LPMS-B2
Quick Start Guide ver. 1.1

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http://www.lp-research.com

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I. Introduction

Welcome to the LP-RESEARCH Motion Sensor LPMS-B2 Quick Start Guide.

In this documentation we will explain everything you need to know to quickly set up the LPMS-B2 hardware, install its software and get started with sensor data acquisition. We have put a lot of effort into making the LPMS-B2 a great product, but we are always eager to improve and work on new developments. If you have any further questions or comments regarding this documentation please feel free to contact us anytime.

For more information on the LPMS-B2 or other product series, please refer to datasheets and user manuals, available from the LP-RESEARCH website at the following address: http://www.lp-research.com.

II. Document Revision History

Date	Revision	Changes
2016-03-01	1.0	- Initial release.
2016-07-27	1.1	- Correction of some parameters of LPMS-B2. - Add the parameter tables of pressure sensor. - Add the LED status table.

III. Device Specification

Table 1. LPMS-B2 Main Specification

Parameters	LPMS-B2	LPMS-B2 OEM
Output range of Euler angle	Roll: ±90°; Pitch: ±180°; Yaw: ±180°	
Bandwidth	400Hz	
Resolution	0.01°	
Accuracy	<0.5° (Static), <2° RMS (Dynamic)	
Max. instant impact (0.1 ms)	10,000g	
Output data type	Raw data/Euler/Quaternion/Linear acceleration/Air pressure/Altitude/Temperature	
Latency	15 ms	
Internal sampling rate	400Hz	
Communication interface	Bluetooth Classic 2.0 (BLE4.1 Optional)	
Max. baudrate	921600 bps	
Communication protocol	LPBUS	
Size	39x39x8 mm	16x31x4 mm
Weight	12 g	2g
Communication distance	<20m	
Max. data update rate	400Hz	
Power consumption	110mW @ 3.3V	
Power supply	Lithium Battery > 6h (3.7V@230mAh)	3.3-5.5V DC
Working temperature	-20~+60 °C	-40 ~ +80 °C
Connector*	Micro USB, type B	SM02B-SURS-TF

*LPMS-B2 USB connector is only used for charging, the sensor is powered by the internal embedded lithium battery.

Table 2. Accelerometer Specification

Parameters	Typical Value	Unit
Measurement range	±2/±4/±8/±16	g
Sensitivity	0.061/0.122/0.244/0.488	mg/LSB
Linear acceleration sensitivity change vs. temperature	±1	%
Linear acceleration typical zero-g level offset accuracy	±40	mg
Linear acceleration zero-rate change vs. temperature	±0.5	mg/°C
Acceleration noise density	90 (FS= ±2 g ODR = 104 Hz)	μg/√Hz

Table 3. Gyroscope Specification

Parameters	Typical Value	Unit
Measurement range	±125/±245/±500/±1000/±2000	dps
Sensitivity	4.375/8.75/17.50/35/70	mdps/LSB
Angular rate sensitivity change vs. temperature	±1.5	%
Angular rate typical zero-rate level	±10	dps
Angular rate typical zero-rate level change vs. temperature	±0.05	dps/°C
Rate noise density	7	mdps/√Hz
Angular random walk	9	degree/hour

Table 4. Magnetometer Specification

Parameters	Typical Value	Unit
Measurement range	±4/±8/±12/±16	Gauss
Sensitivity	6842/3421/2281/1711	LSB/gauss

Zero-gauss level		±1	gauss
RMS noise (Ultra-high-performance mode)	X axis	3.2	mgauss
	Y axis	3.2	mgauss
	Z axis	4.1	mgauss
Non-linearity		±0.12	%FS

Table 5. Pressure and Humidity Sensor Specification

Parameters	Typical Value	Unit
Pressure measurement range	300~1100	hPa
Temperature coefficient of offset	±1.5	Pa/K
Absolute accuracy pressure	±1.0	hPa
Pressure sensitivity	0.18	Pa
Pressure noise	1.3	Pa
Humidity measurement range	0~100	%RH
Humidity accuracy	±3	%RH
Humidity latency （10~90~10 %RH，25 °C）	±1	%RH
Humidity sensitivity	0.008	%RH
Humidity noise	0.02	%RH
Humidity stability （10~90 %RH, 25 °C）	0.5	%RH/year

