

WiT BWT901CL Bluetooth Inclinometer Sensor User Manual

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Product Information

The BWT901CL is a Bluetooth 2.0 inclinometer sensor designed for various applications such as AGV trucks, platform stability, auto safety systems, 3D virtual reality, industrial control, robots, car navigation, UAVs, and truck-mounted satellite antenna equipment. It is a multi-sensor device that detects acceleration, angular velocity, angle, and magnetic field. With its robust housing and small outline, it is suitable for industrial retrofit applications like condition monitoring and predictive maintenance. The device can be configured to address a wide range of use cases by interpreting the sensor data using smart algorithms.

Product Usage Instructions

1. APP Installation

To use the BWT901CL with an Android phone, follow these steps:

1. Download and install the required app from the provided tutorial link.

2. Connection

To connect the BWT901CL to your Android phone:

- 1. Ensure the app is installed and open on your phone.
- 2. Follow the connection instructions provided in the user manual.

3. Instructions of 2023 New Software

Refer to the user manual for instructions on using the new software.

4. Multiple-Connection Instructions

To connect multiple devices:

- Follow the connection instructions provided in the user manual.
- Configure the software settings, including data configuration, calibration, curve display, and data recording.

5. Warning Statement

Do not put more than 5 Volts across the sensor wiring of the main power supply to avoid permanent damage to the sensor.

Tutorial Link

Google Drive

Link to instructions DEMO:

WITMOTION Youtube Channel BWT901CL Playlist

If you have technical problems or cannot find the information that you need in the provided documents, please contact our support team. Our engineering team is committed to providing the required support necessary to ensure that you are successful with the operation of our AHRS sensors.

Contact

Technical Support Contact Info

Application

- AGV T ruck
- · Platform S tability
- · Auto Safety S ystem
- 3D V irtual R eality
- · Industrial C ontrol
- Robot
- · Car Navigation
- UAV
- Truck mounted S atellite A ntenna E quipment

Introduction

The BWT901CL is a multi-sensor device detecting acceleration, angular velocity, angle as well as magnetic filed. The robust housing and the small outline makes it perfectly suitable for industrial retrofit applications such as condition monitoring and predictive maintenance. Configuring the device enables the customer to address a broad variety of use cases by interpreting the sensor data by smart algorithms.

- BWT901CL's scientific name is AHRS IMU sensor. A sensor measures 3-axis angle, angular velocity, acceleration, magnetic field. Its strength lies in the algorithm which can calculate three-axis angle accurately.
- BWT901CL is an CE standard accelerometer. It is employed where the highest measurement accuracy is required. BWT901CL offers several advantages over competing sensor:
 - Heated for best data availability: new WITMOTION patented zero-bias automatic detection calibration algorithm outperforms traditional accelerometer sensor
 - High precision Roll Pitch Yaw (X Y Z axis) Acceleration + Angular Velocity + Angle + Magnetic Field output
 - Low cost of ownership: remote diagnostics and lifetime technical support by WITMOTION service team
 - Developed tutorial: providing manual, datasheet, Demo video, free software for Windows computer, APP for Android smartphones
 - WITMOTION sensors have been praised by thousands of engineers as a recommended attitude measurement solution

Warning Statement

- Putting more than 5 Volt across the sensor wiring of the main power supply can lead to permanent damage to the sen sor.
- For proper instrument grounding: u se WITMOTION with its original factory made cable or acc e sso ries
- · Do not access the I2C interface.
- D o not change the baud rate because WITMOTION BLUETOOTH sensor s baud rate Defalut 115200 is fixed.

LED Status

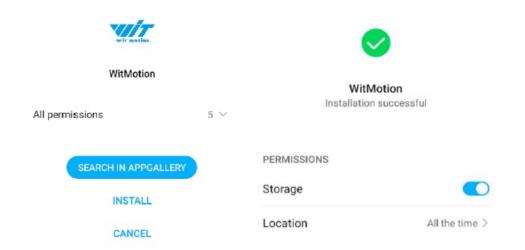
LED	Status	Remark
Red	Flashing	Charging
Blue	Flashing	Pairing process
	Keeping still	Successful pairing

Use Instructions with Android Phone

For APP configuration introduction, please referring to the link. https://drive.google.com/file/d/122Es4QPLi5R-Q4TjN43FMFRcaNK9eSY8/view?usp=share_link.

APP Installation

Install the APK file, give permission of Location and Storage



WITMOTION 2023v New Android APP

Link to check the tutorial video.

https://youtube.com/playlist?list=PL43tdDrVL_VBMU2CrEZfC0MxA0aRz-EY1



About Android APP:

1. It is required to allow for application positioning (Always allowed), and turn on the positioning function and Bluetooth.

Note: Paired devices can be searched without turning on positioning, but according to Google's requirements, if APP installed on a higher version of Android (6.0) mobile phone is paired with a Bluetooth device, positioning must be allowed when using Bluetooth at the same time.

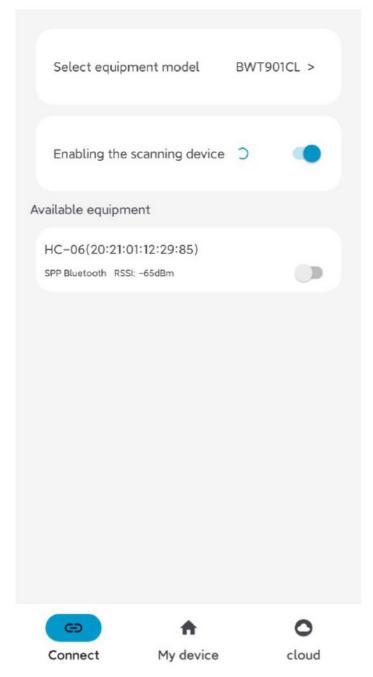
2. After turning on Bluetooth, it takes about one minute to search for authorization to find Bluetooth.

Connection

APP Pairing

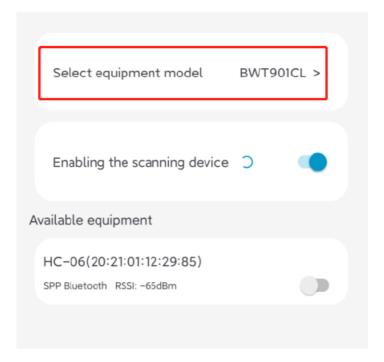
- Step 1. Install the APK file, give permission of Location and Storage
- Step 2. Open APP and click "Connect"

Connecting device



• Step 3. Turn on the sensor, select "BWT901CL" and then scan the device.

