WT901SDCL Attitude Angle Sensor

SPECIFICATION

Model ： WT901BSDCL

Description ： WT901 with SD storage sensor, Built-in battery

Quality system standard: ISO9001:2016

Tilt switch production standard：GB/T191SJ 20873-2016

Criterion of detection：GB/T191SJ 20873-2016

Revision date：2020-03-18

Link to WT901SDCL tutorial:(software, manual, etc.):
https://drive.google.com/file/d/1AAu4U1ylhcfGrfZSMolduqjwhF3tScpp/view
Link to demo video of WT901SDCL
https://www.dropbox.com/sh/n5ujs8vswagvqve/AADPVFA_1FA7gAr4aW6T8yMxa?dl=0

Catalog

1 Description

- The module integrates high-precision gyroscope, accelerometer, and geomagnetic field sensor. Using high-performance microprocessor, advanced dynamics calculation and Kalman dynamic filtering algorithm, it can quickly solve the module's current real-time motion attitude.

- The use of advanced digital filtering technology can effectively reduce measurement noise and improve measurement accuracy.

- The attitude solver is integrated into the module, and the dynamic Kalman filter algorithm can be used to accurately output the current attitude of the module in a dynamic environment. The attitude measurement accuracy is 0.05 degrees static and 0.1 degree dynamic. Some professional inclinometers!

- The module has a built-in voltage stabilization circuit, the working voltage is 3.3v ~ 5v, and the pin level is compatible with 3.3V / 5V embedded system, which is easy to connect.

- The module contains a battery, which can be used alone when fully charged.

- SDThe module has an SD card inside to record the measured data.

- Support serial TTL interface for users to choose the best connection method. The serial port speed is adjustable from 2400bps to 921600bps.

- Up to 200Hz data output rate. The input content can be arbitrarily selected, and the output rate can be adjusted from 0.1 to 200HZ.

2 Features

1, voltage: 3.3V ~ 5V

2, current: <40mA

3. Battery capacity: 200mAh

4. Battery voltage: 3.7V

5. Volume: 51.3mm X 36mm X 15mm

6. Measurement dimensions: acceleration: 3D, angular velocity: 3D, magnetic field: 3D, angle: 3D.

7.Range: Acceleration: ± 2/4/8/16 g (optional), angular velocity: ± 250/500/1000/2000 ° / s (optional), X, Z axis ± 180 °, Y axis ± 90 °.

8. Stability: Acceleration: 0.01g, angular velocity 0.05 ° / s.

9. Stability of attitude measurement: 0.01 °.

10. Data output content: time, acceleration, angular velocity, angle, magnetic field, port status, quaternion.

11. Data output frequency: 0.1Hz ~ 200Hz.

12. Data interface: serial port (TTL level, baud rate support 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600)

3. HardwareConnection

Dimension	36 X 51 X 15 mm
Weight	18G

4.Axial Description

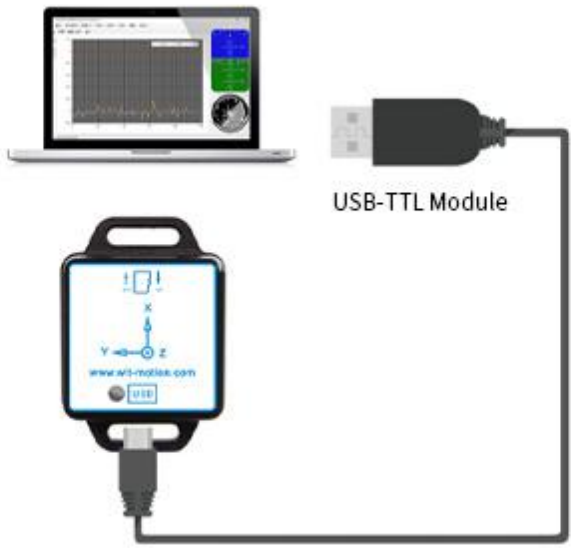
As shown in the figure above, the axial direction of the module is shown on the upper icon, the X axis is upward, the Y axis is left, and the vertical module is outward.

Is the Z axis. The direction of rotation is defined by the right-hand rule, that is, the thumb of the right hand points to the axial direction, and the direction in which the four fingers are bent is the direction of rotation around the axis. The X-axis angle is the angle around the X-axis rotation direction, the Y-axis angle is the angle around the Y-axis rotation direction, and the Z-axis angle is the angle around the Z-axis rotation direction.

5 hardware connection method

5.1 Connecting to a computer

This product has an attached cable that connects the computer and the product. Please use the cable that comes with the product. Use the data cable to connect the product (the SD card is plugged into the module before the module starts to work).



5.2 Indicator status

1. The product is connected to the power supply. At this time, the power indicator (red) indicator is always on, indicating that the product is charging. The red light will go out after charging is

completed.

2. After inserting the SD card for about 1 second, the blue light flashes, indicating that the SD card is recording data.

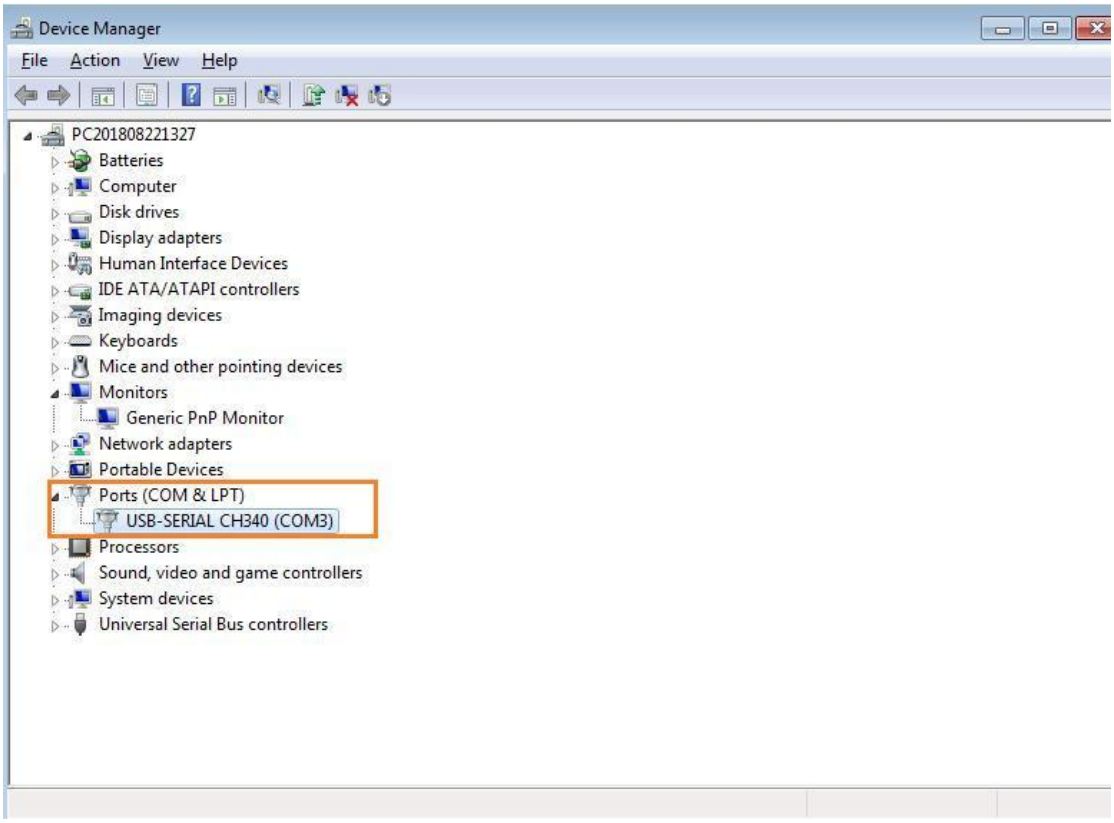
6 software usage

6.1 How to use

Note that users who cannot run on the upper computer should download and install .net framework4.0:

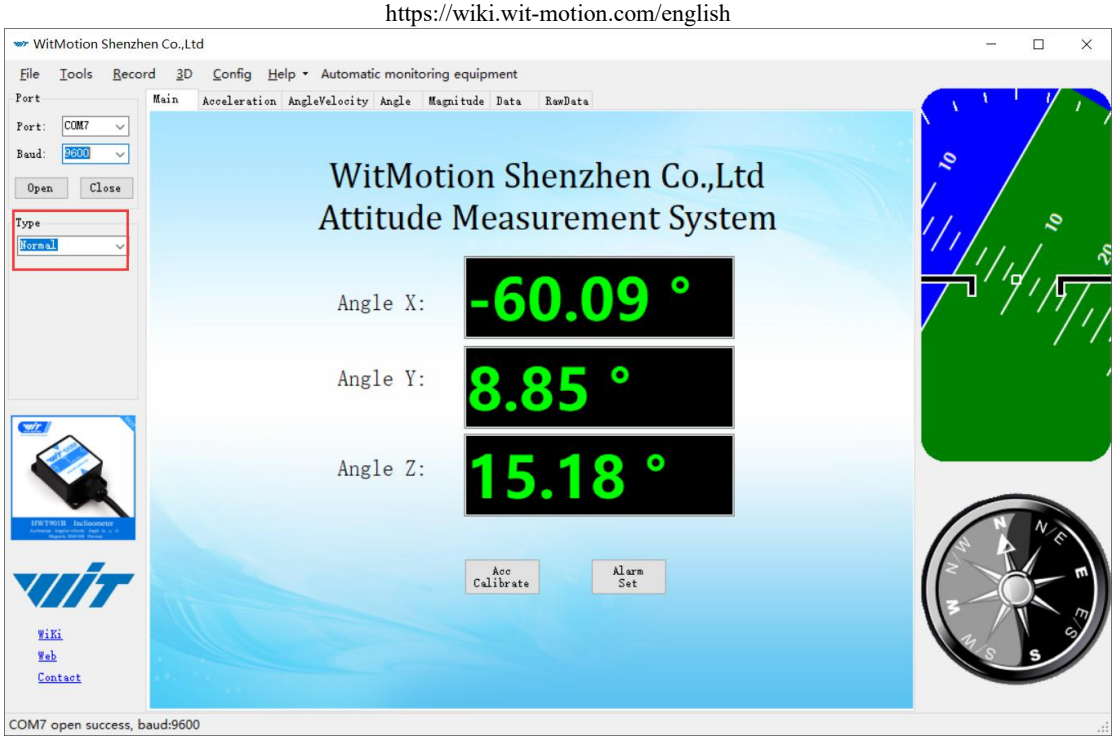
http://www.microsoft.com/en-us/download/details.aspx?id=17718

Connect to the computer via the USB cable attached to the product and turn on the upper computer. After installing the driver CH340 corresponding to the serial port module, you can query the corresponding port number in the device manager, as shown in the figure:



