USER MANUAL BWT61CL

Bluetooth 2.0 Inclinometer Sensor

Tutorial Link

Google Drive

Link to instructions DEMO:
WITMOTION Youtube Channel
BWT61CL 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 Truck
- Platform Stability
- Auto Safety System
- 3D Virtual Reality
- Industrial Control
- Robot
- Car Navigation
- UAV
- Truck-mounted Satellite Antenna Equipment

Contents

1 Introduction

The BWT61CL is a multi-sensor device detecting acceleration, angular velocity and angle . 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.

BWT61CL's scientific name is AHRS IMU sensor. A sensor measures 3-axis angle, angular velocity, acceleration. Its strength lies in the algorithm which can calculate three-axis angle accurately.

BWT61CL is an CE standard accelerometer. It is employed where the highest measurement accuracy is required. BWT61CL 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

• 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

1.1 Warning Statement

- Putting more than 5 Volt across the sensor wiring of the main power supply can lead to permanent damage to the sensor.
- For proper instrument grounding: use WITMOTION with its original factory-made cable or accessories.
- Do not access the I2C interface.
- Do not change the baud rate because WITMOTION BLUETOOTH sensor's baud rate (Defalut 115200) is fixed.

1.2 LED Status

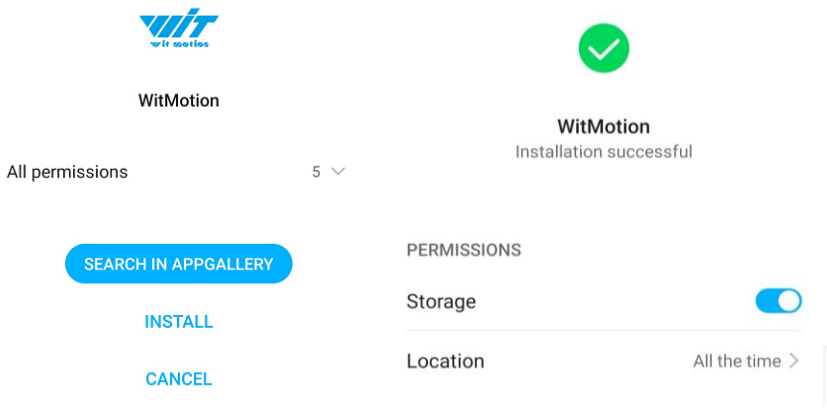
LED	Status	Remark
Red	Flashing	Charging
Blue	Flashing	Pairing process
	Keeping still	Successful pairing

2 Use Instructions with Android Phone

For APP configuration introduction, please referring to the link.
https://drive.google.com/file/d/122Es4QPLi5R-O4TjN43FMFRcaNK9eSY8/view?usp=share_link

2.1 APP Installation

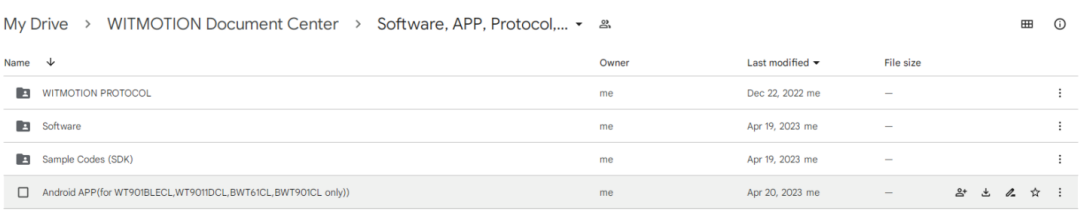
Install the APK file, give permission of Location and Storage



WITMOTION 2023v New Android APP

Link to check the tutorial video.

https://youtube.com/playlist?list=PL43tdDrVL_VC4njMairdwH-O-AVWECvSs



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.

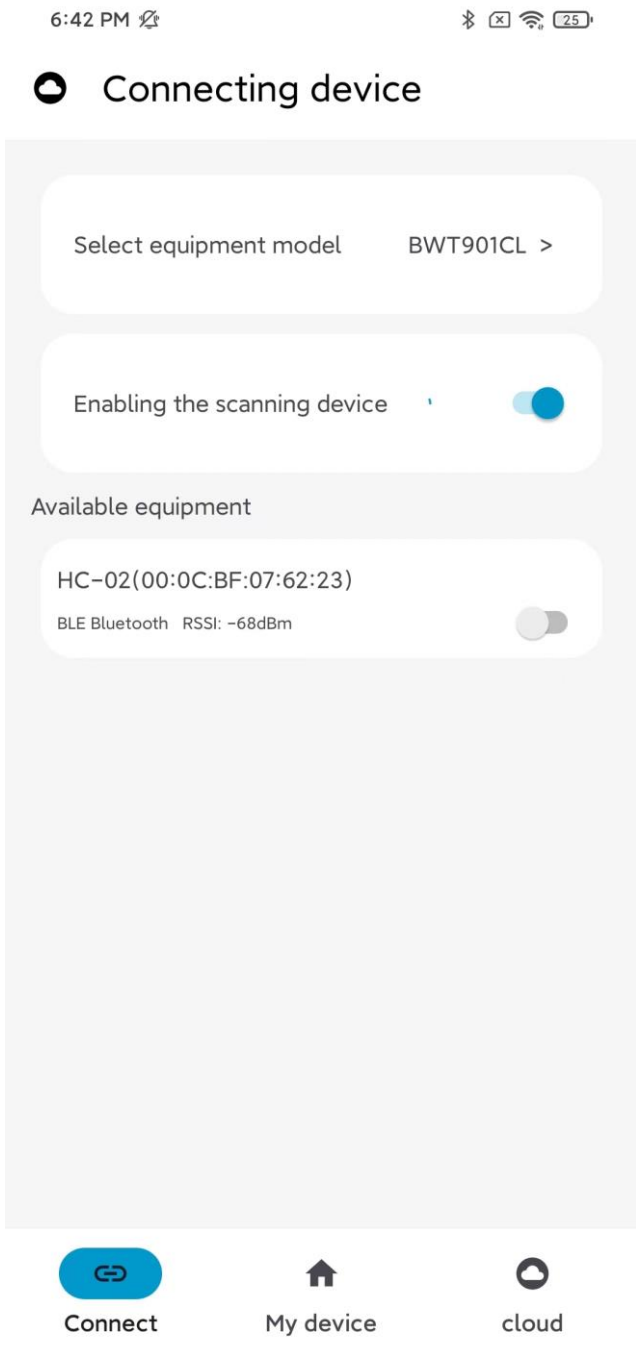
2. After turning on Bluetooth, it takes about one minute to search for authorization to find Bluetooth.

2.2 Connection

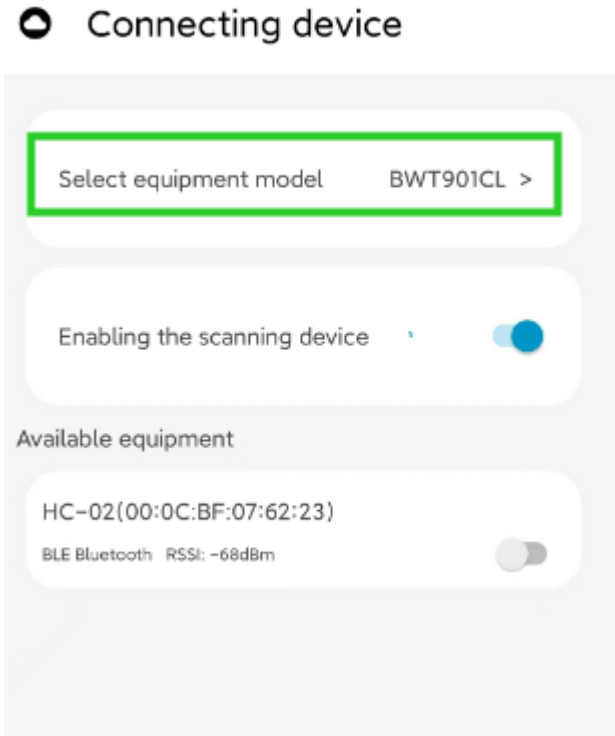
2.2.1 APP Pairing

Step 1. Install the APK file, give permission of Location and Storage

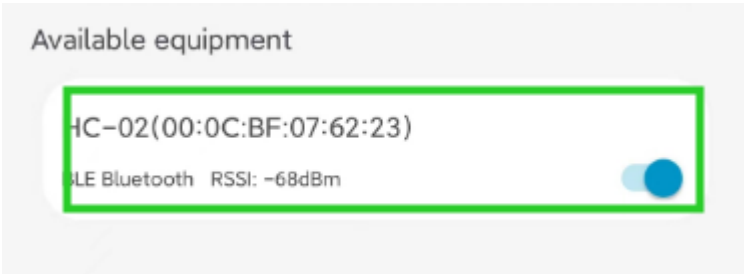
Step 2. Open APP and click “Connect”



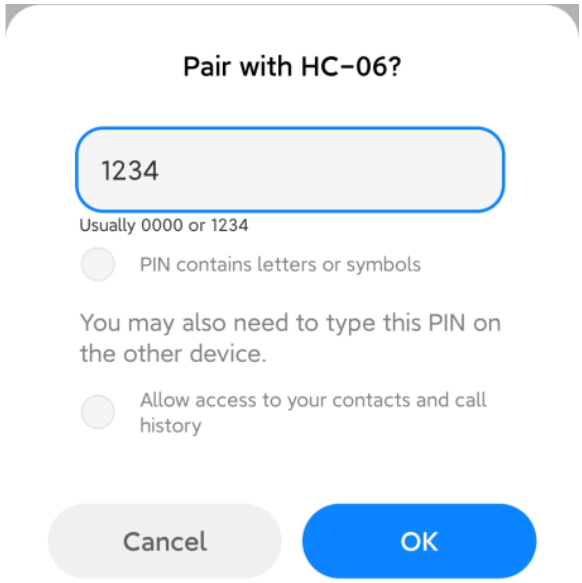
Step 3. Turn on the sensor, select “BWT901CL” and then scan the device.



Note: The device will show as “HC-02”+“MAC address”

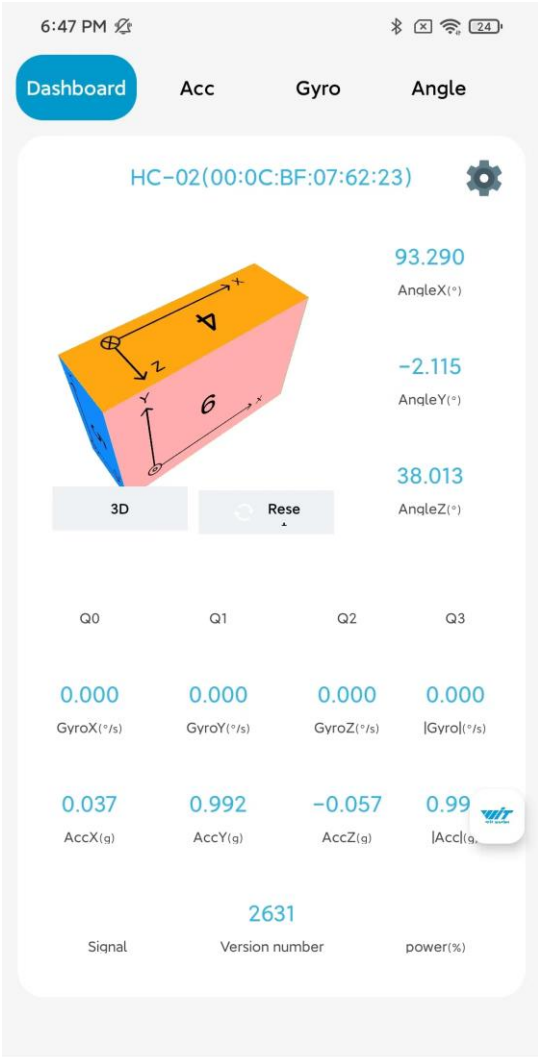


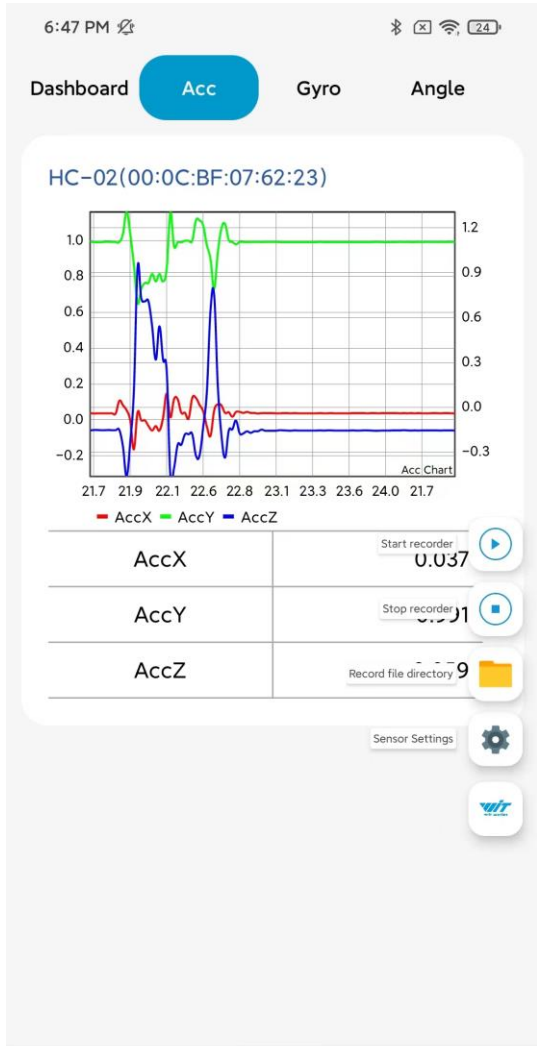
Step 4. Input password "1234" to pair with “HC-06”, then click "OK".