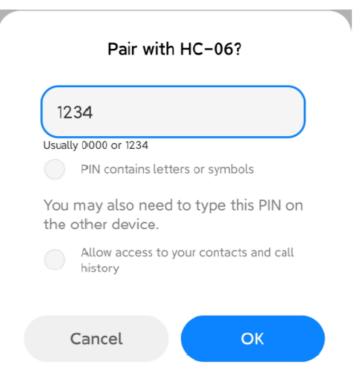
Connecting device



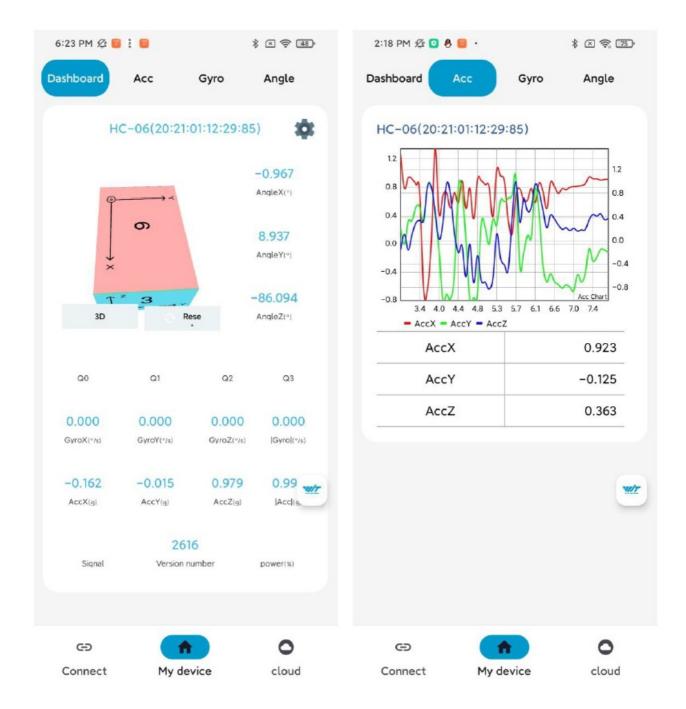
Note: The device will show as "HC-06"+"MAC address" or "HC-02".



• Step 4. Input passward "1234" to pair with "HC-06", then click "OK".

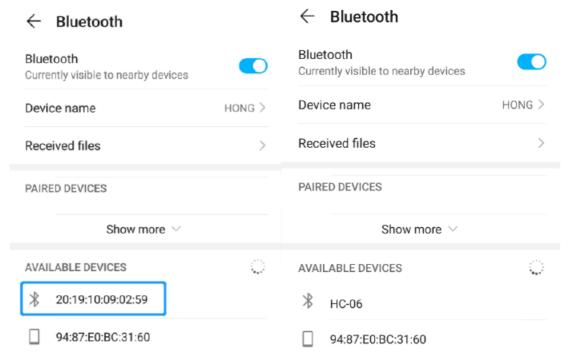


• Step 5. When pairing is done, the blue LED light of the sensor will flash and keep about one second After a few seconds, the data will show automatically.

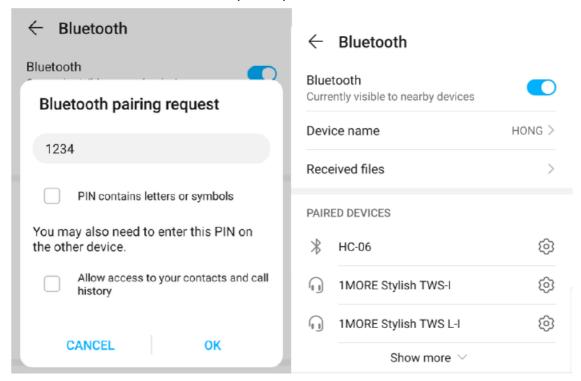


Phone s Bluetooth Pairing

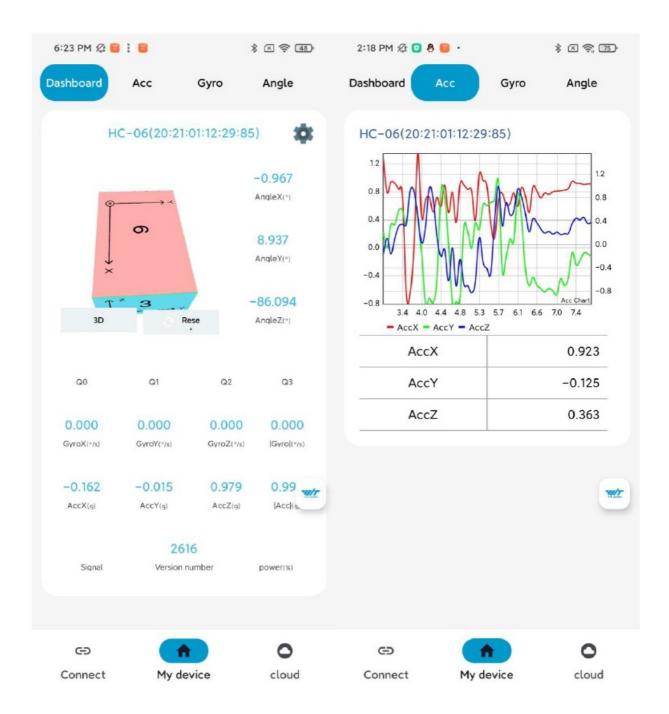
- Step 1. Install the APK file, give permission of Location and Storage
- Step 2. Turn on the Bluetooth in the setting menu of smartphone
- Step 3. Search the Bluetooth sensor (First pairing the device will be recognize as mac address and will be shown as HC-06 after successful pairing.)



Step 4. Click the "MAC address" device and input the password "1234"



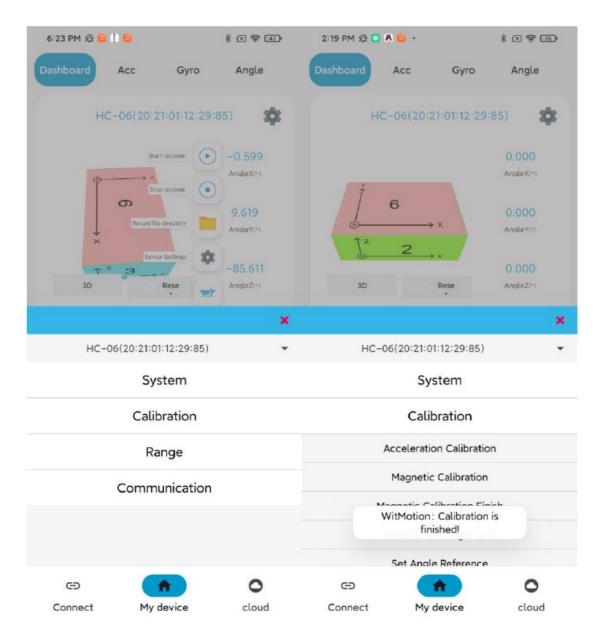
- Step 5. Open the WITMOTION APP, and choose BWT901 CL
- Step 6. Click Scan and select the pa ired Bluetooth device HC 06 (No need to input password)
- Step 7. The Blue LED light of sensor will keep on. Connection with APP is successful.