The driver is CH340, as follows: http://pan.baidu.com/s/1o6Rleae?frm=fujian

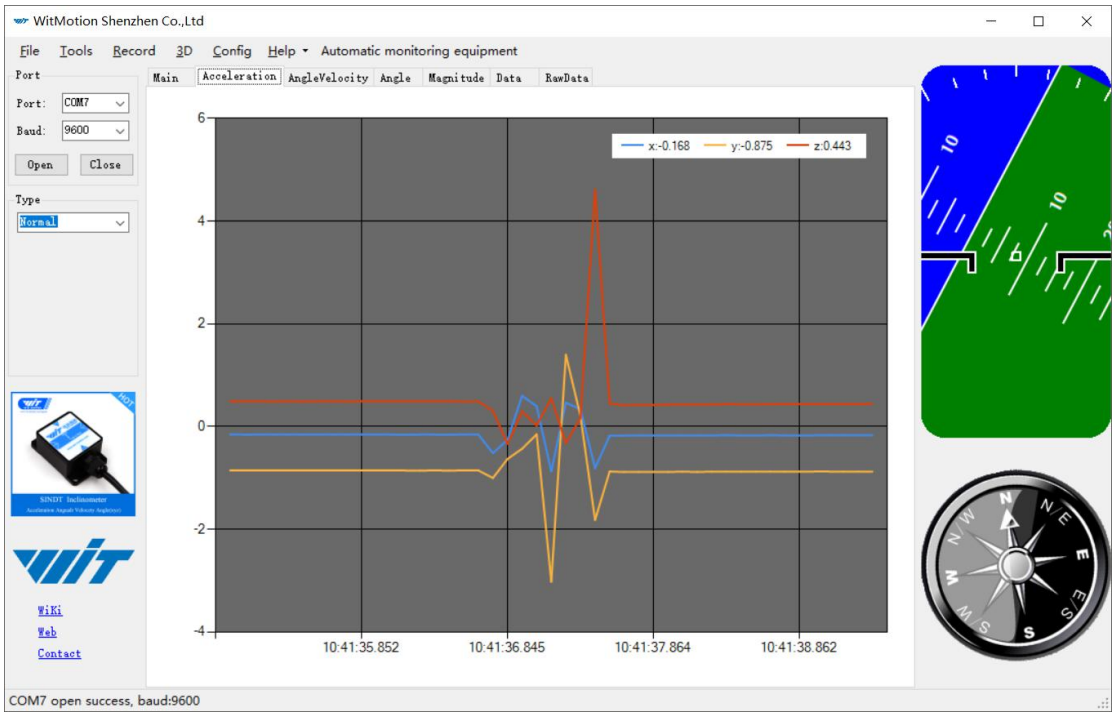
Open the MiniIMU.exe software, in [Data Package / Upper Computer], click the serial port selection menu, and select the COM number you just saw in the device manager.



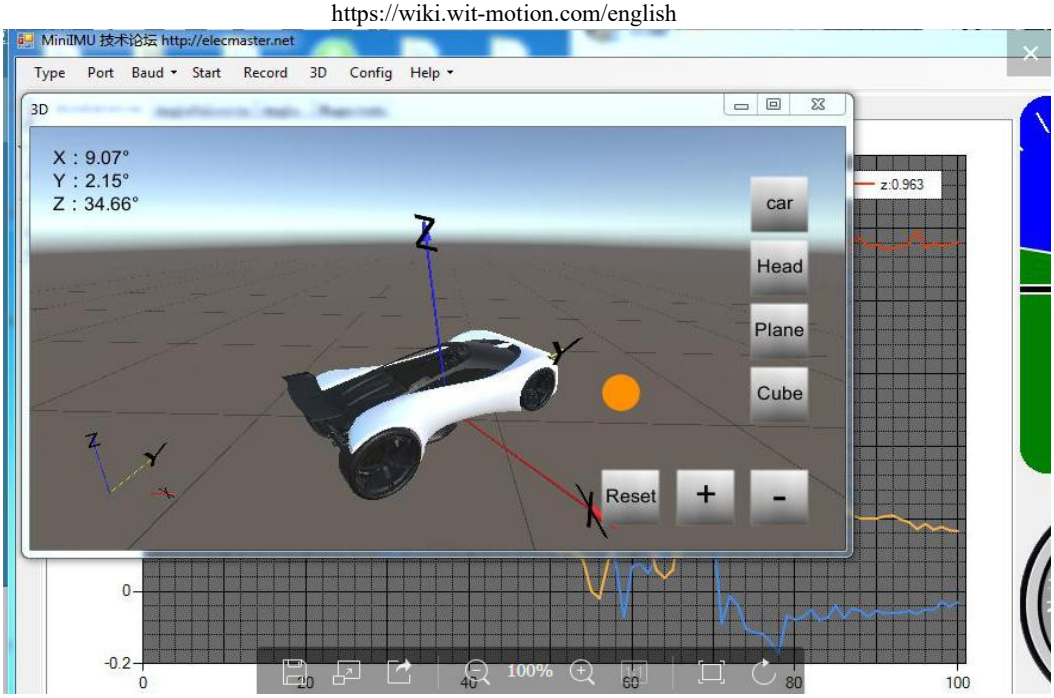
Open the software MiniIMU.exe, Click “Port” and select the com number you just saw in the device manager.

Click the “Type” and select model “Normal.

Click the “Baud” and select “9600”, after all those selections are completed, the software can display data.



Click the "3D" and you can bring up the three-dimensional display interface, which displays the three-dimensional posture of the module.



6.2 Restore factory settings

Command method operation method: Connect the WT901SDCL module and the computer through the cable that comes with the module, click the Settings tab, and click Restore Default. After restoring factory settings, power on the module again. (This method needs to know the baud rate of the module in advance, if the baud rate does not match the instruction will not take effect).

6.3 Module calibration

Note: The module calibration and configuration should be performed in the online state at the lower right corner of the configuration bar of the host computer, as shown in the figure below. Offline indicates that the host computer does not control the module.

Before using the module, you need to calibrate the module. The calibration of WT901SDCL module includes addition calibration and magnetic field calibration.

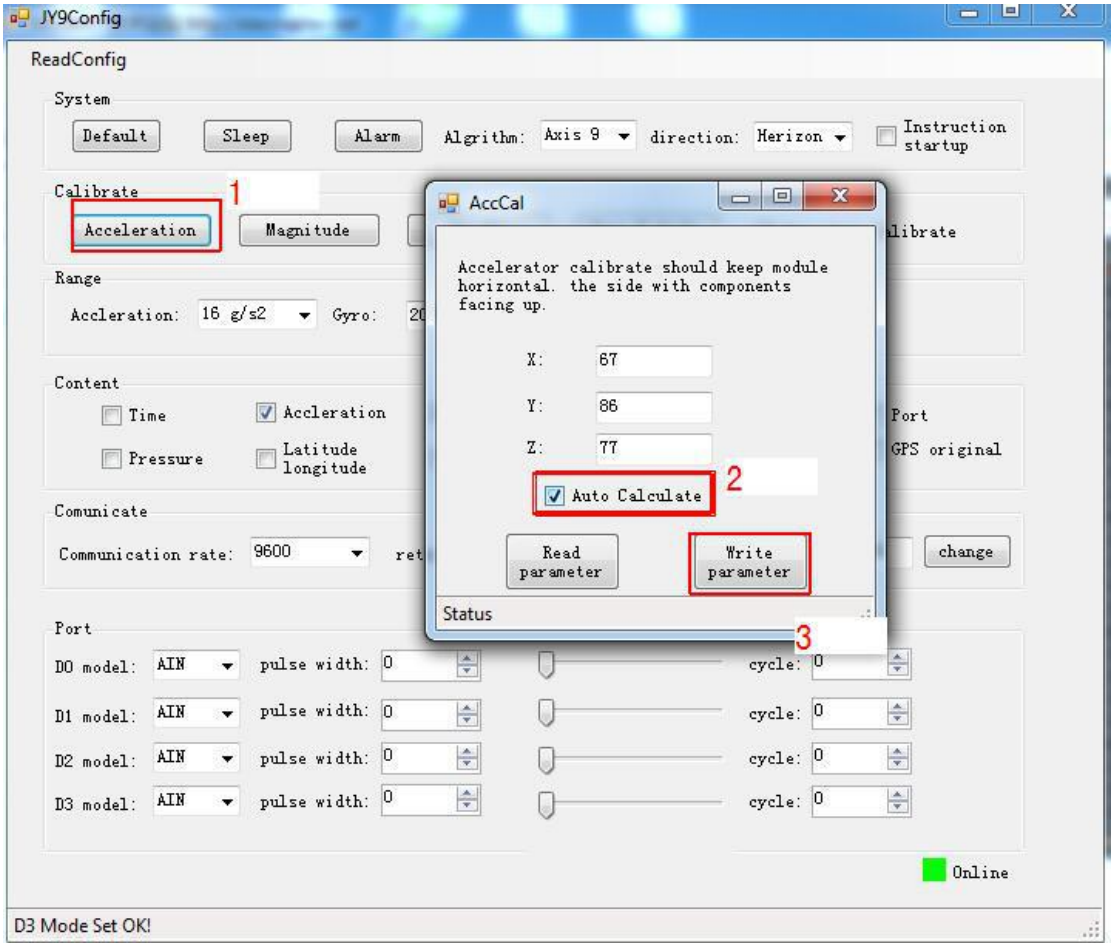
The 6-axis algorithm calibration includes Z-axis return to 0 and addition calibration.4.3 Module Calibration
Reminder: The module calibration and configuration should be carried out under the online state which displayed in the low right corner of the software configuration bar.
The module need to be calibrated before the module is used. The calibration of WT901 includes accelerometer calibration and magnetic calibration.

6.3.1 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.

Methods as follow:

1. Firstly keep the module horizontally stationary, in the “Config” of the software click “Acceleration” and a calibration interface will pop up.
2. Check the “Auto Calculate” option, the software will automatically calculates the zero bias value and then click “Write parameter”



6.3.2 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

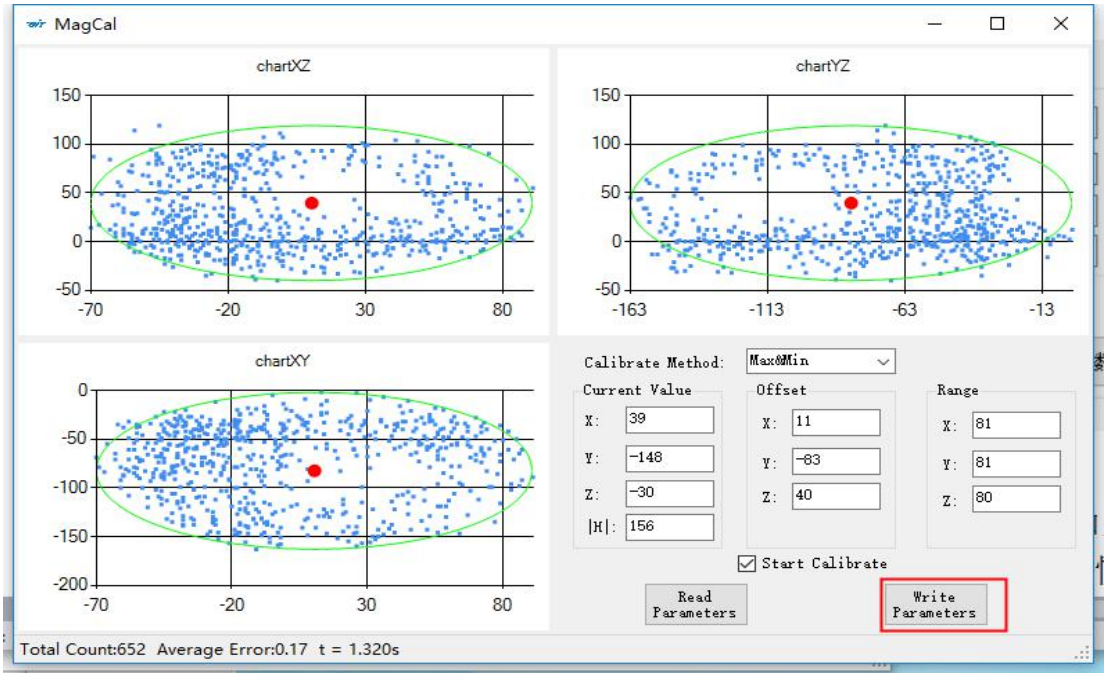
manufactured. If it is not calibrated, it will bring about a large measurement error and affect the accuracy of the Z-axis angle measurement of the heading angle.

