WiFi Attitude Sensor
SPECIFICATION

Type ：WT901WiFi

Description ：9 Axis WiFi Attitude Sensor

Production Standard

Enterprise quality system standard: ISO9001:2016

Tilt switch production standard：GB/T191SJ 20873-2016

Criterion of detection：GB/T191SJ 20873-2016

Revision date：2019.07.23

Catalog

1 Description

- Module integrates high-precision gyroscopes, accelerometer, geomagnetic sensor, high-performance microprocessors and advanced dynamics solves dynamic Kalman filter algorithm to quickly solve the current real-time movement of the module attitude .
- The use of advanced digital filtering technology, can effectively reduce the measurement noise and improve measurement accuracy.
- Integrates gesture solver, with dynamic Kalman filter algorithm, can get the accurate attitude in dynamic environment, attitude measurement precision is up to 0.05 degrees with high stability.
- Integrate voltage stabilization circuit, working voltage is 3.3v ~ 5v, pin level compatible 3.3V or 5V embedded system .
- WIFI connection. Remote end real-time view of data, control module.
- Low power mode, current < 1mA, support outdoor long-term measurement.

2 Features

1) Voltage: 3.3V-5V
2) Consumption current: ≈100mA
3) Volume: 36mm X 51.3mm X 21mm
4) Measuring dimensions: Acceleration: X Y Z Angular Velocity: X Y Z
   Angle: X Y Z Magnetic field：X Y Z
5) Range: Acceleration: ±16g(optional), Angular velocity: ±2000 °/ s(optional).
   Angle: X Z±180 °, Y±90 °
6) Stability: Acceleration: 0.01g, Angular speed 0.05 °/ s.
7) Attitude measurement accuracy: Dynamic: 0.1 °Static: 0.05 °
8) Data output: time, acceleration, angular velocity, angle, magnetic field.

The data output frequency:TCP:1-5HZ、UDP:1~20HZ

9)

3 Axial Direction

As shown in the figure above, the coordinates of the module are indicated, and the left is the Y axis, the upper is X axis, the Z axis is perpendicular to the surface of the paper to yourself. The direction of rotation is defined by the right hand rule, that is, the thumb of the right hand is pointed to the axial direction, and the four is the direction of the bending of the right hand.

4 Interface Button Introduction

	Function Description
USB	Micro charging interface
RES	Distribution network / switch mode button
ON	Power switch (on)
OFF	Power switch (off)

5 Usage Method

5.1 Principles of Obtaining Data

The principle of getting data is like this:

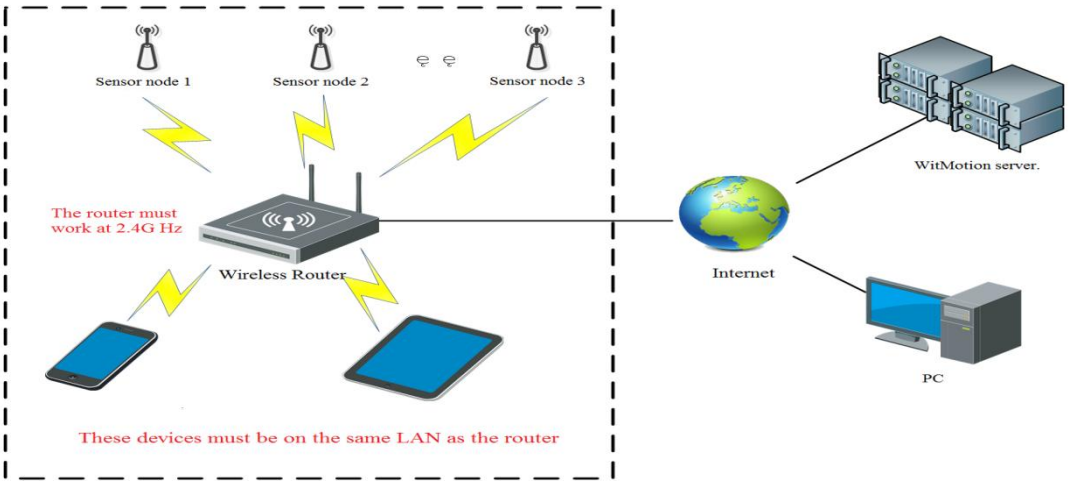
(1) WeChat or PC device establishes the relationship between the device and the micro-signal or the PC to view the account in the web application through registration and device binding;

(2) Each sensor has a unique number, just below the module's QR code. This number is required to get the data.

(3) The sensor is connected to the wireless router through the distribution network, the wireless router needs to access the Internet, and finally the sensor data is transmitted to the WitMotion server.

(4) The client views the data and manipulates the device from the WitMotion Server by accessing the web application through the PC. If you use the app, you can directly establish a connection with the device, and the data is not uploaded to the WitMotion Server.

(5) Developers can get data from the server through the interface provided by WitMotion.



5.2 Output status switching

The WIFI attitude sensor have two data transmission states:

One is TCP, which send data to the server(cloud),which can be viewed on WeChat public account and client

One is UDP, which transfers data to the mobile APP and can view data in the APP.

The module factory default is UDP transmission

Transfer status switching method: First press the rest(RES) button, then turn the switch to ON until the blue light of the module is always on and then release the reset button, , the blue light will be off after 2-3 seconds(TCP to UDP is the same way),there is no need to re-provision the network after switching the data transmission mode.

5.3 LED light status indication

Work indicator light status:

Blue light	Module working status
Constantly bright	Module connect to network
Slow flashing (2S/time)	UDP transmission mode
Fast flashing (1S/time)	TCP transmission mode

Charge indicator status:

Red light	Power status
on	Charging
off	Full/uncharged

5.4 Data acquisition method

The sensor currently supports four data acquisition method:

(1) Obtain data through the mobile APP
(2) Obtain data through the PC network
(3) Obtain data through an officially provided interface
(4) View the data in the PC software
Note: (2) (3) is the TCP mode, and (1) and (4) are the UDP mode.

Data Saving Instructions

Because the module uploads more data, in order to ensure the reliability and stability of the data cloud transmission, the module does not save data by default before leaving the factory. For users who need to view past data, they can be set in the PC client. Setting method reference 5.6.3

5.5 Module networking

The module only needs to be networked once at the same router.

App distribution network method:

Connect the module to the mobile phone with the data cable, open the module, open "WIFI Configuration.apk", enter the WIFI account and password, click "connect", the blue light is always on, and the blue light is automatically turned off after the connection is successful.

