

WTGAHRS2

High Precision Inertial Navigation

SPECIFICATION



Model : WTGAHRS2

Description : 10 axis high precision inertial navigation

Enterprise quality system standard: ISO9001:2016

Tilt switch production standard : GB/T191SJ 20873-2016

Criterion of detection : GB/T191SJ 20873-2016

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Catalog

1 Description.....	3
5.2 Module Calibration.....	12
5.2.1 Accelerometer Calibration.....	12
5.2.2 Magnetic Calibration.....	13
6 Communication Protocol.....	17
6.1 Module to PC Software.....	18
6.1.1 Time Output.....	18
6.1.2 Acceleration Output:	18
6.1.3 Angular Velocity Output.....	18
6.1.4 Angle Output:	19
6.1.5 Magnetic output:	19
6.2 PC Software to Module.....	20
6.2.1 Register Address table.....	20
6.2.2 Save Configuration.....	22
6.2.3 Calibrate.....	22
6.2.4 Set Installation direction.....	22
6.2.5 Sleep/ Wake up.....	22
6.2.6 Algorithm transition.....	22
6.2.7 Gyroscope automatic calibration.....	22
6.2.8 Set return content.....	23
6.2.9 Set return rate.....	24
6.2.10 Set baud rate.....	24
6.2.11 Set X axis Acceleration bias.....	25
6.2.12 Set Y axis Acceleration bias.....	25
6.2.13 Set Z axis Acceleration bias.....	25
6.2.14 Set X axis Angular velocity bias.....	25
6.2.15 Set Y axis Angular velocity bias.....	25
6.2.16 Set Z axis Angular velocity bias.....	26
6.2.17 Set X axis magnetic bias.....	26
6.2.18 Set Y axis magnetic bias.....	26
6.2.19 Set Z axis magnetic bias.....	26
7 Application Area.....	27

1 Description

This product is built-in JY901B and GPS module, the communication protocol and specific parameters please refer to the information.

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

◆ Module integrates high-precision gyroscopes, accelerometer, geomagnetic sensor, GPS module, 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 static:0.05 degrees, dynamic:0.1degrees with high stability, performance is even better than some professional Inclinometer!

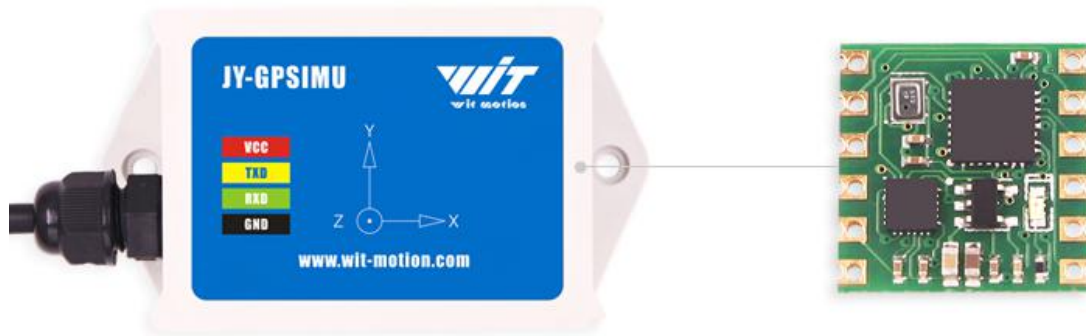
◆ Integrate voltage stabilization circuit, working voltage is 3.3v ~ 5v, pin level compatible 3.3V and 5V embedded system .

◆ Supports serial port TTL/232 digital interface, Serial port rate is adjustable from 2400kbps ~ 921600 kbps (optional)

◆ GPS information and attitude sensor information output together.

◆ Highest 200Hz output data rate. The output data and rate can be adjusted.

