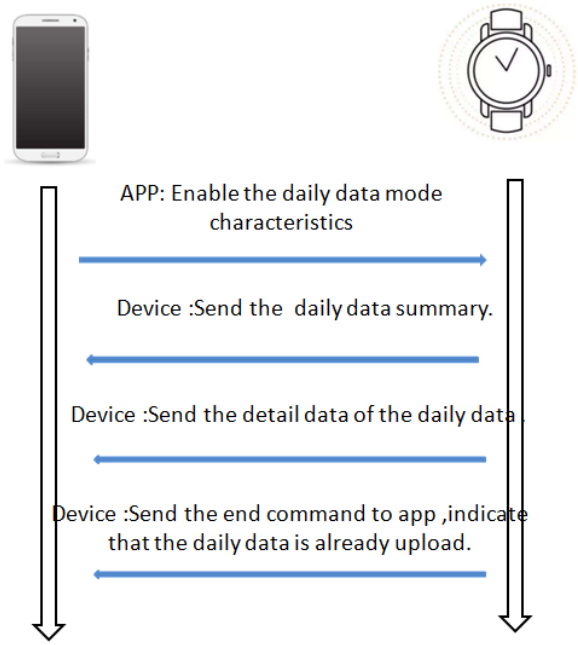
0x01: light sleep

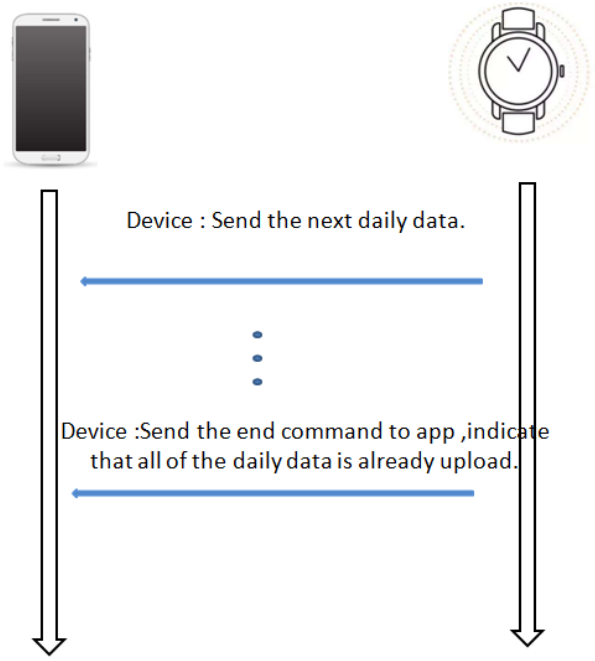
0x02: Deep sleep

0x03: sober

Note:The sleep data need to be counted at the end of the entire sleep cycle, so it sent the sleep data after the end of the sleep.

C. Daily data upload flow chart:





2.6.2.3 Workout data Command

2’ Get the workout mode data:

When app enable the Workout mode characteristic, the device would send the data that record in the device.

A. Workout data structure

Workout summary	Include total steps, total calorie ,total distance,time of duration , Max heart rate, Mix heart rate etc.
Detail data	Include heart rate , step,distance.

B. Workout data format:

Workout summary:

In workout summary , it has 3 packets.

Type of command : Data update(First packet)										
Characteristics: Workout mode (notify)										
Command	Workout	Workout	Start	End	Max	Mix	Average	Duration	Duration	Duration

type	index	type	time	time	HR	HR	HR	of heart rate zone 1	of heart rate zone 2	of heart rate zone 3
1 type	1 byte	1 byte	4 byte	4 byte	1 byte	1 byte	1 byte	2 byte	2 byte	2 byte

Command type: 0x01;
Workout Index : the index of the workout.
Workout type :

Value	Meaning
0x00	OTF
0x01	Run
0x02	Walk
0x03	Bike
0x04	Weights
0x05	Others
0x06	Fit test

Start time: UTC;
End time: UTC;
Max HR: 0 ~ 240(BMP);
Mix HR: 0 ~ 240(BMP);
Average HR: 0 ~ 240(BMP) ;
Duration of heart rate zone 1 ~ 65535(S)
Duration of heart rate zone 2 ~ 65535(S)
Duration of heart rate zone 3 ~ 65535(S)

Type of command : Data update(Second packet)							
Characteristics: Workout mode (notify)							
Command type	Workout Index	Duration of heart rate zone 4	Duration of heart rate zone 5	Total calorie	Total step	Splat pts	Distance
1 type	1 byte	2 byte	2 byte	4 byte	4 byte	2 byte	4 byte