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.


6:47 PM
Dashboard
Acc
Gyro
Angle
HC-02(00:0C:BF:07:62:23)
93.290
AngleX(°)
-2.115
AngleY(°)
38.013
AngleZ(°)
3D
Rese
Q0
Q1
Q2
Q3
0.000
0.000
0.000
0.000
GyroX(°/s)
GyroY(°/s)
GyroZ(°/s)
|Gyro|(°/s)
0.037
0.992
-0.057
0.99
AccX(g)
AccY(g)
AccZ(g)
2631
Signal
Version number
power(%)
Connect
My device
cloud


6:47 PM
Dashboard
Acc
Gyro
Angle
HC-02(00:0C:BF:07:62:23)
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
1.2
0.9
0.6
0.3
0.0
-0.3
Acc Chart
21.7 21.9 22.1 22.6 22.8 23.1 23.3 23.6 24.0 21.7
AccX AccY AccZ
AccX
AccY
AccZ
Start recorder
Stop recorder
Record file directory
Sensor Settings
Connect
My device
cloud

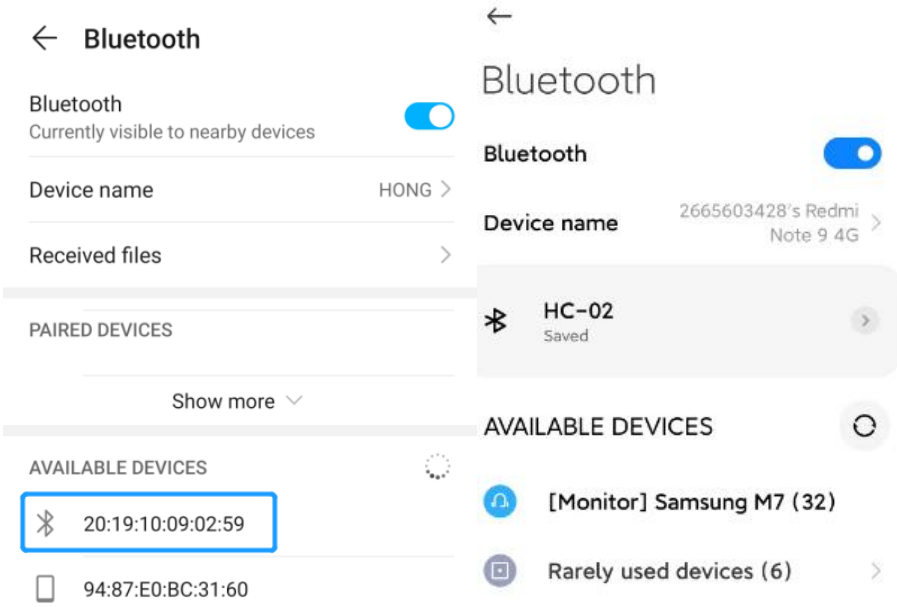
2.2.2 Phone's Bluetooth Pairing

Step 1. Install the APK file, give permission of Location and Storage

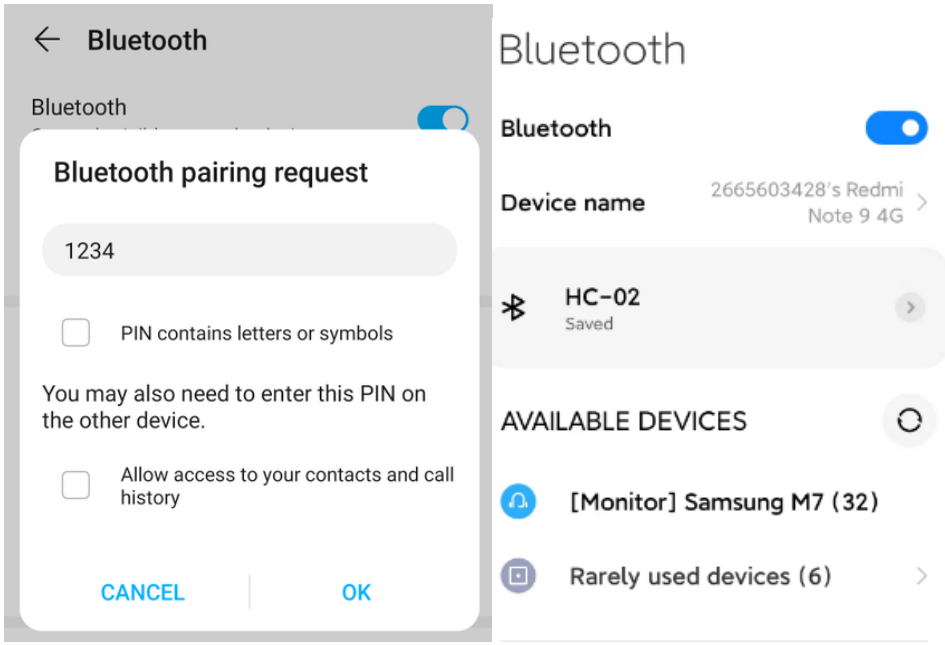
Step 2. Turn on the Bluetooth in the setting menu of smartphone

Step 3. Search the Bluetooth sensor

(First pairing the device will be recognize as mac address and will be shown as HC-02 after successful pairing.)



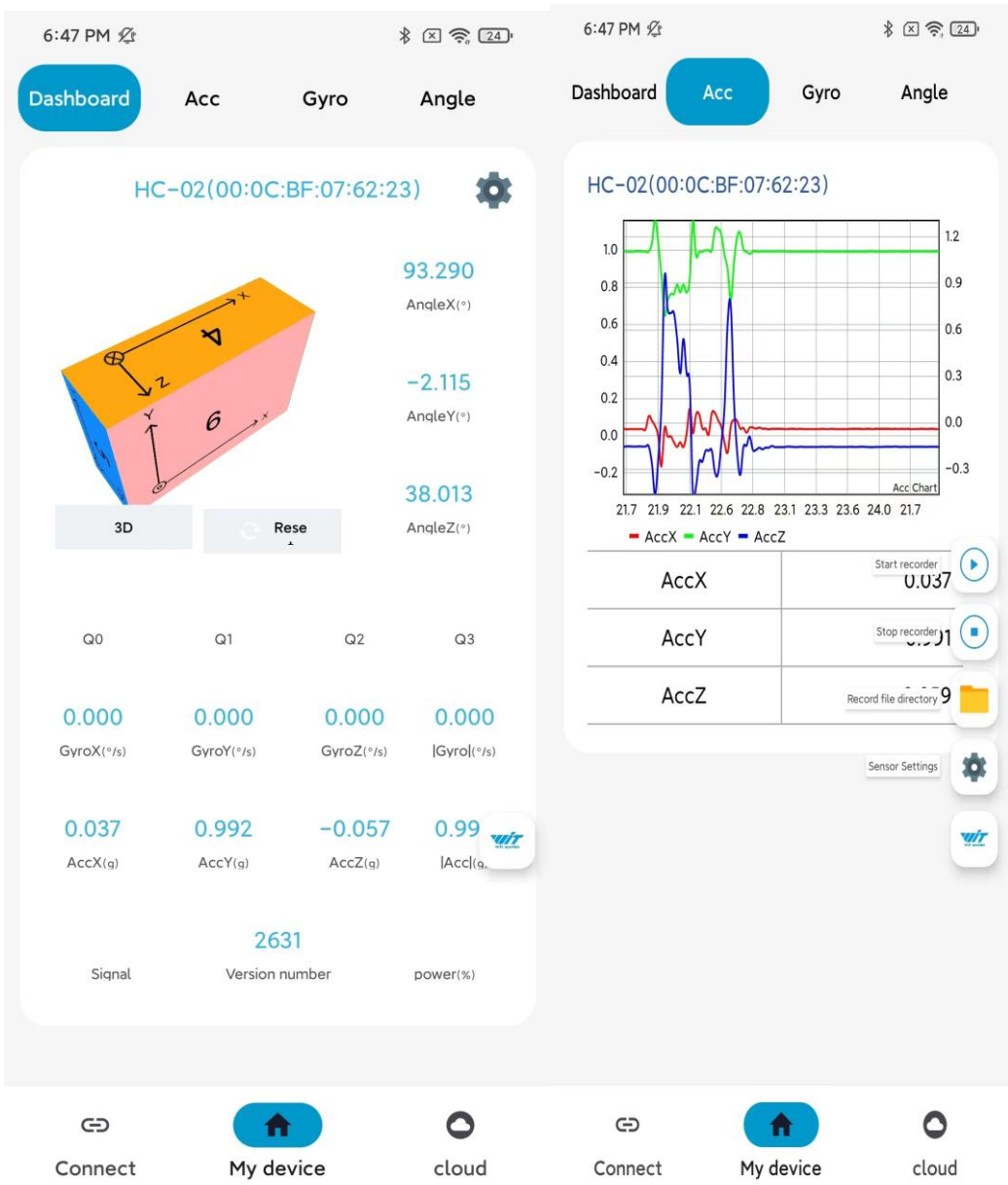
Step 4. Click the "MAC address" device and input the password "1234"



Step 5. Open the WITMOTION APP, and choose “BWT901CL”

Step 6. Click “Scan” and select the paired Bluetooth device “HC-02”
(No need to input password)

Step 7. The Blue LED light of sensor will keep on. Connection with APP is successful.



2.3 Calibration

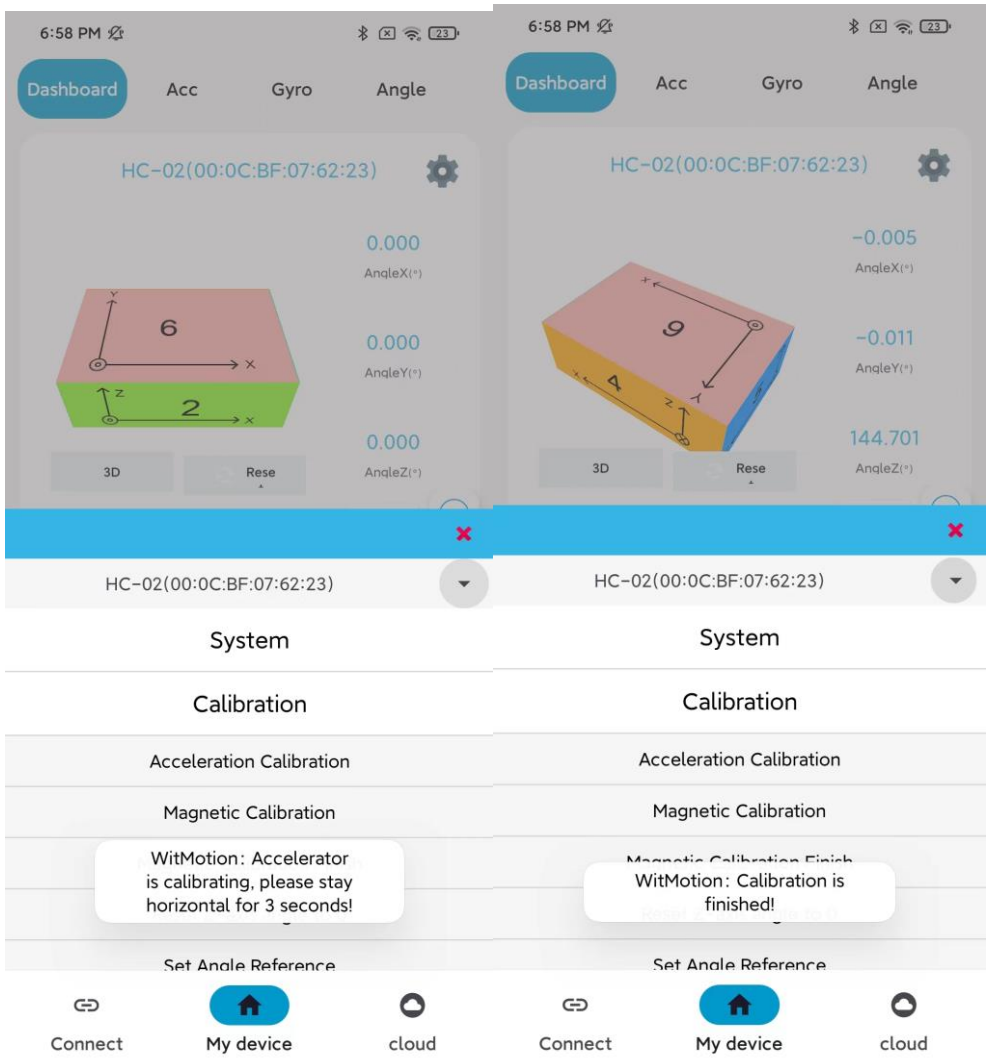
2.3.1 Acceleration Calibration

Step 1. Keep the module horizontally stationary

Step 2. Click the "Calibration" menu

Step 3. Click the "Acceleration Calibration" and wait for 3 seconds

Step 5. Check the result--confirm if there is 1g on Z-axis acceleration



2.4 Multi-connection

Link to the multi-connection video demo.
https://youtu.be/f8jVw6EsgTM

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	BWT61CL	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
Oppo	Android 13	15m	37m	15m	36m
Xiaomi	Android 11	30m	50m		
iPhone	Ios16.4.1	14m	24m		
Lenovo	Android 11	105m	125m	82m	105m