5.6 PC Cloud View Data

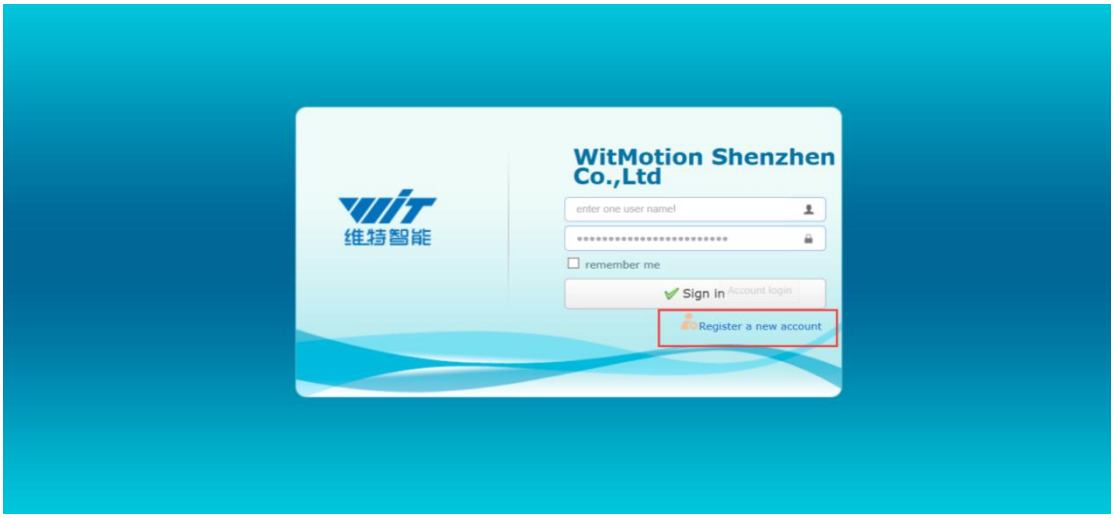
5.6.1Registered user account and client login

Enter the URL:

http://witmotion.cn/WtznEnglish/Index.aspx

to enter the client login interface, register your account and login

you should registration of new accounts


维特智能
WitMotion Shenzhen Co.,Ltd
enter one user name!
remember me
Sign in
Account login
Register a new account

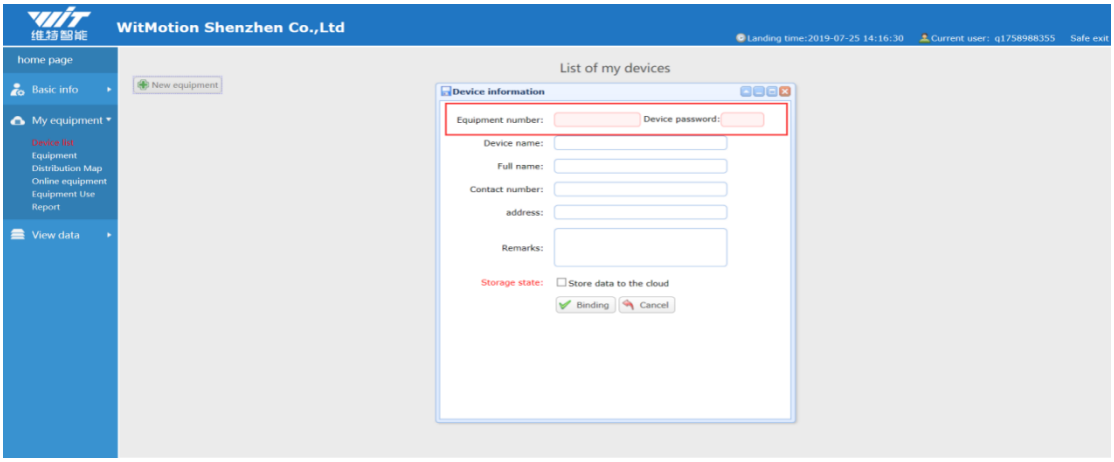
5.6.2 Adding device

1、As shown in the figure below, click on “Device list” in the “My equipment” column

2、Click on “New equipment”

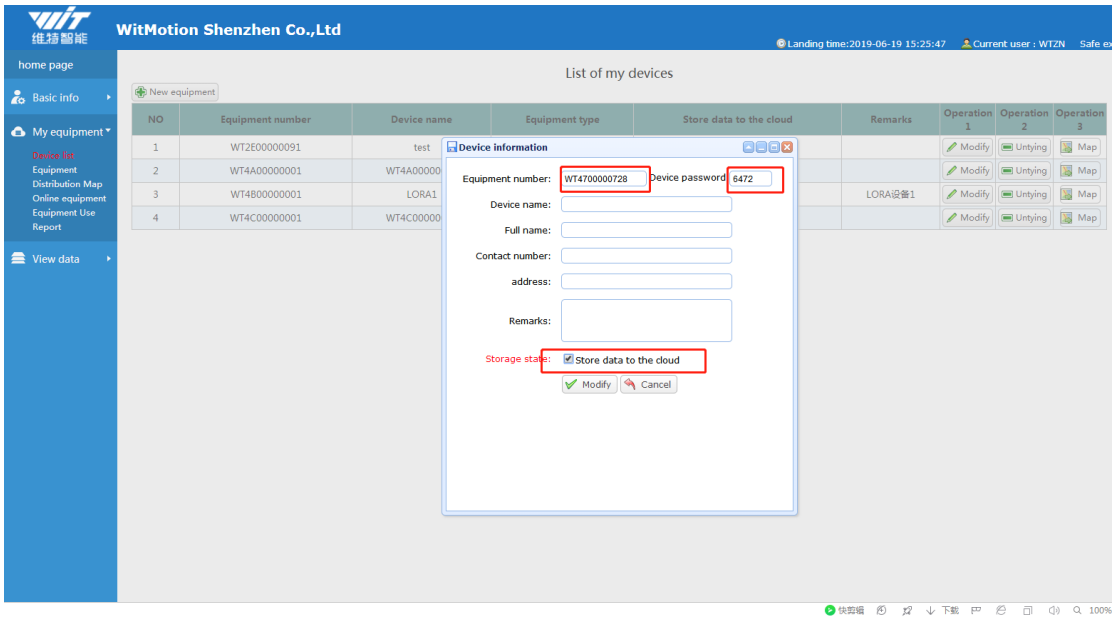
3、Enter the ID below the module QR code into the “device Number”, ,click “Bind” below

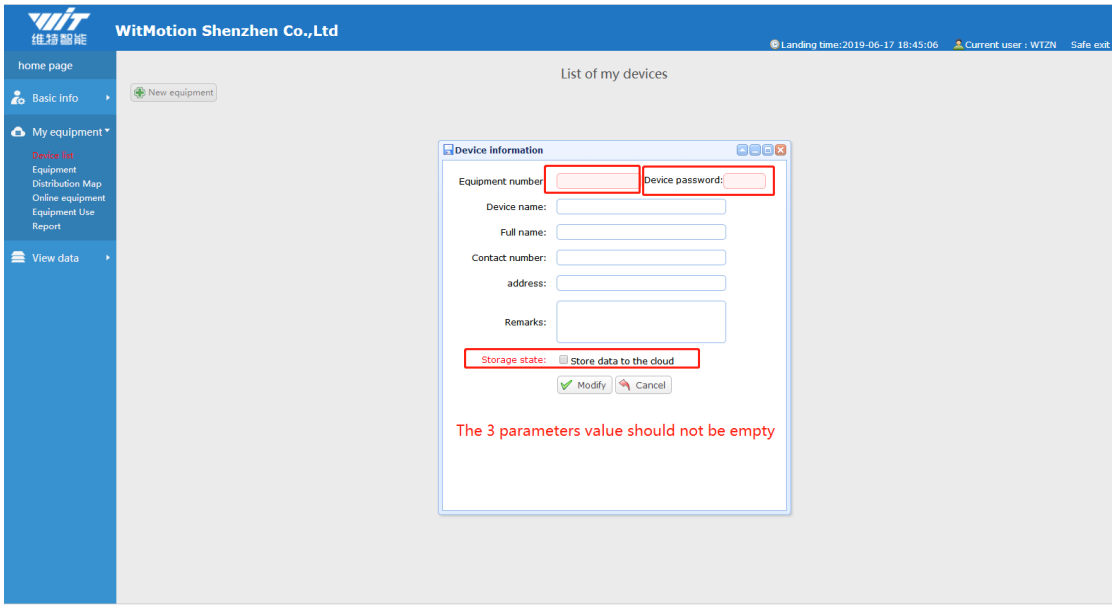
Note : The equipment number and the operation standard and the area must be filled, otherwise the device can’t be bound.