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. In the settings page, click on the magnetic field button under the calibration bar to enter the magnetic field calibration mode. At this time, the MagCal window pops up. Click on the calibration button in this window.

3.Then slowly rotate the module around the three axes, let the data points draw points in the three planes, you can rotate a few more times, and after you draw a more regular ellipse, you can stop the calibration. After the calibration is completed, click Write Parameters.



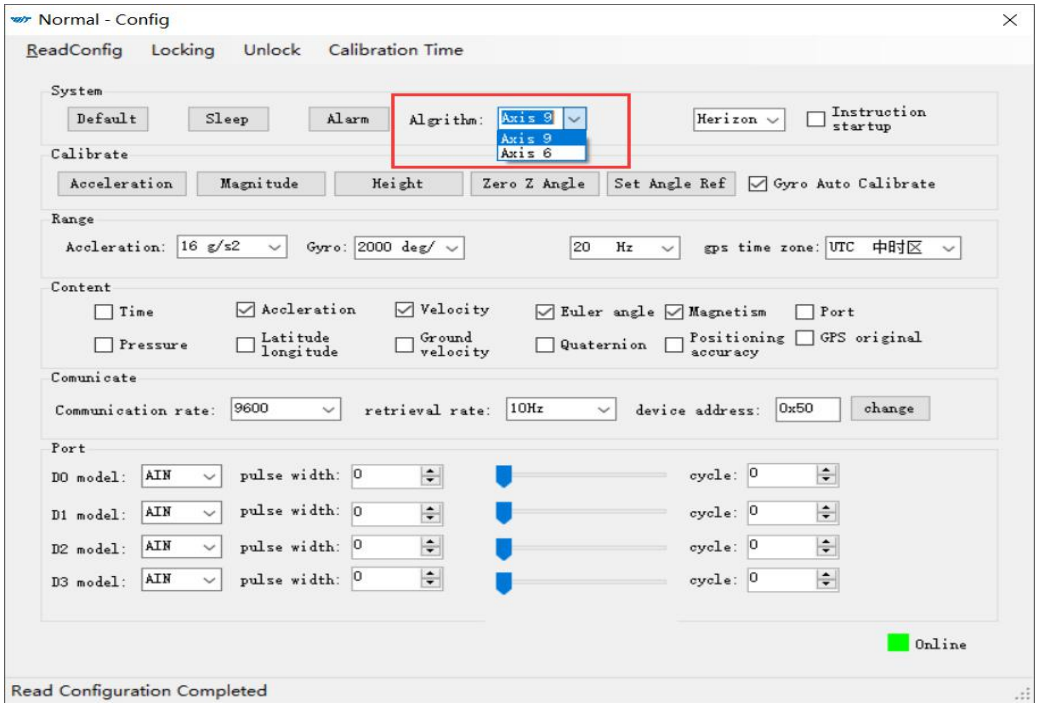
Note: The data points should be within the ellipse but not outside the ellipse. If you cannot draw the ellipse, please keep away from the magnetic field interference.

Video address：

https://www.youtube.com/channel/UCxBLgvYQNk-sGVDp42ch-Ug

6.4 Z axis To 0

Ps：If you want to avoid magnetic interference，you can change the algrithm to Axis 6，the you can use Z axis to 0

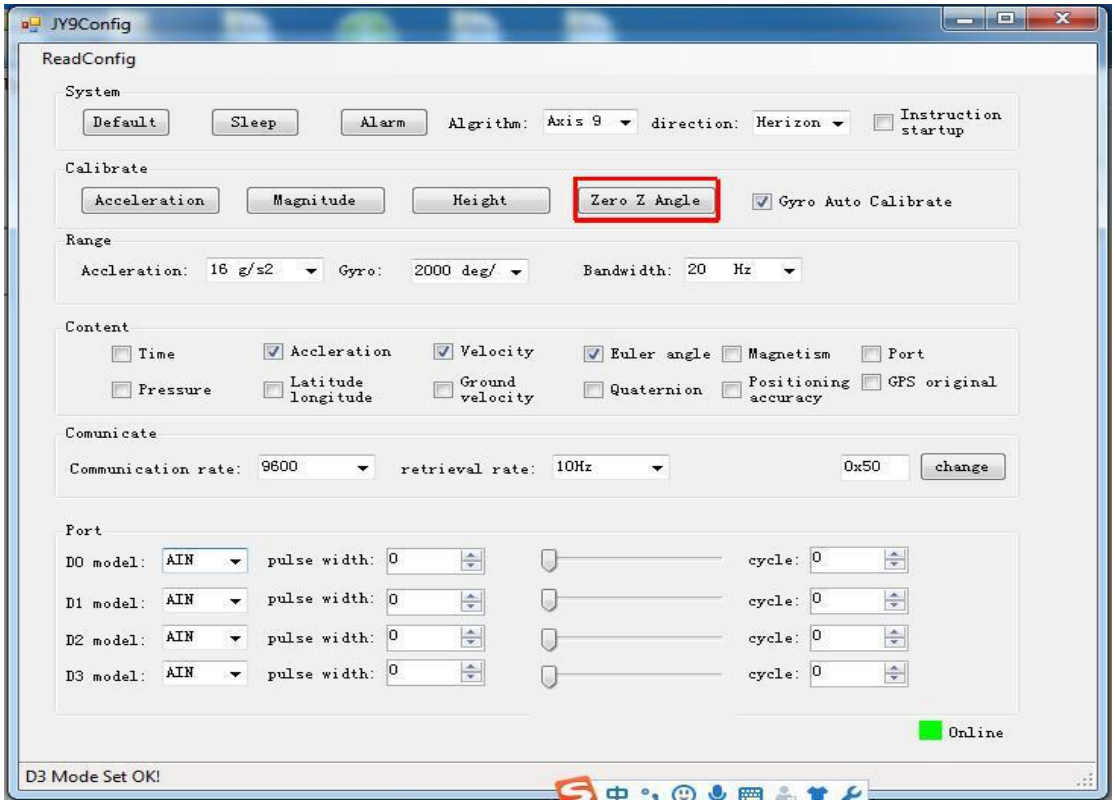


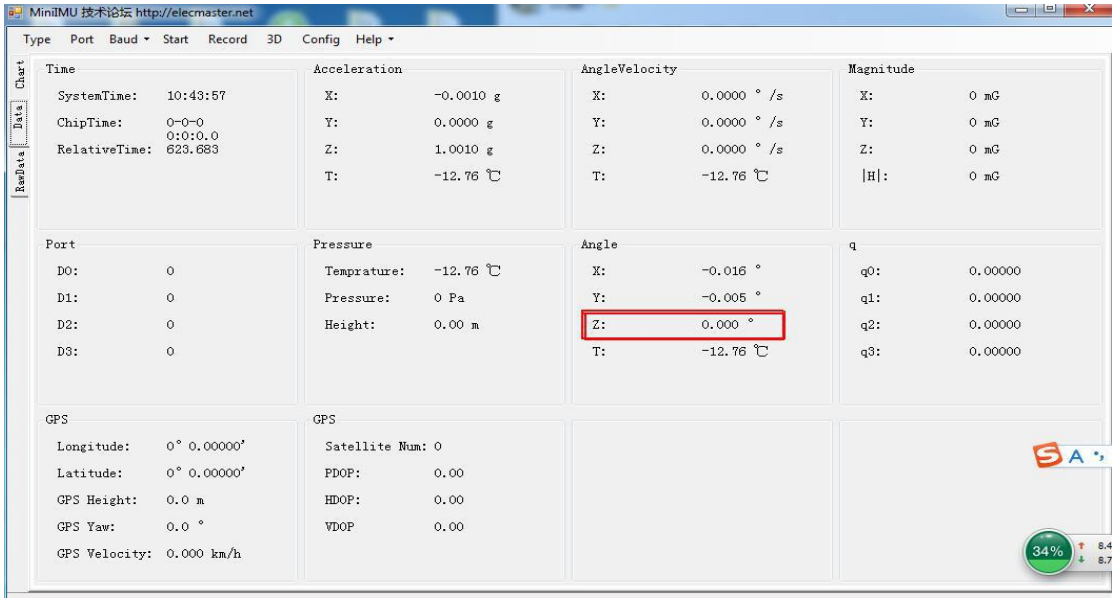
Reminder: Z axis to 0 is valid for JY61P only.

The z-axis angle is an absolute angle, and it takes the northeast sky as the coordinate system can not be relative to 0 degree.

Z axis to 0 is to make the initial angle of the z axis angle is relative 0 degree.When the module is used before and z - axis drift is large, the z - axis can be calibrated, When the module is powered on, the Z axis will automatically return to 0.

Calibration methods as follow: firstly keep the module static, click the “Config” open the configuration bar and then click “Zero Z Angle” option, you will see the the angle of the Z axis backs to 0 degree in the module data bar.





