# LPMS-CANAL2 Quick Start Guide ver. 1.2



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

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# I. Introduction

Welcome to the LP-RESEARCH Motion Sensor LPMS-CANAL2 Quick Start Guide.

In this documentation we will explain everything you need to know to quickly set up the LPMS-CANAL2 hardware, install its software and get started with sensor data acquisition. We have put a lot of effort into making the LPMS-CANAL2 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-CANAL2 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	- Modification on input voltage range



# III. Device Specification

Parameters LPMS-CANAL2 Main Specification			
Parameters	LPWIS-CANAL2		
Output range of Euler angle	Roll: $\pm 90^{\circ}$ ; pitch: $\pm 180^{\circ}$ ; 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	CAN BUS		
Max. baudrate	1M bps		
Communication protocol	LPCAN / CANOpen		
Size	48x40x25 mm		
Weight	67.5 g		
Max. data update rate	400Hz		
Power consumption	155mW@3.3V		
Power supply	5V~15V DC		
Working temperature	-40~+80 °C		
Connector	SACC-DSI-MS-5CON-PG 9/0,5,SCO,M12		
Waterproof level	IP67		

## Table 1. LPMS-CANAL2 Main 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	<u>+40</u>	mg				
Linear acceleration zero-rate change vs. temperature	±0.5	mg∕ ℃				
Acceleration noise density	90 (FS= $\pm 2$ g ODR = 104 Hz)	µg/√Hz				

#### Table 2. Accelerometer Specification

### 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
Angular random walk	9	degree/hour

## Table 4. Magnetometer Specification

Parameters		Typical Value	Unit				
Measurement range	±4/±8/±12/±16		±4/±8/±12/±16		±4/±8/±12/±16		gauss
Sensitivity		6842/3421/2281/1711	LSB/gauss				
Zero-gauss level	±1		gauss				
RMS noise	X axis	3.2	mgauss				
(Ultra-high-performance	Y axis	3.2	mgauss				
mode)	Z axis 4.1 r		mgauss				



Non-linearity	±0.12	%FS
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## 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	<u>±3</u>	%RH
Humidity latency (10~90~10 %RH, 25 ℃)	±1	%RH
Humidity sensitivity	0.008	%RH
Humidity noise	0.02	%RH
Humidity stability (10~90 %RH, 25 °C)	0.5	%RH/year

#### Table 6. Relation between CAN Bus Baudrate and Max. Update Rate

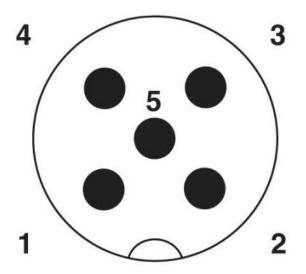
Baudrate (kbps)	Max. Update Rate (Hz)
125	200
250	400
500	400
1000	400

### Table 7. Relation between LPBUS Baudrate and Max. Update Rate

Baudrate (kbps)	Max. Update Rate (Hz)
125	100
250	200
500	400
1000	400



# IV. CAN BUS Connector Pinout



Pin no.	Signal	Remark
1	NC	
2	VDD	+5V~+15VDC
3	GND	
4	CAN+	
5	CAN-	



# V. Operation

### OpenMAT Software Installation

We offer windows OS based software called LpmsControl for users to easily manipulate the LPMS-CANAL2 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.

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.

LIFE PERFORMANCE RESEARCH		НОМЕ	PRODUCTS	SUPPORT	COMPANY	BLOG	CONTACT	中文	۹
		Down	loads						
			ÿ						
		LPMS Use	r's Guide						
		LPMS User's	Guide 1.3.4						
		-	3						
		OPENMAT	BINARIES						
	LpSensor-	1.3.5 library (Ul 1.3.5 library (Ul ry (Ubuntu Linu	(Windows 32-bit buntu Linux 32-bit buntu Linux 64-bit ux armv7hf binary	t binary) t binary) ; suits rasberry					

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		F	7
Please review the license terms before installing OpenMAT-1.3.5.		6	3
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 agreement to install OpenMAT-1.3.5.	u must a	ccept the	
LP-RESEARCH Installer			
I <u>Ag</u> r	ee	Can	cel

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



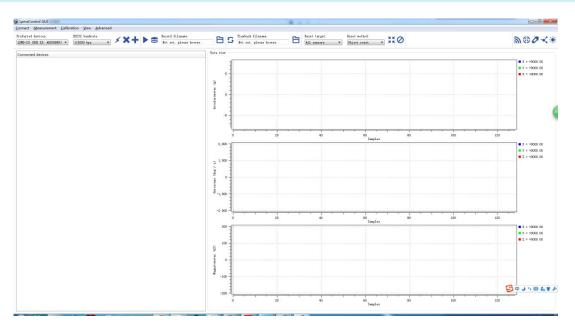
🕹 OpenMAT-1.3.5 Setup	—		$\times$
<b>Choose Install Location</b> Choose the folder in which to install OpenMAT-1.3.5.		E	
Setup will install OpenMAT-1.3.5 in the following folder. To install in a diffe Browse and select another folder. Click Install to start the installation.	erent fi	older, clich	c
Destination Folder C:\OpenMAT\OpenMAT-1.3.5\	Brov	vse	]
Space required: 51.9MB Space available: 21.6GB LP-RESEARCH Installer < Back Instal	1	Can	cel

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

OpenMAT-1.3.5 Setup		$\Box$ $\times$
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**

In order to connect the sensor to a PC via the CAN BUS port, a CAN-to-USB converter is needed. LpmsControl software is supporting the PCAN-USB cable from PEAK-System Technik GmbH. The detailed information of PCAN-USB can be referred to: http://www.peak-system.com.