Calibration

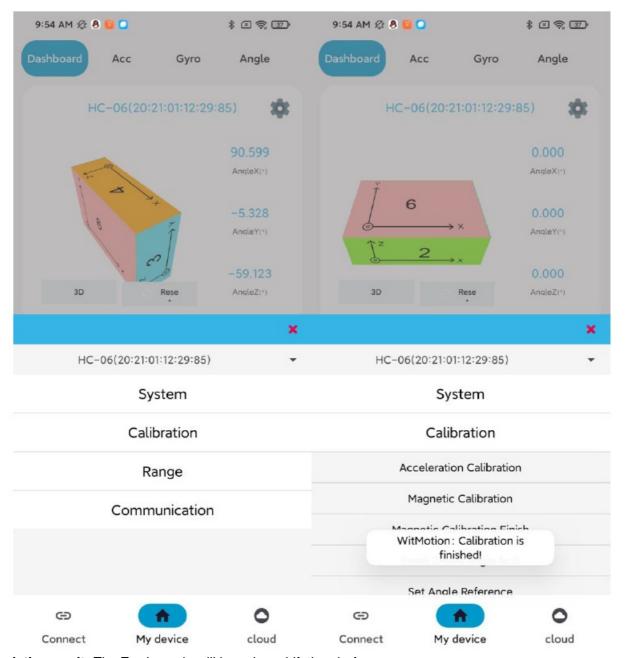
Acceleration Calibration

- Step 1. Keep the module horizontal ly stationary
- Step 2. Click the Calibration menu
- Step 3. Click the Acceleration Calib rati on and wait for 3 seconds
- Step 5. Check the result confirm if there is 1g on Z axis acceleration



MagneticFieldCalibration

- Step 1. Click the "Calibration" menu
- Step 2. Click the "Magnetic calibration" button
- Step 3. Slowly rotate the module 360° around X, Y, Z, 3-axis accordingly
- Step 4. After rotation, click "Finish"



- Check the result: The Z-axis angle will have less drift than before.
- **Notice:** If there is drift of Z-axis, please stay away from the objective that can create magnetic field interference.

Multi-connection

Link to the multi-connection video demo. https://youtu.be/7M6R5Tjrz8U

- As with PC software, we recommend up to 4 devices multi-connection.
- Below is the different phones' actual measure distance.
- BD= Best distance; MD=Max distance

Phone	BWT901CL	Single device		Two devices	
		BD/m	MD/m	BD/m	MD/m
Samsung	Android 13		45m		
Honor	Android 12	29m	65m	23m	46m
Redmi	Android 10	11m	24m	12m	23m
vivo	Android 12	35m	67m	20m	30m
Орро	Android 13	15m	37m	15m	36m
Xiaomi	Android 11	30m	50m		
iPhone	los16.4.1	14m	24m		
Lenovo	Android 11	105m	125m	82m	105m

Use Instructions with iPhone

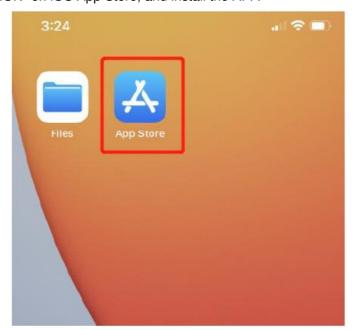
The new version of iOS APP has been launched. There will be many function coming out soon in future.

NOTICE:

- The existing function of history recording is in instructions at present.
- Your understanding would be highly appreciated.
- If you phone comes with txt reader, the recorded file can be easily opened. A txt recorder like Micro Software.
 https://www.youtube.com/playlist?list=PL43tdDrVL_VCgrQJTa0DOhkkbmTkS1kMs

How to install

• Step 1. Search "WITMOTION" on iOS App Store, and install the APP.



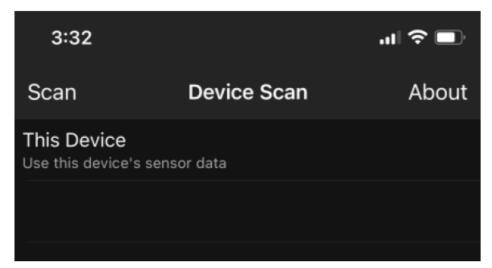




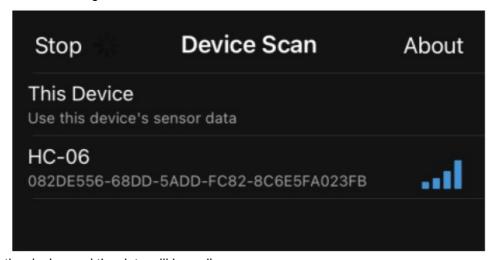


How to setup

• Step 1. Turn on the sensor and then click "Scan"

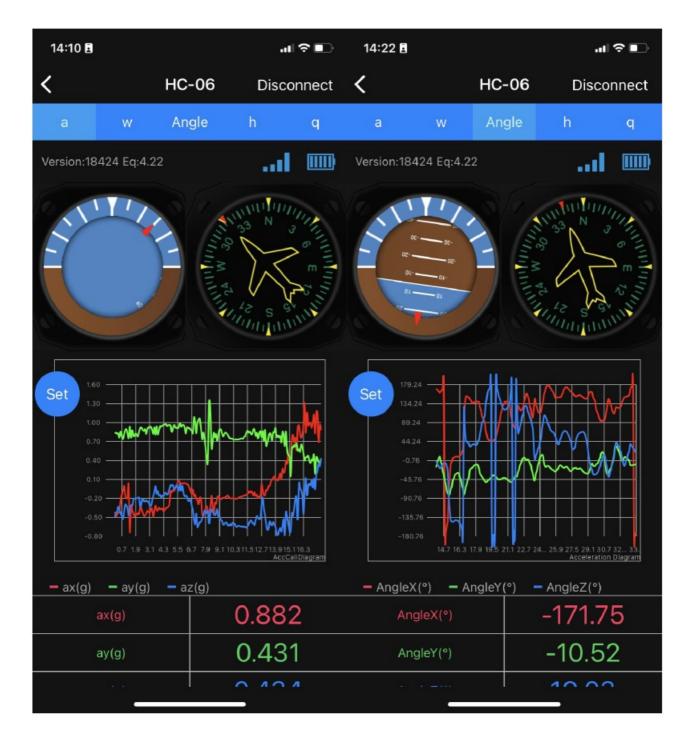


Sensor device ID will be recognized as HC-06 The second column is its SSID number.