Note:

Please pay attention to the values of “Equipment Number” & the “Password” as the picture above. The number is Account number is the top 12， the password is last 4 digits



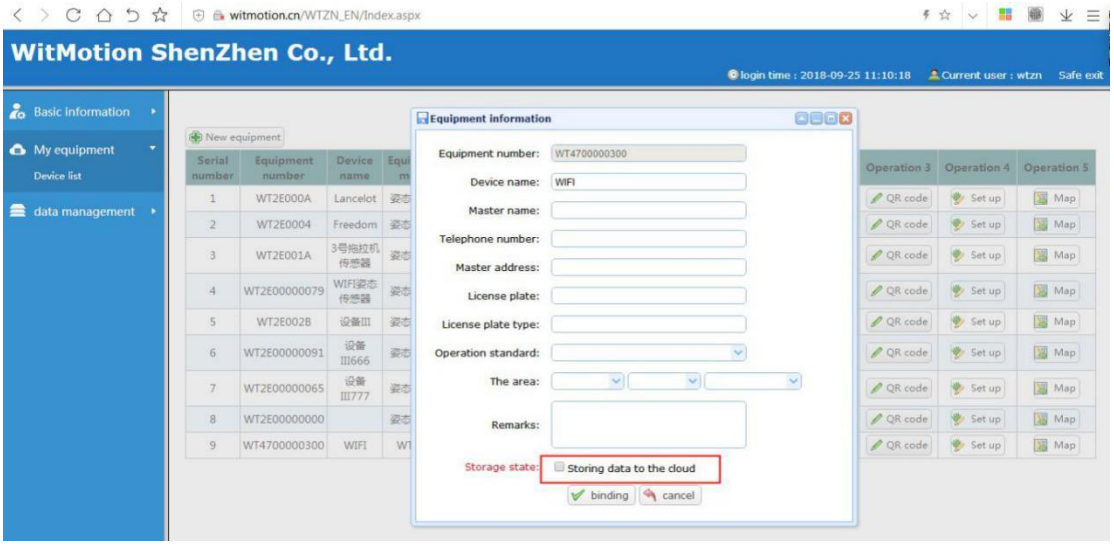


5.6.3Viewing data information

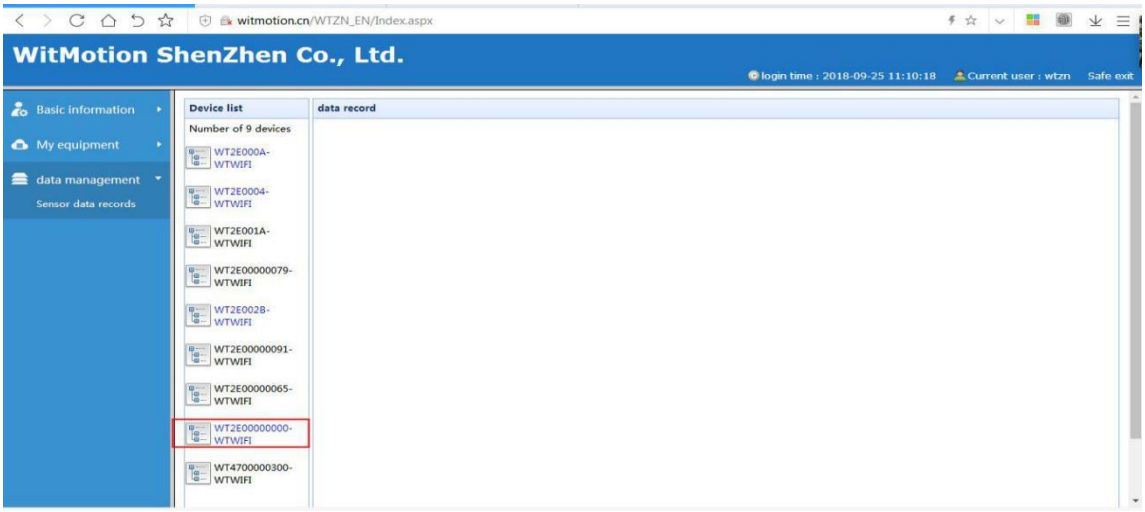
Need to match the network first, refer to 5.6.2.

Storage settings: After the hardware connection, enter the PC web application, find "My Device" -> "Device List" in the function menu on the left. Then find the device you want to control in the device list and click the "Modify" button.

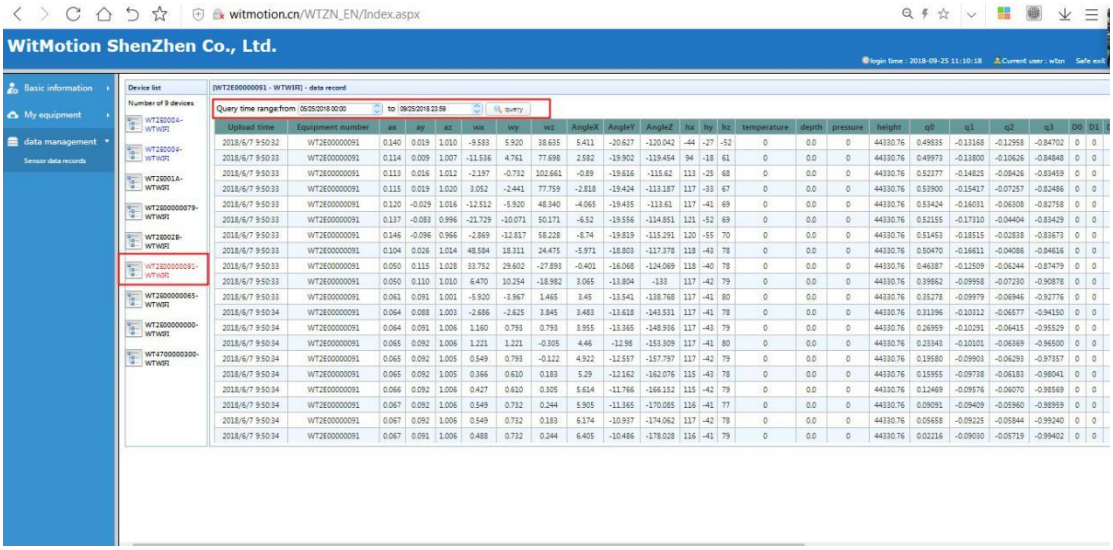
The data will be checked in the cloud check box. At this time, the server cloud will store the data of the device, and the stored data amount is 50M. When it is exceeded, the first saved data will be automatically overwritten.