Command type: 0x02;
Workout Index : the index of the workout
Duration of heart rate zone 4 ~ 65535(S)
Duration of heart rate zone 5 ~ 65535(S)
Total calorie: 0 ~ 65535 (calorie);
Total step: 0 ~ 65535
Splat pts: 0 ~ 0xffff

Distance: 0~0xffffffff(cm)

Fit test mode:

Fit test (Distance 4 byte)	
Distance	Fit test result
2 byte	2byte

		Type of command : Data update(Third packet)		
		Characteristics: Workout mode (notify)		
Command type	Workout Index	Member ID	HR percent	Reserved
1 type	1 byte	5 byte	1byte	12 byte

Command type: 0x03;

Workout Index : the index of the workout

Member ID: 0 ~ 0xfffffffff;

HR percent:0 - 100

Detail data:

For every point , the device would store the data(HR, step , Distance, Calorie)

Type of command : Data update(Detail data)								
Characteristics: Workout mode (notify)								
Command type	Workout Index	Time	HR	Step	Distance	Calorie	State type	Reserved
1 type	1 byte	4 byte	1 byte	2 byte	2 byte	1 byte	1 byte	7 byte

Command type: 0x04;

Time: UTC;

HR: 0 ~ 240(BMP);

Step: 0 ~ 65535;

Distance : 0 ~ 65535(cm);

Note: In workout mode , every 12 second , the device would create a data point.

Workout data end command:

When the device has already upload the workout data, the device would send the workout data end command to the app.

Type of command : Data update(Workout data end command)		
Characteristics: Workout mode (notify)		
Command type	Workout Index	Reserved
1 type	1 byte	18 byte

Command type: 0x05;

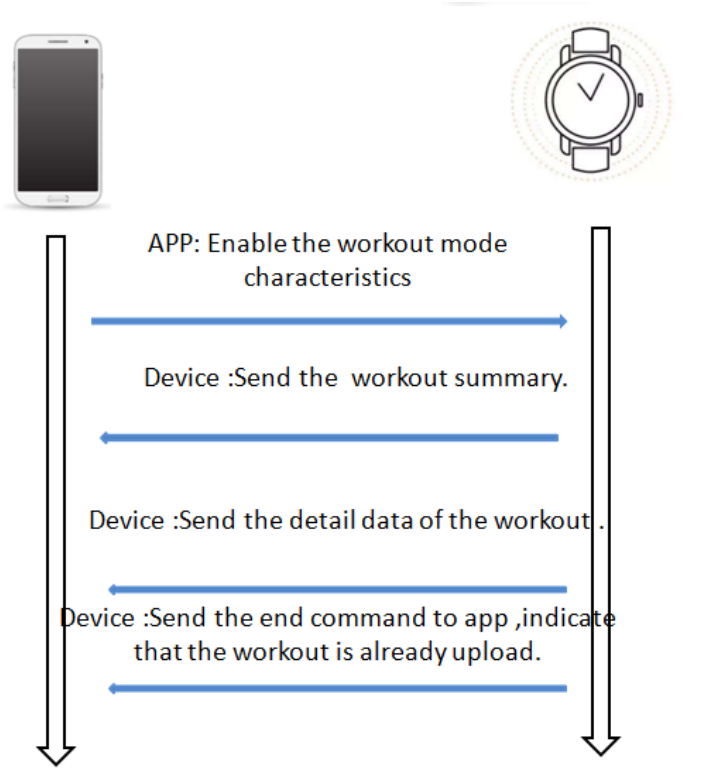
All of the Workout data end command :

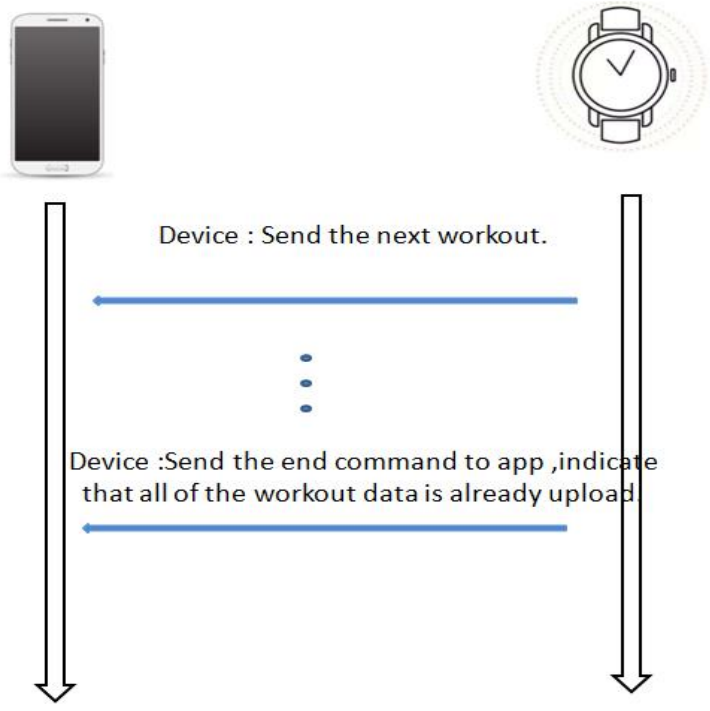
When the device has already upload the all workout data, the device would send this command to the app.

