LPMS-UTTL2 Quick Start Guide ver. 1.4



LP-RESEARCH Inc. http://www.lp-research.com

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I. Introduction

Welcome to the LP-RESEARCH Motion Sensor LPMS-UTTL2 Quick Start Guide.

In this documentation we will explain everything you need to know to quickly set up the LPMS-UTTL2 hardware, install its software and get started with sensor data acquisition. We have put a lot of effort into making the LPMS-UTTL2 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-UTTL2 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
2016-06-01	1.0	- Initial release.
2016-10-01	1.1	- Add the tables of relations between baudrate and data update rate.
2016-10-13	1.2	- Correction on input voltage range.
2017-09-28	1.3	- Correction on DB9 connector pinout information
2018-03-27	1.4	- Updated tables of parameters
2018-06-21	1.5	- Adjusted maximum supply voltage to 18V



III. Device Specification

Table 1. LPWIS-011L2 Main Specification		
Parameters	LPMS-UTTL2	
Output range of Euler angle	Roll: $\pm 180^{\circ}$; pitch: $\pm 90^{\circ}$; Yaw: $\pm 180^{\circ}$	
Bandwidth	400Hz	
Resolution <0.01°		
Accuracy	<0.5° (Static), <2° RMS (Dynamic)	
Max. instant impact (0.1 ms)	10,000 g	
Output data type	Raw data/Euler/Quaternion/Linear acceleration/Air pressure/Altitude/Temperature	
Internal sampling rate	400 Hz	
Communication interface	UART / USB*	
Max. baudrate	921600bps	
Communication protocol LPBUS		
Size	34.5x34x15.7 mm	
Weight	17.6 g	
Max. data update rate	400Hz	
Power consumption	<175mW@3.3V	
Power supply	5V~18V DC (UART TTL) / 5V (USB)	
Working temperature	-40~+80 °C	
Connector	DB9(female) / micro-USB type B	

Table 1. LPMS-UTTL2 Main Specification

* The USB port is primarily used for the connection with windows-based operation systems. With the use of LpmsControl software, users can easily modify the sensor settings and upgrade the sensor firmware.



Table 2. Accelerometer Specification

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

Table 3. Gyroscope Specification

Parameters	Typical Value	Unit	
Measurement range	$\pm 125/\pm 245/\pm 500/\pm 1000/\pm 2000$	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	



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 (FS=±4 gauss)		gauss
RMS noise	X axis	3.2	mgauss
(Ultra-high-performance	Y axis	3.2	mgauss
mode)	Z axis	4.1	mgauss
Non-linearity	±0.12		%FS

Table 5. Pressure and Humidity Sensor Specification

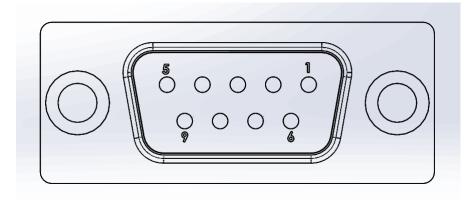
Parameters	Typical Value	Unit
Pressure measurement range	300~1100	hPa
Temperature coefficient of offset	±1.5	Pa/K
Absolute accuracy pressure	±1.0	hPa
Pressure sensitivity	0.18	Ра
Pressure noise	1.3	Ра
Humidity measurement range	0~100	%RH
Humidity accuracy	±3	%RH
Humidity latency (10~90~10 %RH, 25 °C)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



Tuste of Relation Section Child Dualative and Rune Plane		
Baudrate (bps)	Max. Update Rate (Hz)	
19200	10	
57600	50	
115200	100	
921600	400	

Table 6. Relation between UART Baudrate and Max. Update Rate

IV. Connector Pinout



Pin no.	Signal	Remark
1	VDD	+5V~+18VDC
2	RES	
3	RES	
4	RXD	UART_RX
5	GND	
6	GND	
7	RES	
8	TXD	UART_TX
9	RES	

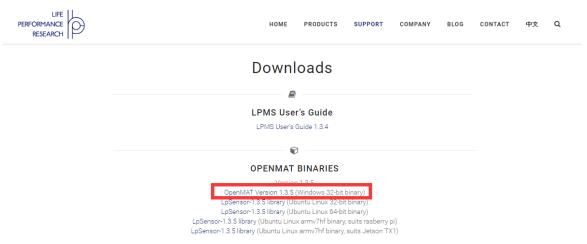


V. Operation

OpenMAT Software Installation

We offer windows OS based software called LpmsControl for users to easily manipulate the LPMS-UTTL2 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 show an example of installing the OpenMAT software under Windows 7 32bit system.

 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.