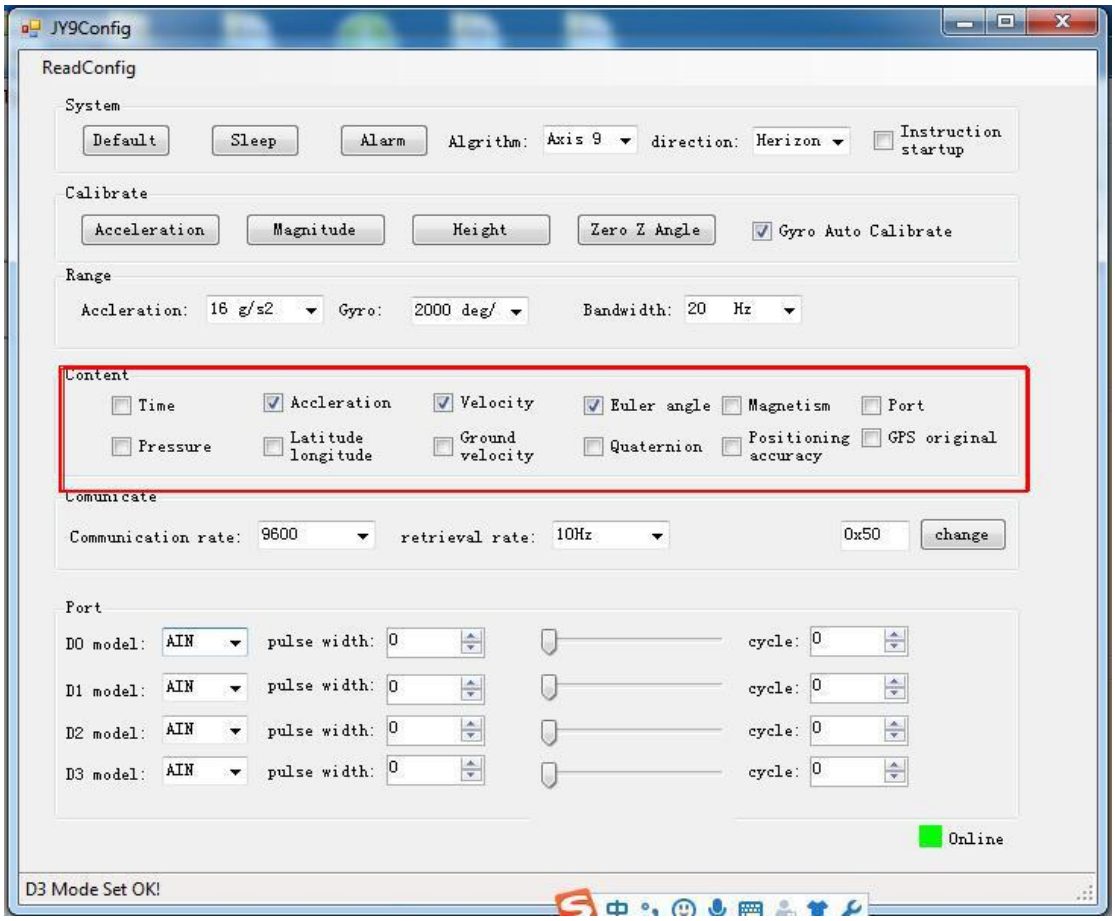
6.5 Gyroscope Automatic Calibration

The gyroscope calibration is to calibrate the angular velocity, and the sensor will calibrate automaticly.

6.6 Set Return Content

Setting method: The content of returned data can be customized according to the user´s needs, click “Config” to open configuration bar, and hook the data content option that you want. Take JY901 as an example, the default output of the module is acceleration, angular velocity angle and magnetic field.

Longitude and ground velocity information are effectively when connected to the GPS module. In order to get the correct data we need to set the content.



6.7 Set Return Rate

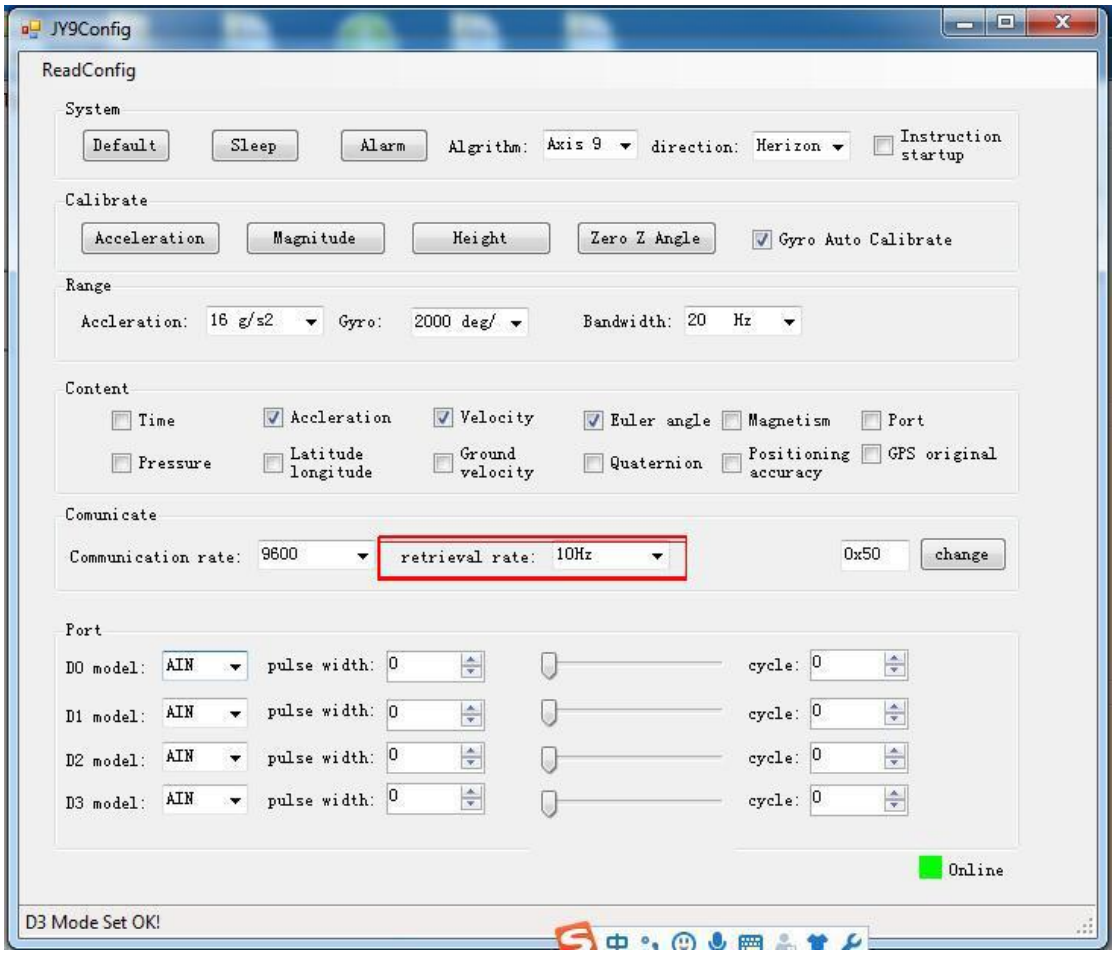
Setting methods: click “Config” to open configuration bar and than set the “retrieval rate” is 0.1HZ-200HZ optional.

The default return rate of the module is 10HZ, the highest return rate supports 200HZ.

10HZ refers to 10 packets returned every second. There contains 33bytes in a data packet in default.

Reminder: If there being a lot of return content and low baud rate of communication, the module

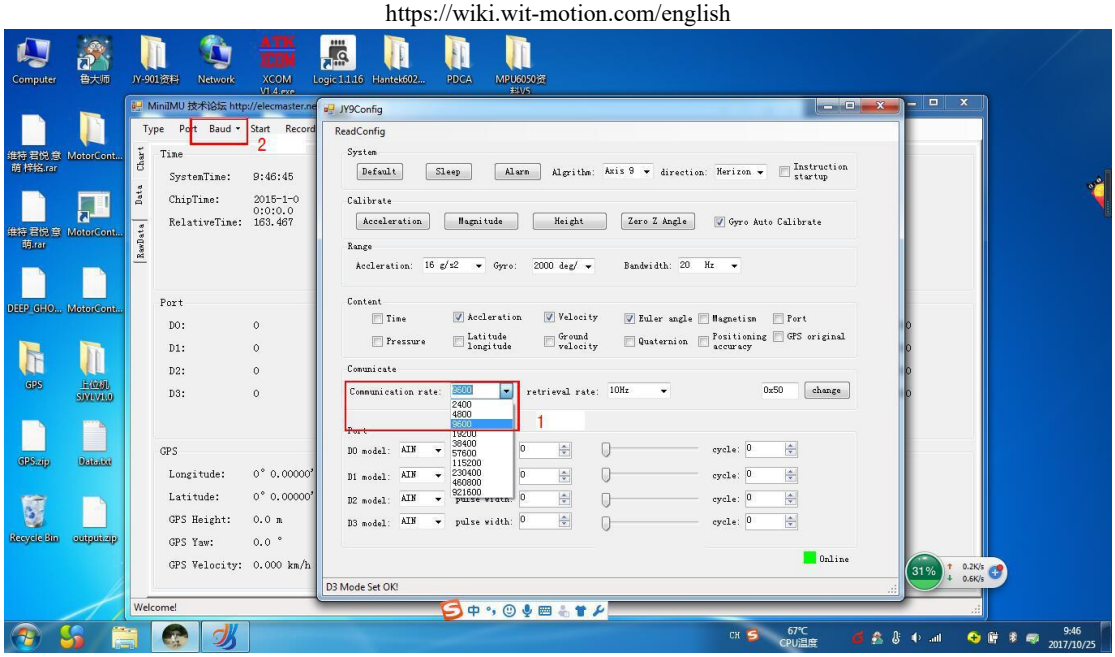
will automatically reduce the frequency and output at a maximum allowable output rate. The default baud rate is 115200.



6.8 Set Baud Rate

Module supports multiple baud, 9600 default. Change baud rate only when the module connect to PC program successfully, choose the baud rate and Click “Change” button.

Reminder: After changing the baud rate, the module does not immediately take effect, need to re-power and then it will take effect.

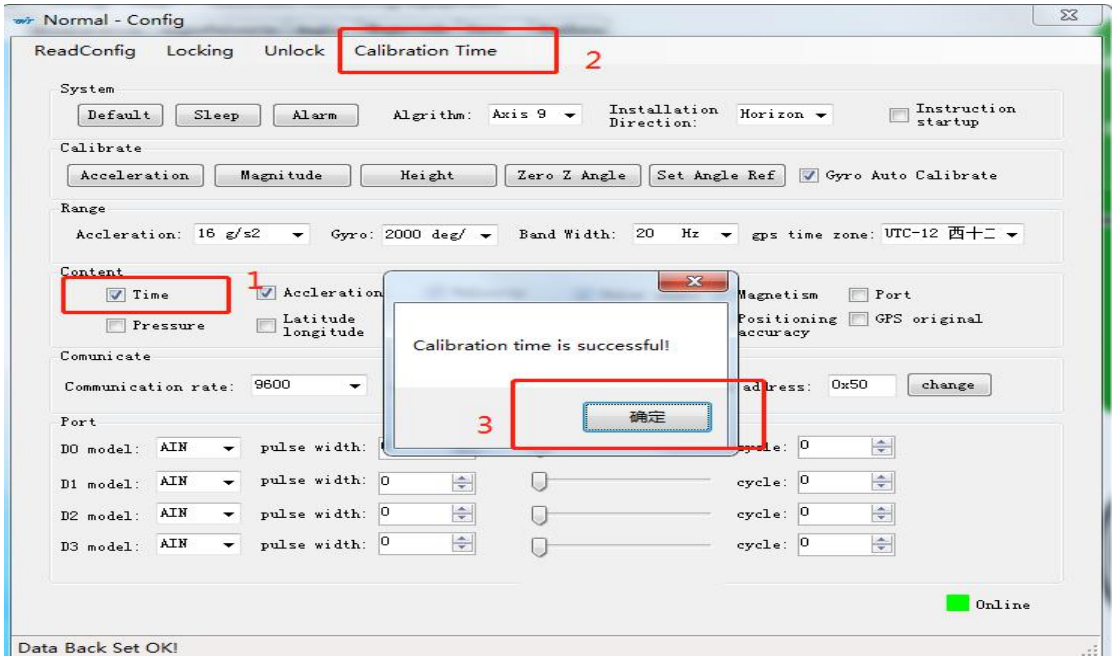


6.9 Calibration time

1. Under Configuration-Time; check before the time button, the time of calibration is displayed in the data interface, and under time-on-chip time, only check to display the time.

2.Setting method: On the host computer-configuration-calibration time, click to calibrate the time, the successful calibration will prompt the calibration time to be successful.

