

Beacon / iBeacon / MiniBeacon

Instructions V1.3

Item	History	Version	Updated Date
MiniBeacon Instructions	Initial version	V1.0	12 th , October 2013
	1. App source code; 2. How to configure the ibeacon via App; 3. Device information; 4. Battery capacity notification; 5. How to change the pairing password; 6. How to change UUID, major, minor; 7. How to change the broadcasting cycle; 8. How to transmission power level; 9. How to adjust proximity accuracy; 10. How to load your own firmware; 11. How to upgrade the firmware via OTA;	V1.1	28 th , December 2013
	1. App source code AirLocate; 2. Add a Beacon Serial ID to MiniBeacon; 3. How to soft reboot the device;	V1.2	24 th , February 2014
	1. New parameter 0xFFFE; 2. Long range BLE module MS47SF3; 3. LightBlue upgraded; 4. Canceled the instructions related to OAD;	V1.3	8 th , June 2014

IMPORTANT TIPS

1. MiniBeacon will disconnect with App automatically when the connection is built over 5 minutes; it saved more power consumption;
2. The changed parameters will be saved and taken effect by soft reboot the MiniBeacon;
3. The instruction manual contains how to configure the parameters of MiniBeacon correctly;
4. The instructions manual is also suitable for the App developers to use, it will help them to understand more about the theory of low energy Bluetooth protocol.

App Source Code (SDK)

The reference app source code is compiled success on iOS 7.0 and Xcode 5.02, we would like to send it to you by Email once you got the MiniBeacon

You can also download the public APP LightBlue and MultiTool from Apple store to do test.

Characteristics List

The parameters of MiniBeacon are integrated into the service OxFFF0, the default setting of MiniBeacon is listed as below Table 1.

Parameter	Definition	Permissions	Default Value and Range (HEX)	Length
0xFFFF1	Proximity UUID	READ/WRITE	0xE2C56DB5DFFB48D2B060D0F5A71096E0	16 octets
0xFFFF2	Major	READ/WRITE	0x0000 (0x0000 – 0xFFFF)	2 octets
0xFFFF3	Minor	READ/WRITE	0x0000 (0x000 – 0xFFFF)	2 octets
0xFFFF4	Measured power	READ/WRITE	0xC5 (0x00 – 0xFF)	1 octet
0xFFFF5	Transmission Power	READ/WRITE	0x00 (0x00 – 0xFF)	1 octet
0xFFFF6	Pairing Password	WRITE	0x0F0FF3 (Decimal:987123)	3 octets
0xFFFF7	Broadcasting Interval	READ/WRITE	0x01-0xFF(100mS – 25500mS)	1 octet
0xFFFF8	Beacon Serial ID	READ/WRITE	Random (0x0000 – 0xFFFF / 1-65535)	2 octets
0xFFFE	Connection Mode	READ/WRITE	0x00 (0x00 – 0xFF)	1 octet
0xFFFF	Soft Reboot	WRITE	0x0F0FF3 (Decimal:987123)	3 octets

Table 1

Detecting the MiniBeacon via LightBlue

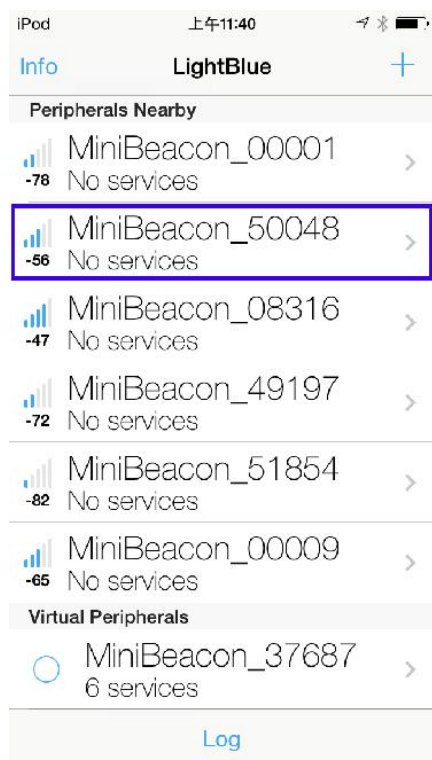


Image 1

Instructions:

1. There are many MiniBeacons were detected by LightBlue;
2. MiniBeacon_50048 is the test one we are used for the instructions;

Usage:

1. Please open the housing of MiniBeacon to turn on the sliding switch before the 1st using;
2. Then MiniBeacon will start to broadcast at once;
3. At last, please cover the housing and fix the MiniBeacon.

Tips:

1. Please do prevent the ESD damaging beacon module when you opened / covered the housing;

Access to the MiniBeacon via LightBlue

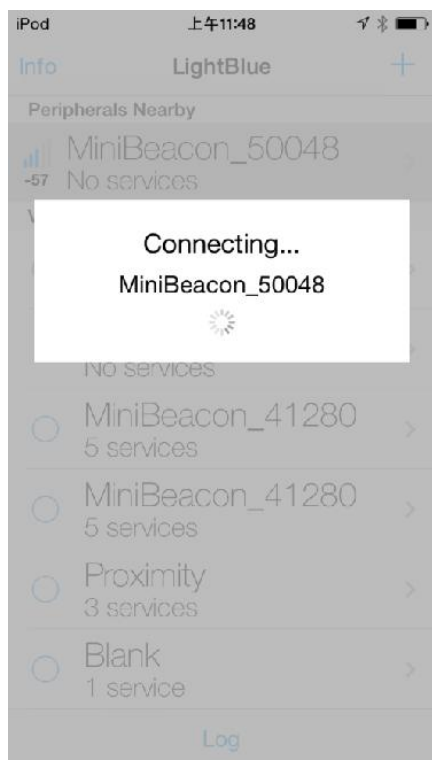


Image 2

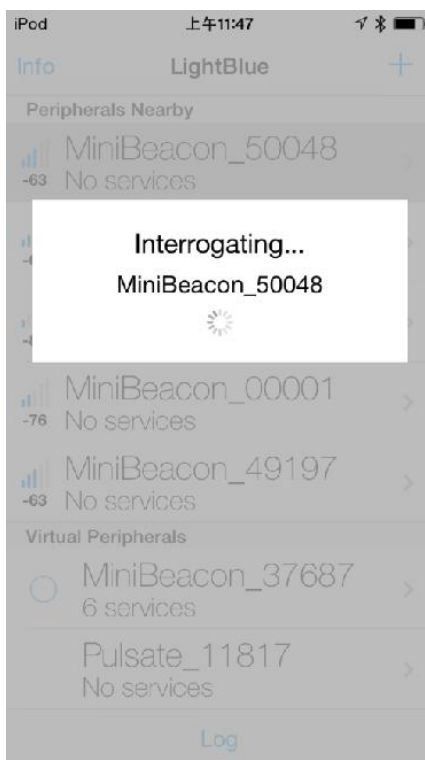


Image 3

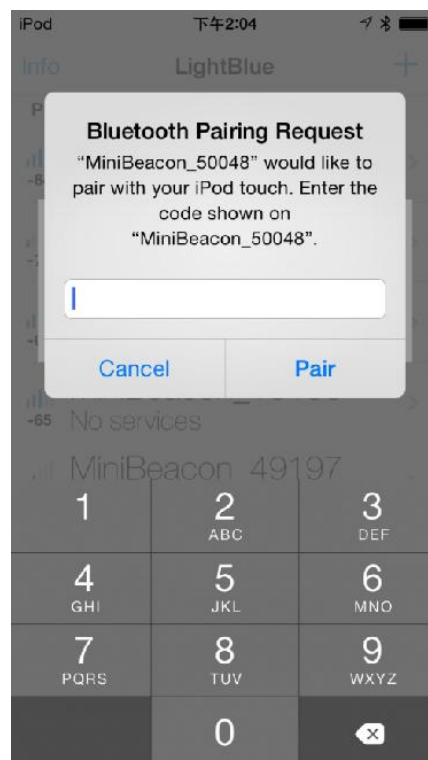


Image 4

Operation:

1. Click the “MiniBeacon_50048” as shown on Image 1;
2. Then the Image 2, Image 3 and Image 4 will be shown on the screen of iOS device in turn;
3. Please input the pairing password 987123 when the Image 4 was occurred;

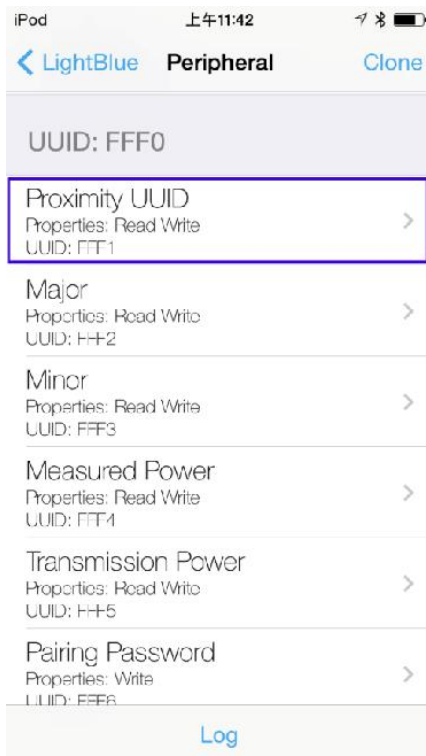
Proximity UUID (0xFFFF1)

Image 5

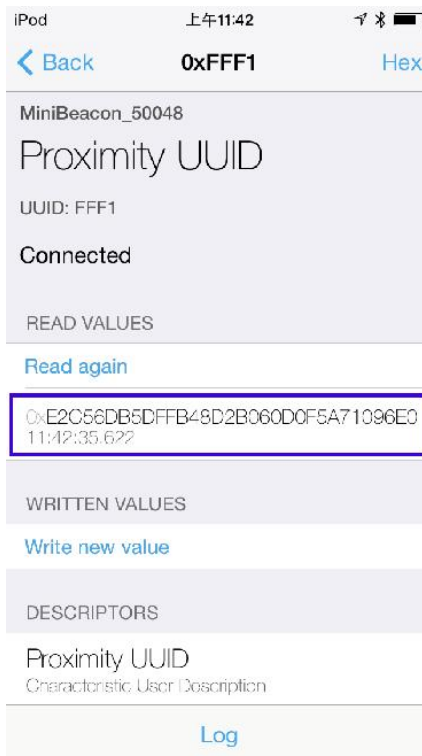


Image 6

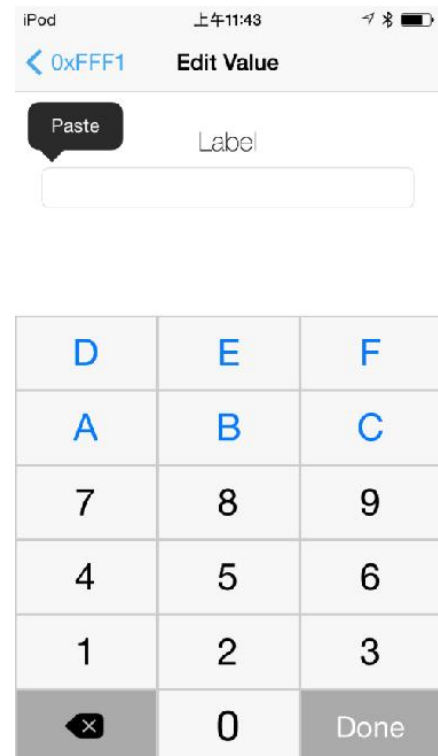


Image 7

Instructions:

1. Default Proximity UUID: 0xE2C56DB5DFFB48D2B060D0F5A71096E0 (shown on Image 6)
2. The default proximity UUID is the same as the example which given by Apple;
3. The proximity UUID consists of 128 bits / 16 octets;
4. The proximity UUID is a unique service UUID for MiniBeacon;
5. The proximity UUID can be changed by LightBlue and customer own App;

Change the UUID:

1. Click “Proximity UUID” on Image 5, and then you can access to the parameter on Image 6;
2. Click the blue characters “Write new value” on Image 6 to change the UUID;
3. Then input a new UUID in HEX code on the soft keyboard shown on Image 7, then click “Done”;
4. Soft reboot the MiniBeacon_50048 by writing the parameter 0xFFFFF.