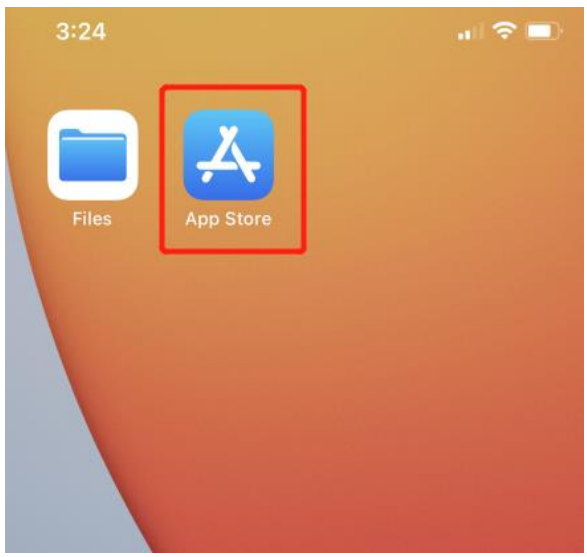
3 Use Instructions with iPhone

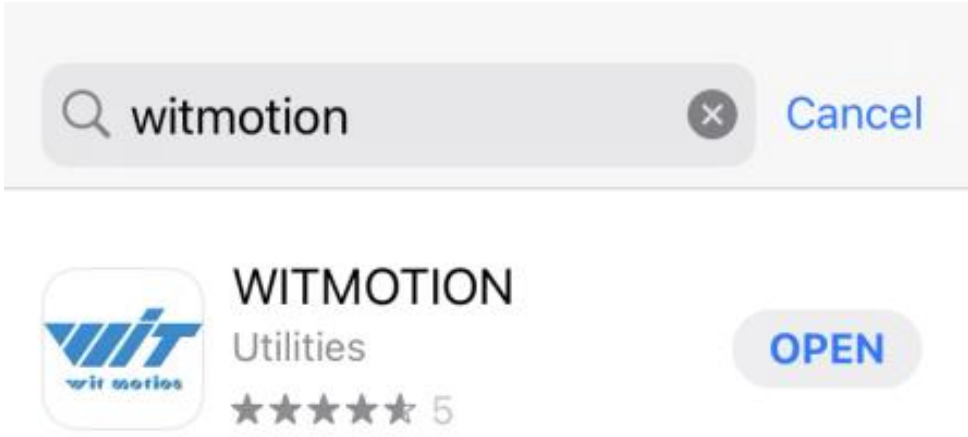
The new version of iOS APP has been launched. There will be many function coming out soon in future.
NOTICE:
The existing function of history recording is in instructions at present.
Your understanding would be highly appreciated.

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_VCgrQJTaODOhkkbmTkS1kMs

3.1 How to install

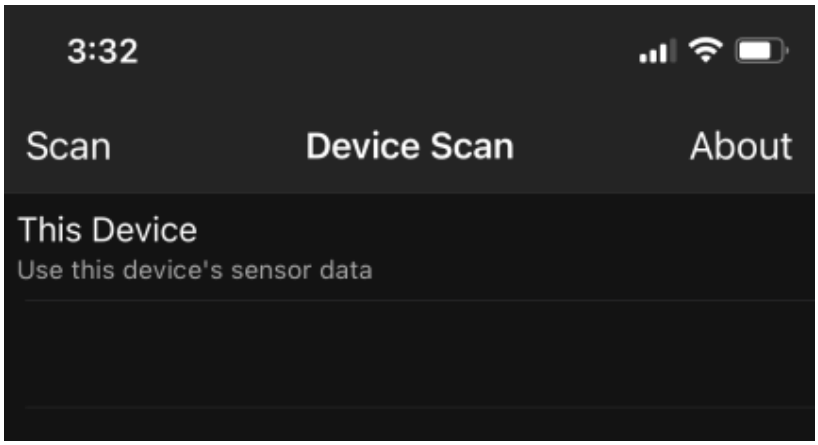
Step 1. Search “WITMOTION” on iOS App Store, and install the APP.



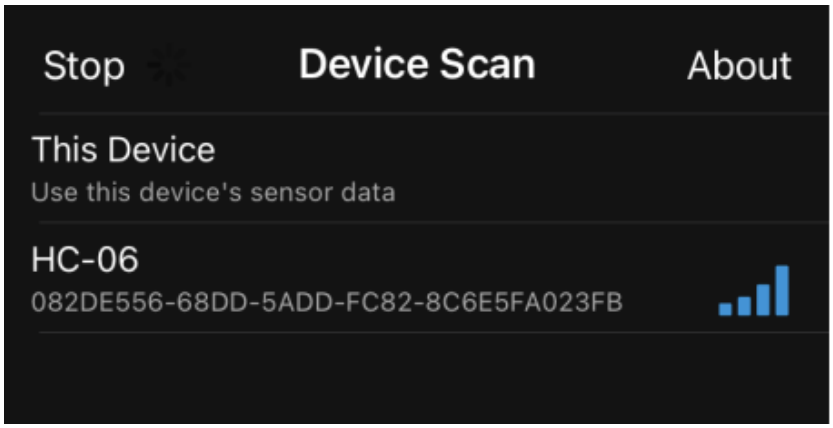


3.2 How to setup

Step 1. Turn on the sensor and then click “Scan”

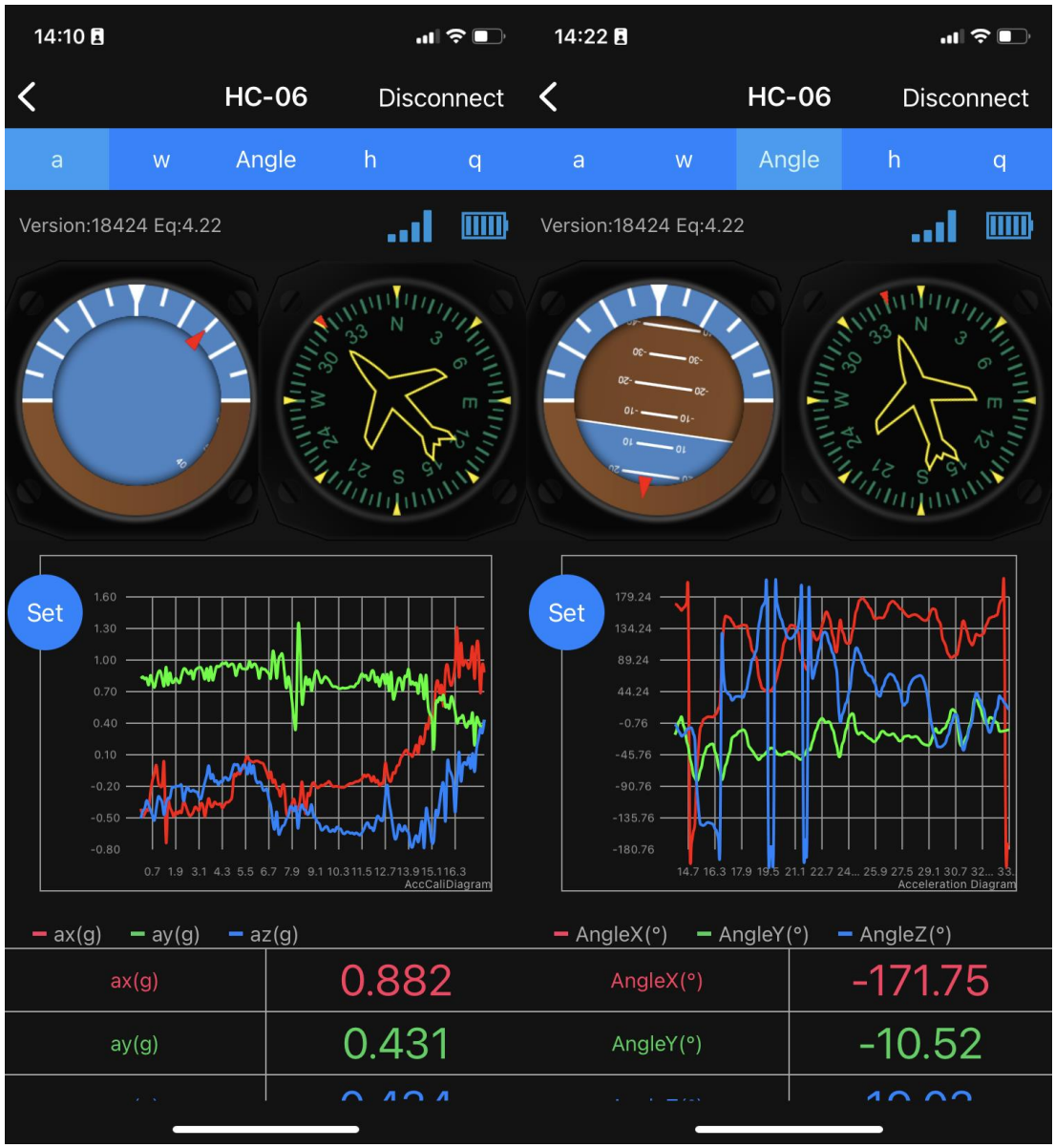


Sensor device ID will be recognized as HC-02
The second column is its SSID number.



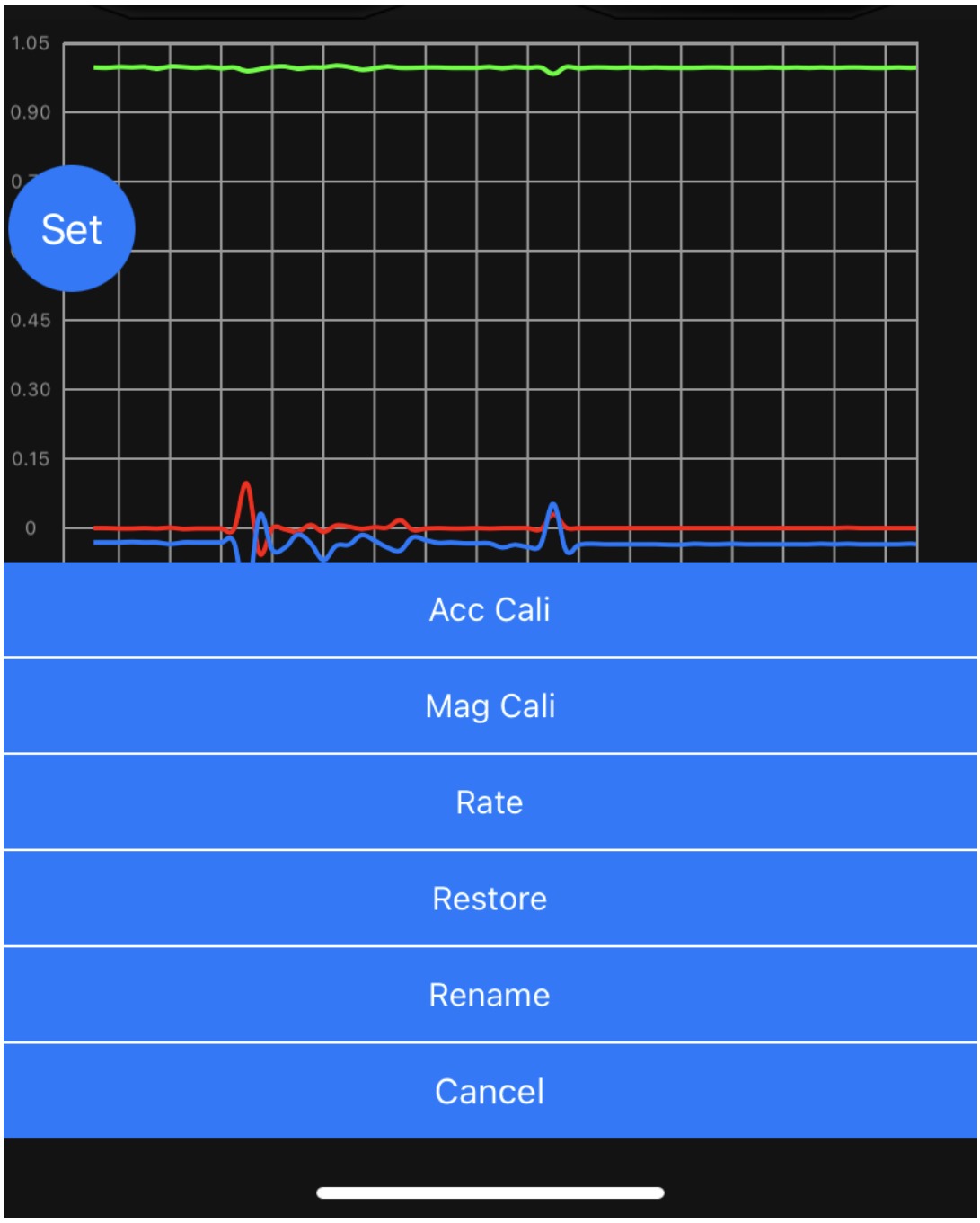
Step 2. Select the device and the data will be online

Demo: Angle data curve



3.3 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.