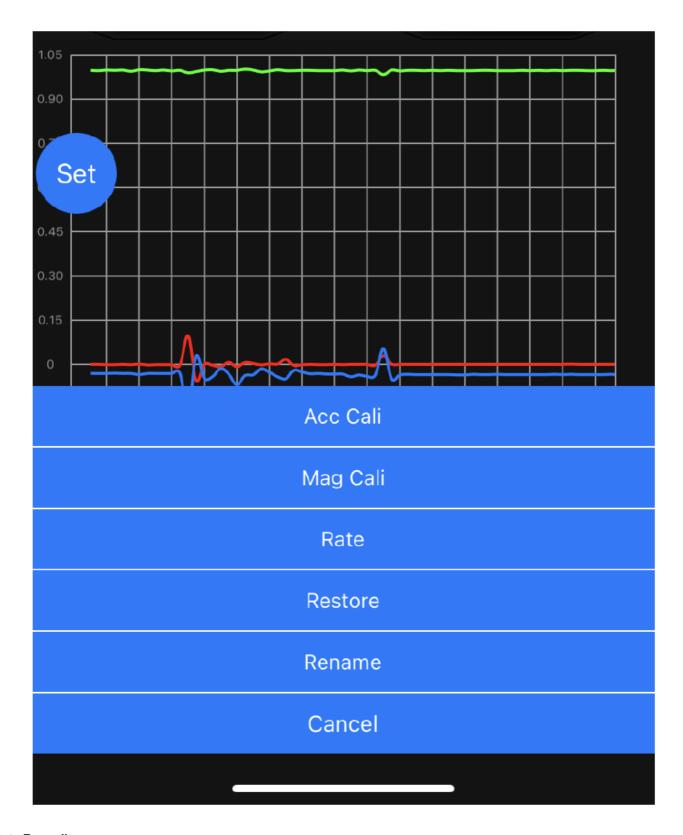
• Step 2. Select the device and the data will be online

Demo: Angle data curve



How to configure

- For menu setting and its introduction including button and functions setting, please referring to the Chapter 4.2.
- Click the button of "SET", the menu will jump out automatically.



Data Recording

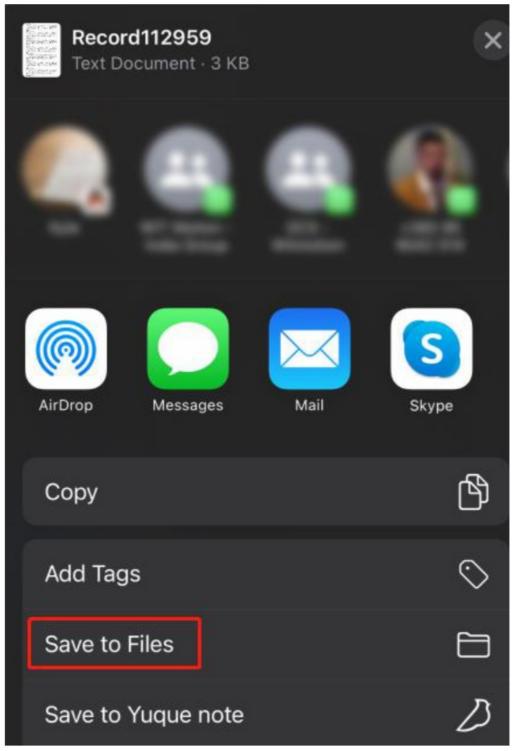
The data can be easily recorded by simply press the button of record. The recorded file can be txt format at present. You can send the record file to the computer and then paste the data to an excel file for intuitive reviewing. P.S If you meet any problem, please reach our team at support@wit-motion.com

- Step 1. Click "Record"
- Step 2. When you finish the record, click "End".

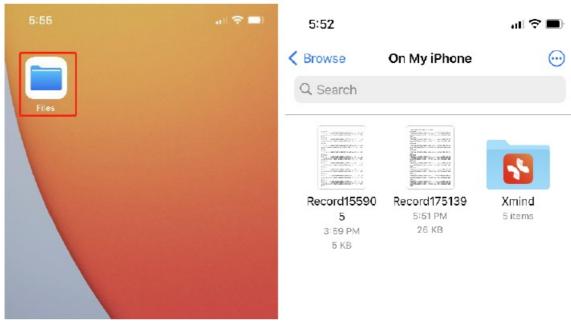
Set -0.15 59 61.1 62 63 64.7 65 67.1 68 - ay - ay - ay	AccCaliDiagram 3 69 70.7 71.9 73.1 74.3 75.5 76.7 7			
ax(g)	-0.009			
ay(g)	0.998			
az(g)	-0.021			
a (g)	0.998			
<u></u>				
Record	HistoryRecord			

• Step3. Once you finished the record, you need to save the file. We recommend you choose the button "Save to Files", the file will save the on your mobile desktop folder.

PS: We tried all saving methods and found this method to be convenient.



• Step 4. Come back to your mobile desktop, click the "Files", then you can check the records files.



• Step 5. The file will show this format.

5:52

Done Record175139 (2 of 2)

,h,-4632.0000,-6725.0000,-1620.0000 2023-04-20

17:51:39.2,a,-0.0063,0.0015,1.0073,ver,18414,eq,4.0600,rs si,-61,T,30.0700,w,0.0000,0.0000,0.0000,Angle,0.5768,-0. 1208,-145.4755,q,0.2967,0.0005,-0.0051,-0.9549,h,-4648 .0000,-6703.0000,-1601.0000 2023-04-20

17:51:39.2,a,-0.0068,0.0020,1.0088,ver,18414,eq,4.0600,r ssi,-61 ,T,30.0700,w,0.0000,0.0000,0.0000,Angle,0.5823,-0.1208,-145.4700,q,0.2968,0.0005,-0.0052,-0.9549,h,-46 44.0000,-6714.0000,-1587.0000 2023-04-20

17:51:39.3,a,-0.0054,0.0015,1.0088,ver,18414,eq,4.0600,rs si,-61,T,30.0300,w,0.0000,0.0000,0.0000,Angle,0.5823,-0.1208,-145.4590,q,0.2969,0.0005,-0.0052,-0.9549,h,-463 2.0000,-6706.0000,-1565.0000 2023-04-20

17:51:39.4,a,-0.0059,0.0024,1.0078,ver,18414,eq,4.0600,rs si,-61,T,30.0700,w,0.0000,0.0000,0.0000,Angle,0.5823,-0.1208,-145.4535,q,0.2969,0.0005,-0.0052,-0.9549,h,-4637.0000,-6709.0000,-1566.0000

Use Instructions with PC

Connection Method

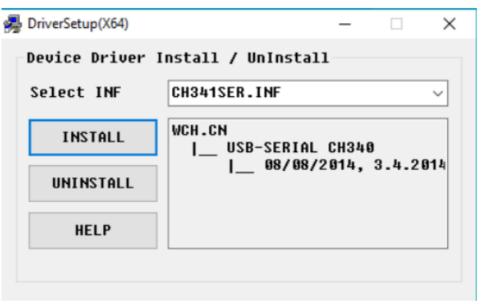
PC software is only compatible with Windows system. BWT901CL Playlist

TypeC-Cable Connection

 Step 1. Connect the sensor with offered Type-Cable. Turn on the sensor and the blue light of the sensor flashes. (Warm Reminder: If you wanna use a longer cable, it should be a standard Type-C data cable)

- Step 2. Unzip the software and install the driver CH340
 https://drive.google.com/file/d/1I3hl9Thsj9aXfG6U-cQLpV9hC3bVEH2V/view?usp=sharing
- · How to Install and update the CH340 driver

Click the "Uninstall" button first. Then click on the "Install" button.