IV.   Operation

Charging

The sensor can be charged through the micro USB port on LPMS-B2. The charging voltage is 5V and required power current is at least 100mA for a efficient charging progress. Depending on the remaining power in the battery, the on-board LED will show different charging status by different colors. Detailed information of the LED status is introduced in the Appendix section.
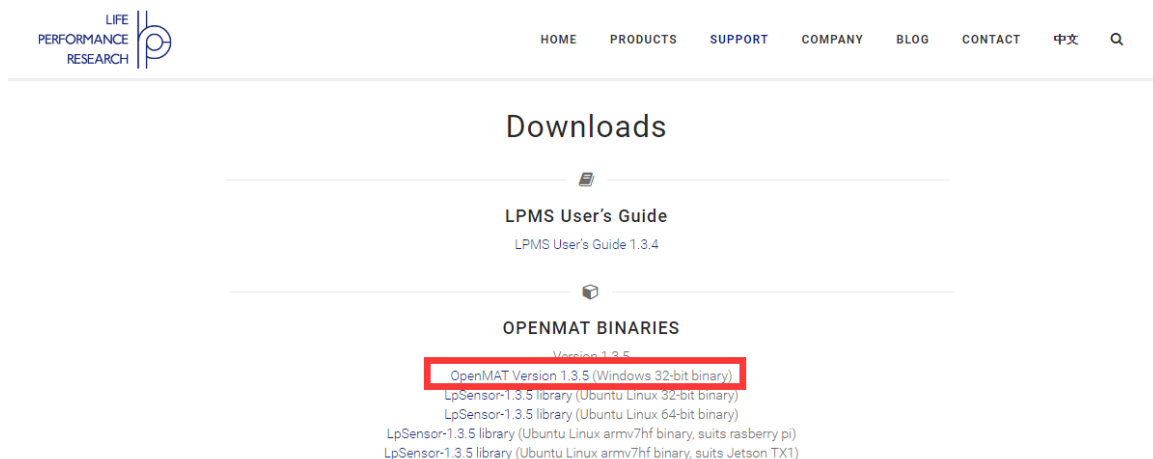
Power on

On the top side of LPMS-B2 there is a button used for switching on the sensor. If there is no connection request from the host system in 3 seconds after the sensor is powered on, the LED will start to blink in an interval of 1 second, which means the sensor is at a standby mode.