😳 OpenMAT-1.3.5 Setup	
License Agreement Please review the license terms before installing OpenMAT-1.3.5.	
Press Page Down to see the rest of the agreement.	
Please go to the following link for release information: https://bitbucket.org/lpresearch/openmat/wiki/Home	
If you accept the terms of the agreement, click I Agree to continue. You mu agreement to install OpenMAT-1.3.5.	ust accept the
LP-RESEARCH Installer	Cancel



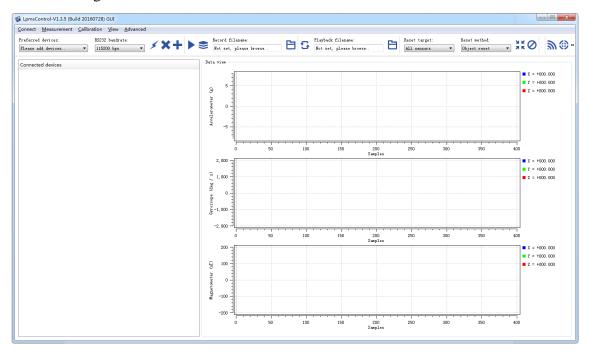
 Push the "Browse" button to select the installation path of the program, and then push "Install" to start the installation process.

OpenMAT-1.3.5 Setup	
Choose Install Location Choose the folder in which to install OpenMAT-1.3.5.	
Setup will install OpenMAT-1.3.5 in the following folder. To install in a differ Browse and select another folder. Click Install to start the installation.	ent folder, dick
Destination Folder C:\OpenMAT\OpenMAT-1.3.5\	Browse
Space required: 55.7MB Space available: 4.3GB LP-RESEARCH Installer	
< Back Install	Cancel

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

OpenMAT-1.3.5 Setup	
Installation Complete Setup was completed successfully.	
Completed	
Show details	
LP-RESEARCH Installer	
< Back	Close Cancel





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

Connection with PC

LPMS-UTTL2 can communicate with a host system via either UART TTL or USB interface. Notice: Both interfaces cannot be used at the same time.

The USB port is aimed at connecting with a windows OS based host system for the sensor. User can change the sensor settings and acquire sensor data by using our LpmsControl software. The UART port is aimed at connecting with various types of industrial host systems via serial communication. Users can change the sensor settings and acquire sensor data based on our LPBUS communication protocols. The sensor operation via either UART or USB interface at a windows operation system is introduced in the following sections.

1. Via UART interface

In order to connect the sensor to a PC via the UART port, a TTL-to-USB conversion cable is needed. Please connect the conversion cable with LPMS-UTTL2 sensor based on the pinout description in section "Connector Pinout". After plugging the conversion cable to a windows OS PC, a COM port is supposed to be assigned to the cable, which can be confirmed through the device manager of windows system. Please remember that COM port number and use it for the sensor connection. The LED on the sensor should behave like a pulsating light at blue color, which indicates the sensor is functionally working.



Please follow the instructions below to complete the remaining steps.

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

	1	~			Reco	Record filename:				
•	۶	~			\gg	Not	set,	please	browse	
			A	/ bb	remov	ve sen	sor	1		

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

🕼 LpmsCon	trol	×
Discovere	d devices	
Preferred	devices	
		ts (only for LPMS-UART)
Add	device	Remove device

- To check the option of "Scan system serial ports (only for LPMS-UART)" and click the "Scan devices" button to start the device discovery process. Please wait until the process is finished.
- 3) To select the target sensor ID from the "Discovered devices" list, for example, "LPMS-CUR(Port:COM9)" in the following image. This COM port should be same as the one of the conversion cable.
- 4) To add the selected sensor to "Preferred devices" list by clicking the "Add device" button.
- 5) To click the "Save devices" button to save the preferred devices list, and return to main interface of LpmsControl.



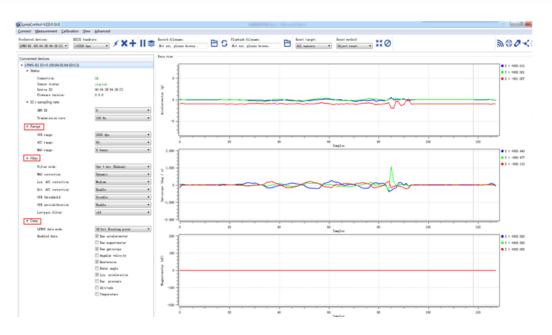
LpmsControl	22
Discovered devices	
LPMS-CUR (Port: C)	COM1)
Interface typ Device ID:	e: RS-232 COM1
LPMS-CUR (Port: C	COM9)
Interface typ Device ID:	⊧: RS-232 COM9
Preferred devices	
 LPMS-CUR (Port: C) 	COM9)
Interface typ Device ID:	≥: RS-232 COM9
✓ Scan system serial	ports (only for LPMS-VART)
Add device	Remove device
Save devices	Scan devices

6) 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. Note: The default baudrate of UART communication is 115200bps.