Type of command : data update(All of the Workout data end command)		
Characteristics: Workout mode (notify)		
Command type	Workout Index	Reserved
1 type	1 byte	18 byte

Command type: 0x06;

C. Workout data upload flow chart:





4 phone send command to device

4.1 Erasure the hole flash

Type of command : command	
Characteristics: Command data (write)	
Command type	Reserved
1 type	19 byte

Command type: 0x01;

Index: 0 ~ TBD;

4.2 get workout data

Type of command : command	
Characteristics: Command data (write)	
Command type	Reserved
1 type	19 byte

Command type: 0x02;

Index: 0 ~ TBD;

4.3 get daily data

Type of command : command	
Characteristics: Command data (write)	
Command type	Reserved
1 type	19 byte

Command type: 0x03;

Index: 0 ~ TBD;

5’ Get the current data :

When app enable the Current data characteristic, the device would send the data at a certain frequency.

Type of command : Current data								
Characteristics: Current data (notify)								
Device state	HR	Step	Distance	Calorie	Splat pts	move	stress	Reserved
1 byte	1 byte	4 byte	4 byte	4 byte	1 byte	1byte	1byte	3byte

Device state:

Value	Meaning
0x00	Daily mode
0x01	Run
0x02	Walk
0x03	Bike
0x04	Weights
0x05	Others
0x06	Fit test
0x07	Device_Basic

Step: 0 ~ 0xffffffff;

Distance : 0 ~ 0xffffffff(cm);

Calories : 0~0xffffffff(calorie)

Splat pts: 0 ~ 0xffff;

Note: In workout mode , the device would send the current data every second, without workout mode , the device would send the data at a certain frequency(10 min).

2.7 Message transmission service

2.7.1 Service description

Message transmission service defines how to get the message that from smart phone. It is different from other services, the Apple Notification Center Service (ANCS) in IOS system is the only way to get the message . In Android system,it should follow the message transmission service that defined by Fenda.

2.7.2.Characteristics

2.7.2.1 Characteristics list

Message	write
Message contral	notify

2.7.2.2 Message format

Message		
Message type	Title	Content

1’Message type : it indicates which application the message came from.

2’ Title: this section is the title of the message.

3’ Content: this section is the content of the message.

2.7.2.3 Data packet

1’ Message type

Data packet : Message type				
Characteristics: Message (write)				
Command type	Message type	Message UUID	Continuous flag	Reserved
1 byte	1 byte	2 byte	1 byte	15 byte

Command type: 0x01
Message type:

Continuous flag: If the message do not have the title and the content ,the continuous flag should be zero , otherwise it should be one.

1	Incoming call
2	Incoming call end
3	SMS
4	Facebook
5	Twitter
6	What apps
…	…

Message UUID: Every message should have a uuid to Identify.

2 ‘ Message title

Data packet : Message title			
Characteristics: Message (write)			
Command type	UUID	Continuous flag	Message
1 byte	2 byte	1 byte	16 byte

Command type: 0x02.
Message UUID: This UUID indicates which message the current titile belong to.
Continuous flag: If the flag set to zero ,it means that the title transfer is

complete, so if it is one ,it means the next packet is also the title.

2’ Message content

Data packet : Messagecontent			
Characteristics: Message (write)			
Command type	UUID	Continuous flag	Message
1 byte	2 byte	1 byte	16 byte

Command type: 0x03.

Message UUID: This UUID indicates which message the current content belong to.

Continuous flag: If the flag set to zero ,it means that the content transfer is complete, so if it is one ,it means the next packet is also the content

2.7.2.4 Message control

The device side allows the user to control the message. Blew is the command.

1’ Positive command

Command type : Positive command		
Characteristics: Message control (notify)		
Command type	Message UUID	Reserved
1 byte	2 byte	17 byte

Command type: 0x01.

Message UUID: This UUID indicates which message that the command would control.