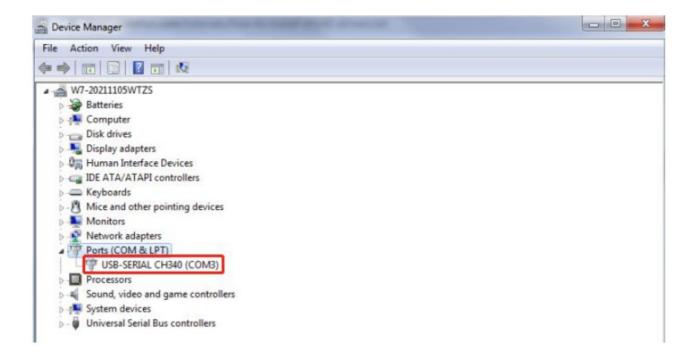


How to verify your driver is working

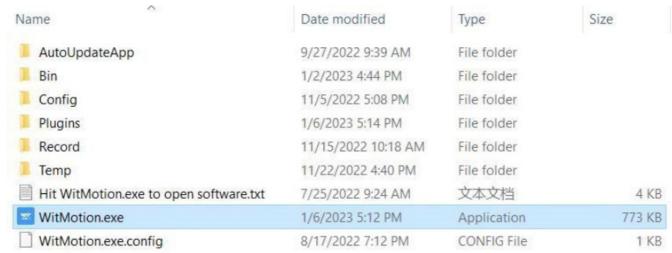
1. To check that the CH340 enumerates to a COM port, you can open the device manager. You can click the Start or ⊞ (Windows) button and type "device manager to quickly search for the application.



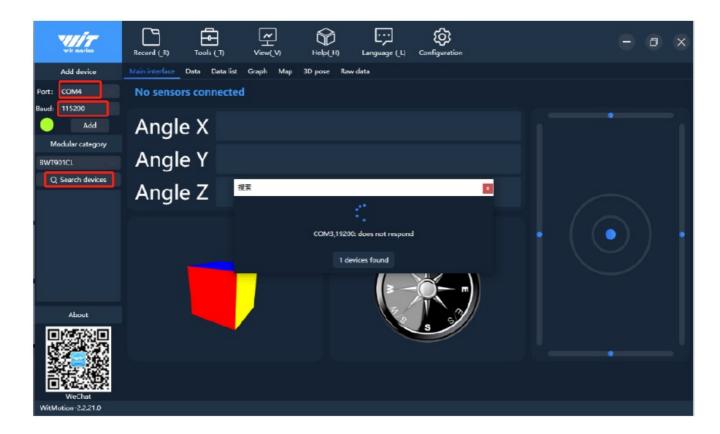
2. After opening the device manager, you will need to open the Ports (COM & LPT) tree. The CH340 should show up as USB-SERIAL CH340 (COM##). Depending on your computer, the COM port may show up as a different number.



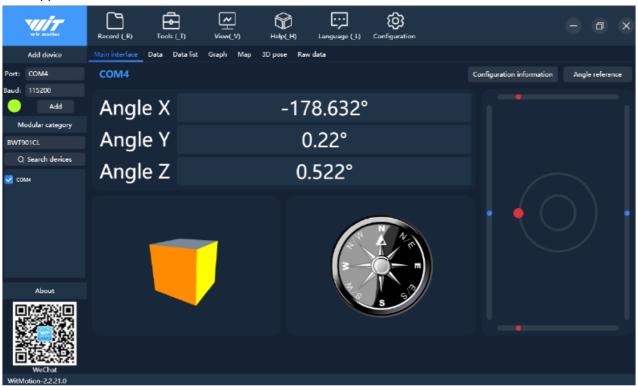
• Step 3. Open the software(WitMotion.exe)



• Step 4. Choose the right "Port", Baud default 115200.enter the model name(BWT901CL), hit "Search devices'.



Data will appear after auto-search finishes



Notice: If not successful, please operate manually

Choose the com port and baud rate 115200, data will be shown on the software.

USB-HID Connection

• Step 1. Open the software(WitMotion.exe)

Name	Date modified	Туре	Size
AutoUpdateApp	9/27/2022 9:39 AM	File folder	
Bin	1/2/2023 4:44 PM	File folder	
Config	11/5/2022 5:08 PM	File folder	
Plugins	1/6/2023 5:14 PM	File folder	
Record	11/15/2022 10:18 AM	File folder	
Temp	11/22/2022 4:40 PM	File folder	
Hit WitMotion.exe to open software.txt	7/25/2022 9:24 AM	文本文档	4 KB
WitMotion.exe	1/6/2023 5:12 PM	Application	773 KB
☐ WitMotion.exe.config	8/17/2022 7:12 PM	CONFIG File	1 KB

• Step 2. Insert the USB-HID adapter into the USB slot of the computer the blue light of HID adapter flashes)



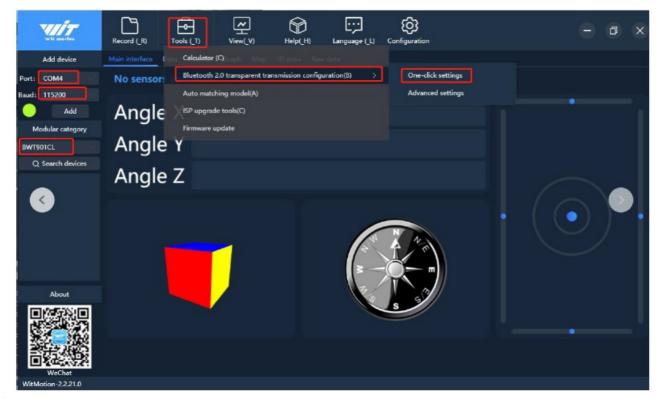
Step 3. Install the driver CH340 and confirm the "com port" in device manager
 https://drive.google.com/file/d/1l3hl9Thsj9aXfG6U-cQLpV9hC3bVEH2V/view?usp=sharing