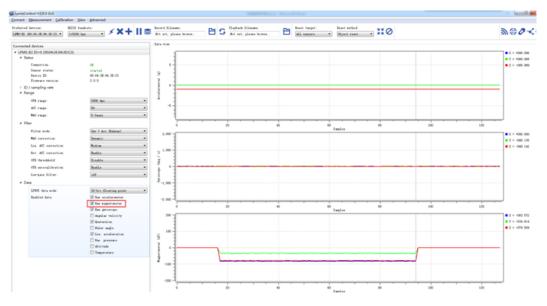
🕑 LpmsCo	ontrol-V1.3.5 (Bu	ild 20160602)	GUI				
<u>C</u> onnect	<u>M</u> easurement	<u>C</u> alibration	<u>V</u> iew	<u>A</u> dvanced			
LPMS-RS2	l devices: 32 (COM9) 32 (COM9)		2 baudr: 200 bps	ate: •	۶	×+	9
Connecto	ed devices						

After completing all the steps above, the LPMS-UTTL2 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.



2. Via USB interface

Users can connect LPMS-UTTL2 to a PC via USB port. After plugging in, windows operation system will activate the installation of USB drivers automatically. USBXpress device will be showed up in the device manager if the driver has been installed successfully,



seen as following.

: 9 -	NUMPER COMPANY
▲ ● 通	用串行总线控制器
🏺	Generic USB Hub
🏺	Generic USB Hub
🏺	Intel(R) 8 Series/C220 Series USB EHCI #1 - 8C26
🖗	Intel(R) 8 Series/C220 Series USB EHCI #2 - 8C2D
	USB Composite Device
🏺	USB Composite Device
	USB Root Hub
	USB Root Hub
L. 🏺	USBXpress Device
D - 高 图	像设备
	这话即哭

After connecting the LPMS-UTTL2 to PC, the LED on the sensor should behave like a pulsating light at blue color, which indicates the sensor is functionally working.

Please follow the instructions below to complete the remaining steps.

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



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



🔹 LpmsControl	x
Discovered devices	
Preferred devices	
📃 Scan system serial ports (only for LPMS-VART)
Add device	Remove device
Save devices	Scan devices

- 2) To click the "Scan devices" button and start the device discovery process. Please wait until the process is done.
- 3) To select the target sensor ID from the "Discovered devices" list, for example, "LPMS-CU2 (USB ID: lpmsra2000013)" in the following image.

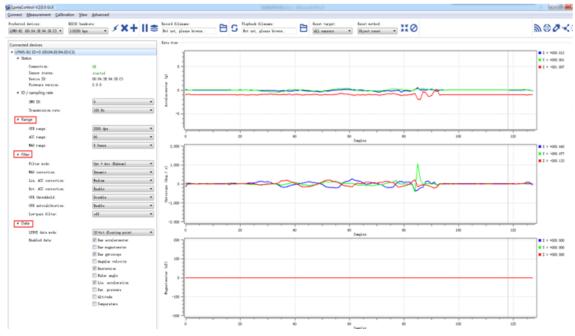
1	LpmsControl	x
	Discovered devices LPMS-CU2 (USB ID:lpmsra2000013)	
	Interface type: USB Device ID: 1pmsra2000013	
	Preferred devices	

- 4) To add the selected sensor to "Preferred devices" list by clicking the "Add device" button.
- 5) To click the "Save devices" button to save the preferred devices list, and return to main interface of LpmsControl.
- 6) 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.



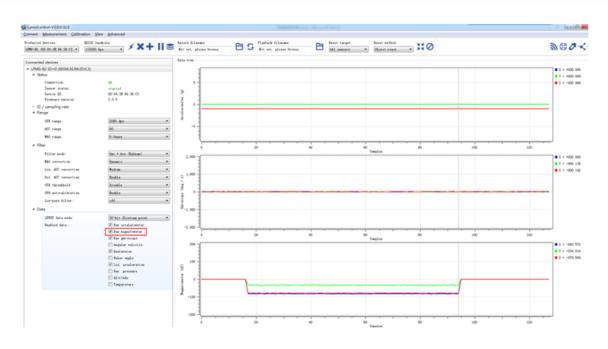
Connect	Measurement Cali	oration	View	Advanced	1		
Professed LPMS-CU2 LPMS-CU2	dowigos: (USB ID: lpmsra20(▼ (U…sra2000013)		32 baudr 5200 bps	ate: •	\$	×+	
Connecte	ed devices						

After completing all the steps above, the LPMS-UTTL2 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.



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