OpenMAT Software Installation

We offer windows OS based software called LpmsControl for users to easily manipulate the LPMS-B2 sensor. The LpmsControl software is a sub program of OpenMAT software. Please choose a correct version of OpenMAT software from our homepage based on the operation system specification. The followings shows an example of installing the OpenMAT software under Windows 7 32bit system.
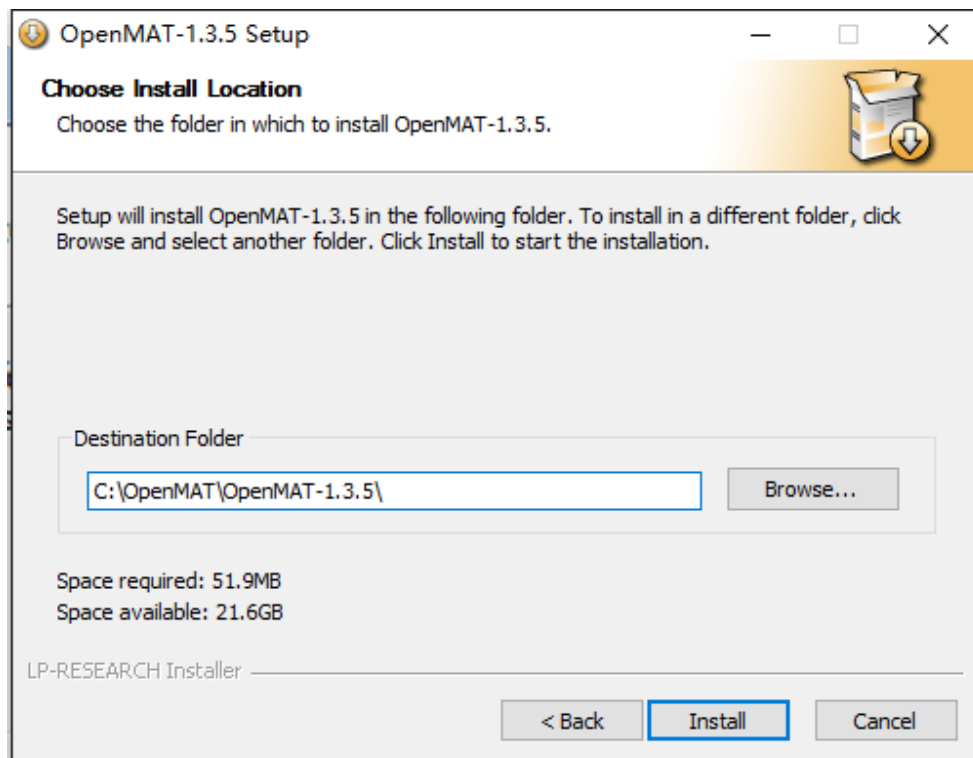
1)   Go to: http://www.lp-research.com/support/, and download the latest version of OpenMAT for the sensor, like OpenMAT Version 1.3.5 (Windows 32-bit binary) showed as below.
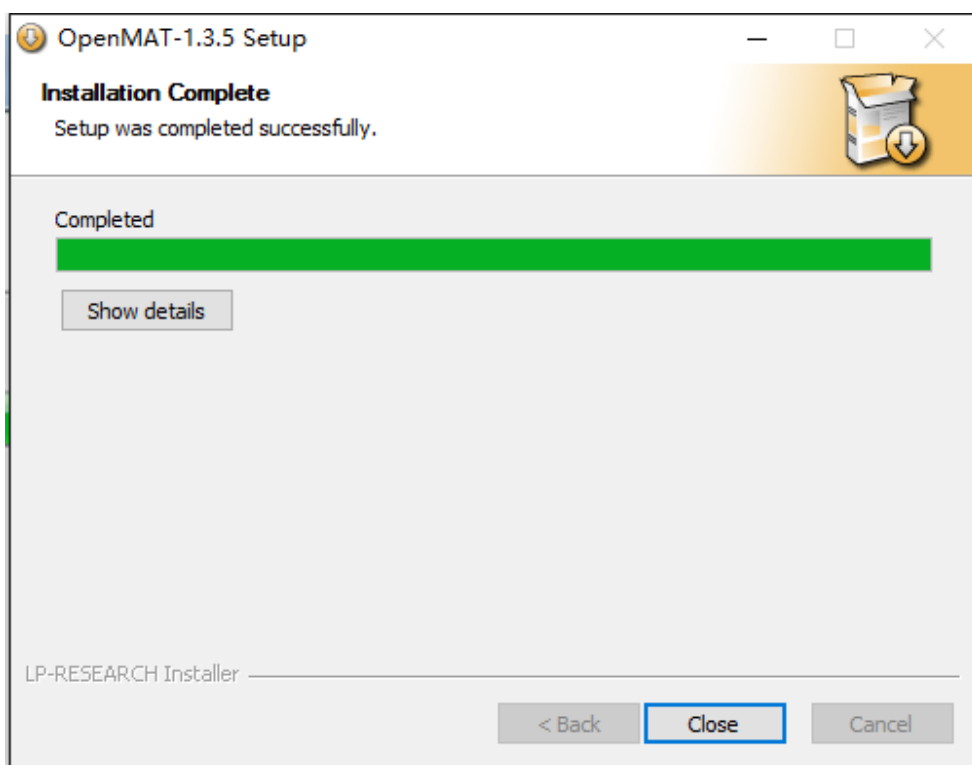
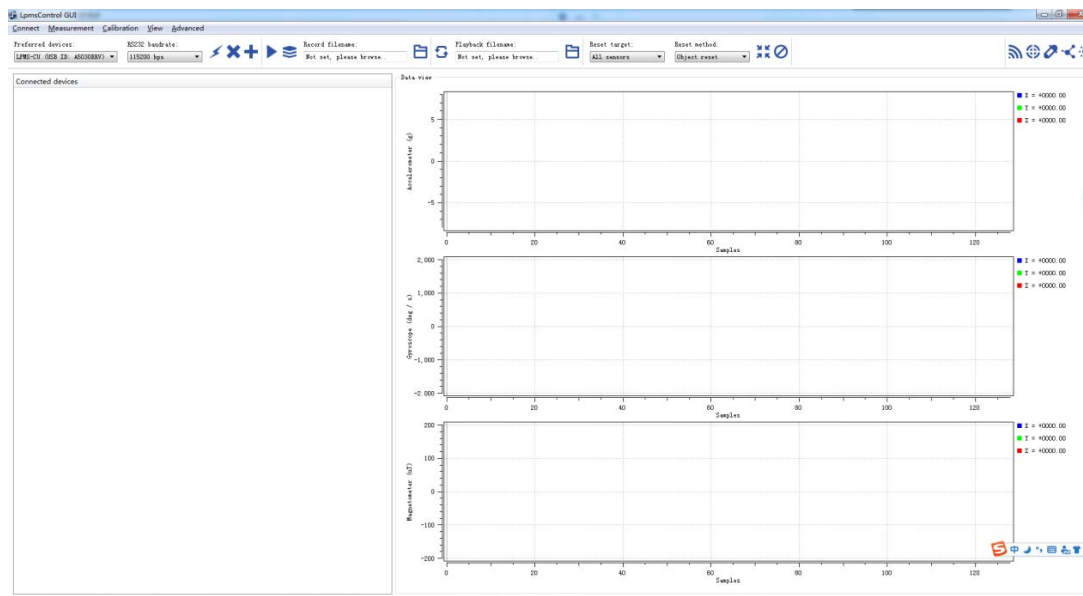2) Run the installer after the download process is finished, and push the "I Agree" button for the next step.