After connecting the PCAN-USB cable to a PC, the system will pop out a notice of driver installation. Please download and install the corresponding driver of PCAN-USB from the webpage of PEAK-System. The device manager of windows operation system will show the PCAN-USB device if the driver is installed correctly, as showed in the following image.

Before connecting LPMS-CANAL2 with PCAN-USB cable, the hardware setting of the DB9 port on PCAN-USB needs to be modified. In default, the pin no.1 of this DB9 port is not outputting 5V voltage. Please refer to section "Voltage Supply of External Devices" in the manual of PCAN-USB to have the pin no.1 output +5V.

品·设备管理器	
文件(F) 操作(A) 查看(V) 帮助(H)	
A 🚔 SKY-20150516HYE	
▲ 🔮 CAN-Hardware	
PCAN-USB	
▷ 🔮 DVD/CD-ROM 驱动器	
▷ 😋 IDE ATA/ATAPI 控制器	
Jungo Connectivity	
▷ 📃 处理器	

When the hardware setting of PCAN-USB is completed, users can connect it with LPMS-CANAL2 sensor with proper wiring between the M12 and DB9 connectors. Then the PCAN-USB can be plugged into PC to power the sensor and acquire data.



Please follow the instructions below to complete the remaining steps.

 To start the LpmsControl software. If the PCAN-USB cable has been connected with PC, the CAN baudrate setting item should be showed up on the toolbar, seen as the following image. Please choose the correct baudrate according to your sensor setting. The default value is 125kbps.

tion <u>V</u> iew <u>A</u> dvanced	
CAN baudrate: 125 kbit 🔹	RS232 baudrate: 115200 bps

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

				Re	Record filename:						
•	>	~	T		$\approx$	N	ot	set,	please	browse	
				Add /	remo	ove s	en	sor	1		

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

LpmsControl	
Discovered devices	
	1
Preferred devices	
Add device     Remove device	
Save devices Scan devices	



- 3) To click the "Scan devices" button and start the device discovery process. Please wait until the process is finished.
- 4) To select the target sensor ID from the "Discovered devices" list, for example, "LPMS-CU2 (CAN ID: 1)" 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.

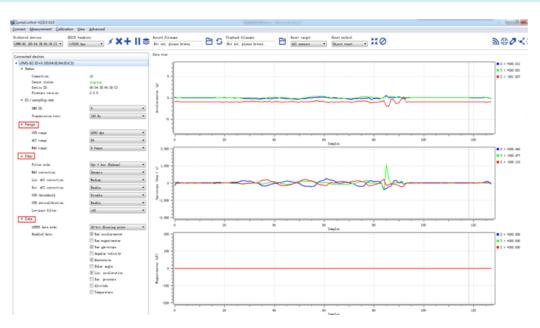
🚯 Lpms	Control	×
Discov	ered devices	
⊿ LPN	AS-CU2 (CAN ID: 1)	)
	Interface type:	CAN bus
	Device ID:	1
Prefer	red devices	
⊿ LPN	AS-CU2 (CAN ID: 1)	)
	Interface type:	
	Device ID:	1
Scan	system serial por	ts (only for LPMS-UART)
	Add device	Remove device
S	ave devices	Scan devices

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.

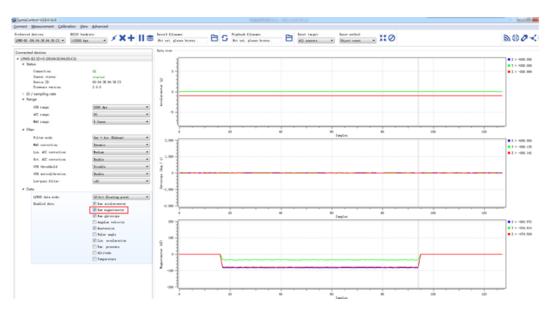
<u>C</u> onnect <u>M</u> easurement	<u>C</u> alibr	ation <u>V</u> iew <u>A</u> dvanced				
Preferred devices:		CAN baudrate:	RS232 baudrate:			
LPMS-CU2 (CAN ID: 1) LPMS-CU2 (CAN ID: 1)	-	125 kbit 🔻	115200 bps	• *	×+	=
Connected devices						

After completing all the steps above, the LPMS-CANAL2 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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