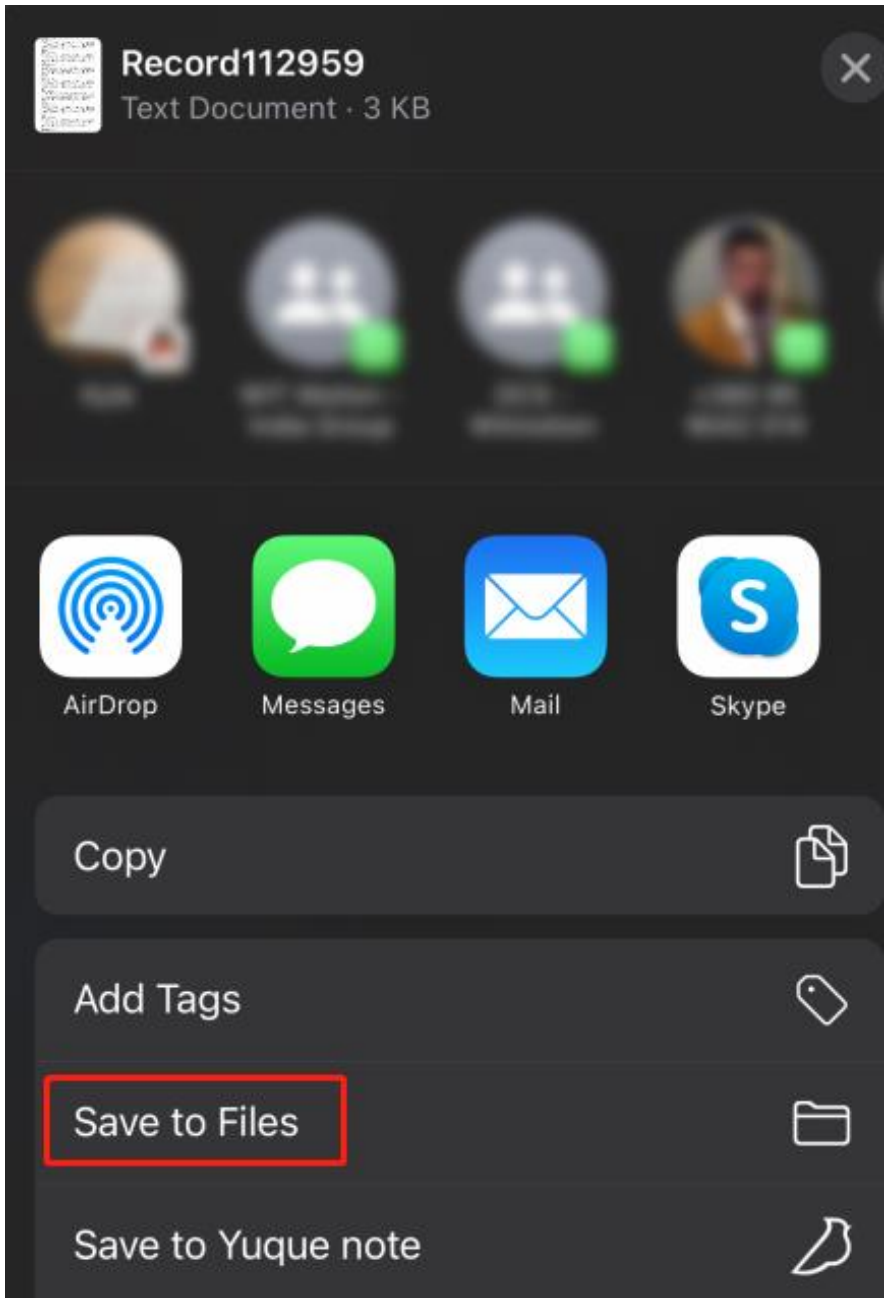


3.4 Data Recording

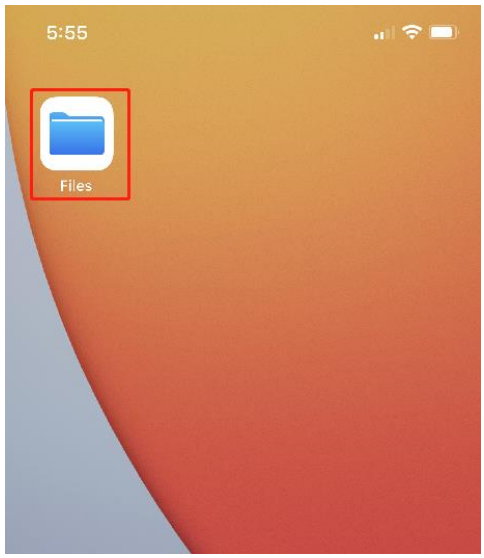
The data can be easily recorded by simply press the button of record.
The recorded file can be txt format at present. You can send the record file to the computer and then paste the data to an excel file for intuitive reviewing.
P.S If you meet any problem, please reach our team at support@wit-motion.com
Step1. Click " Record"
Step2. When you finish the record, click "End".

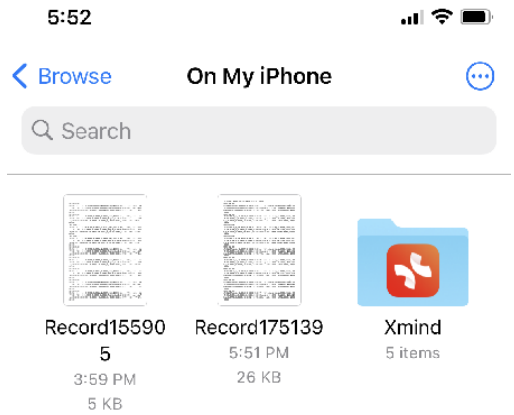
Step3. Once you finished the record, you need to save the file. We recommend you choose the button “Save to Files”, the file will save the on your mobile desktop folder.

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



Step4. Come back to your mobile desktop, click the “Files”, then you can check the records files.





Step 5. The file will show this format.

4 Use Instructions with PC

4.1 Connection Method

PC software is only compatible with Windows system.
BWT61CL Playlist

4.1.1 TypeC-Cable Connection

Step 1. Connect the sensor with offered Type-Cable. Turn on the sensor and the blue light of the sensor flashes.

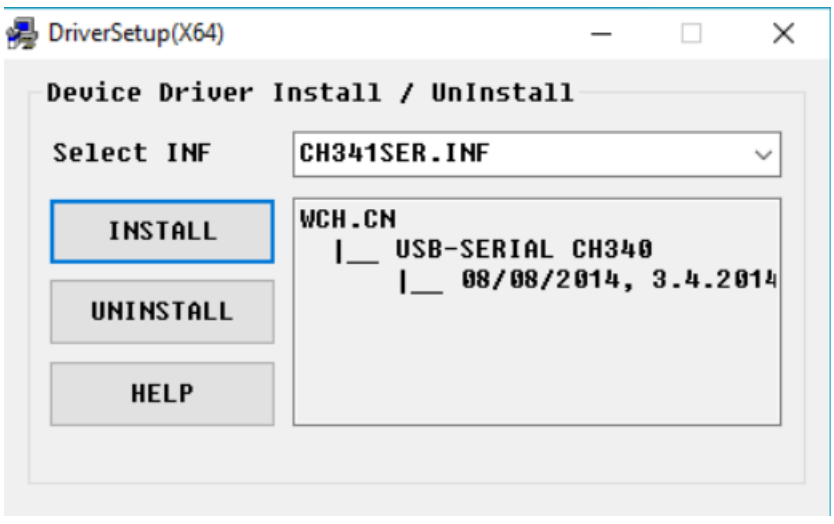
(Warm Reminder: If you wanna use a longer cable, it should be a standard Type-C data cable)

Step 2. Unzip the software and install the driver CH340

https://drive.google.com/file/d/1I3hl9Thsj9aXfG6U-cQLpV9hC3bVEH2V/view?usp=sharing

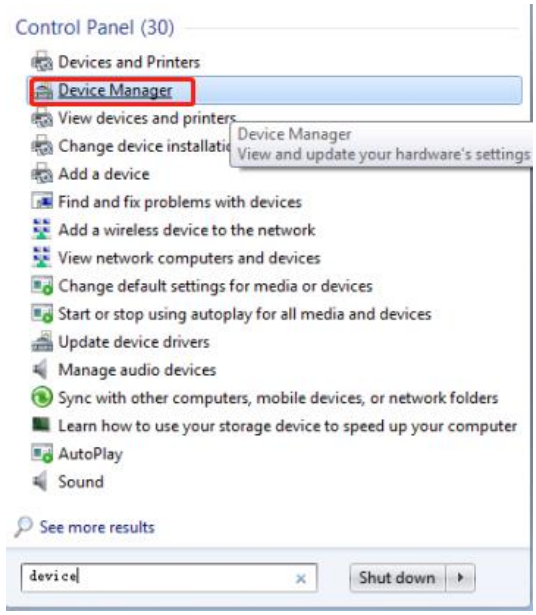
*How to Install and update the CH340 driver

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

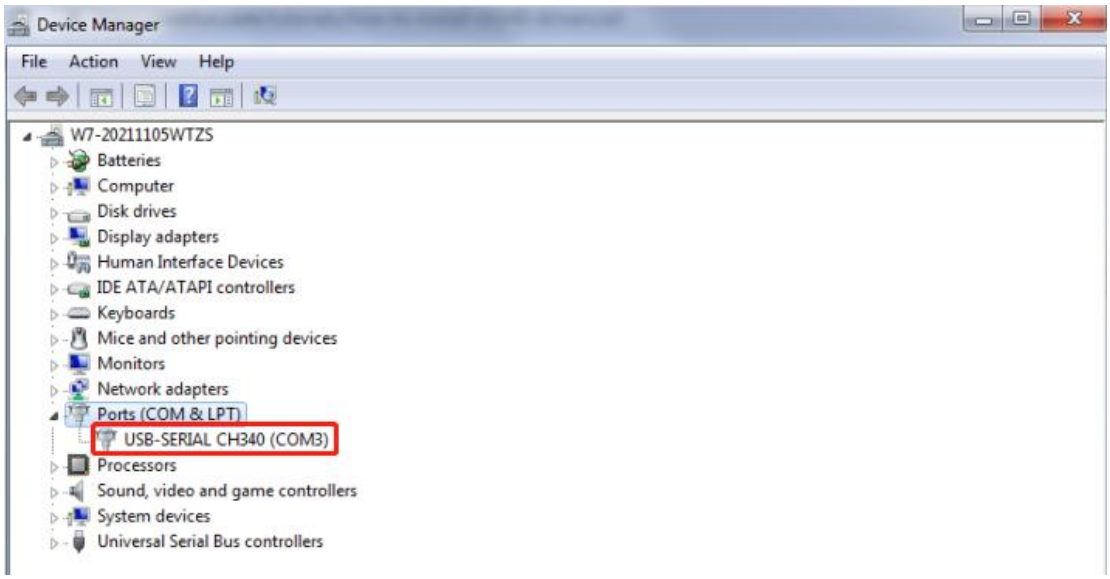


*How to verify your driver is working

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.



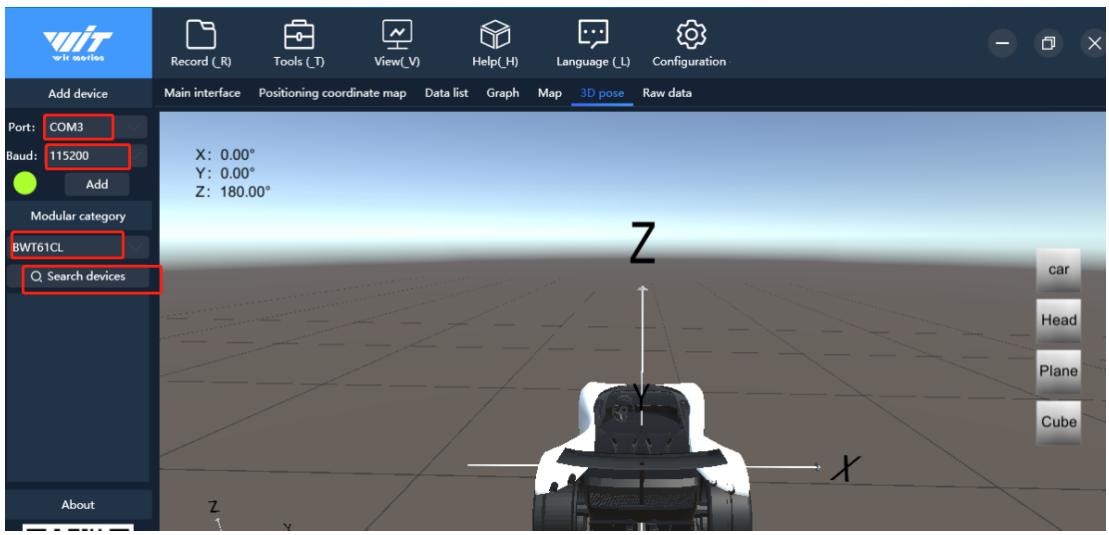
2）After opening the device manager, you will need to open the **Ports (COM & LPT)** tree. The CH340 should show up as **USB-SERIAL CH340 (COM##)**. Depending on your computer, the COM port may show up as a different number.



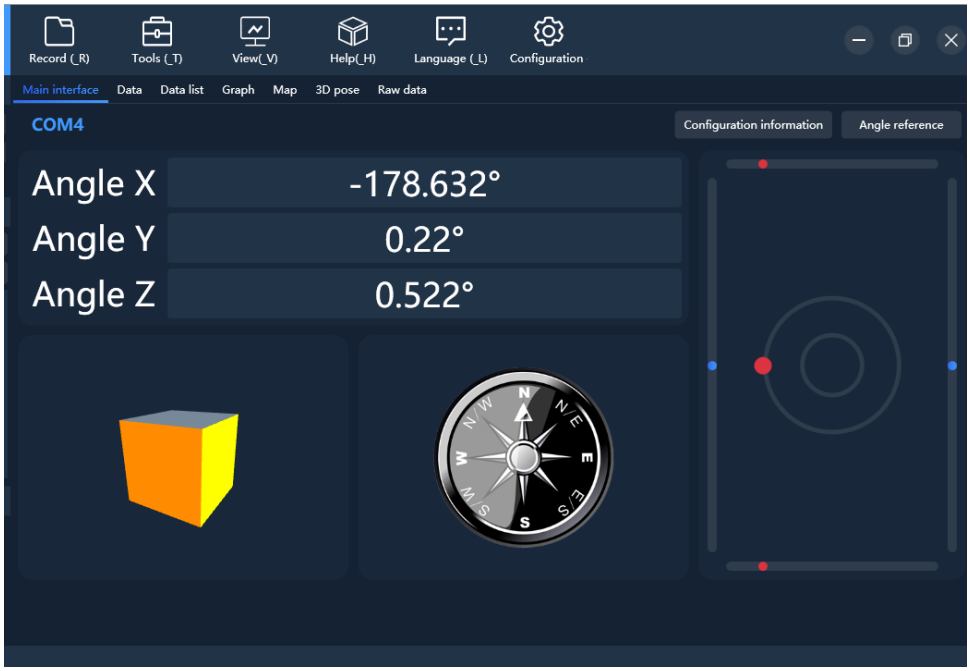
Step 3. Open the software(WitMotion.exe)

Name	Date modified	Type	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 4. Choose the right "Port", Baud default 115200.enter the model name(BWT61CL), hit "Search devices'.