2’ Negative command

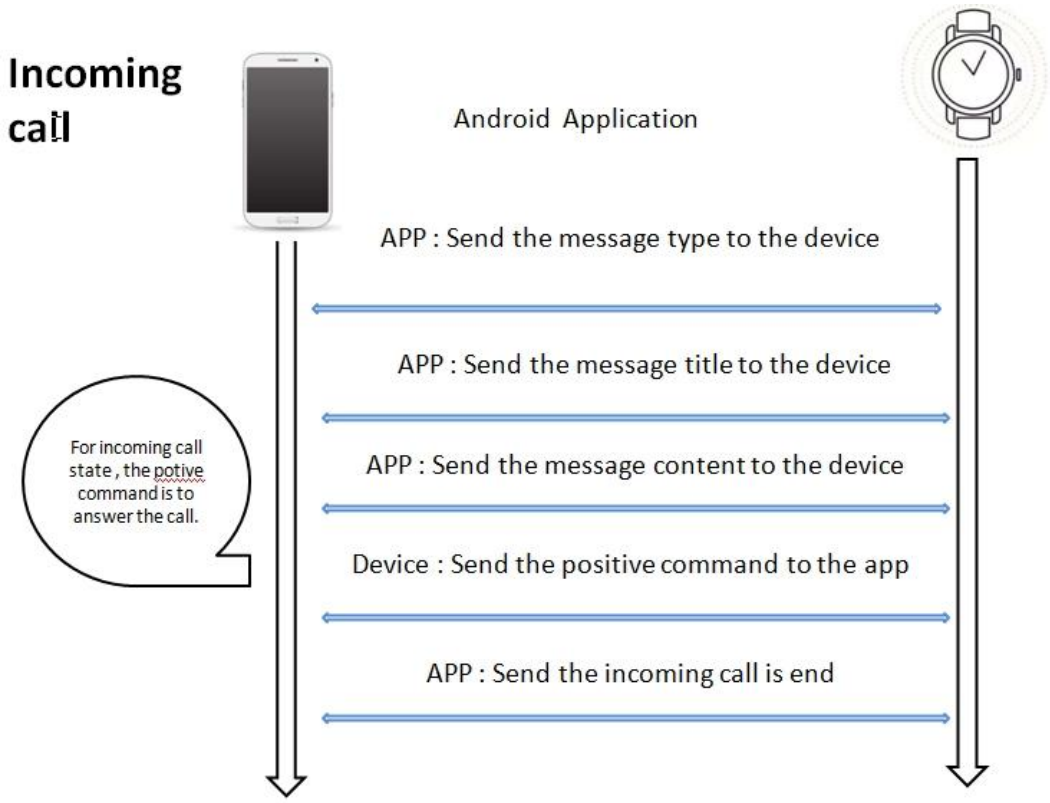
Command type : Negative command		
Characteristics: Message control (notify)		
Command type	Message UUID	Reserved
1 byte	2 byte	17 byte

Command type: 0x02.

Message UUID: This UUID indicates which message that the command would control.

2.7.3 Example:

Incoming call:



APP Send message type to the device:

{0x01,0x01,0x00,0x01,0x01,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,

0x00,0x00,0x00,0x00,0x00,0x00,0x00}

APP Send message title to the device:

{0x02,0x00,0x01,0x00,0x31,0x33,0x35,0x33,0x37,0x36,0x36,0x38,0x37,

0x39,0x30,0x00,0x00,0x00,0x00,0x00}

APP Send message content to the device:

{0x03,0x00,0x01,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,

0x00,0x00,0x00,0x00,0x00,0x00,0x00}

Device Send positive command to the APP:

{0x01,0x00,0x01,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,

0x00,0x00,0x00,0x00,0x00,0x00,0x00}

APP send the incoming call is end:

{0x01,0x03,0x00,0x01,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,

0x00,0x00,0x00,0x00,0x00,0x00,0x00}

2.7.4 Note

For the incoming call , the positive command is answer the call , the negative command is reject the call, and if the message do not have the content ,the content should set to zero.

2.8 Data collection service

2.7.1 Service description

Data collection service defines how to get the raw data that from peripheral. Now It only can be use to get the raw data from the 6D sensor.

2.8.2.Characteristics

2.8.2.1 Characteristics list

Data collection control	Write/ notify
Raw data channel 1	notify

2.8.2.2 Data collection control command:

5’ Get the raw data from channel 1:

When app enable the raw data channel 1, the device would send the raw data at a certain frequency.

Type of command : Get raw data from channel 1	
Characteristics: Current data (notify)	
Device state HR	Raw data structure
2 byte	18 byte

The data structure base on the type of the raw data.

3. Note:

All of the data patterns is Little-endian.