Tips:

1. Proximity UUID must be HEX code;
2. Proximity UUID should be same as the your App’s UUID; if not, your App can’t detect any Beacons;

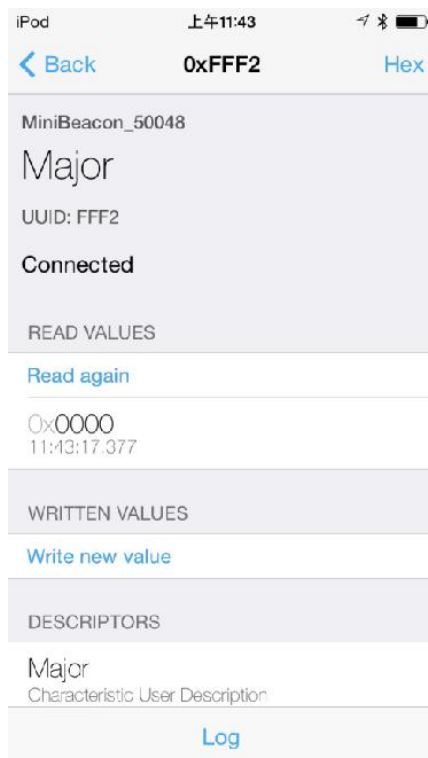
Major and Minor (0xFFFF2, 0xFFFF3)

Image 8

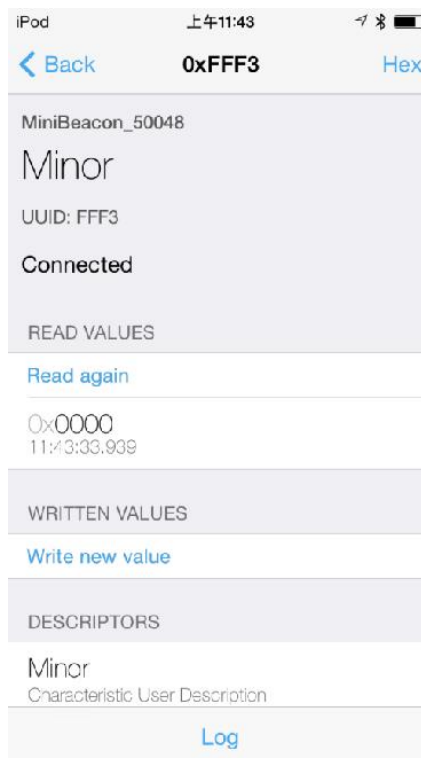


Image 9

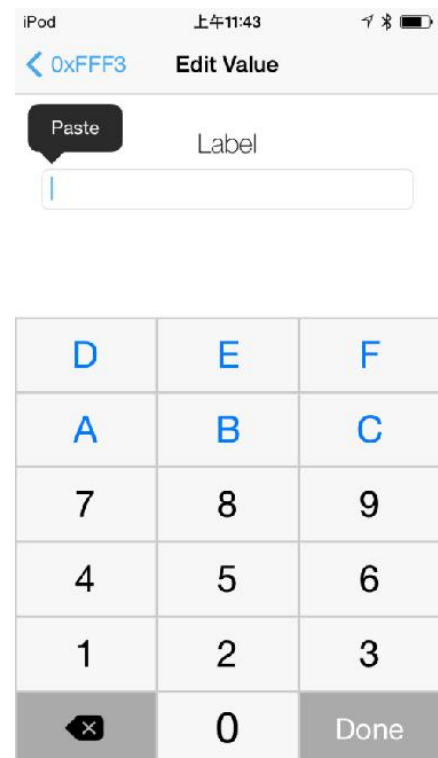


Image 10

Instructions:

1. Default Major: 0x0000, the range is from 0x0000 to 0xFFFF;
2. Default Minor: 0x0000, the range is from 0x0000 to 0xFFFF;
3. Major and Minor values all consist of 2 octets;

Change the value of Major and Minor:

1. Click "Major" or "Minor" on Image 5, and then you can access to the parameter on Image 8/9;
2. Click the blue characters "Write new value" on Image 8/9 to change the value of Major/ Minor;
3. Then input a new value in HEX code on the soft keyboard shown on Image10, and then click "Done";
4. Soft reboot the MiniBeacon_50048 by writing the parameter 0xFFFF.

Tips:

1. The Big octets will be the first sent out by MiniBeacon;
2. For example:
 - 2.1 The Major value 0x0001 was saved as the array Major[2]={0x00, 0x01};
 - 2.2 The data Major[0]=0x00 will be the first sent out, the following is Major[1]=0x01.

Measured Power (0xFFFF4)

Image 11

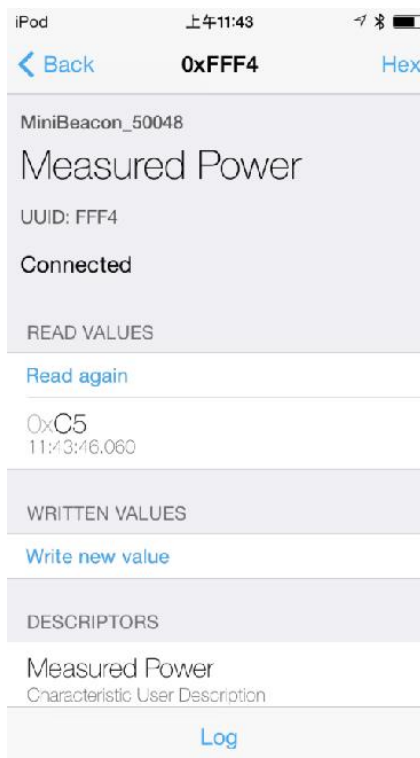


Image 12

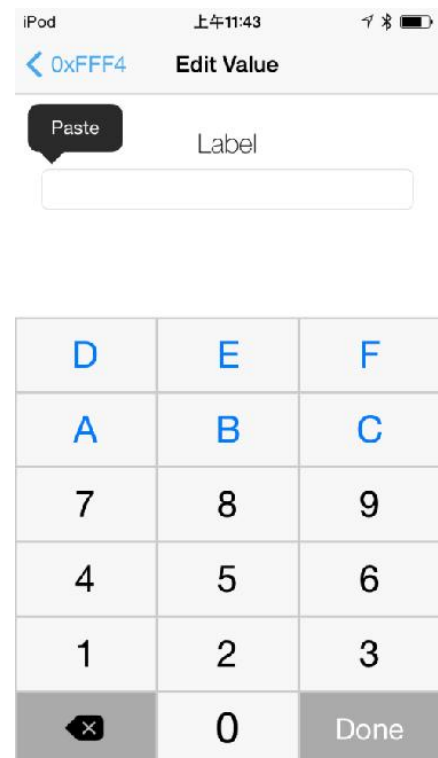


Image 13

Instructions:

1. Default Measured Power: 0xC5, the range is from 0x00 to 0xFF;
2. The value of Measured Power consists of 1 octet;

Change the Measured Power:

1. Click "Measured Power" on Image 11, and then you can access to the parameter on Image 12;
2. Click the blue characters "Write new value" on Image 12 to change the value of Measured Power;
3. Then input the new value in HEX code on the soft keyboard shown on Image13, and then click "Done";
4. Soft reboot the MiniBeacon_50048 by writing the parameter 0xFFFF.