1、After the hardware connection, click on “sensor data record” in the “data report management” column , and choose the device name on the main interface



2、Choose the time range of recorded data, click on “query”, can see the data returned by the device , the query here is recorded data , if you want to view real-time data, can be viewed in the mobile phone APP public number



5.6.4Control and calibration equipment through the PC side web application

5.6.4.1 Enter the device control interface

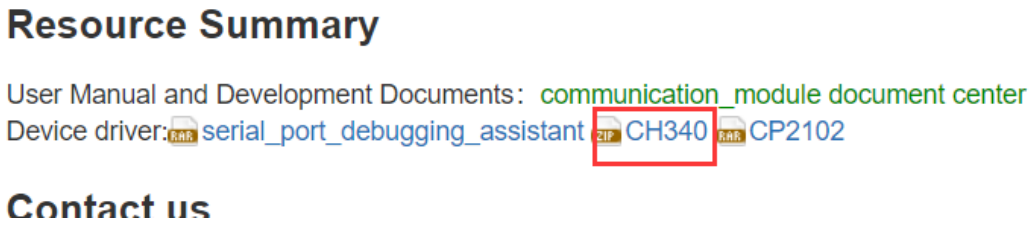
Note that the user whose computer can not run please download and install .net framework4.0：

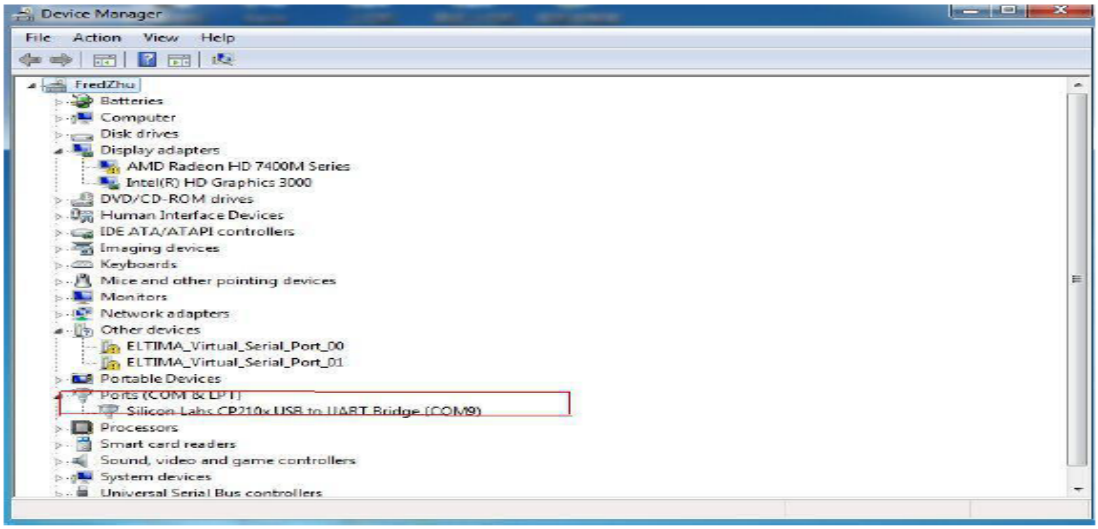
http://www.microsoft.com/zh-cn/download/details.aspx?id=17718

First, the module is connected via 3-IN-1 module to the computer, install the USB-TTL module driver. The drive：

CH340:

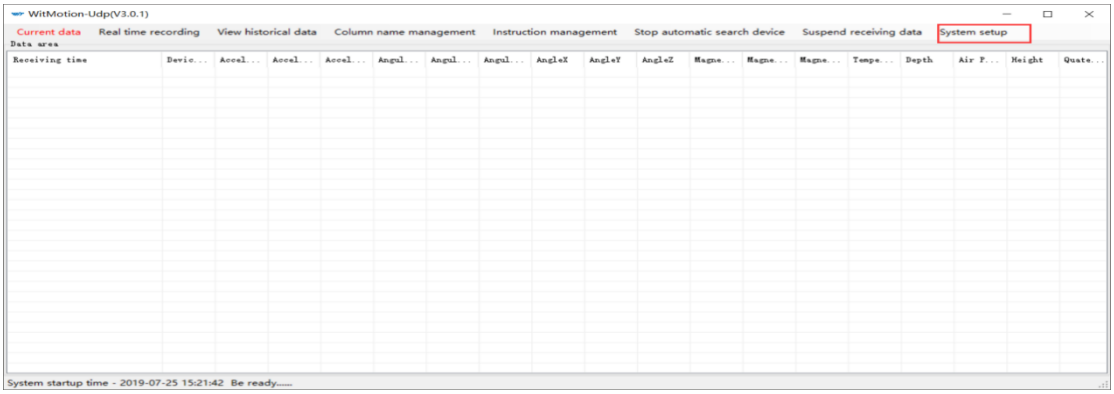
https://wiki.wit-motion.com/english/doku.php?id=communication_module



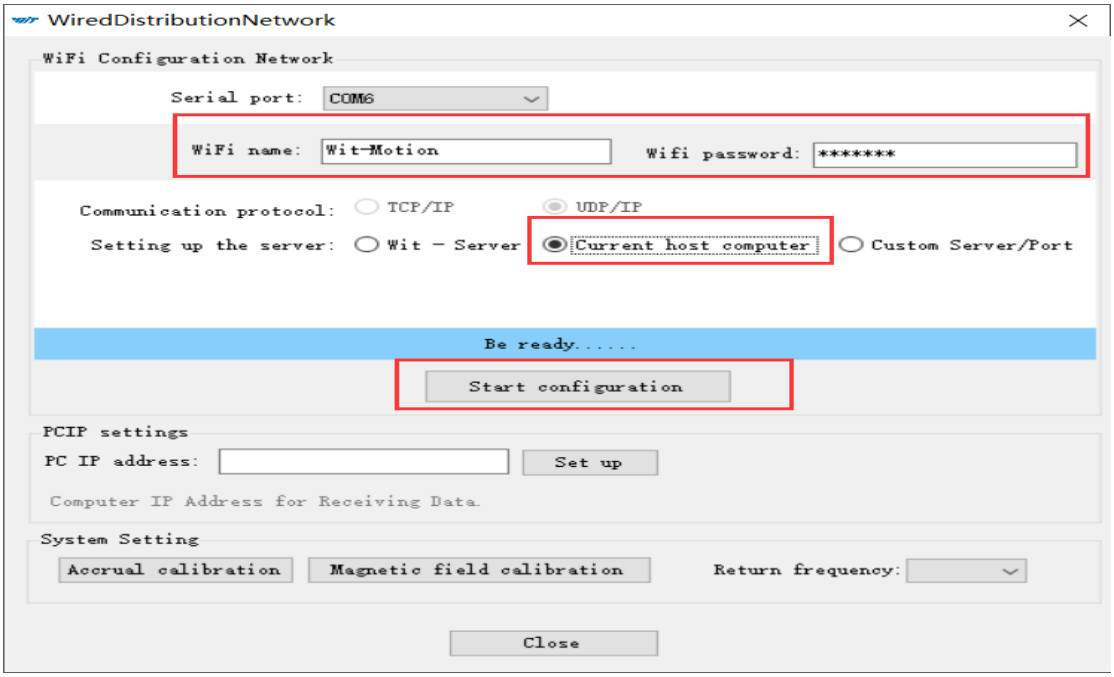


Open the software MiniIMU-Udp.exe, click the “Port” which you have checked before