3.Function: By calibrating the time, the time of the host computer is the same as the current time, and you can know when the data is recorded when recording the data.



Time		Acceleration		AngleVelocity		Magnitude	
System:	14:01:14	X:	-0.5503 g	X:	-0.0610 °/s	X:	217
Chip:	2020-3-17	Y:	0.1294 g	Y:	0.1221 °/s	Y:	-778
	14:1:14.165	Z:	-0.8066 g	Z:	0.1831 °/s	Z:	161
Relative:	103.175	T:	0.9850 g	T:	0.2284 °/s	|H|:	824

Port		Pressure		Angle		q	
D0:	0	Temprature	29.62 ℃	X:	171.046 °	q0:	0.00000
D1:	0	Pressure:	0 Pa	Y:	34.431 °	q1:	0.00000
D2:	0	Height:	0.00 m	Z:	20.869 °	q2:	0.00000
D3:	0			T:	29.62 ℃	q3:	0.00000

GPS		GPS	
Longitude:	0°0.00000'	Satellite	0
Latitude:	0°0.00000'	PDOP:	0.00
GPS H:	0.0 m	HDOP:	0.00
GPS Yaw:	0.0 °	VDOP	0.00
GPS V:	0.000 km/h		

6.10 Data Recording

There is no memory chip in the sensor module, and the data can be recorded and saved in the software.

Method are as follows: Click “Record” and “Start” will save the data as a file.

StartTime: 2019-07-24 10:45:13.047

address	Time(s)	ax(g)	ay(g)	az(g)	wx(deg/s)	wy(deg/s)		wz(deg/s)	AngleX(deg)	AngleY(deg)		AngleZ(deg)		T(°)	hx	hy	hz
0x50	10:48:55.760	-0.1670	-0.8496	0.4971	0.6714	-0.1221		-0.0610	-60.0623	9.6075	12.6727	38.6900	66	84	380			
0x50	10:48:55.860	-0.1670	-0.8530	0.4878	0.2441	0.0610		0.1221	-60.0677	9.6130	12.6672	38.6800	67	85	381			
0x50	10:48:55.960	-0.1665	-0.8521	0.4878	-0.1831	0.0000		0.0000	-60.0787	9.6185	12.6727	38.6800	65	86	379			
0x50	10:48:56.059	-0.1660	-0.8545	0.4932	0.0000	-0.1831		0.0000	-60.0677	9.6185	12.6617	38.6900	69	86	384			
0x50	10:48:56.160	-0.1675	-0.8525	0.4927	-0.0610	0.0000		-0.0610	-60.0677	9.6185	12.6727	38.6900	65	85	382			
0x50	10:48:56.260	-0.1660	-0.8516	0.4873	-0.0610	0.0000		0.0000	-60.0732	9.6185	12.6782	38.6900	67	87	384			
0x50	10:48:56.360	-0.1670	-0.8496	0.4937	-0.0610	0.0000		0.0000	-60.0623	9.6185	12.6947	38.6900	66	83	385			

The saved file is in the directory of the software Data.tsv:

The file begins with a value indicating the data. “Time” stands for time, “ax, ay, az” respectively represents the acceleration of X, Y , Z axis. “wx, wy, wz” respectively represents the angular velocity of X, Y, Z axis. “AngleX, AngleY, AngleZ” respectively represents the angle of the X, Y, Z axis. T represents the temperature.

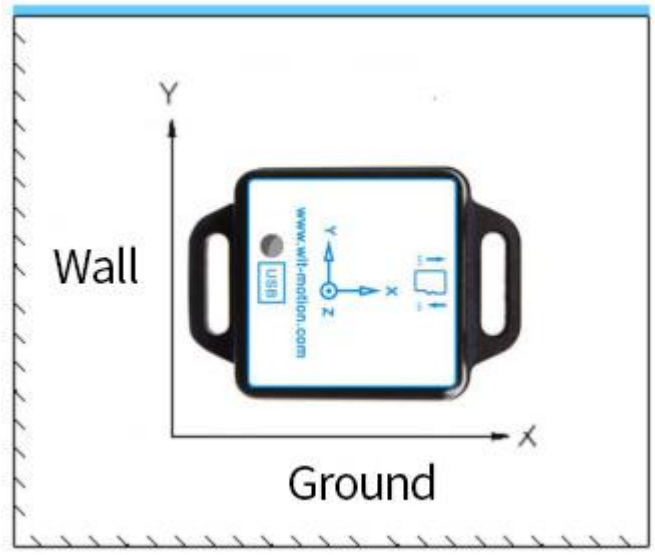
Data can be imported into the Exel or analysis in Matlab. In the Matlab environment running xxx.m document and it can plot of the data.

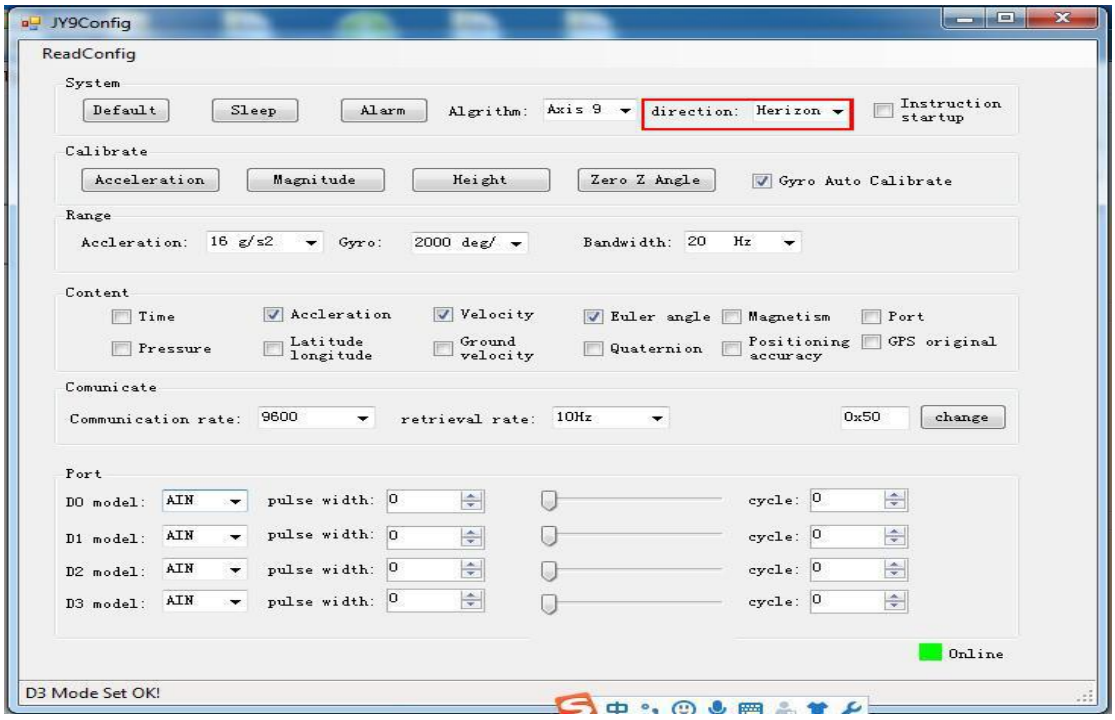
6.11 Installation Direction

The default installation direction of the module is horizontal installation. When the module needs

to be vertically placed, it can be installed vertically.

Vertical installation method: Put the module around X-axis rotation 90 degrees vertical placement. In the “Config” of the software, click “Vertical” option. The calibration can be used after the setup is completed.

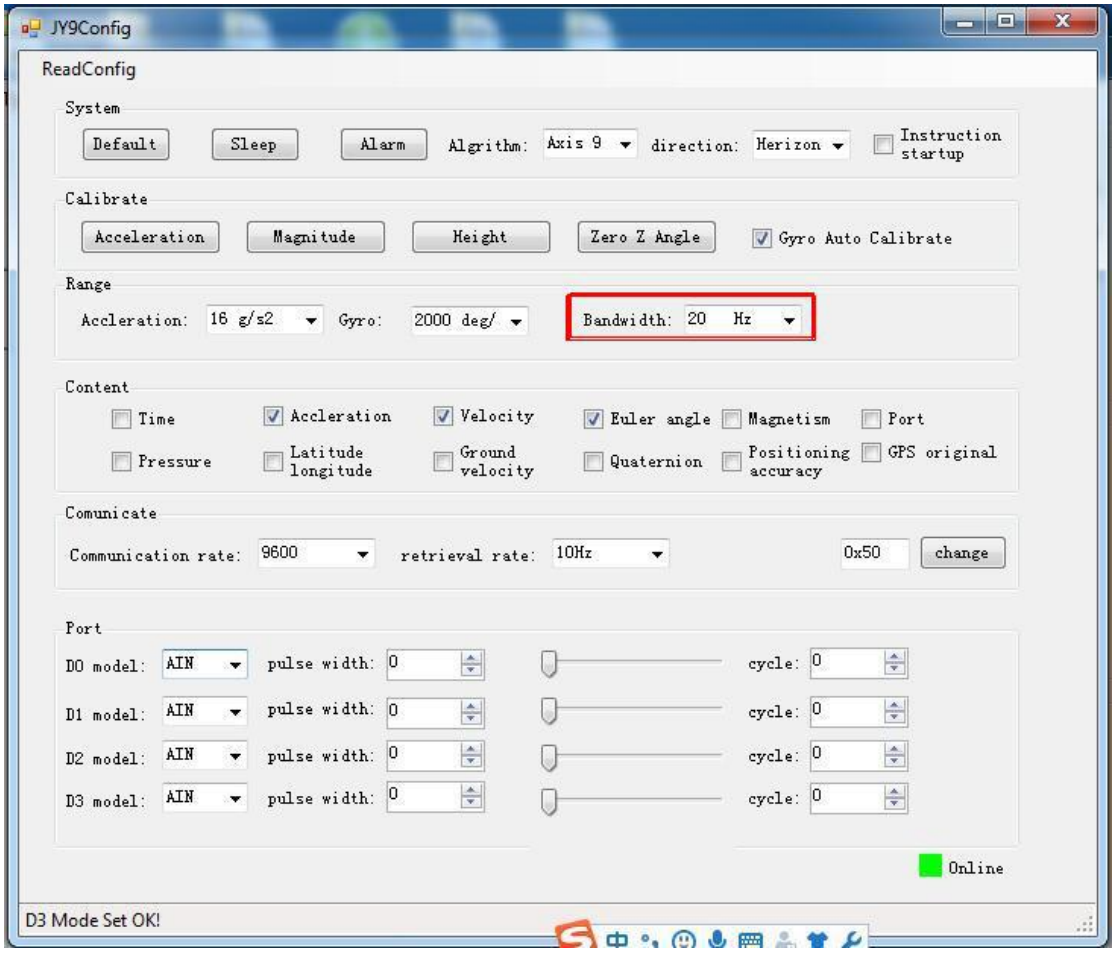




6.12 Set Bandwidth

Bandwidth: The module outputs only the data within the measurement bandwidth, and the data which is larger than the bandwidth will be filtered automatically.

In the “Config” of the software, click “Bandwidth” option to set it, the default setting is 20HZ.



6.13 Six axis/ Nine axis Algorithm

JY61P uses the 6 axis algorithm, and the z axis angle is calculated mainly according to the angular velocity integral.