Improve the accuracy of location:

1. Hold the iPhone 5S in a portrait orientation with the top half uncovered (this includes cases);
2. While the beacon is advertising, repeatedly sample the RSSI at a 1 meter distance for a minimum of 10 seconds;
3. Discard the highest 10% of the RSSI samples;
4. Discard the lowest 20% of the RSSI samples;
5. Average the remaining samples to obtain the Measured Power value;

If you get the average value of RSSI is -65dBm, please calculate it as the below methods:-

1. $-65 + 256 = 191$;
2. Change 191 from decimal to hex: 0xBF;
3. Write the Hex code 0xBF to 0xFFFF4 as the above "change the Measured Power";
4. Soft reboot the beacon to take effect the new value of measured power;

Transmission Power (0xFFFF5)



Image 14

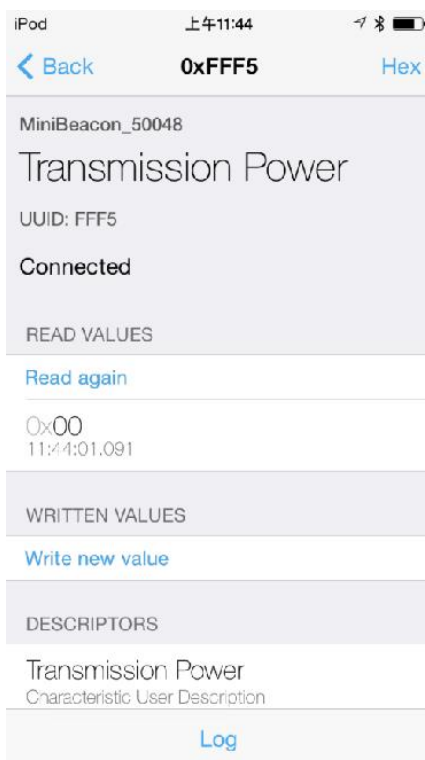


Image 15

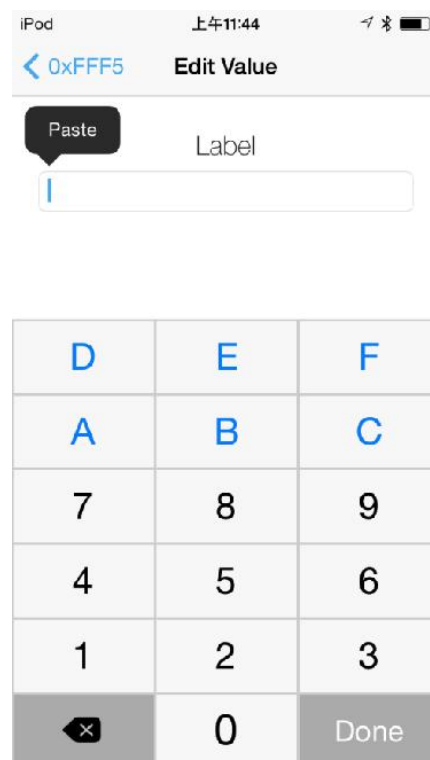


Image 16

Instructions:

1. Default value: 0x00, the range is from 0x00 to 0x03;
2. The value of Transmission Power consists of 1 octet;

Change the Transmission Power as the Table 2:

1. Click "Transmission Power" on Image 14, and then you can access to the parameter on Image 15;
2. Click the blue characters "Write new value" on Image 15 to change the Transmission Power;
3. Then input a new value in HEX code on the soft keyboard shown on Image16, and then click "Done";
4. Soft reboot the MiniBeacon_50048 by writing the parameter 0xFFFFF.

Transmission Power	Tx Power Value	Range (meters)	BLE4.0 Chip
0x00	0 dBm	50 - 70	CC2540 / CC2541
0x01	+ 4 dBm	70 - 150	Reserved for CC2540
0x02	- 6 dBm	15 - 30	CC2540 / CC2541
0x03	-23 dBm	5 - 15	CC2540 / CC2541

Table 2

Pairing Password (0xFF6)



Image 17

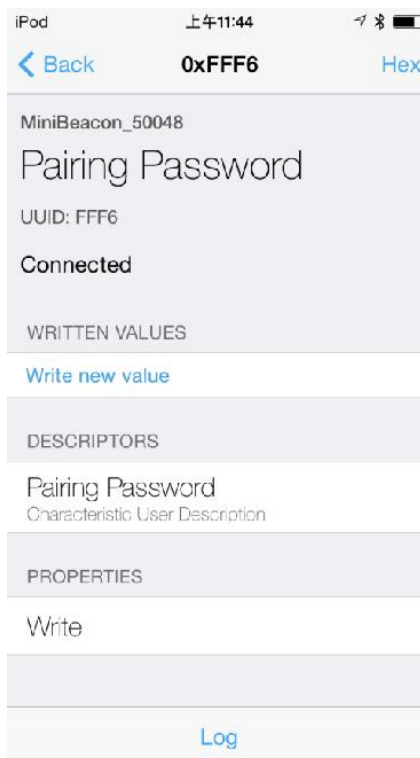


Image 18

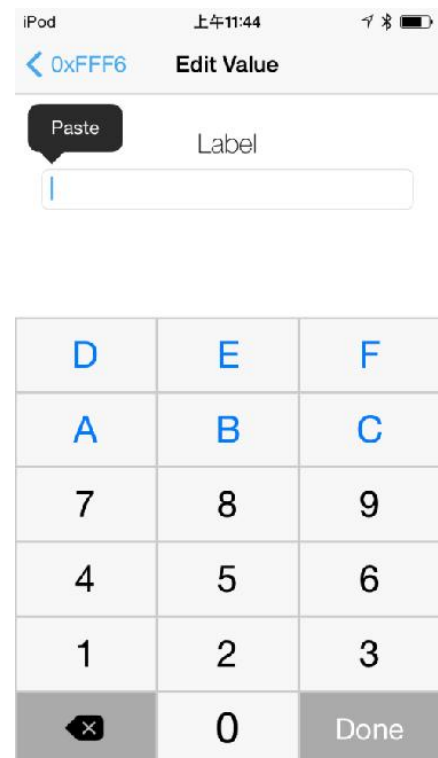


Image 19

Instructions:

1. Default value: 0x0F0FF3, the range is from 0x000001 to 0x0F423F (Decimal: 000001-999999);
2. Pairing Password consists of 3 octets;

Change the Pairing Password:

1. Click "Pairing Password" on Image 17, and then you can access to the parameter on Image 18;
2. Click the blue characters "Write new value" on Image 18 to change the Pairing Password;
3. Then input a new value in HEX code on the soft keyboard shown on Image19, and then click "Done";
4. Soft reboot the MiniBeacon_50048 by writing the parameter 0xFFFF.