How to Install and update the CH340 driver

Please kindly refer to Chapter 5.1.1 TypeC-Cable Connection, content of installing or updating CH340 driver

- Step 4. Turn on the sensor and the blue light of the sensor flashes
- Step 5. Open the software. The default baud rate is 115200. Choose the right Port, enter the purchased product model, then hit

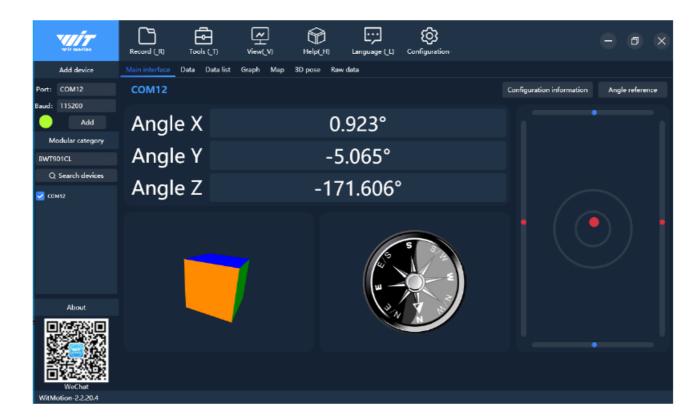
Tools<Transmission Configuration<One-cick settings.



- Step 6. the software will be set up unbinding automatically and search devices successfully (Bluetooth Pairing process)
- Step 7. Wait till the sensor's blue LED light remains on-means pairing succeeded

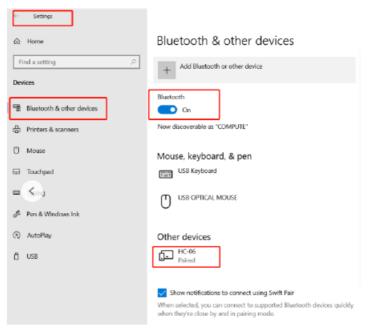


• Step 8. Data will appear once the auto-search finishes

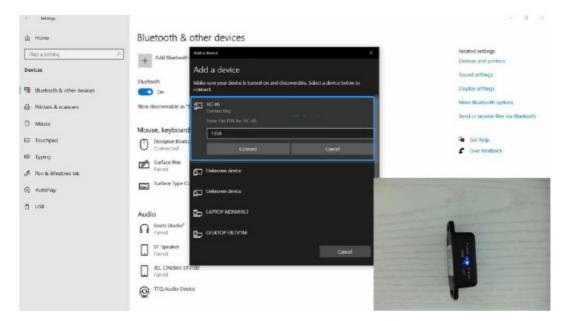


PC's Bluetooth Connection

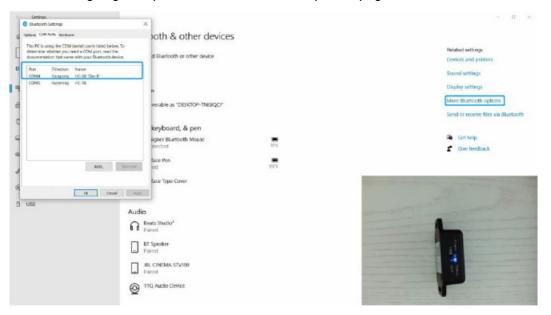
• Step 1. Turn on the computer's Bluetooth



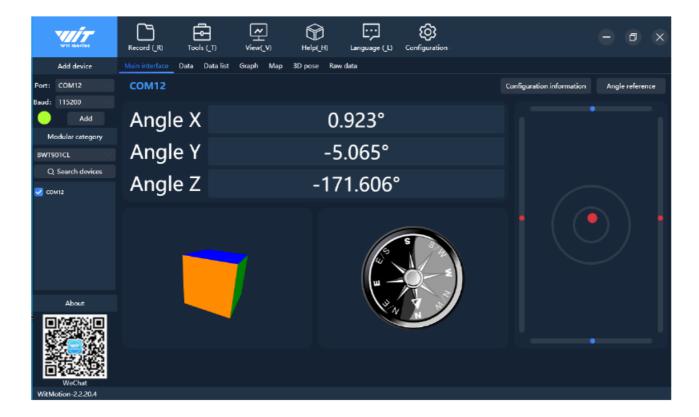
- Step 2. Turn on the sensor
- Step 3. Search HC-06 device and input pairing password, 1234



• Step 4. Confirm the "outgoing com port" on "More Bluetooth Options" page



- Step 5. Open software (WitMotion.exe) and choose the correct com port and keep the baud 115200.
- Step 6. Data will appear once the automatic search finishes.



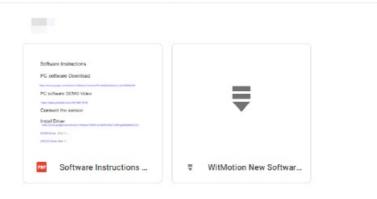
Instructions of 2023 New Software

In order to improve the user experience and our customer service, we develop a new version PC software.

Link to check the PC Software connection video demo. Video demo

Below is the new software and universal instruction download link. https://drive.google.com/drive/folders/1dnwmnH7mi4zBpNqDywLzrzsV7BfeKaD9?usp=share_link.

WITMOTION New Software(Universal)

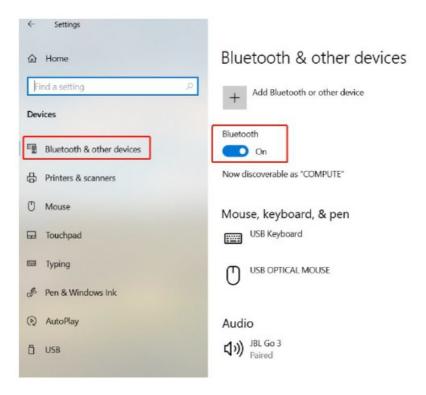




Multiple-Connection Instructions

The BWT901CL can be connected via laptop's Bluetooth. It is required to use the WitMotion New Software. The maximum is up to 4 units in the same time via connection.

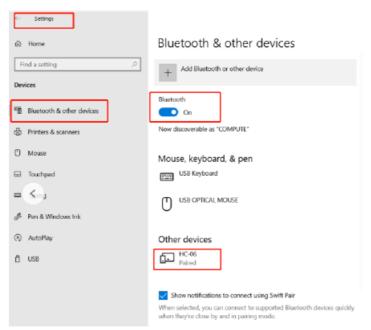
PS. It is required to turn on the laptop's Bluetooth.