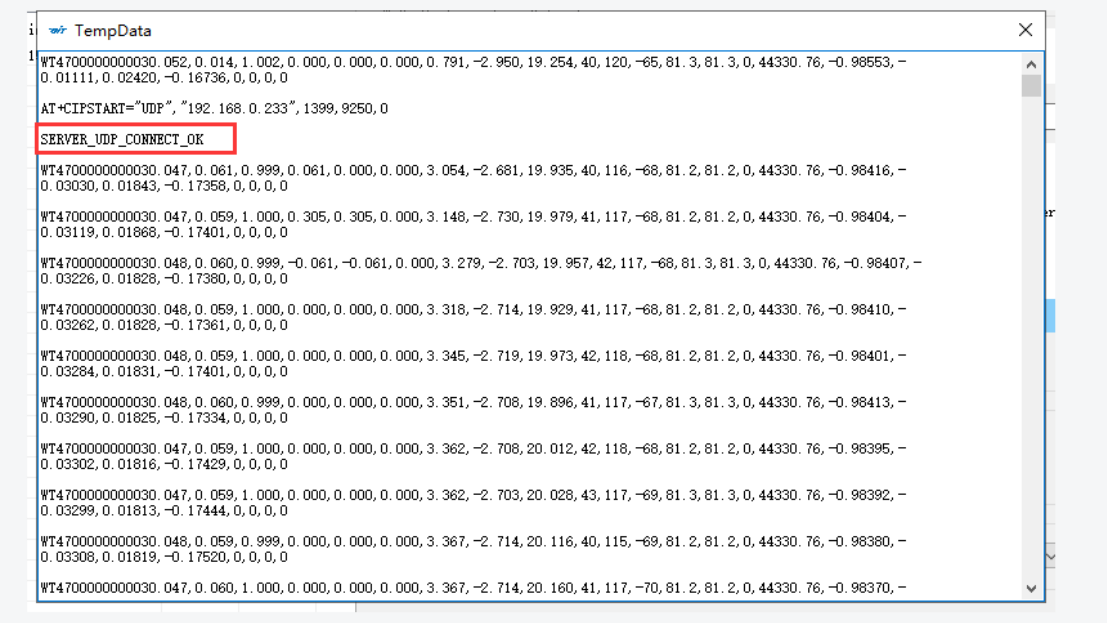
1） choose wired distribution network



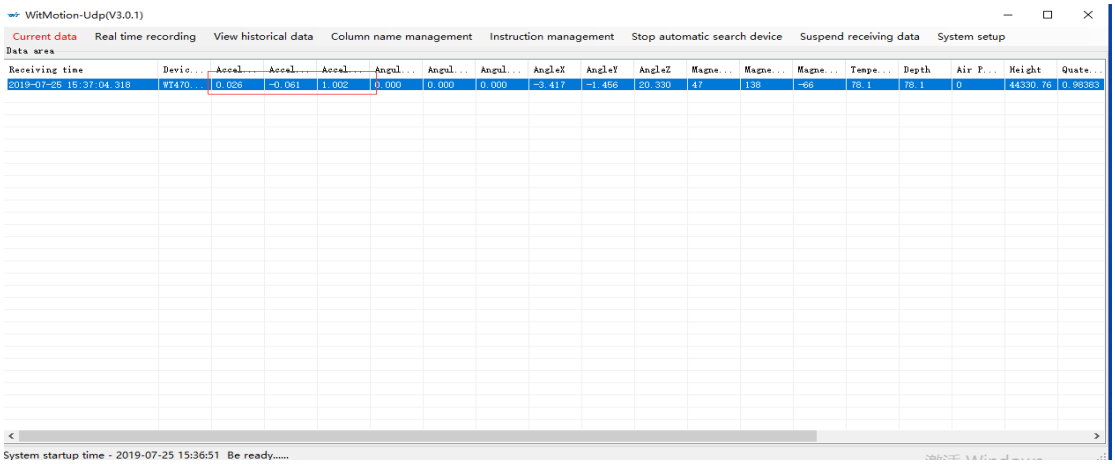
2） You must make sure that the configured wifi is the same as the wifi connected to the computer.



3) click start configuration,and then wait for Temp Data show that

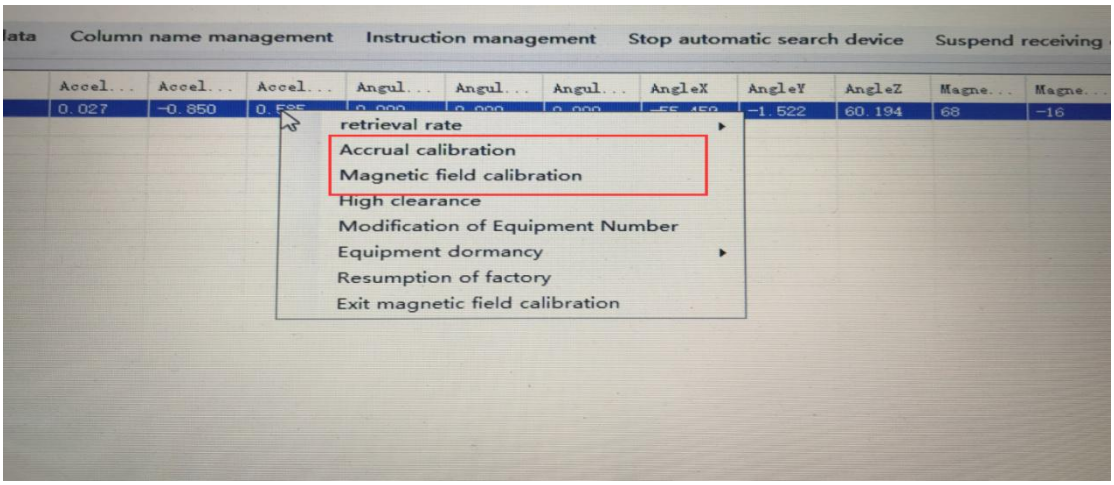


Then the data will show



5.6.4.2 Calibration on PC software

You have to select the data and right click, the you can Calibrate, just click which you want