Tips:

1. The Pairing Password is the value of Soft Reboot. If the Pairing Password has been changed, the value of Soft Reboot will be changed at the same time;
2. The Big octets will be the first sent out by MiniBeacon;
3. The corresponding decimal rule of 0x0F0FF3 is 987123;
4. For example:
 - 3.1 The Pairing Password 0x0F0FF3 was saved as the array PSW[3]={0x0F, 0x0F, 0xF3};
 - 3.2 The data PSW[0]=0x0F will be the first sent out, the following is PSW[1]=0x0F, PSW[2] will be sent at the last;

Broadcasting Interval (0xFFFF7)

Image 20

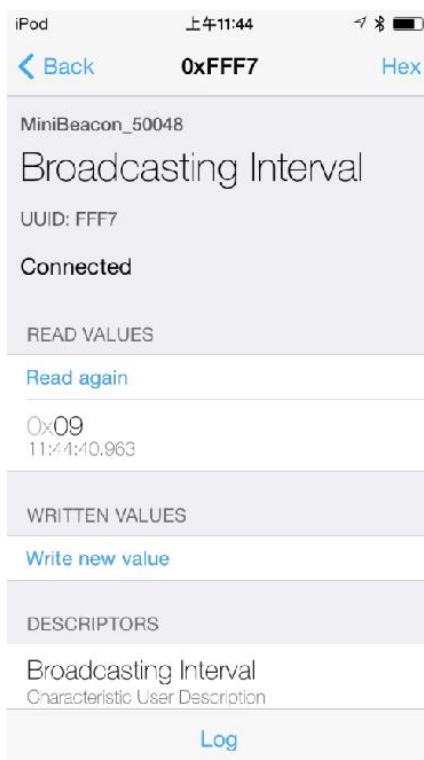


Image 21

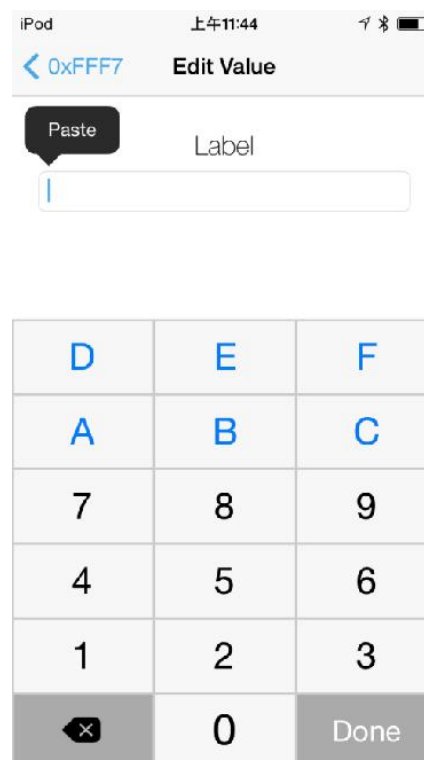


Image 22

Instructions:

1. Default value: 0x09, the range is from 0x09 to 0xFF (Decimal: 100mS-25500mS);
2. Broadcasting Interval consists of 1 octet;

Change the Broadcasting Interval:

1. Click "Broadcasting Interval" on Image 20, and then you can access to the parameter on Image 21;
2. Click the blue characters "Write new value" on Image 21 to change the Broadcasting Interval;
3. Then input the new value in HEX code on the soft keyboard shown on Image22, and then click "Done";
4. Soft reboot the MiniBeacon_50048 by writing the parameter 0xFFFF.

Tips:

1. 0x01, 100mS; 0x02, 200mS.....0x09, 900mS and so on;
2. If the value of Broadcasting Interval is set larger, it can save more power consumption;
3. It will hard to build a connection with MiniBeacon if the value of Broadcasting Interval is set greater than 0x32 (5000mS).

Beacon Serial ID (0xFFFF8)