Data will appear after auto-search finishes



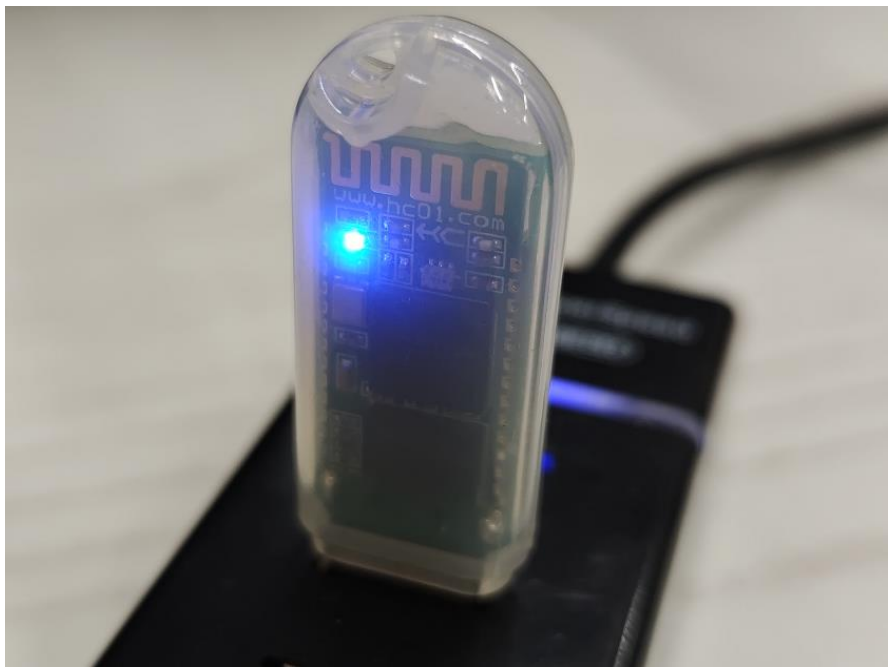
Notice: If not successful, please operate manually
Choose the com port and baud rate 115200, data will be shown on the software.

4.1.2 USB-HID Connection

Step 1. Open the software(WitMotion.exe)

Name	Date modified	Type	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

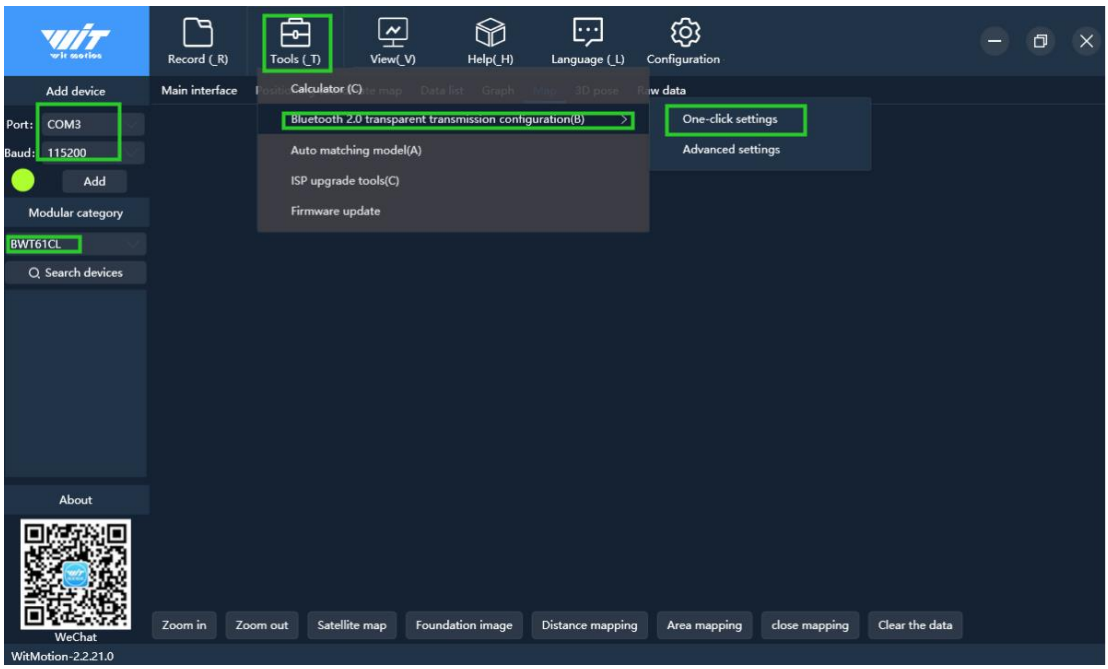
https://drive.google.com/file/d/1I3hl9Thsj9aXfG6U-cQLpV9hC3bVEH2V/view?usp=sharing

*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

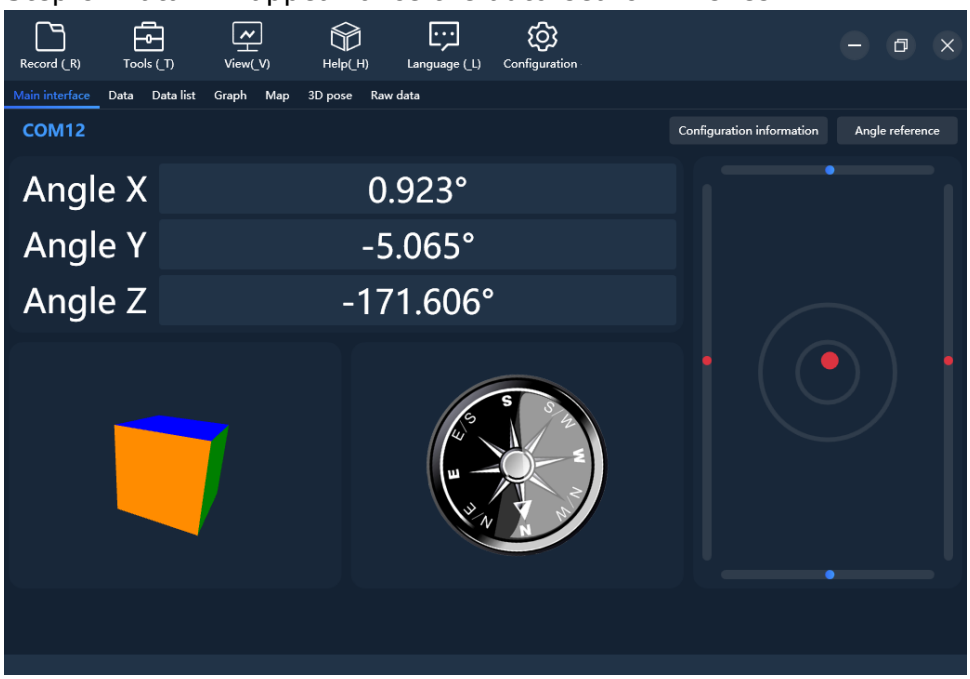
Step 5. Open the software. The default baud rate is 115200.Choose the right Port, enter the purchased product model, then hit Tools<Transmission Configuration<One-cick settings.



Step 6. the software will be set up unbinding automatically and search devices successfully (Bluetooth Pairing process)

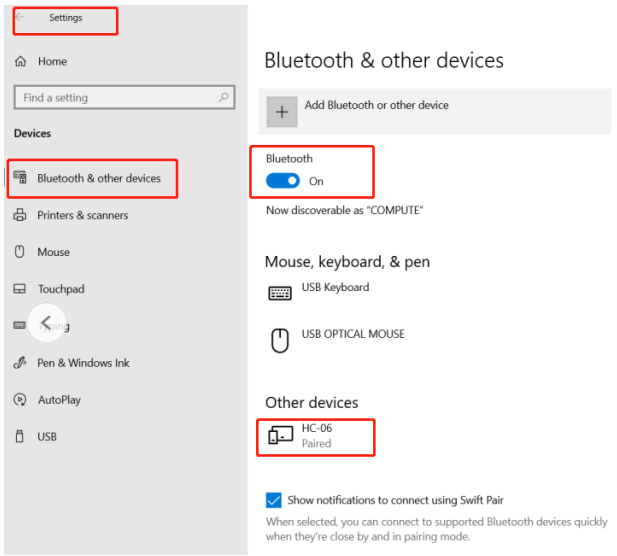
Step 7. Wait till the sensor's blue LED light remains on--means pairing succeeded

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



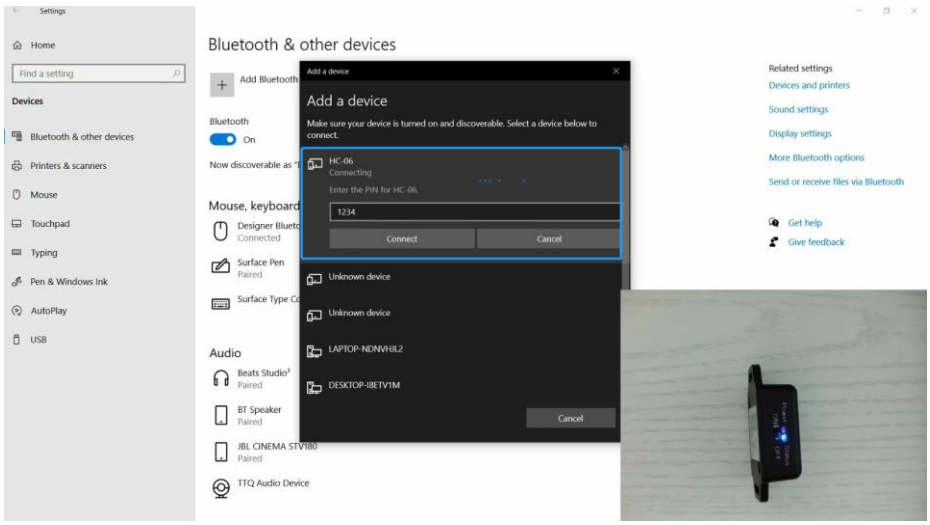
4.1.3 PC's Bluetooth Connection

Step 1. Turn on the computer's Bluetooth

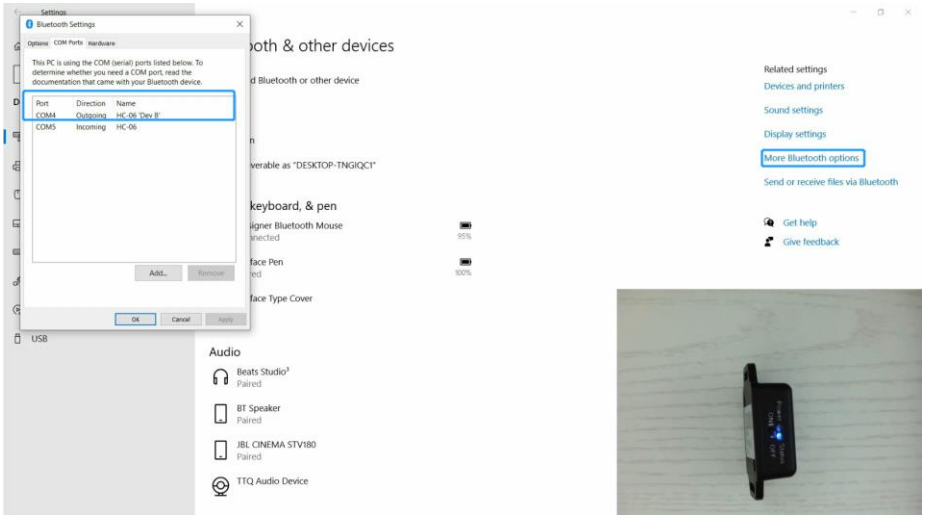


Step 2. Turn on the sensor

Step 3. Search HC-06/HC-02 device and input pairing password, 1234

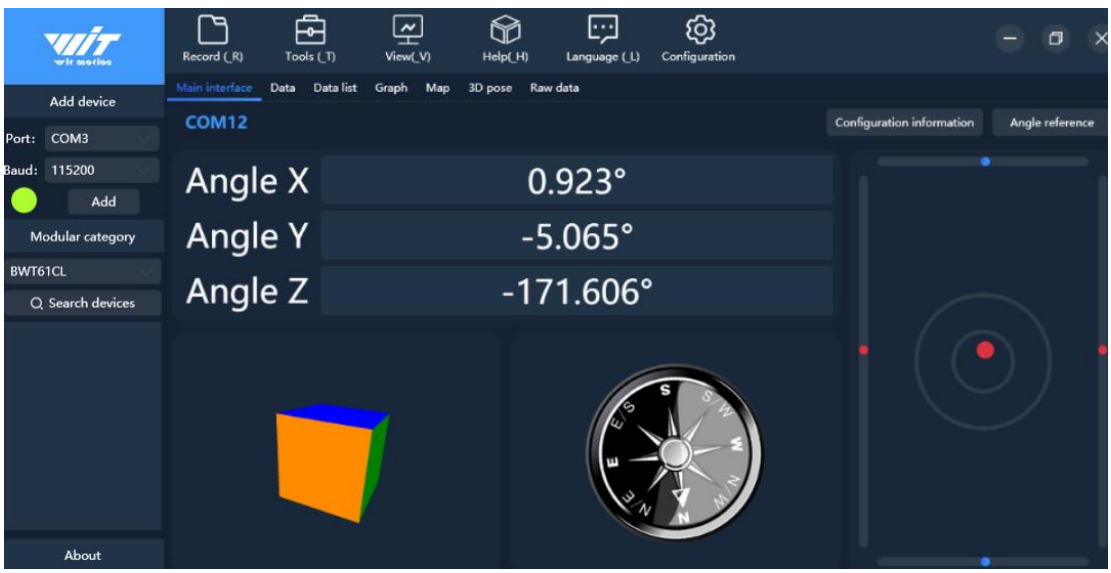


Step 4. Confirm the "outgoing com port" on "More Bluetooth Options" page



Step 5. Open software (WitMotion.exe) and choose the correct com port and keep the baud 115200.