3) Push the "Browse" button to select the installation path of the program, and then push "Install" to start the installation process.

4) Push the "Close" button to complete the installation.

To run the LpmsControl software from the start menu of your windows system, you can see the following interface.
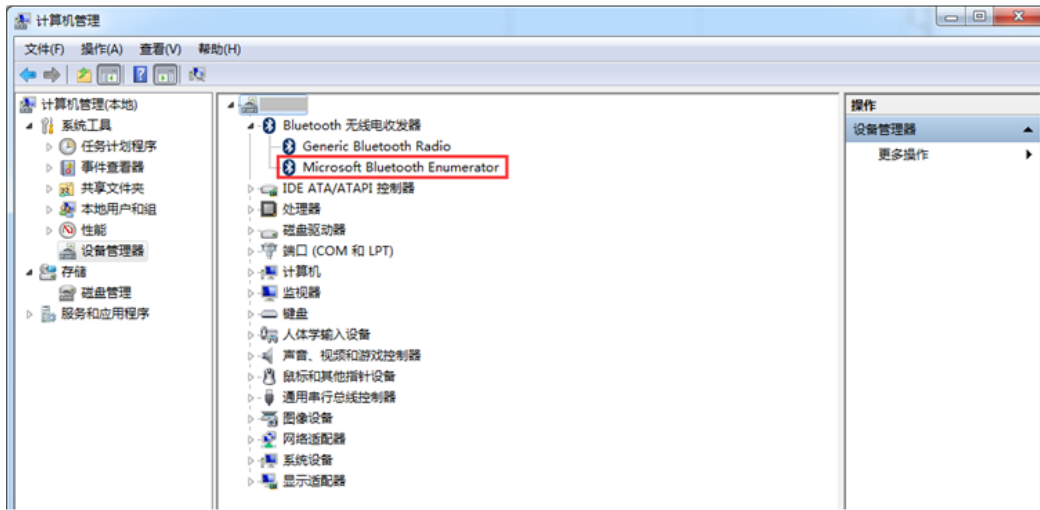