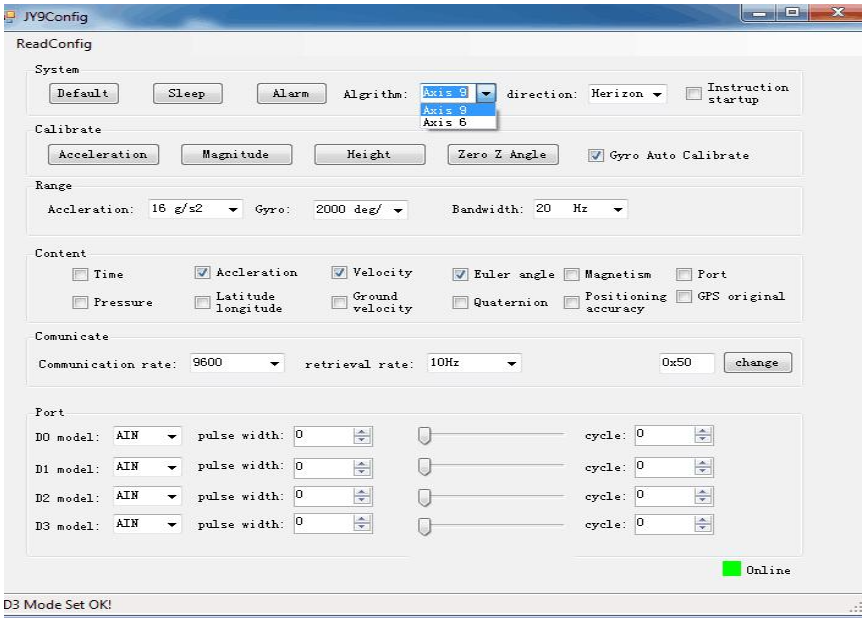
JY901 uses the 9 axis algorithm, the z axis angle is mainly calculated according to the magnetic field, there will be no drift phenomenon.

When the JY901 environment is disturbed by magnetic field, the 6 axis algorithm can be used to detect the angle.

Nine axis algorithm to use 6 axis algorithm: in the PC configuration bar, the algorithm changed to

"Axis6", and then additional calibration and Z axis zeroing calibration. The calibration will be ready for use.

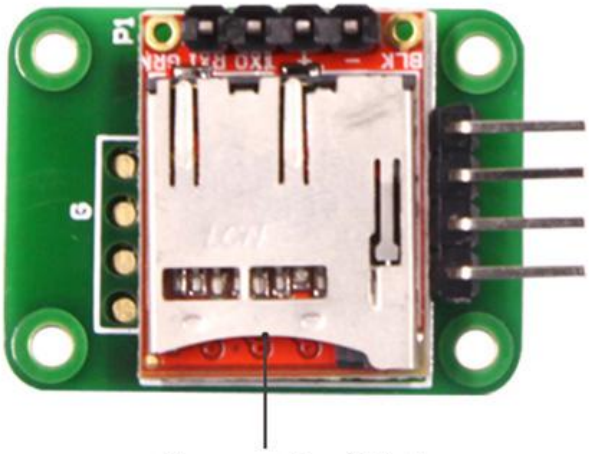
Reminder: here only JY901 can do the algorithm conversion, and the system defaults to the 9 axis algorithm. JY61P is unable to convert algorithms.



5 SD card storage data

5. 1 Method of storing data

1. Insert the SD card into the memory card slot on the back of the module to supply power to the module. After the module is powered on (1~2S), the module starts to work and stores data.
2. The data is stored in the TXT file in hexadecimal output.



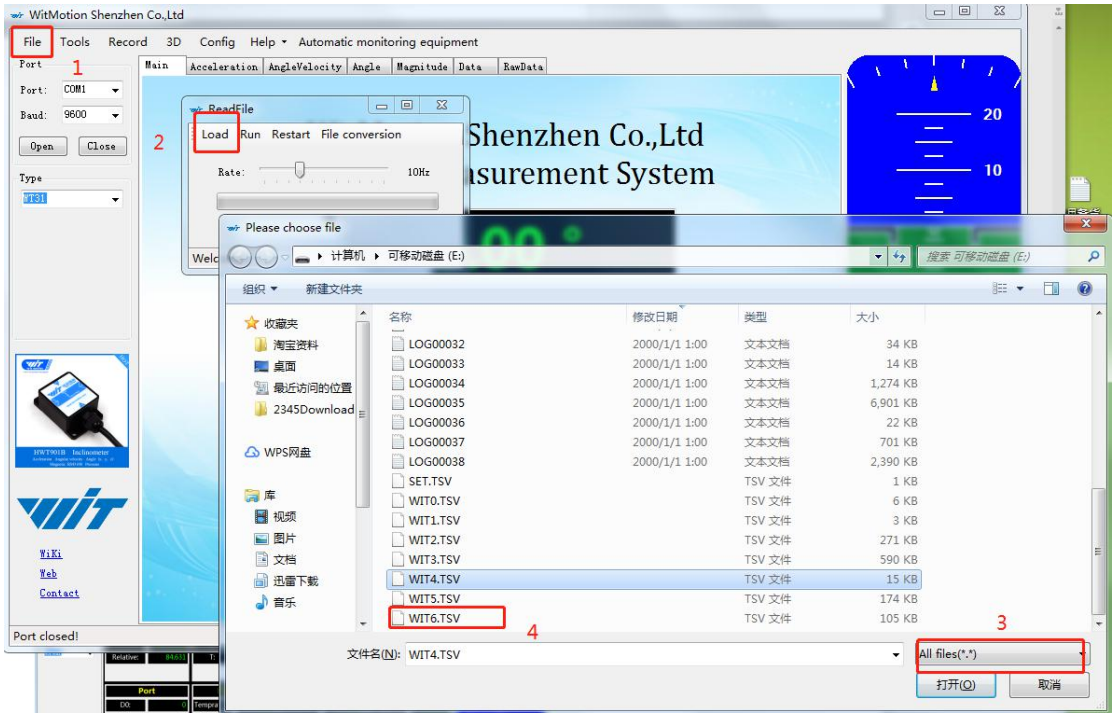
6.14 SD card data playback

1. In this product, the SD card is mainly used to record data. The product will only transfer data when the SD card is inserted into the product.

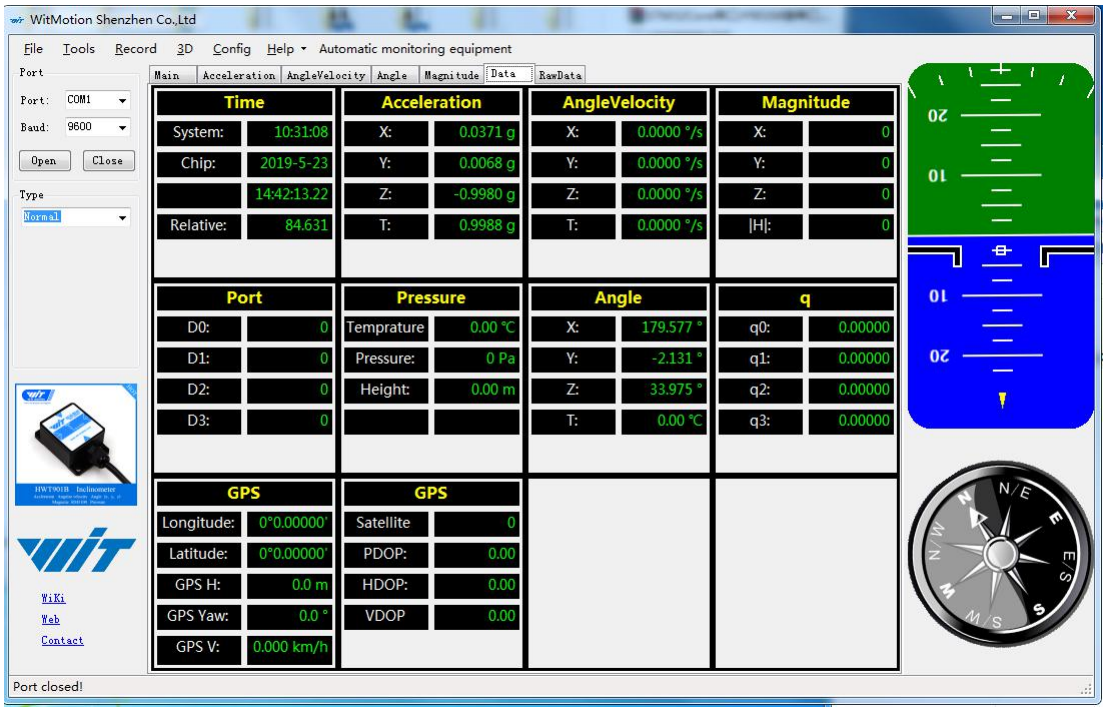
2. Each time the SD card is inserted, the data is recorded once. The data will be stored in the SD card as a text. The text number is the number of times the data was recorded. For example, the last file name at this time is WIT142.TSV. Insert the SD card once, remove the SD card for a period of time, and then use a card reader to read the SD card file. At this time, the last file name should be WIT143.TSV.

3. The SD card file is readable. On the host computer corresponding to the product, open the host computer and click File-Load-

Select all files --- select the file to be read-run, you can read out the data in the file, which is represented by a graph in the upper computer.



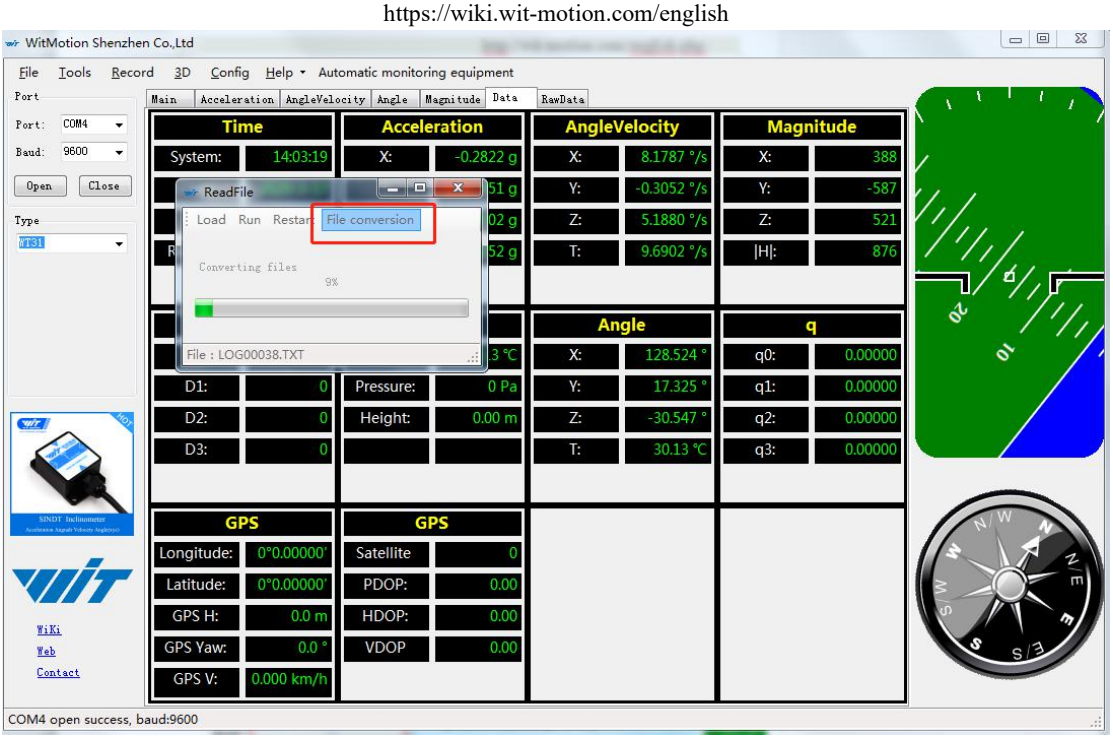
And you will get the data on PC software as below:



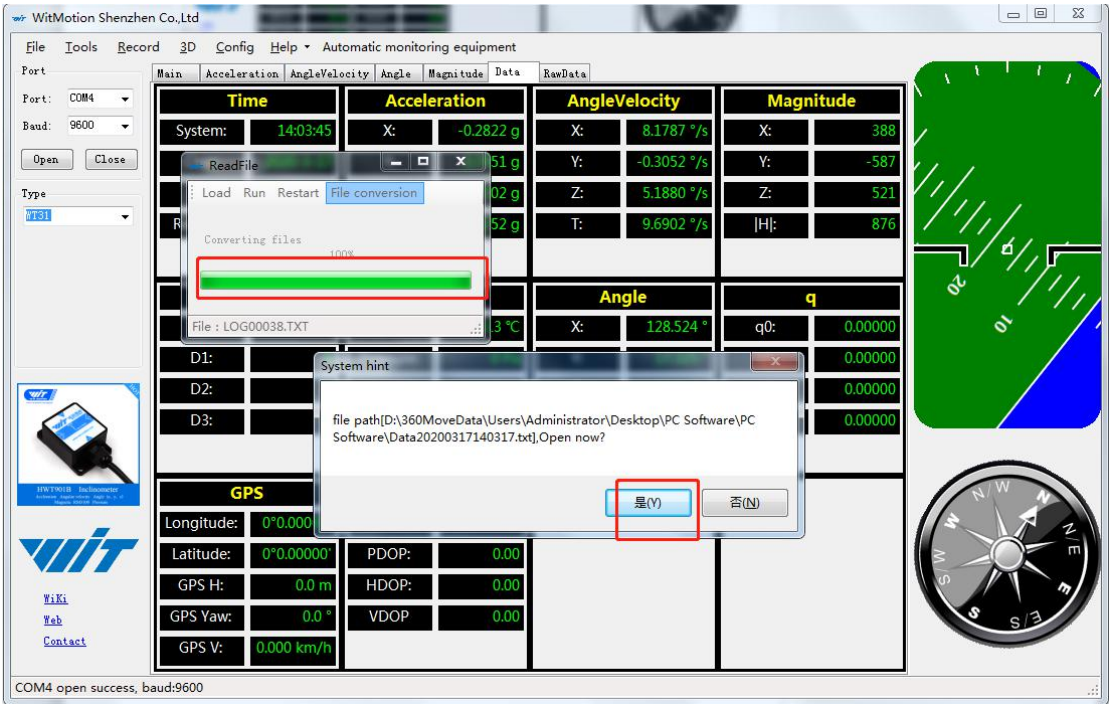
6.15 Text Conversion

Tutorial of converting SD card TSV file format data to TXT file format data tutorial:

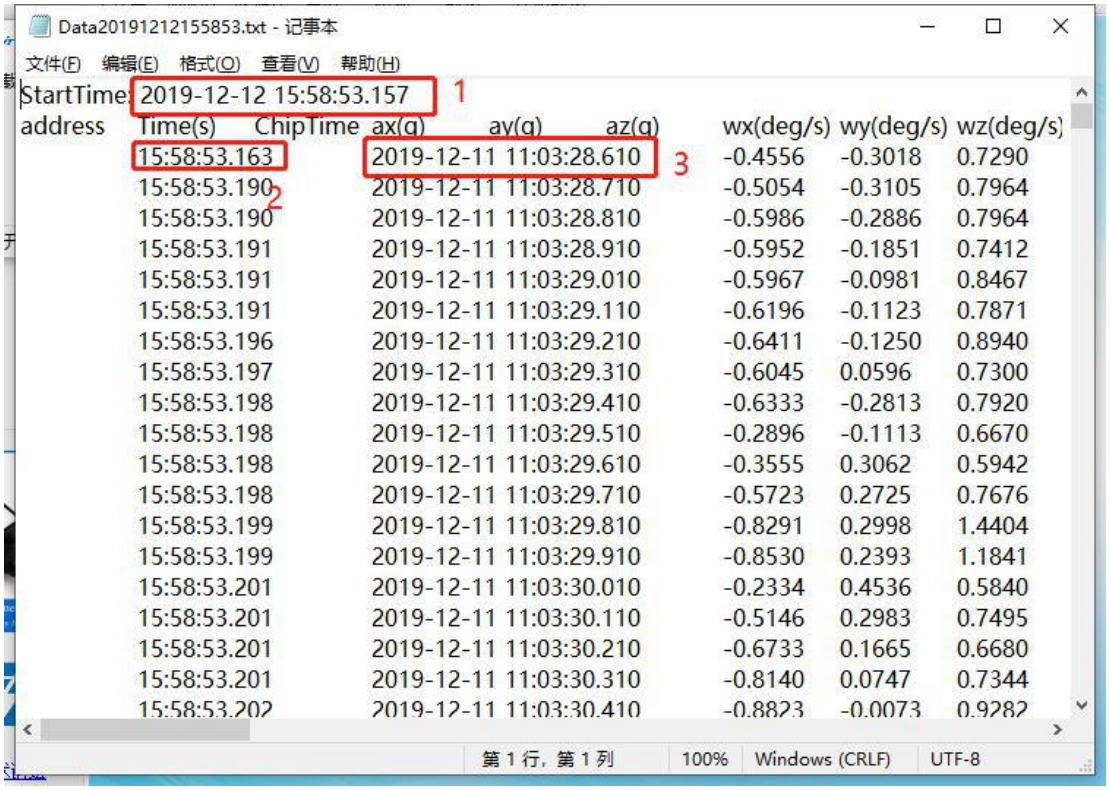
1. After the data can be played back, click "File Conversion".



2. After the conversion reaches 100%, it will pop up whether to open the conversion document and the path of the conversion document.



Click Yes to open the document as shown in the figure below, 1 represents the time to convert the document, 2 represents the time to convert the data, and 3 represents the time to record the data.



7.Communication Protocol

Level: TTL level (non RS232 level, if the module is wrong to the RS232 level may cause damage to the module)

Baud rate: 2400, 4800, 9600 (default), 19200 38400, 57600, 115200, 230400, 460800, 921600, stop bit and parity bit 0

7.1Module to PC Software

7.1.1 Time Output

0x55	0x50	YY	MM	DD	hh	mm	ss	msL	msH	SUM

YY：Year，20YY Year

MM：Month

DD：Day

hh：hour

mm：minute

ss：Second

ms：Millisecond

Millisecond calculate formula：

ms=((msH<<8)|msL)

Sum=0x55+0x51+YY+MM+DD+hh+mm+ss+ms+TL

7.1.2 Acceleration Output：

0x55	0x51	AxL	AxH	AyL	AyH	AzL	AzH	TL	TH	SUM

Calculate formula：

a_x=((AxH<<8)|AxL)/32768*16g(g is Gravity acceleration，9.8m/s^2)

a_y=((AyH<<8)|AyL)/32768*16g(g is Gravity acceleration，9.8m/s^2)

a_z=((AzH<<8)|AzL)/32768*16g(g is Gravity acceleration，9.8m/s^2)

Temperature calculated formular：

T=((TH<<8)|TL) /100 ℃

Checksum：

Sum=0x55+0x51+AxH+AxL+AyH+AyL+AzH+AzL+TH+TL

Note：

1、 the data is transmitted in accordance with the 16 hexadecimal, not ASCII code

2、 Each data is transmitted in a low byte and a high byte, and the two is combined into a short type of symbol. Such as X axis acceleration data Ax, where AxL is the low byte, AxH is high byte.

The conversion method is as follows:

Assuming Data is the actual data, DataH for its high byte, DataL for its low byte part, then: Data= ((short) DataH<<8) |DataL. Here we must pay attention to that force the DataH to be converted into a symbol of the short type of data and then after shift 8 bit, and the type of Data is also a symbol of the short type, so it can show a negative.

7.1.3 Angular Velocity Output

0x55	0x52	wxL	wxH	wyL	wyH	wzL	wzH	TL	TH	SUM

Calculated formular：

w_x=((wxH<<8)|wxL)/32768*2000(°/s)

w_y=((wyH<<8)|wyL)/32768*2000(°/s)

w_z=((wzH<<8)|wzL)/32768*2000(°/s)

Temperature calculated formular：

T=((TH<<8)|TL) /100 ℃

Checksum：

Sum=0x55+0x52+wxH+wxL+wyH+wyL+wzH+wzL+TH+TL

7.1.4 Angular Velocity Output

0x55	0x53	RollL	RollH	PitchL	PitchH	YawL	YawH	TL	TH	SUM

Calculated formular：

Roll（x axis）Roll=((RollH<<8)|RollL)/32768*180(°)

Pitch（y axis）Pitch=((PitchH<<8)|PitchL)/32768*180(°)

Yaw（z axis）Yaw=((YawH<<8)|YawL)/32768*180(°)

Temperature calculated formular：

T=((TH<<8)|TL) /100 ℃

Checksum：

Sum=0x55+0x53+RollH+RollL+PitchH+PitchL+YawH+YawL+TH+TL

Note：

1. Attitude angle use the coordinate system for the Northeast sky coordinate system, the X axis is East,the Y axis is North, Z axis toward sky. Euler coordinate system rotation sequence defined attitude is z-y-x, first rotates around the Z axis. Then, around the Y axis, and then around the X axis.
2. In fact, the rotation sequence is Z-Y-X, the range of pitch angle (Y axis) is only ±90 degrees, when the pitch angle (Y axis) is bigger than 90 degrees and the pitch angle (Y axis) will become less than 90 degrees. At the same time, the Roll Angle(X axis) will become larger than 180 degree. Please search on Google about more information of Euler angle and attitude information.
3. Since the three axis are coupled, the angle will be independent only when the angle is small. It will be dependent of the three angle when the angle is large when the attitude angle change, such as when the X axis close to 90 degrees, even if the attitude angle around the X axis, Y axis angle will have a big change, which is the inherent characteristics of the Euler angle

7.1.5 Magnetic output：

0x55	0x54	HxL	HxH	HyL	HyH	HzL	HzH	TL	TH	SUM

Calculated formular：

Magnetic（x axis）Hx=((HxH<<8)| HxL)

Magnetic（y axis）Hy=((HyH <<8)| HyL)

Magnetic（z axis）Hz =((HzH<<8)| HzL)