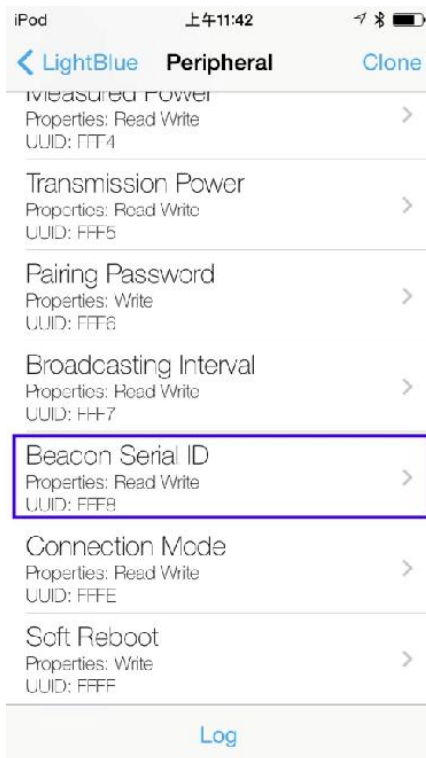


Image 23

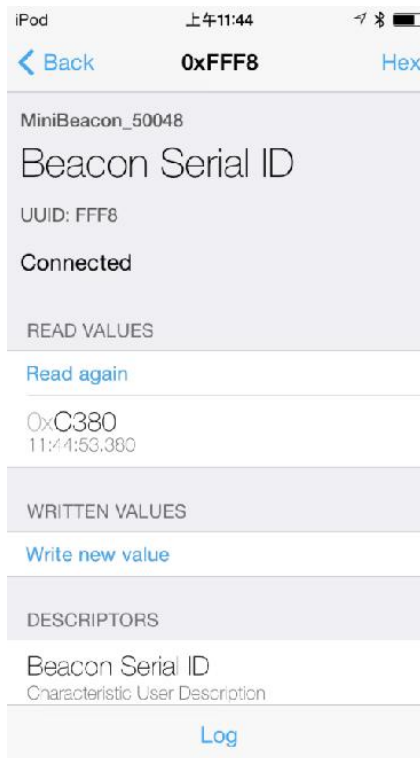


Image 24

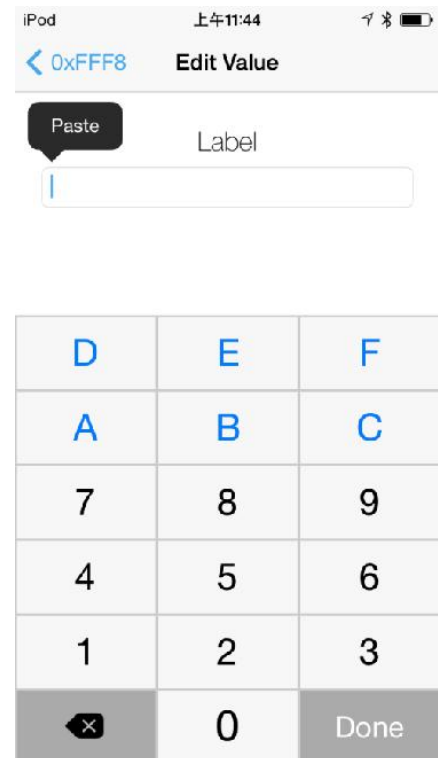


Image 25

Instructions:

1. The Beacon Serial ID is random but can be configured before the shipping;
2. The Beacon Serial ID consists of 2 octets;
3. The range of Beacon Serial ID is from 0x0001 to 0xFFFF (Decimal: 1 to 65535);

Change the Beacon Serial ID:

1. Click "Beacon Serial ID" on Image 23, and then you can access to the parameter on Image 24;
2. Click the blue characters "Write new value" on Image 24 to change the Broadcasting Interval;
3. Then input the new value in HEX code on the soft keyboard shown on Image 25, and then click "Done";
4. Soft reboot the MiniBeacon_50048 by writing the parameter 0xFFFF.

Tips:

1. The digit part of MiniBeacon_50048 is the Beacon Serial ID, it is 50048;
2. The Big octets will be the first sent out by MiniBeacon;
3. For example:
 - 3.1 The Beacon Serial ID 0xC380 (Decimal: 50048) was saved as the array ID[2]={0xC3, 0x80};
 - 3.2 The data ID[0]=0xC3 will be the first sent out, the following is ID[1]=0x80.

Connection Mode (0xFFFE)