Connection with PC

The communication between LPMS-B2 sensor and a windows OS PC is based on Bluetooth technology. Therefore, please make sure your system has an embedded Bluetooth (2.0) receiver or an external Bluetooth USB dongle for device pairing and data exchange.

Note: Only Microsoft Bluetooth driver is supported by our software. Please confirm

if you have installed the correct driver for your Bluetooth receiver from the device manager of windows system, seen as the image below.
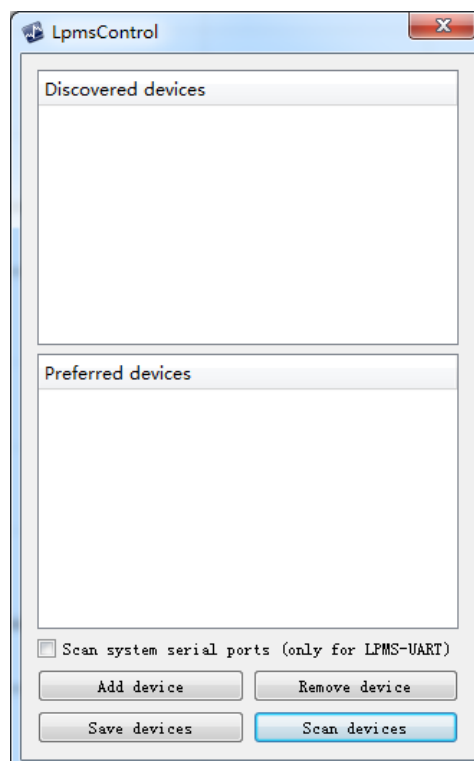

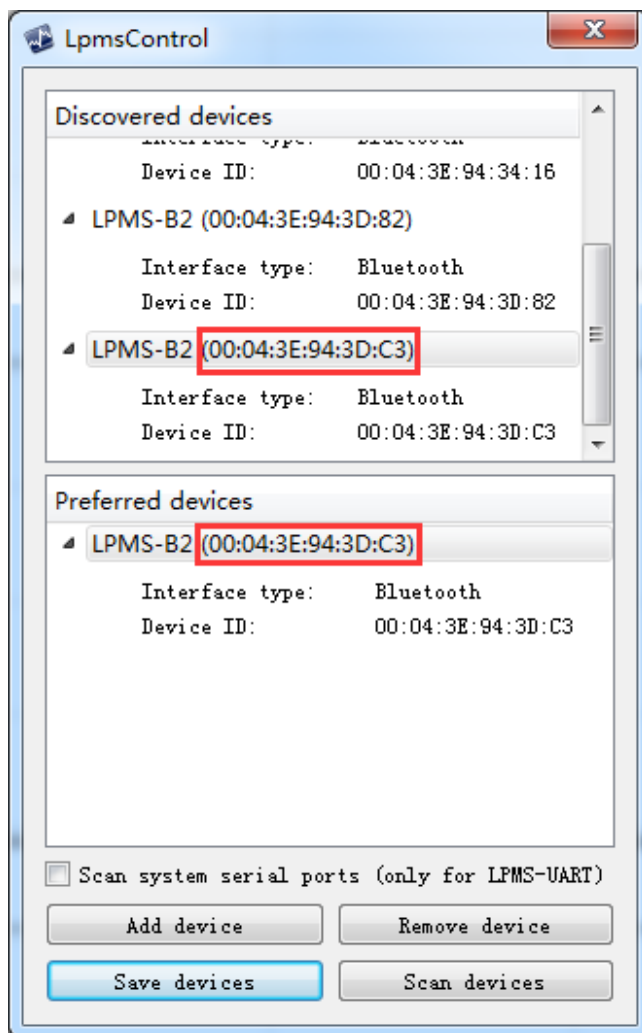Please follow the instructions below to complete the remaining steps.