Temperature calculated formular：

T=((TH<<8)|TL) /100 ℃

Checksum：

Sum=0x55+0x53+HxH+HxL+HyH+HyL+HzH+HzL+TH+TL

7.1.6Quaternion：

0x55	0x59	Q0L	Q0H	Q1L	Q1H	Q2L	Q2H	Q3L	Q3H	SUM

Calculated formular：

Q0=((Q0H<<8)|Q0L)/32768

Q1=((Q1H<<8)|Q1L)/32768

Q2=((Q2H<<8)|Q2L)/32768

Q3=((Q3H<<8)|Q3L)/32768

Checksum：

Sum=0x55+0x59+Q0L+Q0H+Q1L +Q1H +Q2L+Q2H+Q3L+Q3H

7.2 Software to Module

Remider:

1. Factory settings default to use serial port, band rate is 9600, frame rate is 10HZ. Configuration can be configured through PC software. All configuration are power down storage, so you just need to configure it just once on the line.
2. Data format

0xFF	0xAA	Address	DataL	DataH

7.2.1 Register Address table

Address	Symbol	Meaning
0x00	SAVE	Save
0x01	CALSW	Calibration
0x02	RSW	Return data content
0x03	RATE	Return data Speed
0x04	BAUD	Baud rate
0x05	AXOFFSET	X axis Acceleration bias
0x06	AYOFFSET	Y axis Acceleration bias
0x07	AZOFFSET	Z axis Acceleration bias
0x08	GXOFFSET	X axis angular velocity bias
0x09	GYOFFSET	Y axis angular velocity bias
0x0a	GZOFFSET	Z axis angular velocity bias

0x0b	HXOFFSET	X axis Magnetic bias
0x0c	HYOFFSET	Y axis Magnetic bias
0x0d	HZOFFSET	Z axis Magnetic bias
0x0e	D0MODE	D0 mode
0x0f	D1MODE	D1 mode
0x10	D2MODE	D2 mode
0x11	D3MODE	D3 mode
0x12	D0PWMH	D0PWM High-level width
0x13	D1PWMH	D1PWM High-level width
0x14	D2PWMH	D2PWM High-level width
0x15	D3PWMH	D3PWM High-level width
0x16	D0PWMT	D0PWM Period
0x17	D1PWMT	D1PWM Period
0x18	D2PWMT	D2PWM Period
0x19	D3PWMT	D3PWM Period
0x1a	IICADDR	IIC address
0x1b	LEDOFF	Turn off LED
0x1c	GPSBAUD	GPS baud rate
0x30	YYMM	Year、Month
0x31	DDHH	Day、Hour
0x32	MMSS	Minute、Second
0x33	MS	Millisecond
0x34	AX	X axis Acceleration
0x35	AY	Y axis Acceleration
0x36	AZ	Z axis Acceleration
0x37	GX	X axis angular velocity
0x38	GY	Y axis angular velocity
0x39	GZ	Z axis angular velocity
0x3a	HX	X axis Magnetic
0x3b	HY	Y axis Magnetic
0x3c	HZ	Z axis Magnetic
0x3d	Roll	X axis Angle
0x3e	Pitch	Y axis Angle
0x3f	Yaw	Z axis Angle
0x40	TEMP	Temperature
0x41	D0Status	D0Status
0x42	D1Status	D1Status
0x43	D2Status	D2Status

0x44	D3Status	D3Status
0x45	PressureL	Pressure Low Byte
0x46	PressureH	Pressure High Byte
0x47	HeightL	Height Low Byte
0x48	HeightH	Height High Byte
0x49	LonL	Longitude Low Byte
0x4a	LonH	Longitude High Byte
0x4b	LatL	Latitude Low Byte
0x4c	LatH	Latitude High Byte
0x4d	GPSHeight	GPS Height
0x4e	GPSYaw	GPS Yaw
0x4f	GPSVL	GPS speed Low byte
0x50	GPSVH	GPS speed High byte
0x51	Q0	Quaternion Q0
0x52	Q1	Quaternion Q1
0x53	Q2	Quaternion Q2
0x54	Q3	Quaternion Q3

7.2.2 Save Configuration

0xFF	0xAA	0x00	SAVE	0x00

SAVE：Save

0：Save current configuration

1：set to default setting

7.2.3 Calibrate

0xFF	0xAA	0x01	CALSW	0x00

CALSW：Set calibration mode

0：Exit calibration mode

1：Enter Gyroscope and Accelerometer calibration mode

2：Enter magnetic calibration mode

3：Set height to 0

7.2.4 Set Installation direction

0xFF	0xAA	0x23	DIRECTION	0x00

DIRECTION：set installation direction

0：set to horizontal installation

1：set to vertical installation

7.2.5 Algorithm transition

0xFF	0xAA	0x24	ALG	0x00

ALG：6-axis/ 9-axis algorithm transition

0：set to 9-axis algorithm

1：set to 6-axis algorithm

7.2.6 Gyroscope automatic calibration

0xFF	0xAA	0x63	GYRO	0x00

GYRO：gyroscope automatic calibration

0：set to gyroscope automatic calibration

1：removed to gyroscope automatic calibration

7.2.7 Set return content

0xFF	0xAA	0x02	RSWL	RSWH

RSW byte definition

byte	7	6	5	4	3	2	1	0
Name	0x57 pack	0x56 pack	0x55 pack	0x54 pack	0x53 pack	0x52 pack	0x51 pack	0x50 pack
default	0	0	0	1	1	1	1	0

0x50 pack：time pack

0：Not output 0X50 pack

1：Output 0X50 pack

0x51 pack：Acceleration pack

0：Not output 0x51 pack

1：Output 0x51 pack

0x52 pack：Angular velocity pack

0：Not output 0x52 packet

1：Output 0x52 pack

0x53 pack：Angle Pack

0：Not output 0x53 pack

1：Output 0x53 pack

0x54 pack：Magnetic Pack

0：Not output 0x54 pack

1：Output 0x54 pack

0x55 pack：Port status pack

0：Not output 0x55 pack

1：Output 0x55 pack

0x56 pack：Atmospheric pressure &Height Pack

0：Not output 0x56 pack

1：Output 0x56 pack

0x57 pack：Longitude and Latitude Output Pack

0：Not output 0x57 pack

1：Output 0x57 pack

0x58 pack：GPS speed Pack

0：Not output 0x58 pack

1：Output 0x58 pack

0x59 pack：Quaternion Pack

0：Not output 0x59 pack

1：Output 0x59 pack

0x5A pack：Satellite position accuracy

0：Not output 0x5A pack

1：Output 0x5A pack

7.2.8 Set return rate

0xFF	0xAA	0x03	RATE	0x00

RATE：return rate

0x01：0.1Hz

0x02：0.5Hz

0x03：1Hz

0x04：2Hz

0x05：5Hz

0x06：10Hz（default）

0x07：20Hz

0x08：50Hz

0x09：100Hz

0x0a：125Hz

0x0b：200Hz
0x0c：Single
0x0d: Not output

After the setup is complete , need to click save,and re-power the module to take effect.

7.2.9 Set baud rate

0xFF	0xAA	0x04	BAUD	0x00

BAUD：
0x00：2400
0x01：4800
0x02：9600（default）
0x03：19200
0x04：38400
0x05：57600
0x06：115200
0x07：230400
0x08：460800
0x09：921600

7.2.10 Set X axis Acceleration bias

0xFF	0xAA	0x05	AXOFFSETL	AXOFFSETH

AXOFFSETL：X axis Acceleration bias low byte
AXOFFSETH：X axis Acceleration bias high byte
AXOFFSET= (AXOFFSETH <<8) | AXOFFSETL
Note：When set the acceleration bias, the output equal the value of the acceleration sensor output value minus the bias value

7.2.11 Set Y axis Acceleration bias

0xFF	0xAA	0x06	AYOFFSETL	AYOFFSETH

AYOFFSETL：Y axis Acceleration bias low byte
AYOFFSETH：Y axis Acceleration bias high byte
AYOFFSET= (AYOFFSETH <<8) | AYOFFSETL
Note：When set the acceleration bias, the output equal the value of the acceleration sensor output value minus the bias value.

7.2.12 Set Z axis Acceleration bias

0xFF	0xAA	0x07	AZOFFSETL	AZOFFSETH

AZOFFSETL：Z axis Acceleration bias low byte

AZOFFSETH：Z axis Acceleration bias high byte

AZOFFSET= (AZOFFSETH <<8) | AZOFFSETL

Note：When set the acceleration bias, the output equal the value of the acceleration sensor output value minus the bias value.

7. 2.13 Set X axis Angular velocity bias

0xFF	0xAA	0x08	GXOFFSETL	GXOFFSETH

GXOFFSETL：Set X axis Angular velocity bias low byte

GXOFFSETH：Set Y axis Angular velocity bias high byte

GXOFFSET= (GXOFFSETH <<8) | GXOFFSETL

Note：When set the Angular velocity bias, the output equal the value of the sensor output value minus the bias value.

7.2.14 Set Y axis Angular velocity bias

0xFF	0xAA	0x09	GYOFFSETL	GYOFFSETH

GYOFFSETL：Set X axis Angular velocity bias low byte

GYOFFSETH：Set X axis Angular velocity bias high byte

GYOFFSET= (GYOFFSETH <<8) | GYOFFSETL

Note：When set the Angular velocity bias, the output equal the value of the sensor output value minus the bias value.

7.2.15 Set Z axis Angular velocity bias

0xFF	0xAA	0x0a	GXOFFSETL	GXOFFSETH

GZOFFSETL：Set Z axis Angular velocity bias low byte

GZOFFSETH：Set Z axis Angular velocity bias low byte

GZOFFSET= (GZOFFSETH <<8) | GZOFFSETL

Note：When set the Angular velocity bias, the output equal the value of the sensor output value minus the bias value.

7.2.16 Set X axis magnetic bias

0xFF	0xAA	0x0b	HXOFFSETL	HXOFFSETH

HXOFFSETL：Set X axis magnetic bias low byte

HXOFFSETH：Set X axis magnetic bias high byte

HXOFFSET= (HXOFFSETH <<8) | HXOFFSETL

Note：When set the magnetic bias, the output equal the value of the sensor output value minus the bias value.

7.2.17 Set Y axis magnetic bias

0xFF	0xAA	0x0c	HXOFFSETL	HXOFFSETH

HXOFFSETL：Set Y axis magnetic bias low byte

HXOFFSETH：Set Y axis magnetic bias high byte

HXOFFSET= (HXOFFSETH <<8) | HXOFFSETL

Note：When set the magnetic bias, the output equal the value of the sensor output value minus the bias value.

7.2.18 Set Z axis magnetic bias

0xFF	0xAA	0x0d	HXOFFSETL	HXOFFSETH

HXOFFSETL：Set Y axis magnetic bias low byte

HXOFFSETH：Set Z axis magnetic bias high byte

HXOFFSET= (HXOFFSETH <<8) | HXOFFSETL

Note：When set the magnetic bias, the output equal the value of the sensor output value minus the bias value.

8Application Area

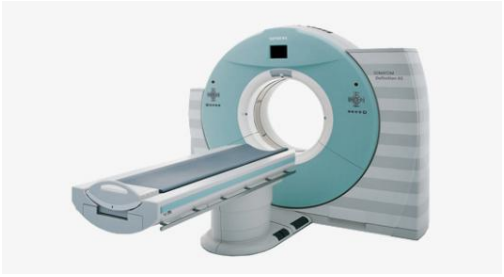
Agricultural machinery

Internet of things

Solar energy

Power monitoring

Medical instruments



Construction machinery

Geological monitoring

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