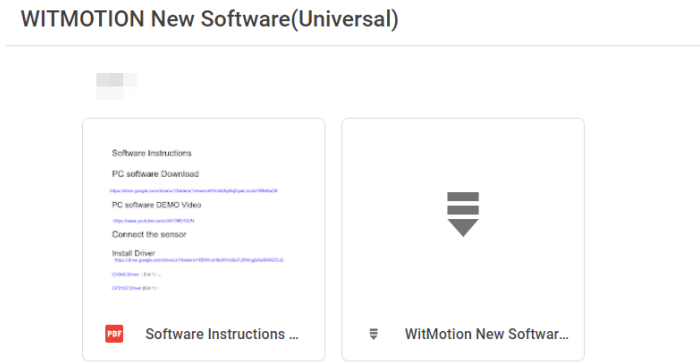
Step 6. Data will appear once the automatic search finishes.

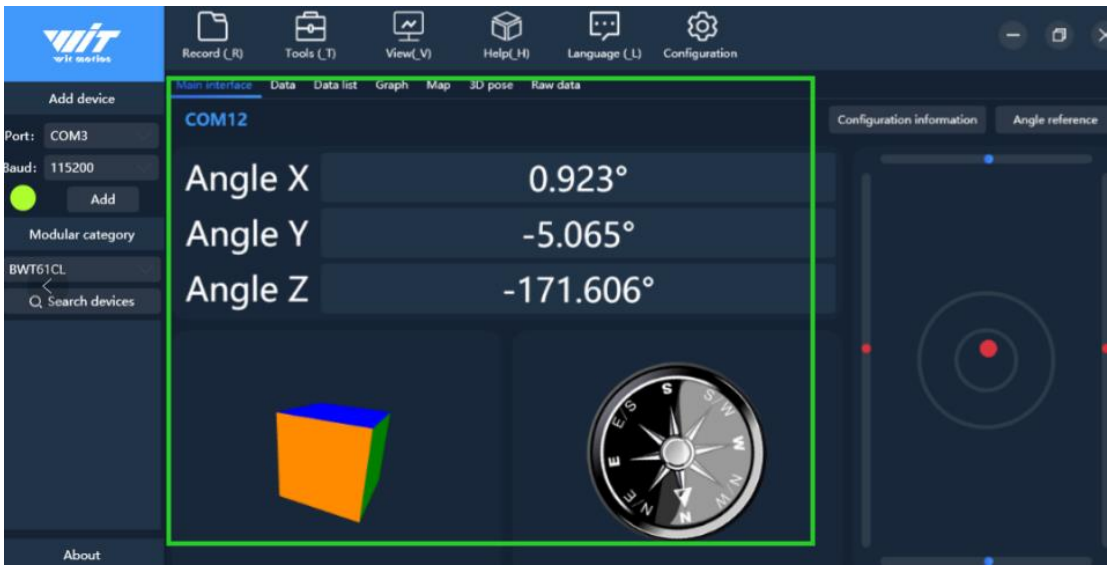


5 Instructions of 2023 New Software

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

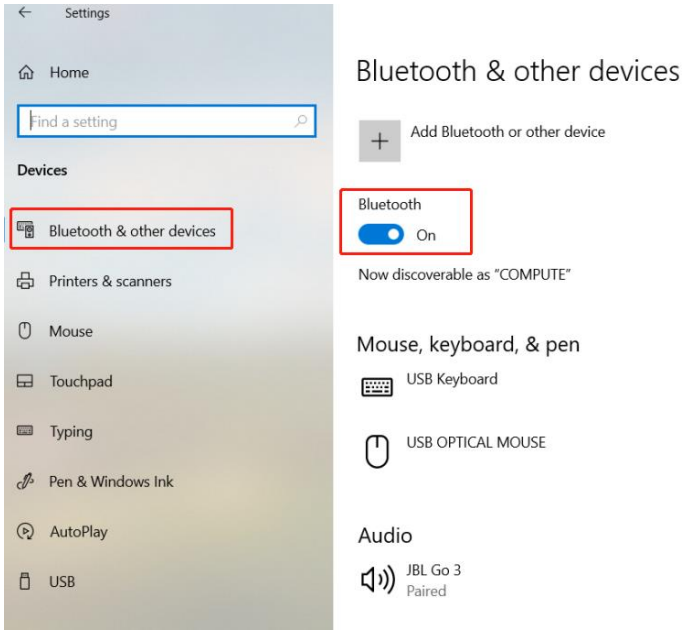




6 Multiple-Connection Instructions

The BWT61CL 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.

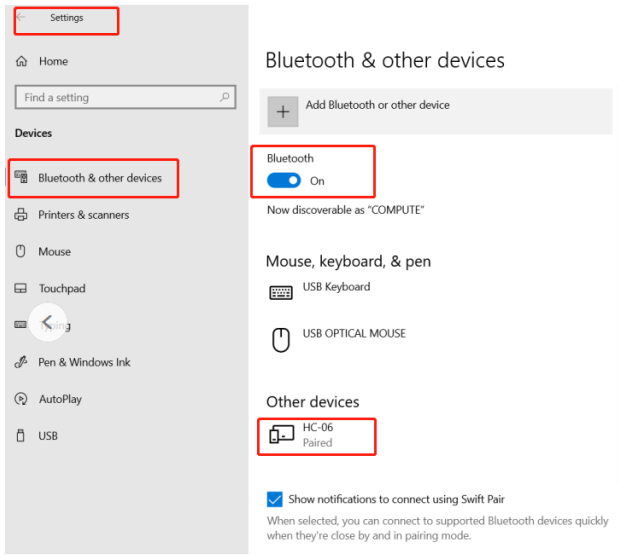


Because Bluetooth is limited, sometimes the data lag when you're using Bluetooth to multi-connect, and the Bluetooth range will be less. Of course, the different phone has a different range.
If you need longer Bluetooth range when multi-connection (up to 30m), please use our USB-HID adapter (refer to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

6.1 Connection Instructions

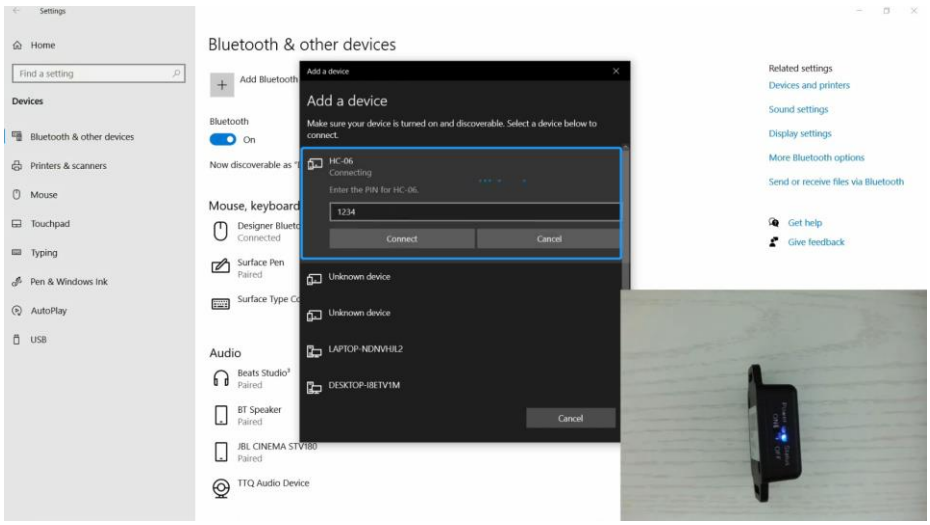
Step 1. Install WitMotion New Software (Download link).

Step 2. Turn on the computer's Bluetooth

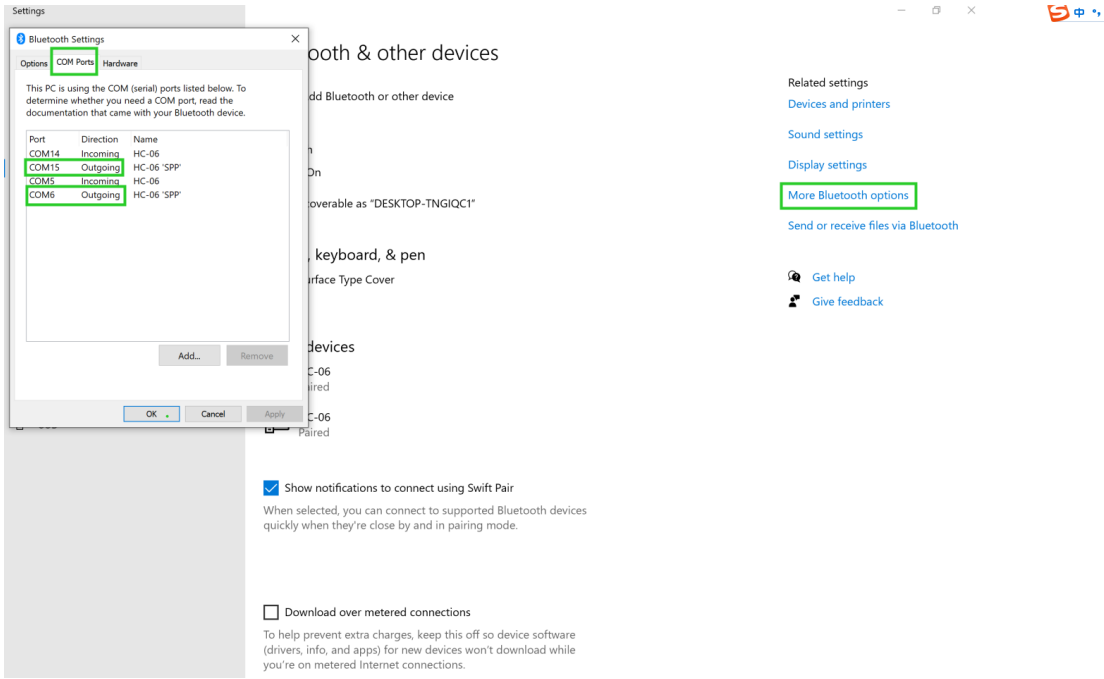


Step 3. Turn on the sensor

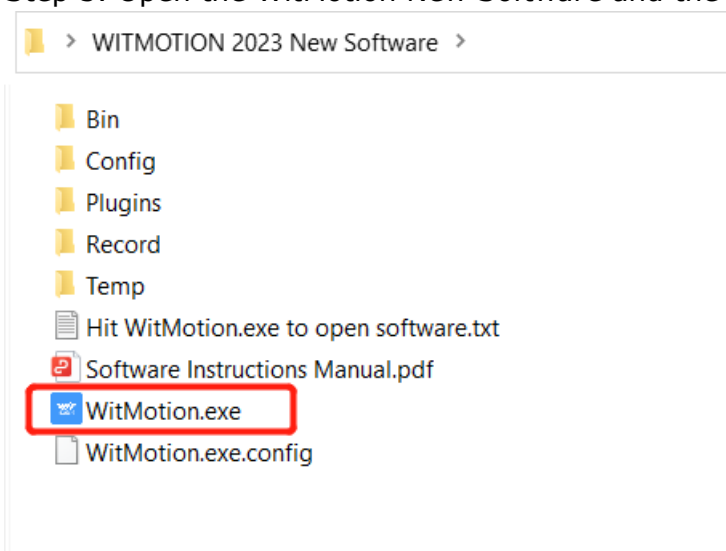
Step 4. Search HC-06 device and input pairing password, 1234



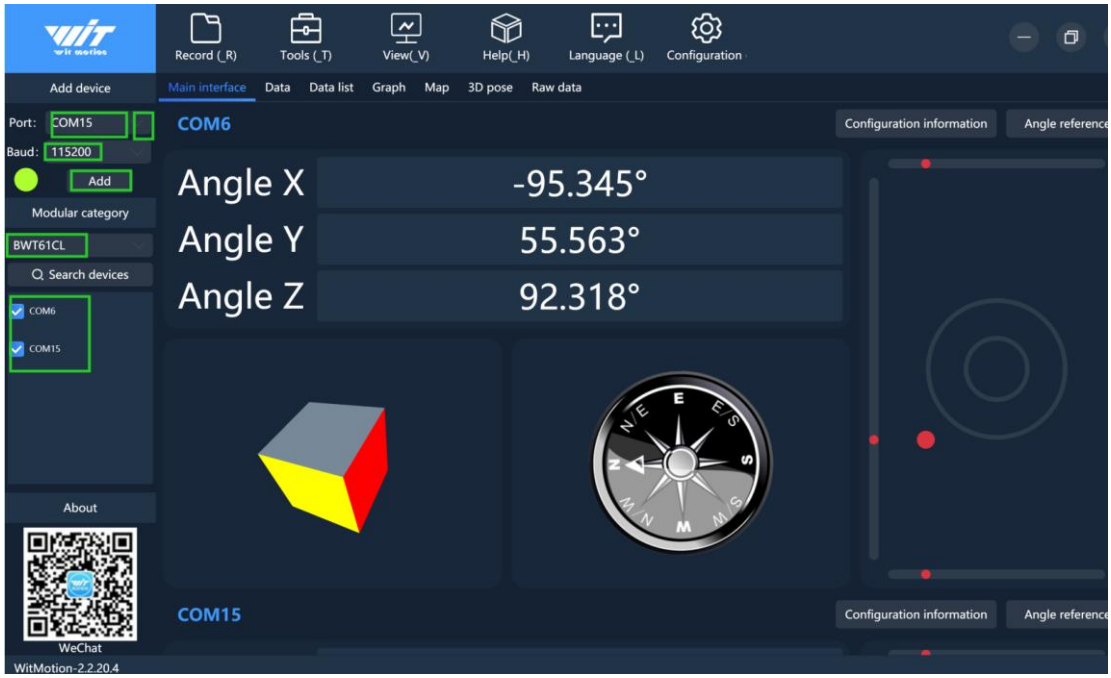
Step 4. Confirm the “outgoing com port” on “More Bluetooth Options” page, and check the Port corresponding to Direction is “Outgoing”.