5.7APP view data

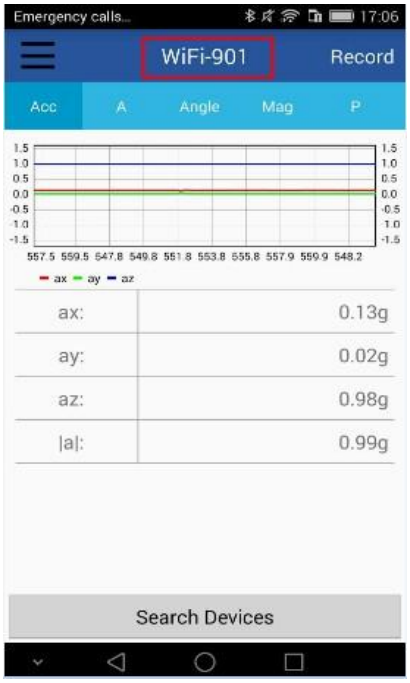
UDP transmission

5.7.1How to use the APP

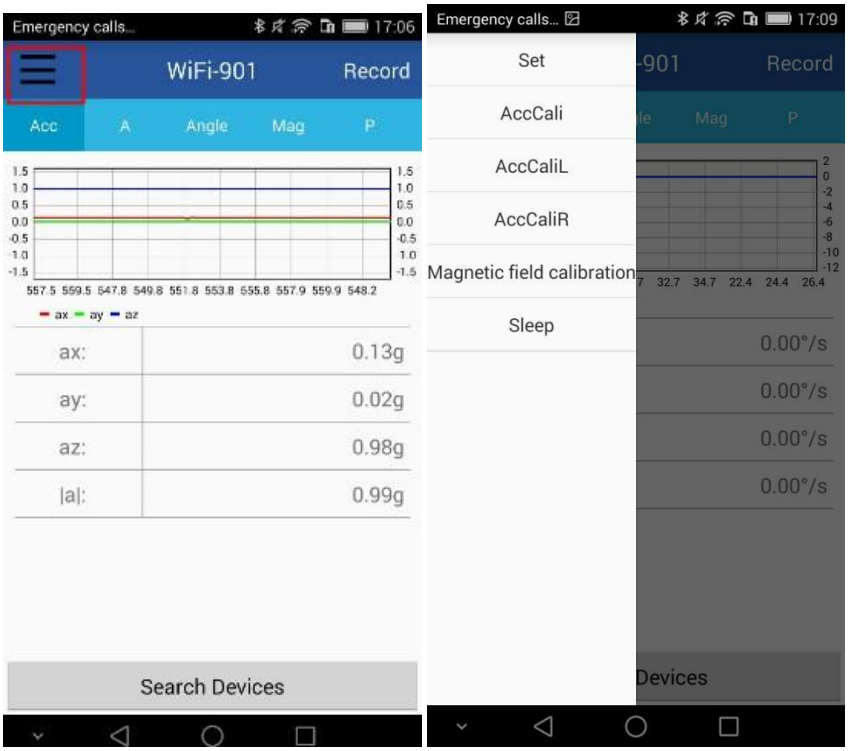
Need to match the network first, refer to 5.6.2.

1、 Open the APP, the software will automatically search for connected devices. After the connection is successful, the data and waveform graph can be directly seen on the APP.

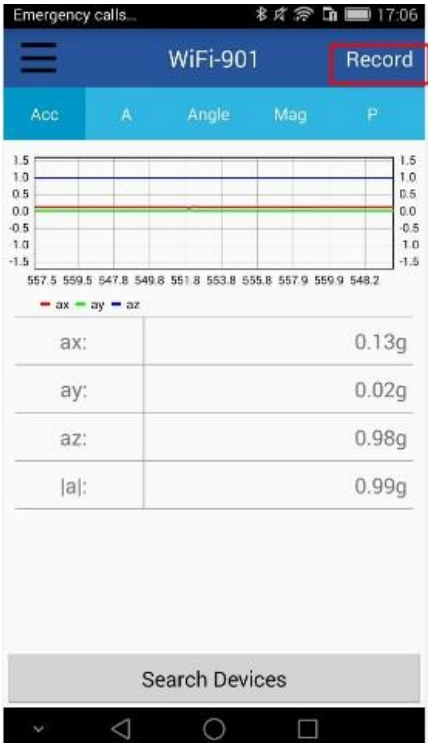
2、As shown in the figure below, click the “WIFI-901” column to pop up the device ID interface, you can select different device IDs to view different device data. (Multiple connections must be selected when the module is to be calibrated.)



3. As shown in the figure below, click on the “horizontal line” bar to pop up the device settings interface to calibrate the module.



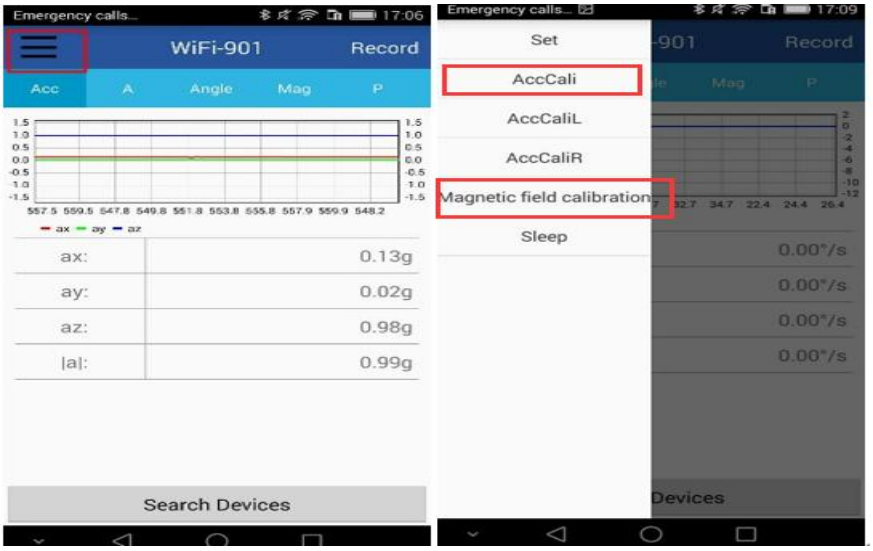
4. As shown in the figure below, click the “Record” column to start recording data. After stopping the recording, you can view the recorded data.




Start time: 2018 年 09 月 25 日 17:09:31

17:09:31 :a 0.13g|0.02g|0.98g|0.99g
17:09:31 :w 0.00°/s|0.00°/s|0.00°/s|0.00°/s
17:09:31 :Angle 1.05°|-7.50°|-46.59°
17:09:31 :h -107|100|-6|147
17:09:31 :p 0.00Pa|44330.76m
17:09:31 :Port 0|0|0|0
17:09:31 :Quater 0.917|-0.017|-0.064|-0.394
17:09:31 :a 0.13g|0.02g|0.98g|0.99g
17:09:31 :w 0.00°/s|0.00°/s|0.00°/s|0.00°/s
17:09:31 :Angle 1.05°|-7.50°|-46.63°
17:09:31 :h -107|99|-5|146
17:09:31 :p 0.00Pa|44330.76m
17:09:31 :Port 0|0|0|0
17:09:31 :Quater 0.917|-0.017|-0.064|-0.394
17:09:32 :a 0.13g|0.02g|0.98g|0.99g
17:09:32 :w 0.00°/s|0.00°/s|0.00°/s|0.00°/s
17:09:32 :Angle 1.05°|-7.51°|-46.62°
17:09:32 :h -106|100|-5|146
17:09:32 :p 0.00Pa|44330.76m
17:09:32 :Port 0|0|0|0
17:09:32 :Quater 0.917|-0.017|-0.064|-0.394
17:09:32 :a 0.13g|0.02g|0.98g|0.99g
17:09:32 :w 0.00°/s|0.00°/s|0.00°/s|0.00°/s
17:09:32 :Angle 1.05°|-7.51°|-46.58°
17:09:32 :h -107|100|-5|147
17:09:32 :p 0.00Pa|44330.76m
17:09:32 :Port 0|0|0|0
17:09:32 :Quater 0.917|-0.017|-0.064|-0.394
17:09:32 :a 0.13g|0.02g|0.98g|0.99g
17:09:32 :w 0.00°/s|0.00°/s|0.00°/s|0.00°/s
17:09:32 :Angle 1.05°|-7.51°|-46.59°
17:09:32 :h -107|100|-5|147
17:09:32 :p 0.00Pa|44330.76m
17:09:32 :Port 0|0|0|0
17:09:32 :Quater 0.917|-0.017|-0.064|-0.394
17:09:32 :a 0.13g|0.02g|0.98g|0.99g
17:09:32 :w 0.00°/s|0.00°/s|0.00°/s|0.00°/s
17:09:32 :Angle 1.05°|-7.51°|-46.62°
17:09:32 :h -109|98|-4|147
17:09:32 :p 0.00Pa|44330.76m
17:09:32 :Port 0|0|0|0
17:09:32 :Quater 0.917|-0.018|-0.064|-0.394
17:09:32 :a 0.13g|0.02g|0.99g|0.99g
17:09:32 :w 0.00°/s|0.00°/s|0.00°/s|0.00°/s
17:09:32 :Angle 1.05°|-7.51°|-46.65°
17:09:32 :h -107|98|-5|145