Core module: JY901B



2 Product Parameters

2.1 Attitude Sensor Parameters

- 1、 Voltage: 3.3V~5V
- 2、 Consumption current: <40mA
- 3、 Volume: 61.2mm X 45.2mm X27.8mm
- 4、 Measuring dimensions:
 - Acceleration: X Y Z
 - Angular Velocity: X Y Z
 - Angle:X Y Z
 - Magnetic field: X Y Z
 - Atmospheric pressure:YES
 - GPS: X Y Z
- 5、 Range: Acceleration: $\pm 2/4/8/16g$ (optional),
Angular Velocity: $\pm 250/500/1000/2000$ °/s (optional), Angle: $\pm 180^\circ$.
- 6、 Stability: Acceleration: 0.01g, Angular Speed 0.05° / s.
- 7、 Attitude measurement stability: 0.01°
- 8、 Angle Accuracy: Static 0.05° Dynamic 0.1°

- 9、 Data output: time, acceleration, angular velocity, angle,magnetic field, pressure (JY-901B) , height (JY-901B) , longitude, latitude(need to connect GPS), Ground speed(need to connect GPS)
- 10、 The data output frequency 0.1Hz to 200Hz
- 11、 Data Interface:
UART(TTL/232 level, baud rate support 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600)
- 12、 GPS: YES + Beidou signal(satellite)
- 13、 Environment: Static, Dynamic
- 14、 Antenna: Built-in

2.2 GPS Parameters

GPS Parameters



Content	Description		
C / A code	1.023mhz stream		
Receive band	BDS/GPS/GLONASS/GALILEO/QZSS/SBAS		
Receive channel	Three-channel RF, support for the whole constellation bds, GPS and glonass at the same time to receive		
S11SWR	≤1.3	S22SWR	≤1.3
S21Log Mag	≥20.0dB	S11Smith	50Ω ±5%
Positioning performance			
Horizontal position accuracy	<2.5m[autonomous][50%] <2m[sbas] (cep,50%,24 when the static, signal strength, -130dbm, about 6 available satellites available)		
Rate	<0.1m/s	Direction	<0.5Degrees
Timing accuracy	30ns	Reference coordinate system	WGS-84
Maximum altitude	50000m	Maximum speed	50000m/s
Acceleration	≤4g		
Electrical performance			
Tracking Sensitivity	-162dbm	Capture sensitivity	-148dbm
Cold start Sensitivity	-148dbm	Hot start sensitivity	-156dbm
Cold start time	35S	Warm start time	32S
Hot start time	1S		
Other parameters			
Standard clock pulse	0.25HZ~1KHZ		
Positioning update rate	1HZ~110HZ(Default 1Hz)	UART / TTL Port Interface (Default)	

3 Axial Direction

As shown in the figure above, the coordinates of the module are indicated, and the right is the X-axis, the upper is Y 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 Hardware Connection