1) To switch on the sensor.

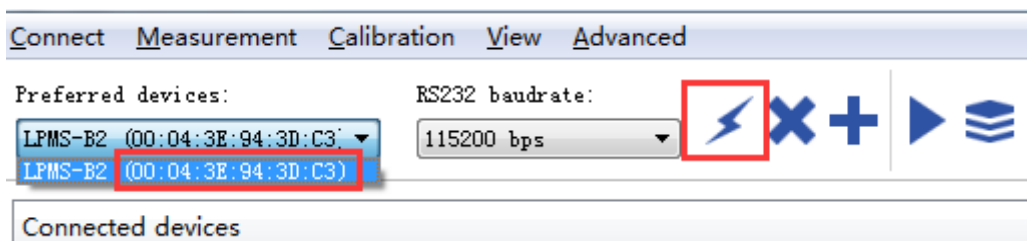2) To select the "Add/remove sensor" under "Connect" menu or click the "+" button on toolbar.
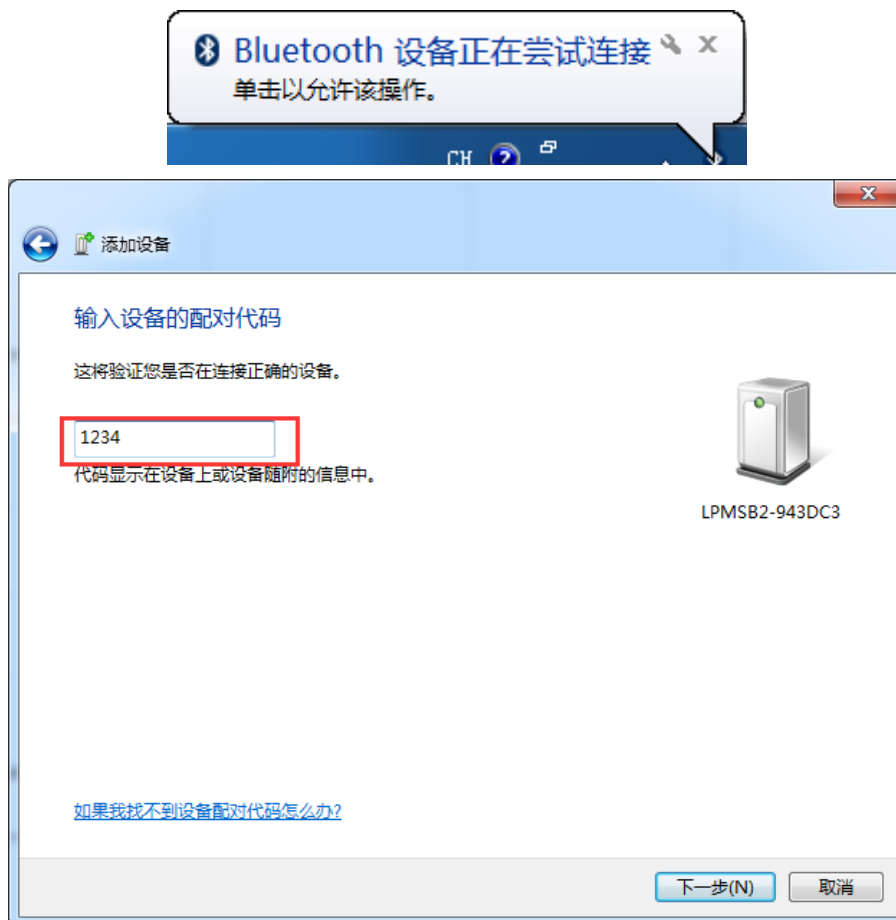

The "add device" window will pop out, as following.

3) To click the "Scan devices" button and start the device discovery process. Please wait until the process is done.