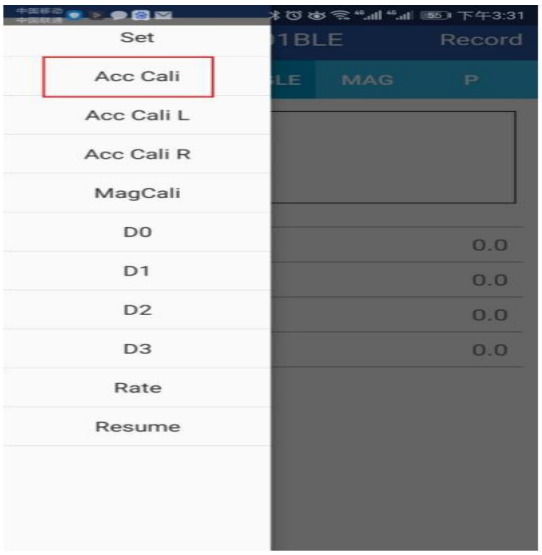
5.7.2Calibration on App



1) Accelerometer Calibration

The accelerometer calibration is used to remove the zero bias of the accelerometer. When the sensor is out of the factory, there will be different degrees of bias error. After manual calibration, the measurement will be accurate.

1、Methods as below: Firstly keep the module horizontally stationary, click "Acceleration" , after 1~2s the acceleration X Y Z value will at 0 0 1. X Y angle: 0°.After calibration the value will be accurate.



2) Magnetic Calibration

Magnetic field calibration is used to remove the magnetic field sensor's zero offset. Usually, the magnetic field sensor will have a large zero error when it is manufactured. If it is not

calibrated, it will bring about a large measurement error and affect the accuracy of the Z-axis angle measurement of the heading angle.

Calibration methods as follow:

1. When calibrating, first connect the module and the computer, and place the module in a place far away from the disturbing magnetic field (ie, more than 20 CM away from magnets and iron, etc.),and then open the upper computer software.

2.Click the "Magnetic Field Calibration" and rotate 360° around the X axis of the module (you can rotate around the Y axis or the Z axis first). Rotate a few turns, then turn 360° around the Y axis. Then turn 360° around the Z axis, then turn a few turns at random, then click the "Finish" to complete the calibration.

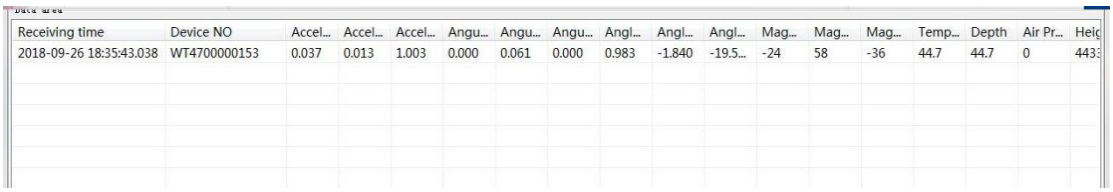
5.8 PC software view data

5.8.1How to use the PC software

Need to match the network first, refer to 5.6.2.

Open the PC software, the PC software will automatically search for the device. After a successful connection, the data information is displayed as shown below.

The computer and module need to be in the same wifi.



Receiving time	Device NO	Accel...	Accel...	Accel...	Angu...	Angu...	Angu...	Angl...	Angl...	Angl...	Mag...	Mag...	Mag...	Temp...	Depth	Air Pr...	Heig
2018-09-26 18:35:43.038	WT4700000153	0.037	0.013	1.003	0.000	0.061	0.000	0.983	-1.840	-19.5...	-24	58	-36	44.7	44.7	0	4433

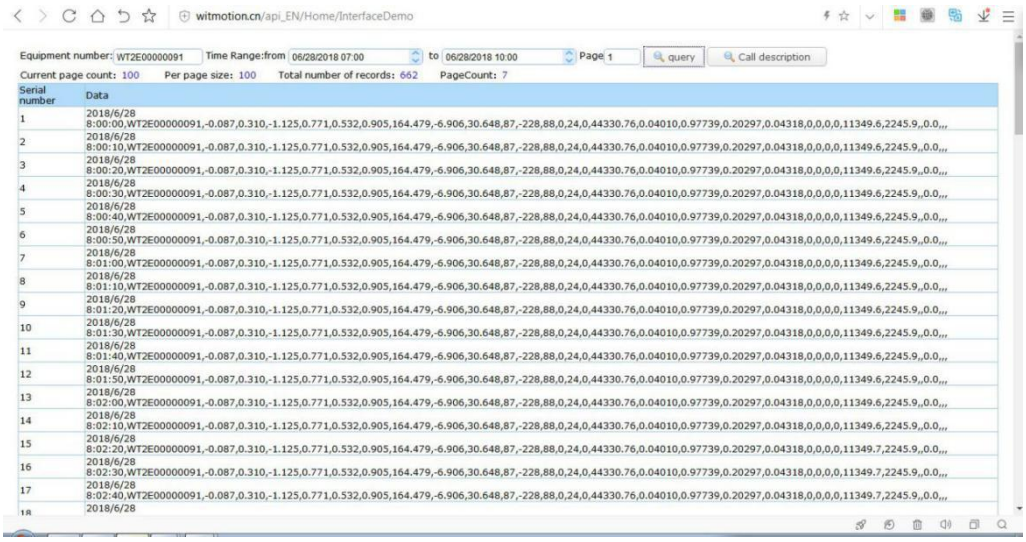
Note: If the connection is not available,

1. Please check if the module is successfully distributed.
2. Is the module and computer under the same wifi
3. Does the module enter UDP mode?
4. The computer firewall is turned on, which may also cause data to not be transmitted properly.
5. Whether the pc software has enabled the function of automatically searching for the device, the following picture appears, please left click on the “Enable automatic search for device” function.

6 Cloud interface call

6.1DEMO:

Example of interface call: http://witmotion.cn/api_EN/Home/InterfaceDemo



6.2 HTTP data acquisition interface description

6.3 Request Address, Request Parameters, and Return Parameters

In the TCP transmission mode, the device transmits data to the witmotions server by accessing the Internet. The company provides the user with a data interface, so that the JSON format data can be obtained through the interface. The data acquisition interface requires the user to initiate an Http request to the data acquisition server according to the specified format. After the user obtains the data and parses according to the agreed parameter format, the data can be obtained.

Table 5-1 Description of request addresses, request parameters, and parameter formats

Submission method	protocol	HTTP	Request address	http://witmotion.cn/api/api/Business/SetDataRecords
parameter name	Format requirements and other constraint parameter implications			Required Fill or not
Equipment No	The number starting with “WT” under the QR code on the back of the device, for example: WT2E00000091			Yes
Start Time	Format ： yyyy-MM-dd hh:mm:ss			Yes
End Time	Format: yyyy-MM-dd hh:mm:ss			Yes
Page Th	Integer			Yes
User Name	Not Fill			No
User Pwd	Not Fill			No

The format of the return parameters is shown in Table 5-2.