4.1 Serial Connection

4.1.1 Connection with PC

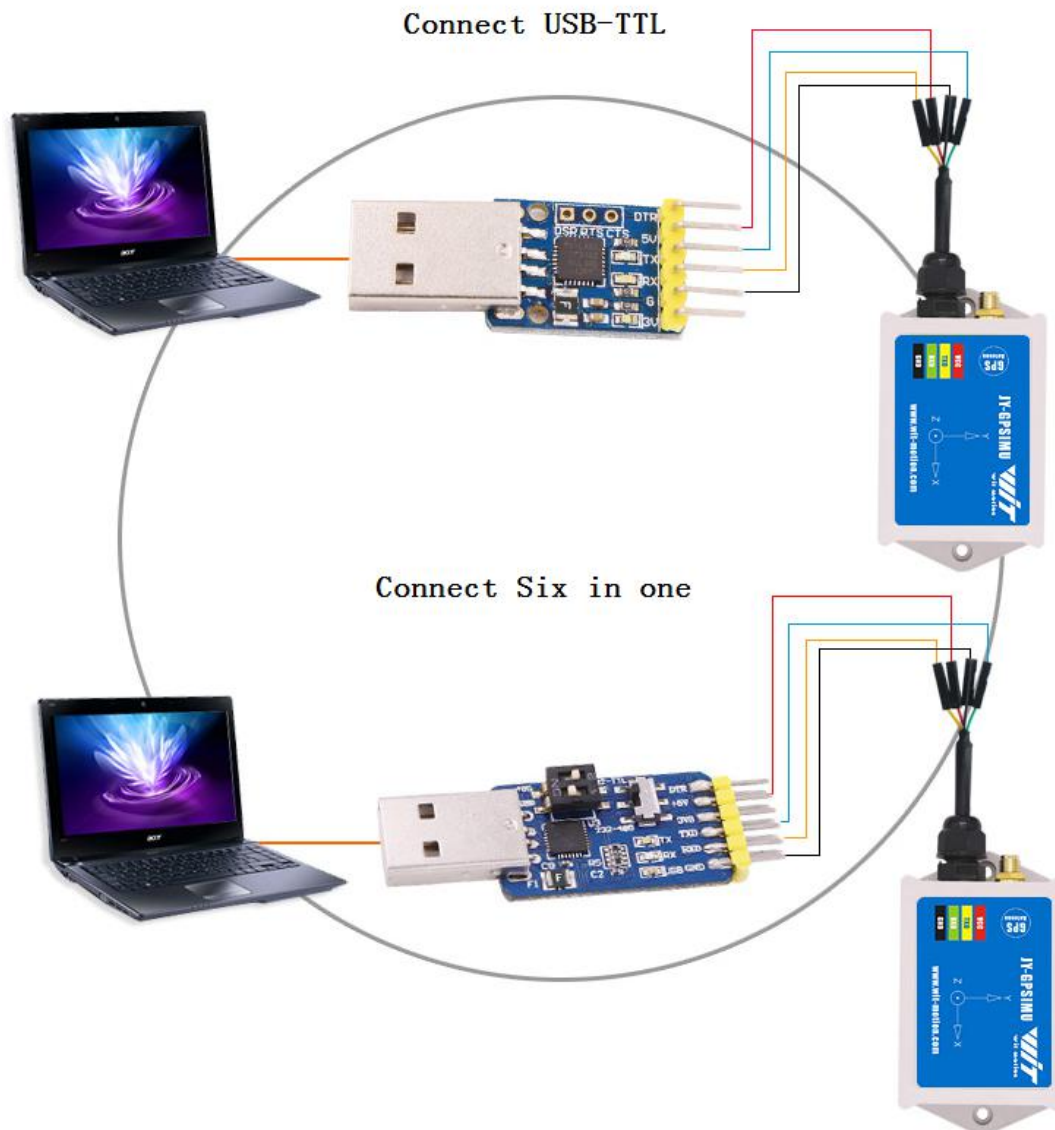
Connecting to a computer requires a USB to TTL serial port module. The following USB-to-serial module is recommended:

https://www.aliexpress.com/store/product/Usb-converter-cp2102-usb-ttl-485-232-3-3v-and-5v-output-three-multifunctional-functions/2029054_32873159970.html?spm=2114.12010612.8148356.3.30b57b82smrtiU



USB -TTL module: Connect the module to the USB-TTL and plug it into the computer.

The module and USB-TTL connection method is: the module's 3V/5V TX RX GND is connected to the 3V/5V RX TX GND of the USB serial port module respectively. Note that TX and RX need to cross, that is, TX is connected to RX, and RX is connected to TX.



5 Software Method

5.1 Method

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>

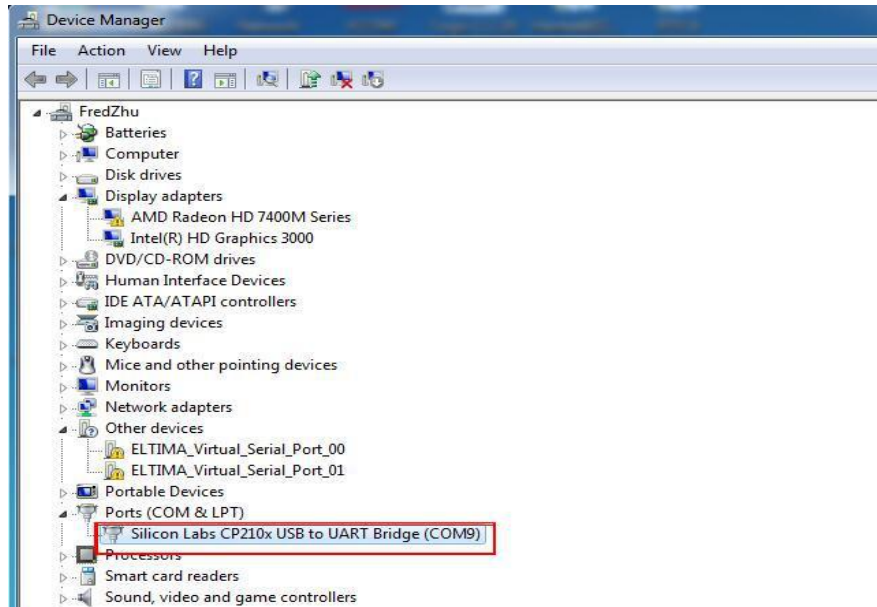
First, the module is connected via USB-TTL module to the computer, install the USB-TTL module driver. The drive:

CH340:https://wiki.wit-motion.com/english/doku.php?id=communication_module

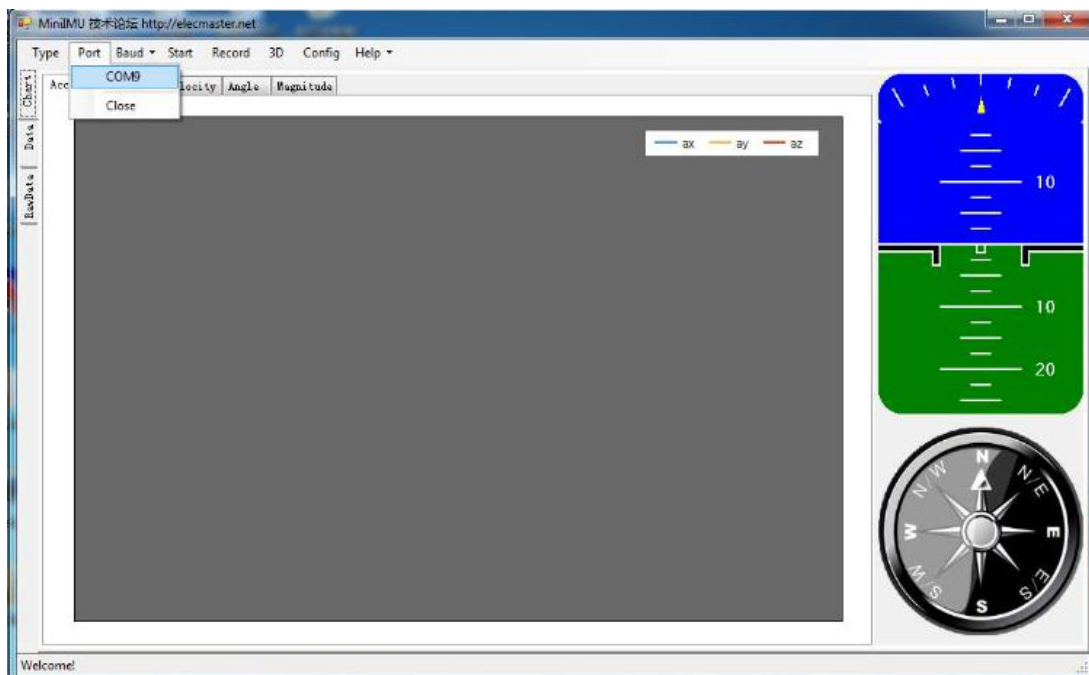
If choose the USB-TTL(CP2102),the driver is :

CP210X:https://wiki.wit-motion.com/english/doku.php?id=communication_module

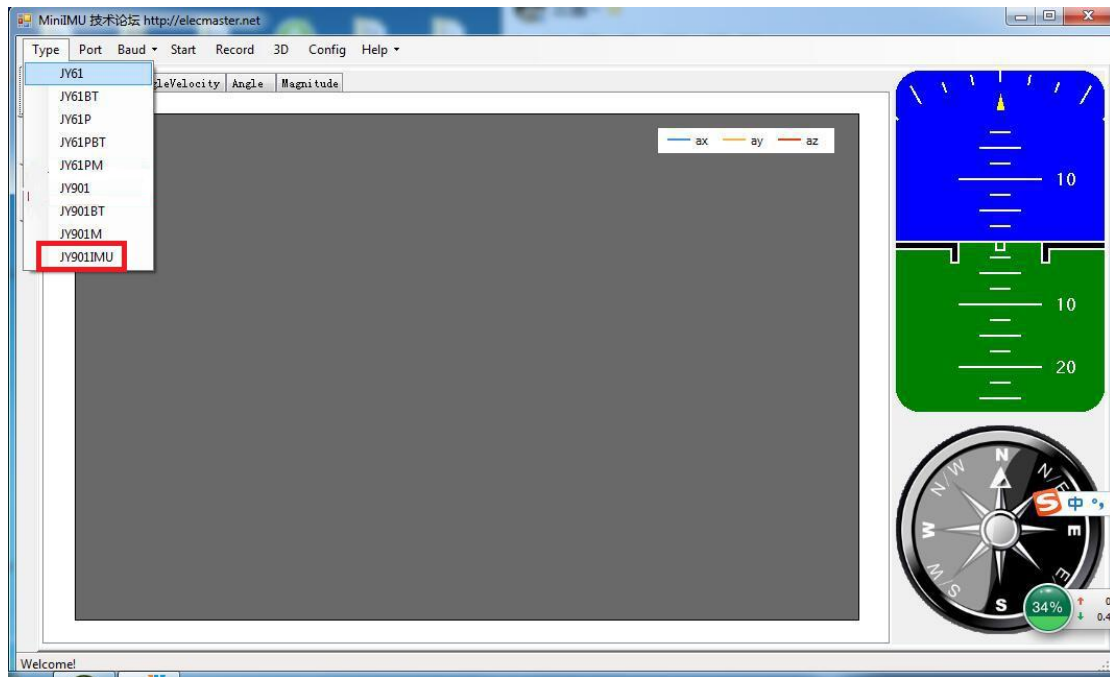
After installing the module driver, and then Device Manager can query corresponding serial number, as below figure shows:



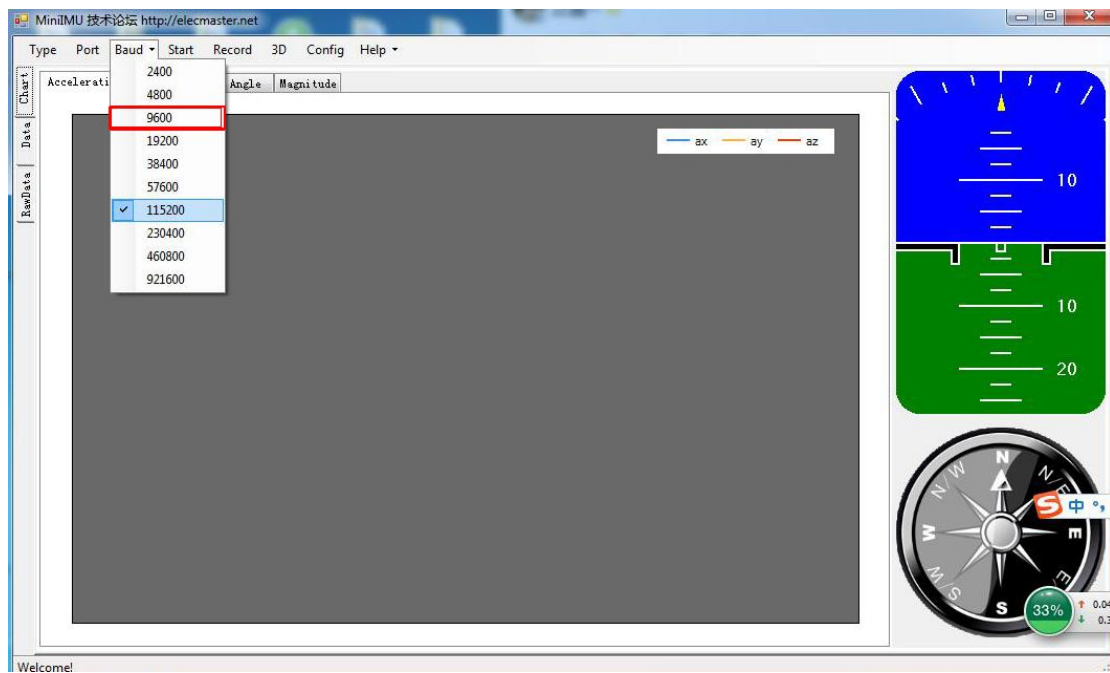
Open the software MiniIMU.exe, In the "Packet / PC",Click "Port" and select the com number you just saw in the device manager.