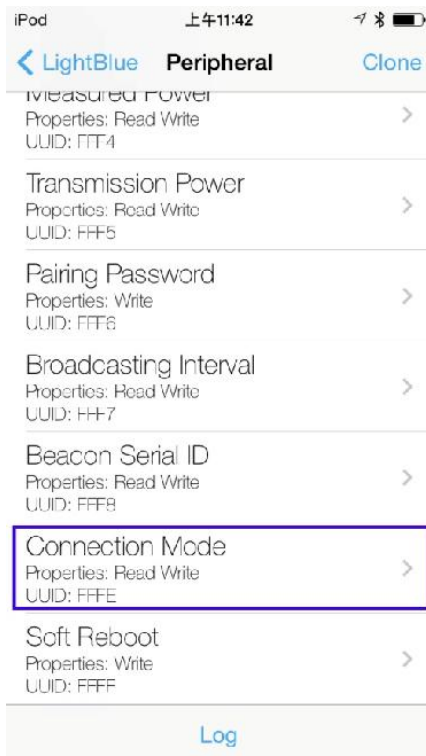


Image 26

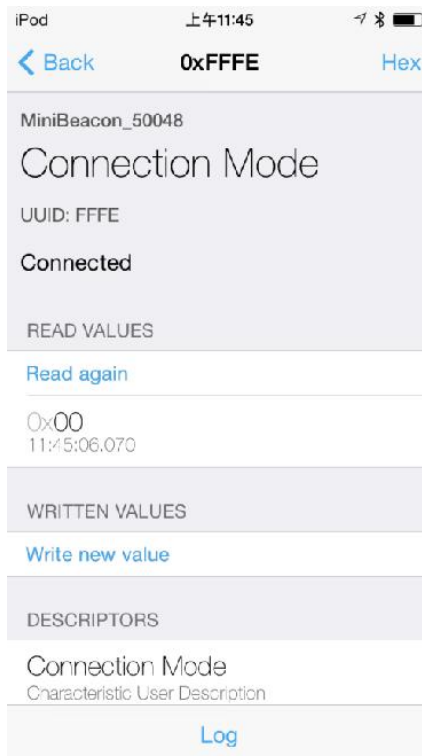


Image 27

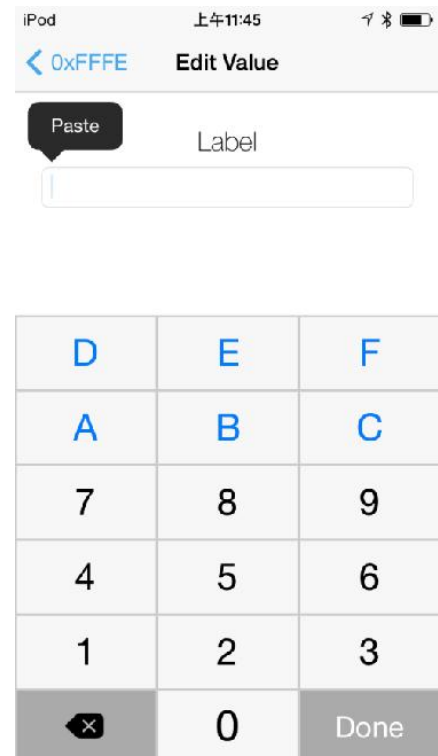


Image 28

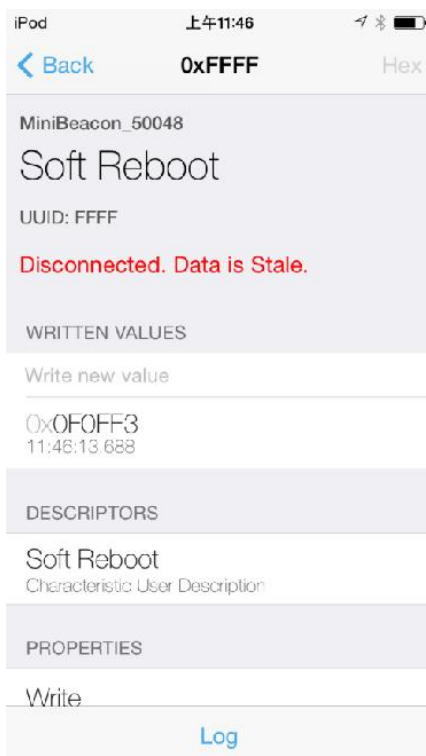


Image 29

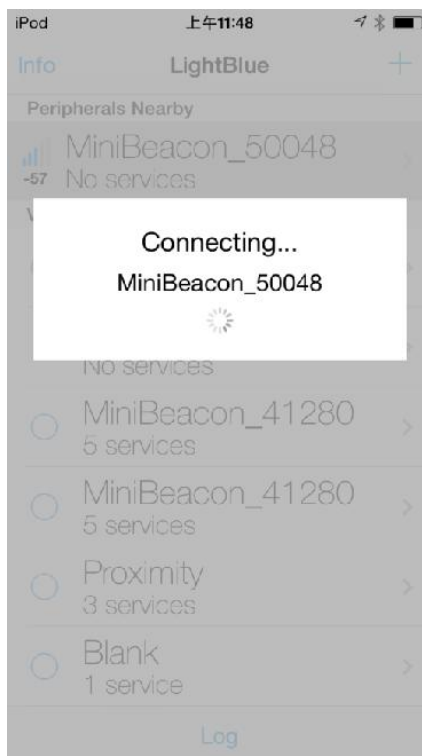


Image 30

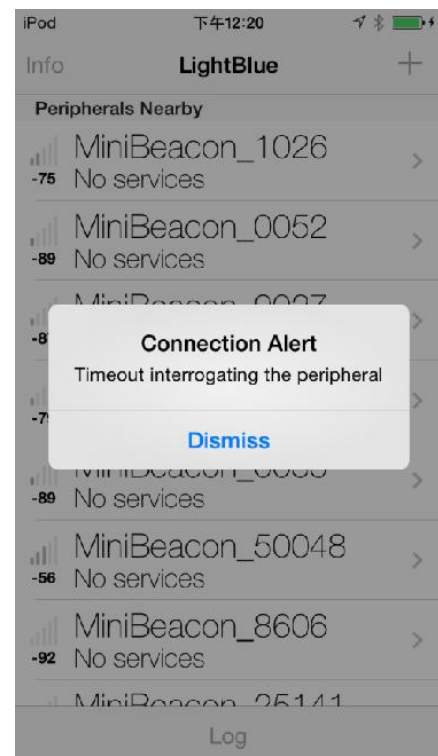


Image 31

Instructions:

1. Default value: 0x00, the range is from 0x00 to 0xFF; and Connection Mode consists of 1 octet;

Connectable and Non-connectable Mode:

1. If the value is set to 0x00, it means that MiniBeacon is working in the connectable mode.
In the connectable mode, all of parameters are allowed to change all the time;
2. If the value is NOT set to 0x00, it means that MiniBeacon is working in the non-connectable mode.
In the non-connectable mode, all of parameters are NOT allowed to change;
3. MiniBeacon will work on the connectable mode after it was powered on, then it will go to the corresponding mode according to the value of Connection Mode after 5 minutes.

Change the Connection Mode:

1. Click "Connection Mode" on Image 26, and then you can access to the parameter on Image 27;
2. Click the blue characters "Write new value" on Image 27 to change Connection Mode;
3. Then input the new value in HEX code on the soft keyboard shown on Image 28, and then click "Done";
4. Soft reboot the MiniBeacon_50048 by writing the parameter 0xFFFF;
5. It showed MiniBeacon_50048 was disconnected with LightBlue successfully on Image 29;

Test Non-connectable Mode:

1. If tried to connect with MiniBeacon_50048 again, the result was failure as shown on Image 30 and 31;
2. Or using MultiTool to check the setting as the following steps:-
 - 2.1 Run the MultiTool on the iOS device as shown on Image 32;
 - 2.2 Press the "MiniBeacon_50048" and keep holding a while, the Image 33 will occur soon;
 - 2.3 Click the "Show advertisement data", the Image 34 will occur soon; the "Connectable" is NO, it means that MiniBeacon_50048 is working in the non-connectable mode;
3. All of above test results showed the MiniBeacon is working in the non-connectable mode!