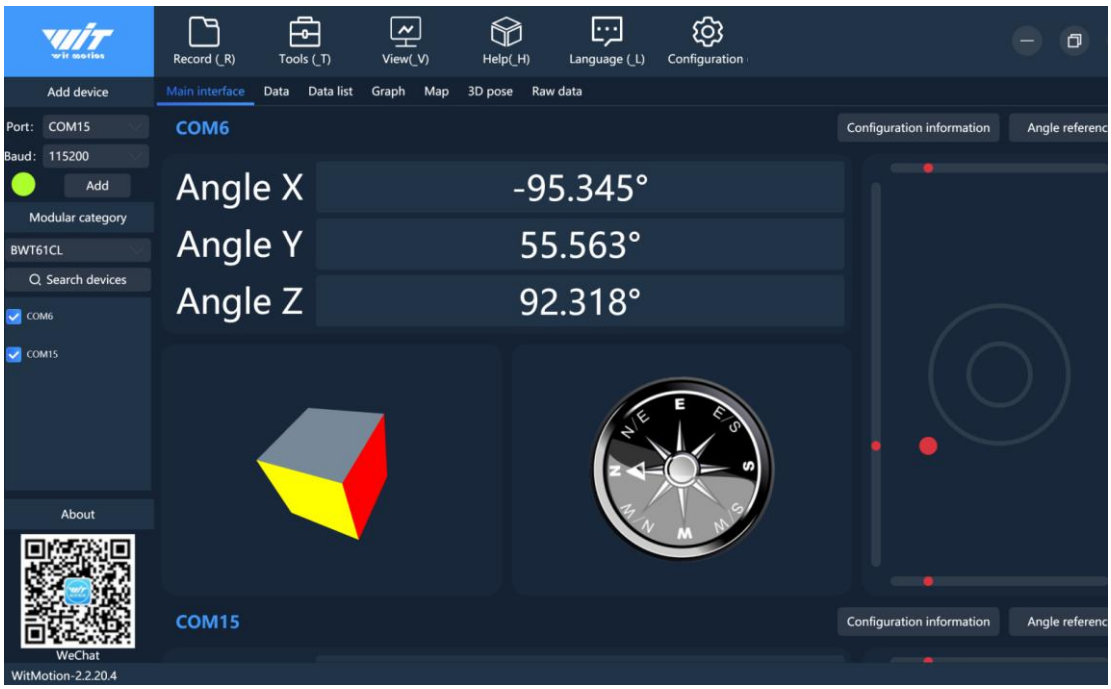
Step 5. Open the WitMotion New Software and the laptop’s Bluetooth.



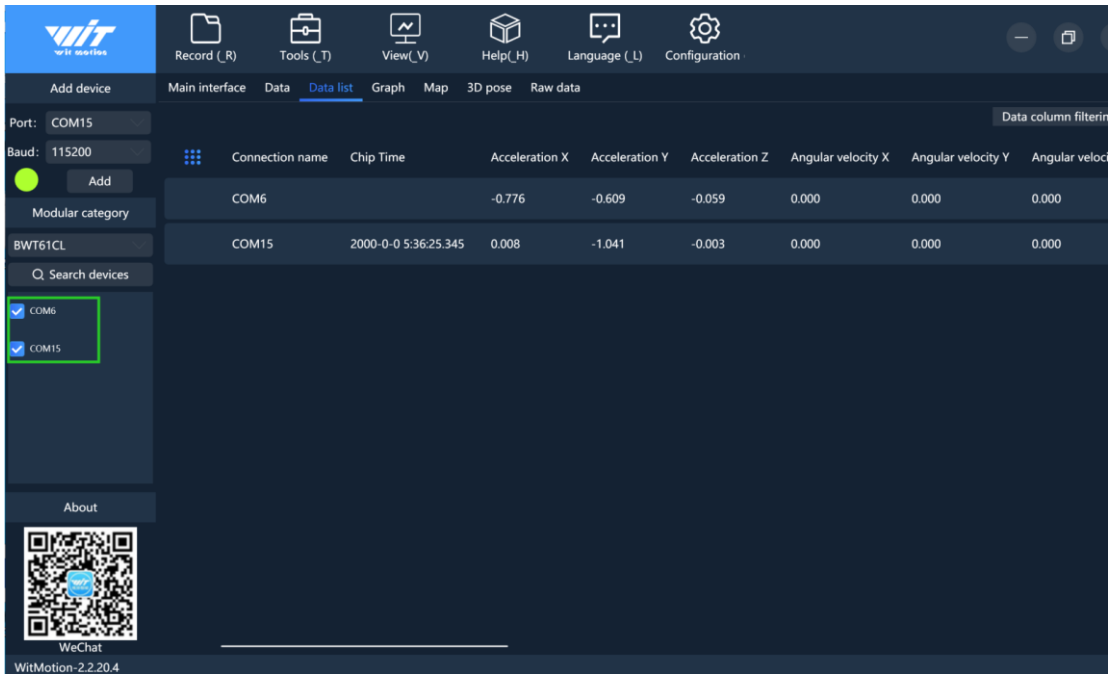
Step 6. Choose module ”BWT61CL”, and choose the right Port, then click ‘Add’.



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”.



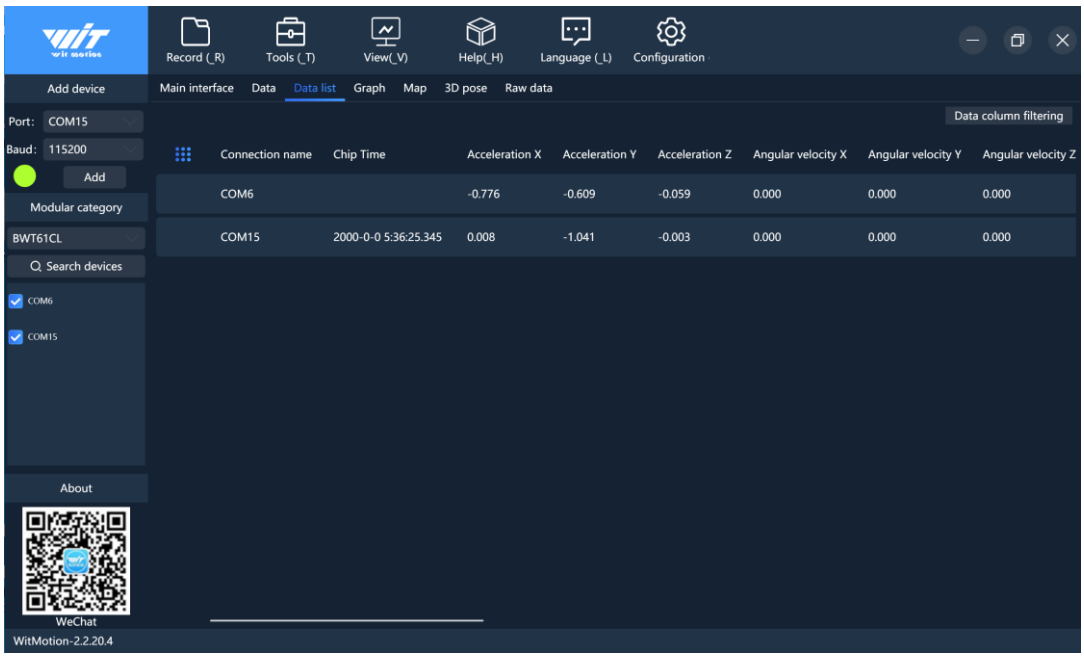
Noted: In standby mode, the sensor flashes quickly. Once the sensor was connected successfully, the blue light will start flashing slowly.

6.1 Software Setting

For software introduction including button and functions setting, please referring to the below link.
https://drive.google.com/file/d/18OntSUDU1m4vNhcRXvmTeFN1rAK3jcmZ/view?usp=share_link

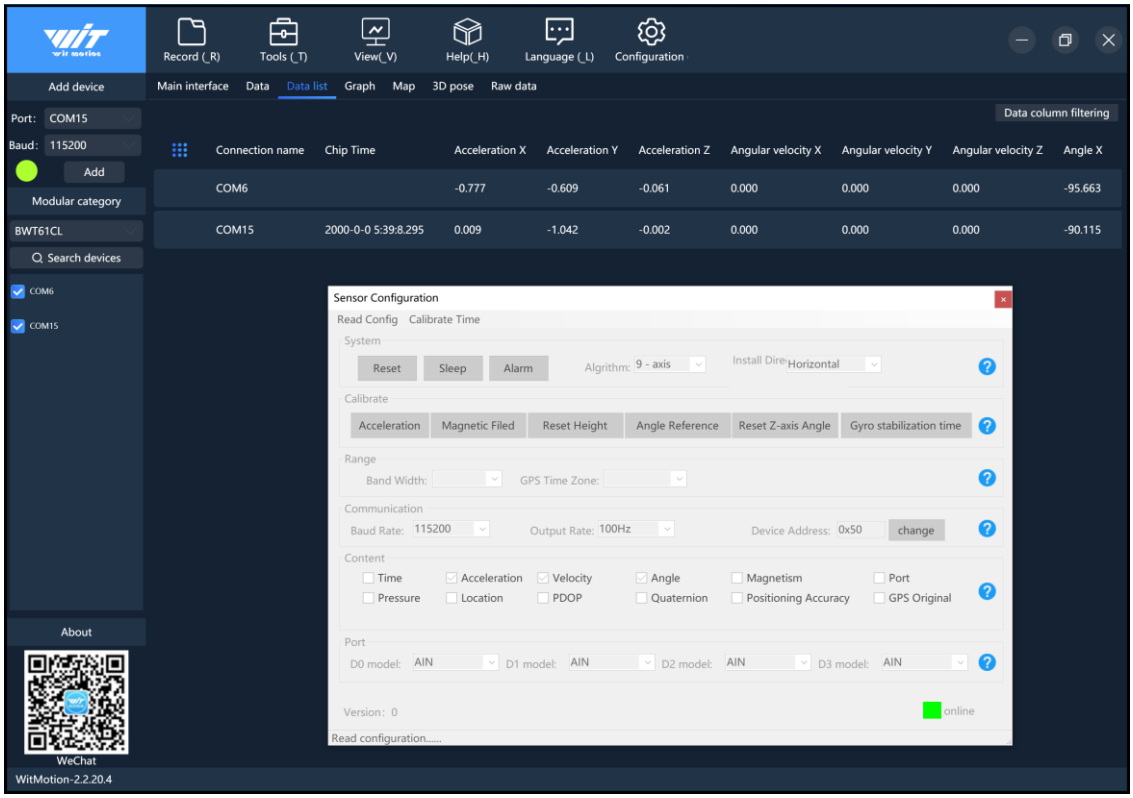
6.1.1 Data Configuration

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



Step 1. Click the config as you request.

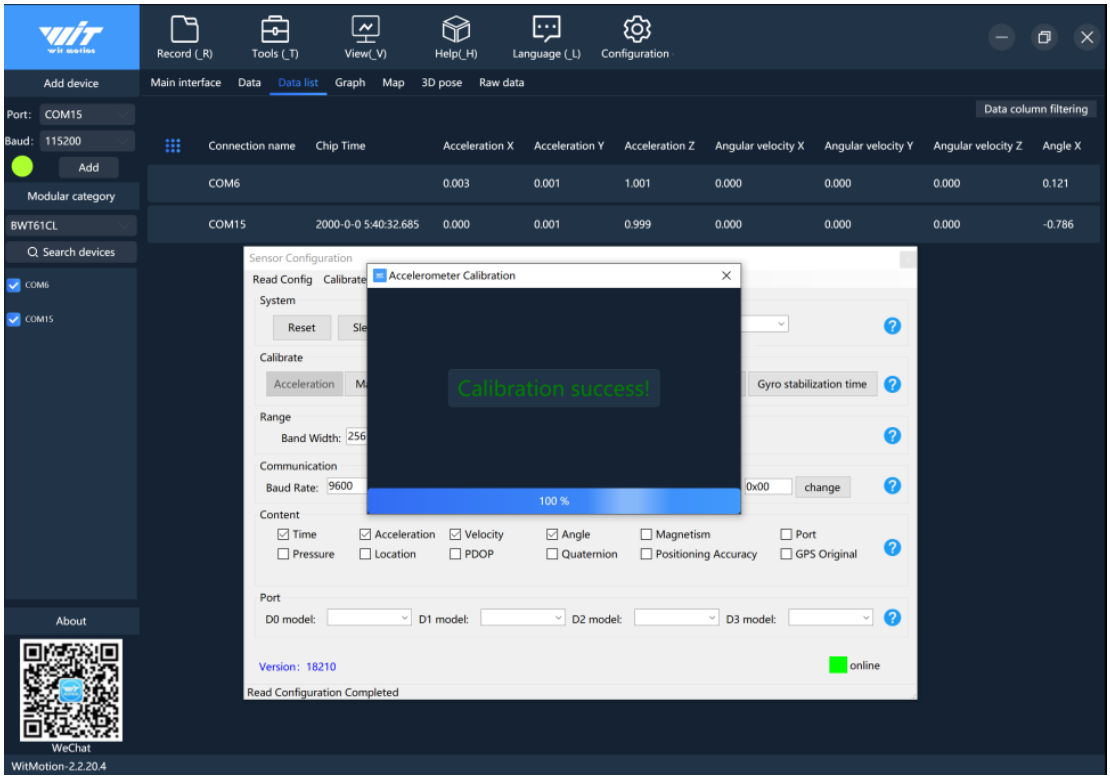
Step 2. The software will auto-save the config.