4) To select the target sensor ID from the "Discovered devices" list, for example, "LPMS-B2 (00:04:3E:94:3D:C3)" in the following image.
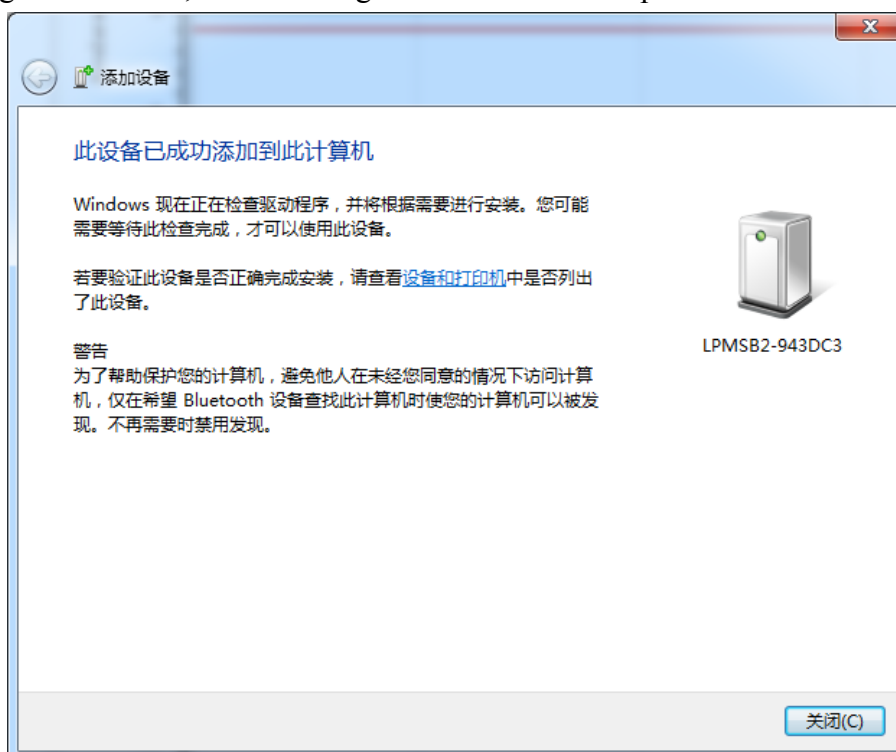

5) To add the selected sensor to "Preferred devices" list by clicking the "Add device" button.

6) To click the "Save devices" button to save the preferred devices list, and return to main interface of LpmsControl.