Note: Attach an explanation of the parameters

Table 5-2 Return parameters and format description

Parameter	Parameter Meaning	Remarks and instructions

name		
status	state	0 means success, others mean failure
Cur count	Count of Record Return On Current Page	Paging parameters, how many records are on the current page (this number may not reach the maximum number of records per page)
Page size	Size per Page	Paging parameters, how many records can be per page
Page count	Number Of Pages	Paging parameters, according to the size of each page, all eligible query records can be divided into several pages
Total count	Number Of Counts	Paging parameters, if not paging, how many records are found in the eligible records
trans_date	Server Time	The system time of the Witt Intelligent Server when initiating a query request, not the time of data reporting
showmsg	Message Notification	If an error occurs during the query, this section explains the cause of the error.
data	Data	For example, the meaning of the data part from left to right is: data reporting time device number (ID) X-axis acceleration\ Y-axis acceleration\Z-axis acceleration X-axis angular velocity\ Y-axis angular velocity\ Z-axis angular velocity X-axis angle\ Y-axis angle\ Z-axis angle X-axis magnetic field\Y-axis magnetic field\Z-axis magnetic field Module temperature\ depth\ air pressure\ height Four elements: q0 q1 q2 q3 Port number: D0 D1 D2 D3 GPS\ longitude\ latitude\ altitude\ heading\ ground speed\ positioning accuracy\ CSQ

(1) The five parameters of module temperature, depth, air pressure, altitude and CSQ have no meaning and can be ignored;
(2) Four elements: q0 q1 q2 q3 is another way of calculating the pose;
(3) Port number: D0 D1 D2 D3 These four ports are used for external expansion of the chip. The extended port functions are: analog input (0~VCC), digital input, digital output, PWM output (period 1us-65535us, resolution 1us);
(4) GPS parameters have no practical meaning and can be ignored.

6.4 Example of initiating a request and returning data

This section mainly gives a concrete example of the format introduced in the previous section for easy understanding.

http://witmotion.cn/api/api/Business/SetDataRecords?EquipmentNo=WT2E00000091&StartTime=2018-06-28 08:00:00&EndTime=2018-06-28 10:00:00&PageTh=1&userName=&userPwd=

An example of a URL to initiate an Http GET request is as follows:

The meaning of this request format example is to initiate a data acquisition request to the Witt Intelligent Server. The device with the number WT2E00000091 is required to start from 2018-06-28 08:00:00 to 2018-06-28 10:00:00. The data in the period of time, at this time, the data is paged according to a maximum of 100 pages per page (the default is 100 records per page), and the data of the first page is required to be obtained (ie, the first to the 100th of the query conditions) data). Since the Witt Intelligent Server does not have a check mechanism for the identity of the data requester, the username and password may not be filled in, but the name of the two parameters must be carried in the requested URL.

After initiating this data request, the Witt Intelligent Server will help us find out the data we want, and sort and wrap according to our requirements. Finally, we will return the data to us in JSON format. The meaning of the return parameters is shown in Table 5- 2.
The following is the data returned by the Witt Intelligent Server after receiving the above example request **(the data part should have 100 groups, the data format is exactly the same, but the value is different. In order to save space, only 4 groups are reserved).**


```
{
    "statu": 0,
    "curcount": 100,
    "pagesize": 100,
    "pagecount": 7,
    "totalcount": 662,
    "trans_date": "20180725222017",
    "showmsg": "ok",
    "data": [
        "2018/6/28 8:00:00,WT2E00000091,-0.087,0.310,-1.125,0.771,0.532,0.905,164.479,-6.906,30.648,87,-228,88,0,24,0,44330.76,0.04010,0.97739,0.20297,0.04318,0,0,0,0,11349.6,2245.9,,0.0,,,",
        "2018/6/28 8:00:10,WT2E00000091,-0.087,0.310,-1.125,0.771,0.532,0.905,164.479,-6.906,30.648,87,-228,88,0,24,0,44330.76,0.04010,0.97739,0.20297,0.04318,0,0,0,0,11349.6,2245.9,,0.0,,,",
        "2018/6/28 8:00:20,WT2E00000091,-0.087,0.310,-1.125,0.771,0.532,0.905,164.479,-6.906,30.648,87,-228,88,0,24,0,44330.76,0.04010,0.97739,0.20297,0.04318,0,0,0,0,11349.6,2245.9,,0.0,,,",
        "2018/6/28 8:00:30,WT2E00000091,-0.087,0.310,-1.125,0.771,0.532,0.905,164.479,-6.906,30.648,87,-228,88,0,24,0,44330.76,0.04010,0.97739,0.20297,0.04318,0,0,0,0,11349.6,2245.9,,0.0,,,"
    ]
}
```


The time trans_date is 22:20:17 on July 25, 2018, and the acquired data has been returned to us in the specified format. A statu of 0 indicates that the data is successfully acquired. At this time, the

showsg is ok, indicating that the data is successfully acquired. The paging information tells us that the device numbered WT2E00000091 starts from 2018-06-28 08:00:00 to 2018-06-28 10:00:00. There are 662 data totalcounts during this period. The default is 100 per page. Tabs (the maximum number of records per page pagesize=100 is controlled by the Witt Intelligent Server, we can't modify it), so it is divided into pagecount = 7 pages. Among them, we want to take the first page (that is, the first 1-100 data), so the number of records on page 1 is curcount 100. The data format of the data section can be understood by referring to the explanation of the data column in Table 5-2.

Referring to the first set of data in the example data section given, a comparison of data and interpretation is given. The first group of data in the data section is as follows **(note the yellow part, there is no null content between the two commas, there is also a null value between the comma and the last quote):**

"2018/6/28 8:00:00,WT2E00000091,-0.087,0.310,-1.125,0.771,0.532,0.905,164.479,-6.906,30.648,87,-228,88,0,24,0,44330.76,0.04010,0.97739,0.20297,0.04318,0,0,0,0,11349.6,2245.9,,0.0,,,"

The corresponding explanation is: **(vertically, the empty part is represented by)**

Table 5-2 Return parameters and format description

Meaning	Corresponding value	Name	Corresponding value	Name	Corresponding value
Data reporting time	2018/6/28 8:00:00	x axis Magnetic Field	87	The port numberD0	0
Device number (ID)	WT2E00000091	y axis Magnetic Field	-228	The port numberD1	0
X-axis acceleration	-0.087	Z axis Magnetic Field	88	The port numberD2	0
Y-axis acceleration	0.310	Temperature	0	The port numberD3	0
Z-axis acceleration	-1.125	Depth	24	GPS longitude	11349.6
X-axis angular velocity	0.771	Air Pressure	0	GPS latitude	2245.9
Y-axis angular velocity	0.532	Height	44330.76	GPS altitude	
Z-axis angular velocity	0.905	Four elements q0	0.04010	GPS heading	0.0
X-axis angle	164.479	Four elements q1	0.97739	GPS ground speed	
Y-axis angle	-6.906	Four elements q2	0.20297	GPS positioning accuracy	
Z-axis angle	30.648	Four elements q3	0.04318	CSQ	

7 Application area

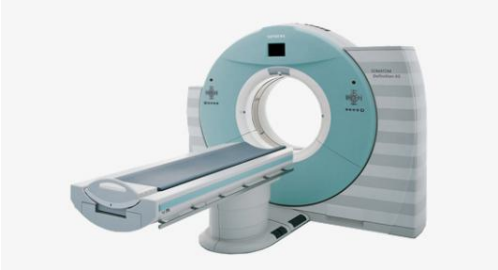
Agricultural machinery

Internet of things

Solar energy

Power monitoring

Medical instruments



Construction machinery

Geological monitoring

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