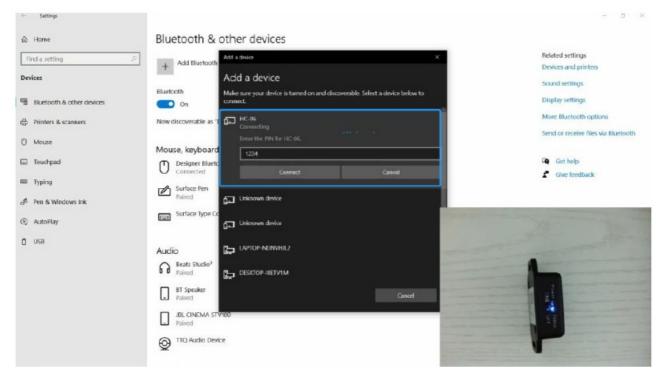
- Because Bluetooth is limited, sometimes the data lag when you're using Bluetooth to multi-connect, and the Bluetooth range will be less. Of course, the different phone has a different range.
- If you need longer Bluetooth range when multi-connection (up to 30m), please use our USB-HID adapter (refer to the chapter 4.1.2 USB-HID Connection)

Connection Instructions

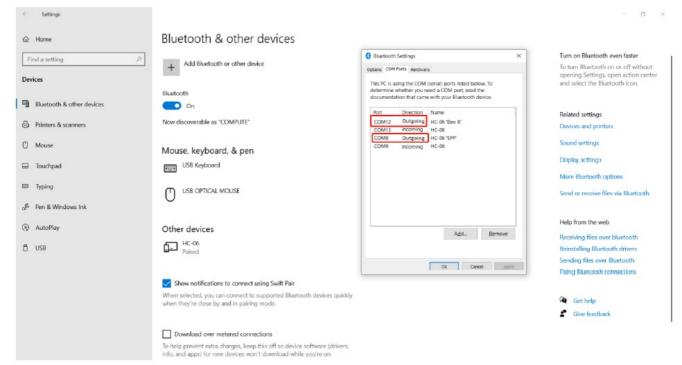
• Step 1. Install WitMotion New Software (Download link). Step 2. Turn on the computer's Bluetooth



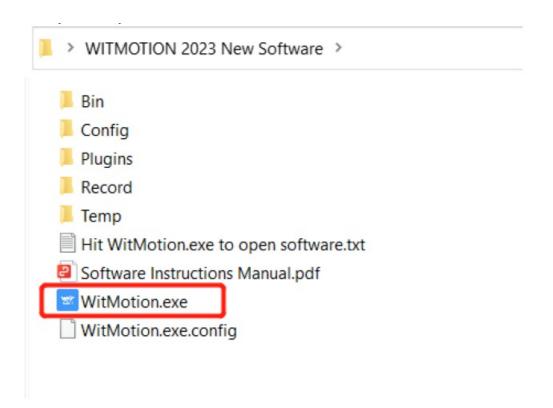
- · Step 3. Turn on the sensor
- Step 4. Search HC-06 device and input pairing password, 1234



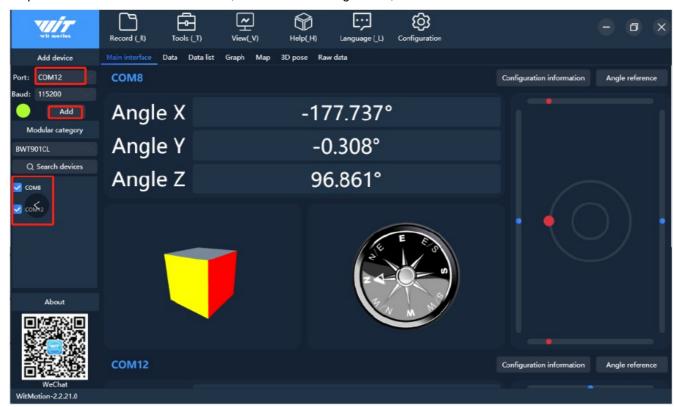
• Step 4. Confirm the "outgoing com port" on "More Bluetooth Options" page, and check the Port corresponding to Direction is "Outgoing".



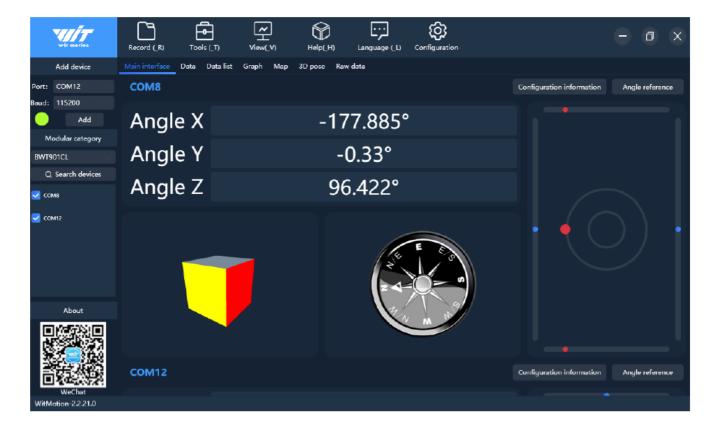
• Step 5. Open the WitMotion New Software and the laptop's Bluetooth.



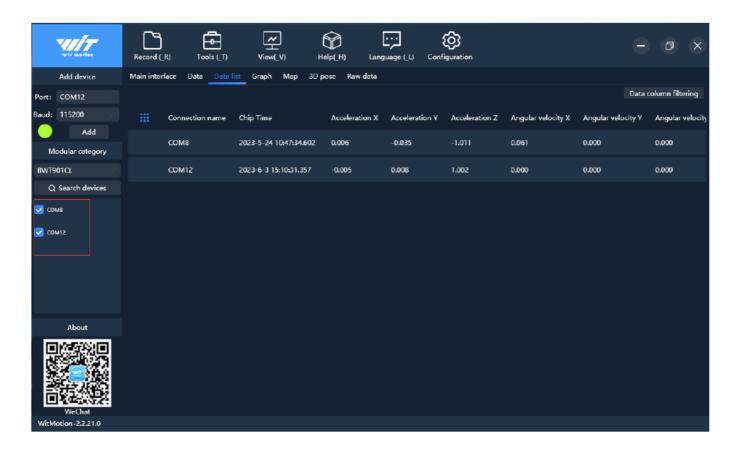
• Step 6. Choose module "BWT901CL", and choose the right Port, then click 'Add'.



• Step 7. Wait for a minute, you can see the data.



PS: If the interface hasn't show the data, select the device "COM+Number".