6.1.2 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”.

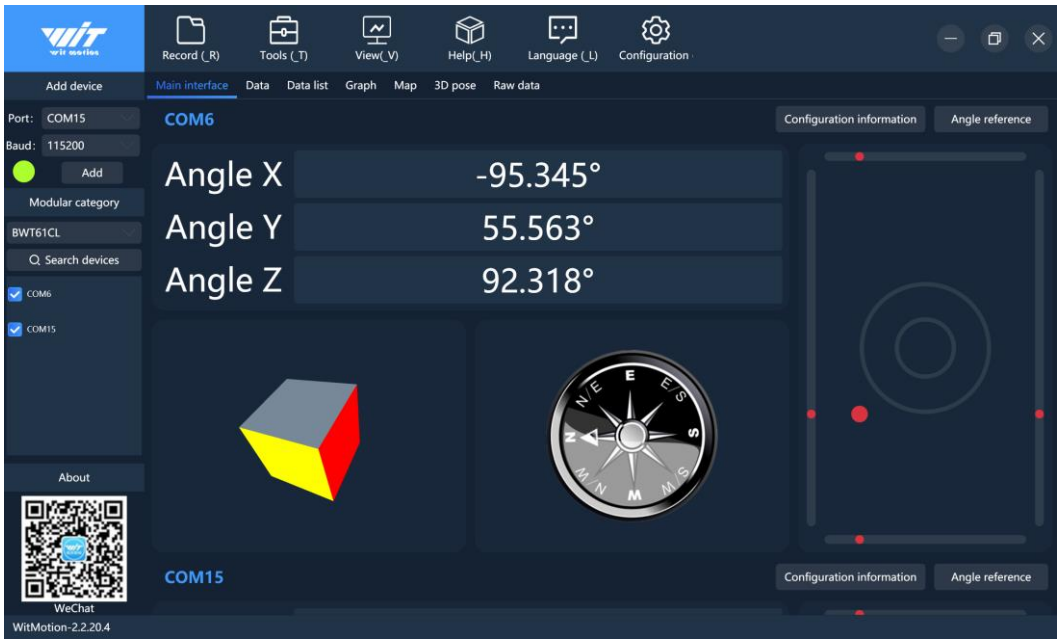


6.1.3 Curve Display

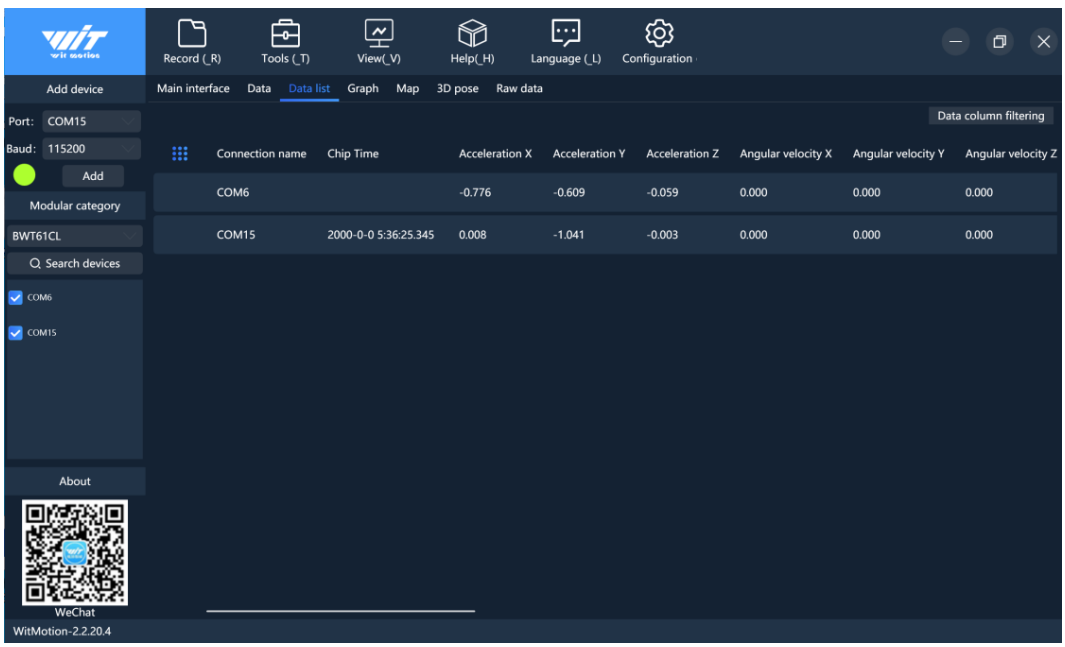
There are various choices on the data details, such as acceleration, angle data and so on.

Demo 1:

You can switch views as you like.



Demo 2:



6.1.4 Data Recording

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.

_1685819431238	6/3/2023 7:10 PM	BIN 文件	22 KB
_1685819431238.play	6/3/2023 7:10 PM	PLAY 文件	331 KB
_1685819431238_1	6/3/2023 7:10 PM	XLS 工作表	70 KB
_1685819431238_1	6/3/2023 7:10 PM	文本文档	63 KB

时间	设备名称	Chip Time	Acceleration	Acceleration	Acceleration	Angular v	Angular v	Angular v	Angle X(°	Angle Y(°	Angle Z(°	Magnetic	Magnetic	Magnetic	Temperatu	Pr
19:10:31	COM8_1152	2023-5-2	-0.679	0.239	0.585	-119.812	-36.377	-14.465	-3.455	61.699	-147.618	7.6	-71.583	-32.867	40.33	
19:10:31	COM8_1152	2023-5-2	-0.688	0.054	0.542	-115.601	-47.729	-6.104	-4.449	61.216	-147.513	7.042	-71.225	-32.458	40.52	
19:10:31	COM8_1152	2023-5-2	-0.847	-0.055	0.544	-101.807	-26.978	-9.216	-5.592	60.941	-147.744	6.65	-70.592	-32.067	40.33	
19:10:31	COM8_1152	2023-5-2	-0.829	-0.056	0.512	-107.056	-15.93	1.831	-6.509	60.804	-147.706	6.392	-69.808	-31.642	40.39	
19:10:31	COM8_1152	2023-5-2	-0.888	-0.049	0.508	-99.67	-1.892	-2.747	-7.493	60.749	-147.805	6.208	-69.233	-31.133	40.45	
19:10:31	COM8_1152	2023-5-2	-0.832	0.379	0.533	-140.686	18.311	19.287	-8.416	60.941	-147.607	6.058	-68.867	-30.458	40.33	
19:10:31	COM8_1152	2023-5-2	-0.736	-0.065	0.581	-84.839	26.184	13.611	-9.108	61.188	-147.431	5.942	-68.633	-29.8	40.33	
19:10:31	COM8_1152	2023-5-2	-0.799	-0.048	0.523	-75.195	47.363	22.705	-9.58	61.655	-147.228	5.808	-68.458	-29.125	40.33	
19:10:31	COM8_1152	2023-5-2	-0.878	-0.04	0.5	-66.04	75.378	27.466	-9.915	62.364	-146.992	5.667	-68.342	-28.317	40.45	
19:10:31	COM8_1152	2023-5-2	-0.914	-0.117	0.509	-58.228	116.272	35.4	-10.19	63.43	-146.75	5.492	-68.242	-27.475	40.33	
19:10:31	COM12	2023-6-3	0.462	0.16	0.876	-5.249	-31.921	28.259	14.31	-23.516	39.216	10.486	14.406	-44.59	35.69	
19:10:31	COM8_1152	2023-5-2	-0.852	-0.03	0.401	-35.339	152.344	38.025	-10.305	64.929	-146.585	5.258	-67.383	-26.625	40.33	
19:10:31	COM8_1152	2023-5-2	-0.872	-0.04	0.341	-10.62	170.349	45.105	-10.118	66.61	-146.371	5.383	-66.692	-25.792	40.26	
19:10:31	COM8_1152	2023-5-2	-0.904	-0.032	0.28	6.348	199.89	56.274	-9.558	68.566	-145.953	5.742	-66.9	-24.942	40.45	
19:10:31	COM8_1152	2023-5-2	-0.91	-0.011	0.247	26.855	222.656	59.998	-8.646	70.774	-145.371	5.9	-67.008	-24.017	40.2	
19:10:31	COM8_1152	2023-5-2	-0.92	-0.044	0.211	49.683	240.845	62.866	-7.289	73.152	-144.575	6.333	-67.008	-22.958	40.45	
19:10:31	COM8_1152	2023-5-2	-0.916	0.073	0.167	72.937	259.827	72.144	-5.026	75.729	-143.047	6.908	-66.942	-21.883	40.33	
19:10:31	COM8_1152	2023-5-2	-0.944	0.339	0.222	93.506	281.982	66.772	-1.851	78.47	-140.856	7.25	-66.842	-20.817	40.26	
19:10:31	COM8_1152	2023-5-2	-1.039	0.075	0.041	136.78	295.959	68.115	3.098	81.304	-137.263	8.15	-67.092	-19.775	40.45	
19:10:31	COM8_1152	2023-5-2	-1.144	0.105	0.011	152.344	352.783	83.13	15.04	84.452	-126.898	8.725	-67.55	-18.717	40.39	
19:10:31	COM8_1152	2023-5-2	-1.116	0.078	-0.068	167.847	417.053	87.219	60.529	87.27	-83.106	9.025	-67.817	-17.575	40.39	
19:10:31	COM8_1152	2023-5-2	-1.11	0.052	-0.064	175.964	435.669	91.003	132.632	85.594	-12.777	9.933	-67.942	-16.433	40.39	
19:10:31	COM12	2023-6-3	-0.147	0.671	0.716	618.347	226.318	-266.907	45.967	-15.496	33.569	10.584	0.49	-46.746	35.74	
19:10:31	COM8_1152	2023-5-2	-1.121	0.059	-0.086	183.044	443.298	95.398	151.694	81.584	4.427	10.567	-68.392	-15.242	40.33	
19:10:31	COM8_1152	2023-5-2	-0.927	0.033	-0.107	189.819	450.745	99.182	158.857	77.217	9.657	11.35	-68.992	-13.967	40.39	
19:10:31	COM8_1152	2023-5-2	-0.917	-0.042	-0.168	177.551	431.885	120.911	162.048	72.823	10.953	12.225	-69.383	-12.525	40.52	
19:10:31	COM8_1152	2023-5-2	-0.968	0.024	-0.424	165.71	361.389	119.934	163.658	68.983	10.761	12.833	-69.642	-11.008	40.33	
19:10:31	COM8_1152	2023-5-2	-1.018	0.054	-0.514	162.17	322.571	114.99	164.822	65.693	10.124	13.267	-70.142	-9.575	40.45	
19:10:31	COM8_1152	2023-5-2	-1.118	0.18	-0.511	169.739	330.75	96.558	166.146	62.397	9.63	13.533	-70.817	-8.092	40.33	
19:10:31	COM8_1152	2023-5-2	-0.833	0.1	-0.476	162.109	333.801	92.651	167.503	59.079	9.223	13.708	-71.275	-6.575	40.26	
19:10:31	COM8_1152	2023-5-2	-0.861	0.071	-0.585	159.058	321.594	84.595	168.849	55.893	8.811	13.842	-71.558	-5.133	40.26	
19:10:31	COM8_1152	2023-5-2	-0.699	0.105	-0.613	158.508	320.74	76.965	170.195	52.762	8.421	13.975	-71.708	-3.733	40.33	
19:10:31	COM8_1152	2023-5-2	-0.792	0.073	-0.654	162.476	328.003	79.59	171.502	49.565	7.954	14.117	-71.808	-2.342	40.52	
19:10:31	COM12	2023-6-3	-0.648	0.689	-0.378	1189.514	-43.396	-458.191	120.026	16.271	35.662	23.52	-28.42	-29.106	35.67	
19:10:31	COM8_1152	2023-5-2	-0.768	0.095	-0.701	167.725	336.487	79.285	172.809	46.329	7.405	14.292	-72.683	-0.925	40.45	
19:10:31	COM8_1152	2023-5-2	-0.68	0.063	-0.695	158.875	363.831	76.965	174.106	42.874	6.861	14.558	-73.367	0.45	40.45	
19:10:31	COM8_1152	2023-5-2	-0.726	0.102	-0.707	150.513	385.742	75.989	175.281	39.172	6.279	14.475	-73.95	1.817	40.45	
19:10:31	COM8_1152	2023-5-2	-0.611	-0.048	-0.726	126.221	381.47	98.816	176.155	35.458	5.477	14.117	-73.633	3.15	40.33	
19:10:31	COM8_1152	2023-5-2	-0.569	0	-0.811	148.254	353.577	71.35	177.308	32.031	4.796	13.983	-74.158	4.583	40.26	