7) To select the target sensor ID from the Preferred devices list, and click Connect function under "Connect" menu or click the lightning button on toolbar to connect the sensor.
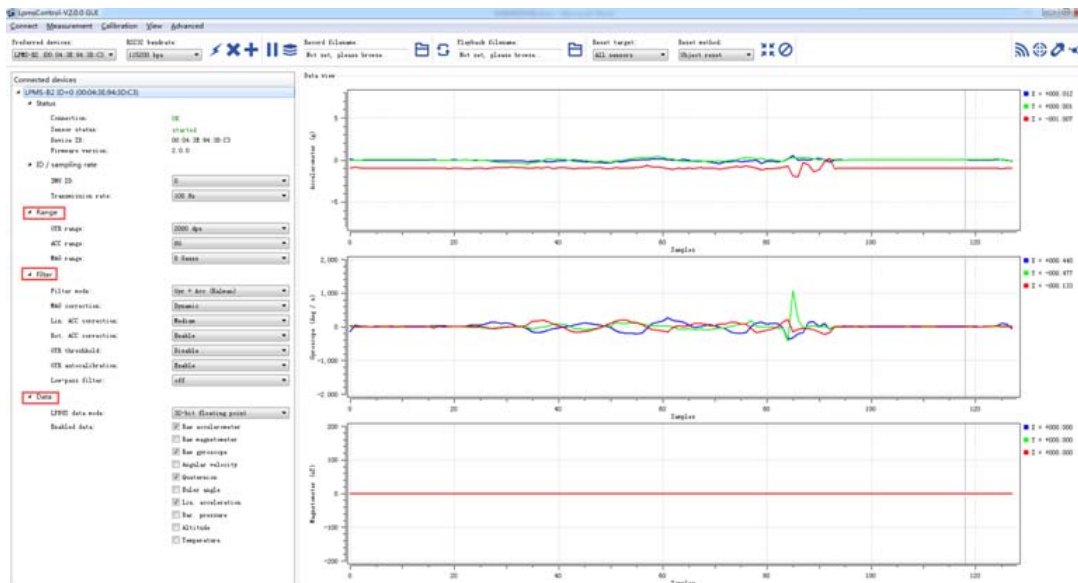
During this process, there might be a pop out message from the taskbar of windows to ask for the permission of Bluetooth pairing. Please enter "1234" as the pairing code.
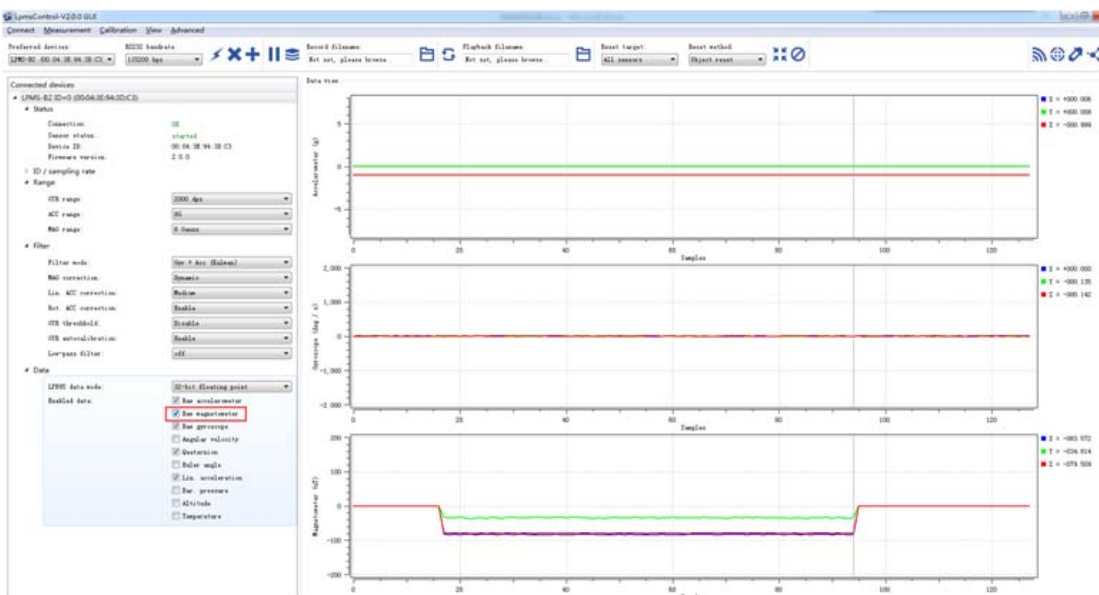

If the pairing is successful, the following window will show up.

After completing all the steps above, the LPMS-B2 should have been connecting with windows system. Users can check all the data visualization and parameter settings of the sensor from LpmsControl.

On the left side of the main interface of LpmsControl, users can change the sensor settings, like measurement range, filter modes, data updating rate, etc. Moreover, the types of output data can be modified by checking or unchecking the check box of each parameter. For example, in the following image the "raw magnetometer" is checked so that the acquisition of magnetic data is enabled.

For more information, please refer to our product datasheets and product manuals.

V.   Appendix

TABLE 6. LED Status Indication

Work Mode		LED Status	LED Color	Remaining Battery
Normal	Connection off	Blinking light	Blue	>10%
			Red	<10%
	Connection on	Pulsating light	Blue	>10%
			Red	<10%
Charging		Always on	Green	>90%
			Blue	20%~90%
			Red	<20%

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.

Note: 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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.