Noted:

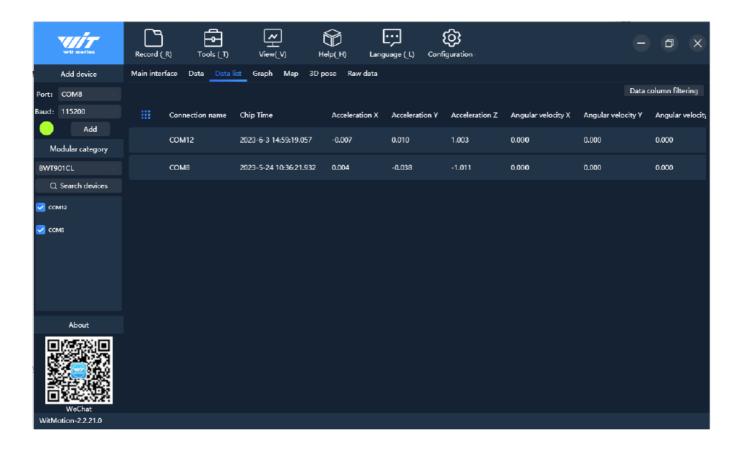
In standby mode, the sensor flashes quickly. Once the sensor was connected successfully, the blue light will start flashing slowly.

Software Setting

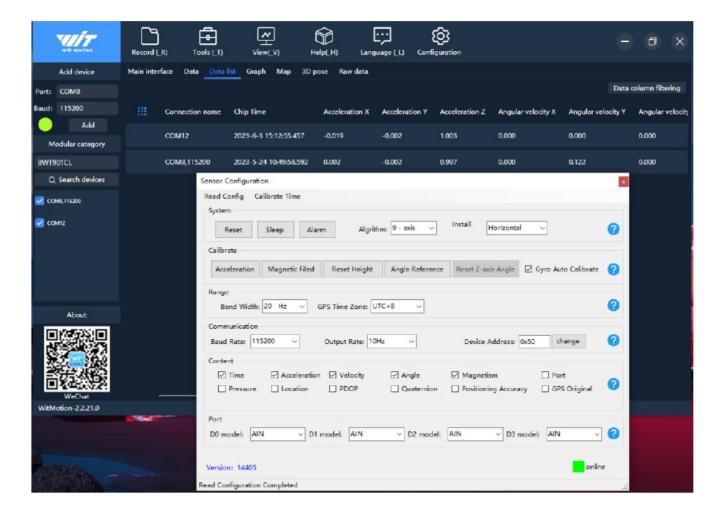
For software introduction including button and functions setting, please referring to the below link.

Data Configuration

Click the corresponding sensor, you can configure the individual sensor separately, record and so on.

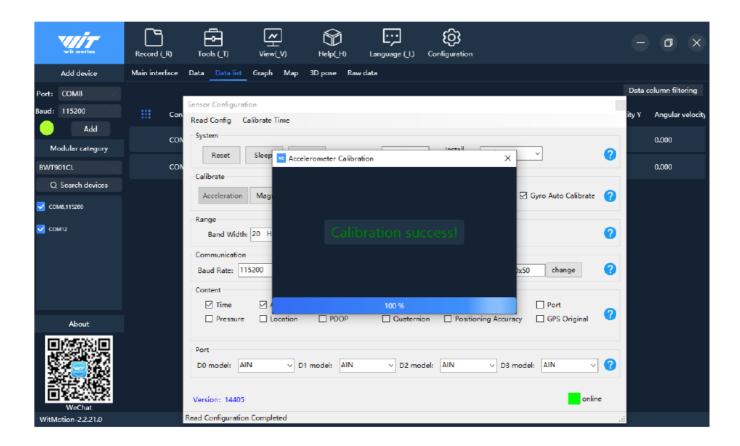


- Step 1. Click the config as you request.
- Step 2. The software will auto-save the config.



Calibrate

It is the similar with the method of the calibration of the standard PC software. If you don't how to config the parameter, please click "question mark".



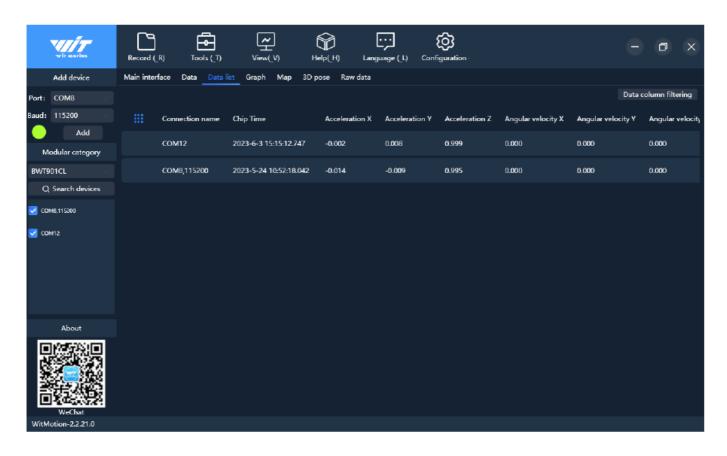
There are various choices on the data details, such as acceleration, angle data and so on.

Demo 1:

You can switch views as you like.

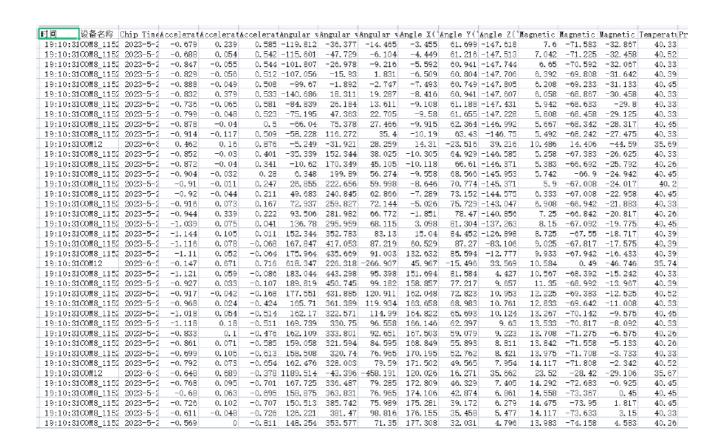


Demo 2:



- Step 1. Click "Record".
- · Step 2. Click "Stop".
- · Step 3. Extract the recorded file.
- Step 4. Paste all the recorded data packet to a Excel file for intuitive reviewing.

BWT901CL_1685819431238	6/3/2023 7:10 PM	BIN 文件	22 KB
BWT901CL_1685819431238.play	6/3/2023 7:10 PM	PLAY 文件	331 KB
BWT901CL_1685819431238_1	6/3/2023 7:10 PM	XLS 工作表	70 KB
BWT901CL_1685819431238_1	6/3/2023 7:10 PM	文本文档	63 KB



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Documents / Resources



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BWT901CL Bluetooth Inclinometer Sensor, BWT901CL, Bluetooth Inclinometer Sensor, Inclinometer Sensor, Sensor

References

- Hukseflux | #1 in solar radiation & heat flux measurement
- *** Accelerometer, Gyroscope, 6050 Mpu, Ahrs Sensor, Mpu-6050 Supplier
- Wir Contacts
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