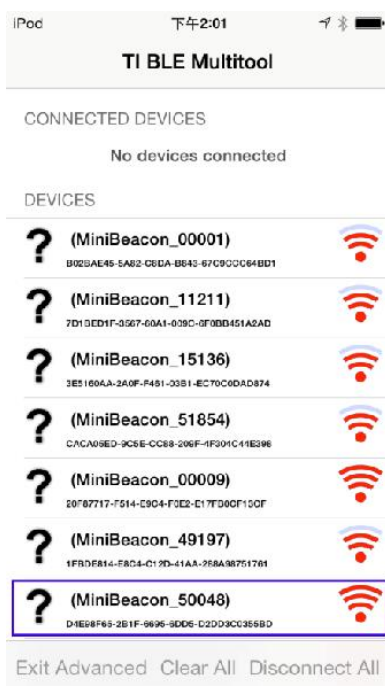


Image 32

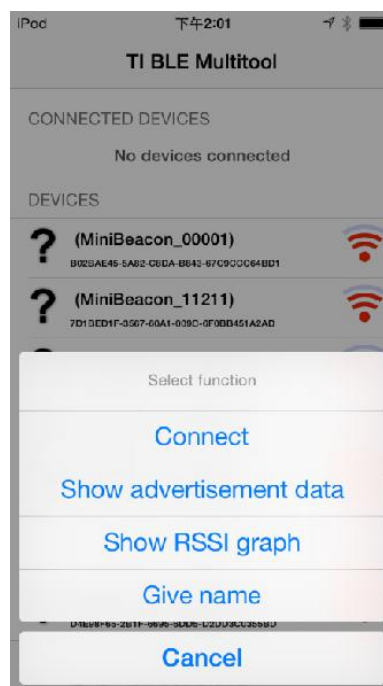


Image 33

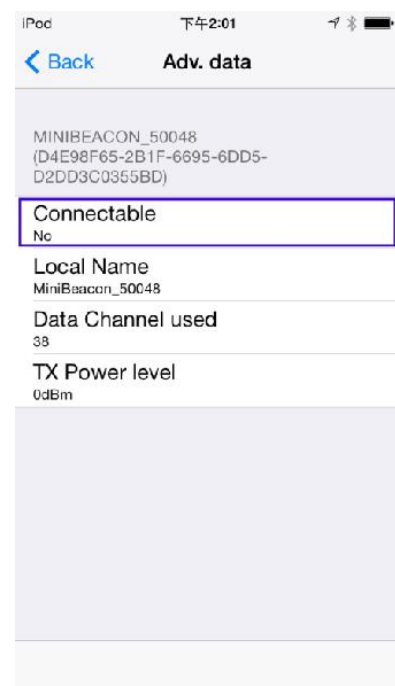


Image 34

Soft Reboot (0xFFFF)



Image 35

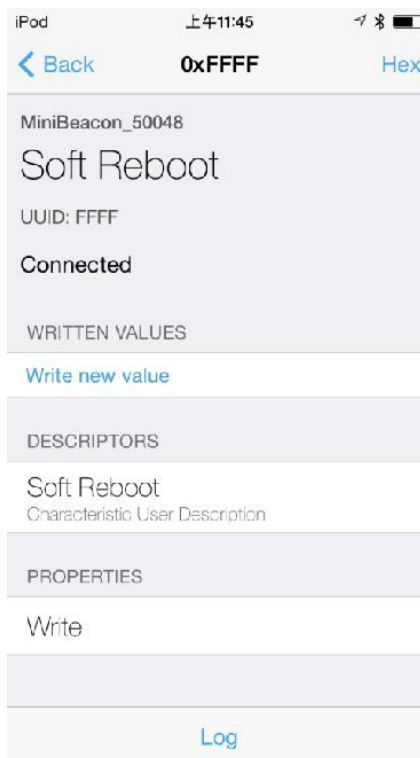


Image 36

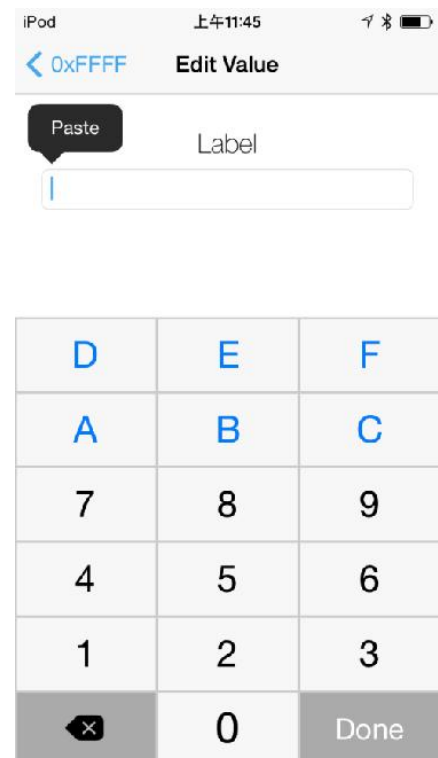


Image 37

Instructions:

1. Default value: 0x0F0FF3, the range is from 0x000001 to 0x0F423F (Decimal: 000001-999999);
2. The value of Soft Reboot consists of 3 octets;

Soft Reboot the MiniBeacon:

1. Click "Soft Reboot" on Image 35, and then you can access to the parameter on Image 36;
2. Click the blue characters "Write new value" on Image 36 to write data to reboot the MiniBeacon;
3. Then input the new value in HEX code on the soft keyboard shown on Image37, and then click "Done";

Tips:

1. It is used for saving and taking effect the new values for the MiniBeacon;
2. Write the latest Pairing Password to the parameter 0xFFFF to reboot the MiniBeacon;
3. The Big octets will be the first sent out by MiniBeacon;
4. For example:
 - 3.1 The Pairing Password 0x0F0FF3 was saved as the array PSW[3]={0x0F, 0x0F, 0xF3};
 - 3.2 The data PSW[0]=0x0F will be the first sent out, the following is Major[1], PSW[2]=0xF3 will be sent at the last;

Clear the history record / buffer in your iOS device

Because the LightBlue has a memory function, you need to clear the record / buffer in your iOS device. If you don't clear the record / buffer, you can't see any updated although beacon's parameters or software has been changed.

Step 1: please open the **Settings** on image 38, and then click the **Bluetooth** on image 39;

Step 2: please find the beacon from **DEVICES** which you has been paired, for example **MiniBeacon_50048**;

Step 3: please click  on image 39;

Step 4: click **Forget this Device** on image 40;

Step 5: click **Forget Device**, see image 41;

Step 6: you can find MiniBeacon_50048 is **Not Paired**.

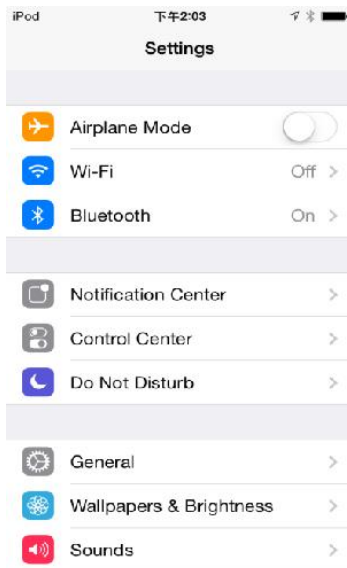


Image 38



Image 39

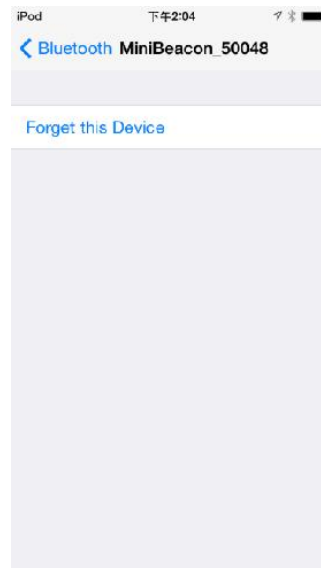


Image 40



Image 41



Image 42