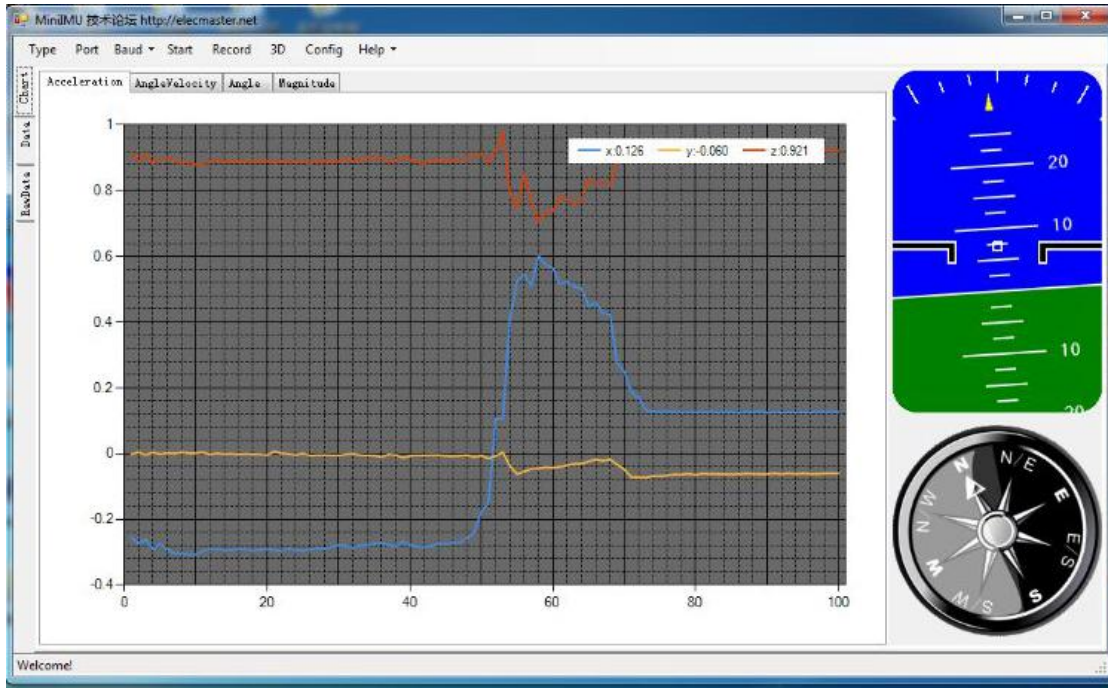


Click the “Type” and select model “JY901 IMU”.



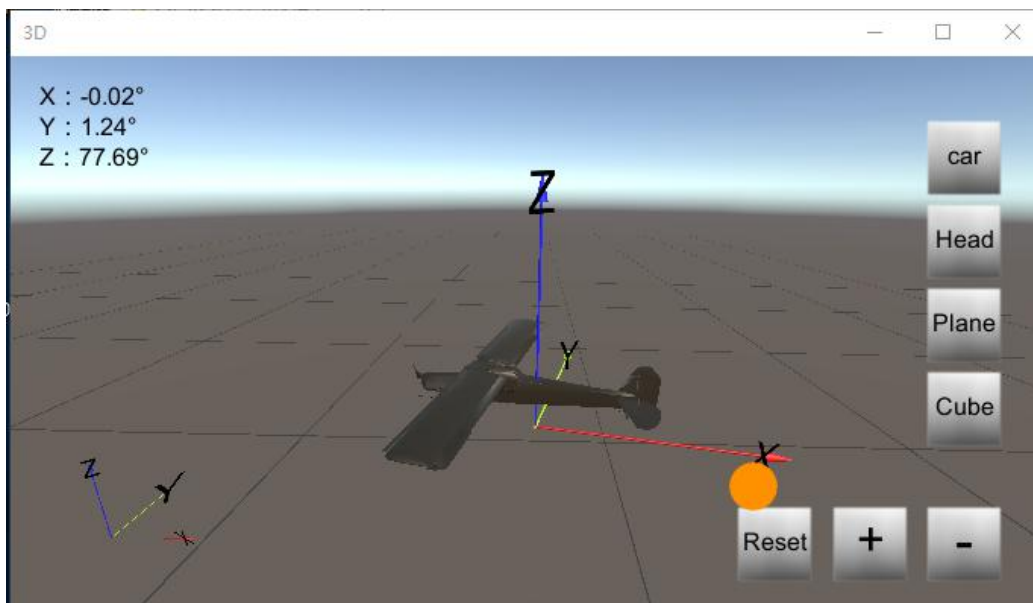
Click the “Baud” and select “9600”, after all those selections are completed, the software can display data.





When the time interval between the current acquisition data and the previous acquisition data is long, the chart update will be slow. At this time, you can right-click the image and pop up the clear diagram bar. Click the clear diagram option to speed up the data refresh rate.

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



5.2 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.

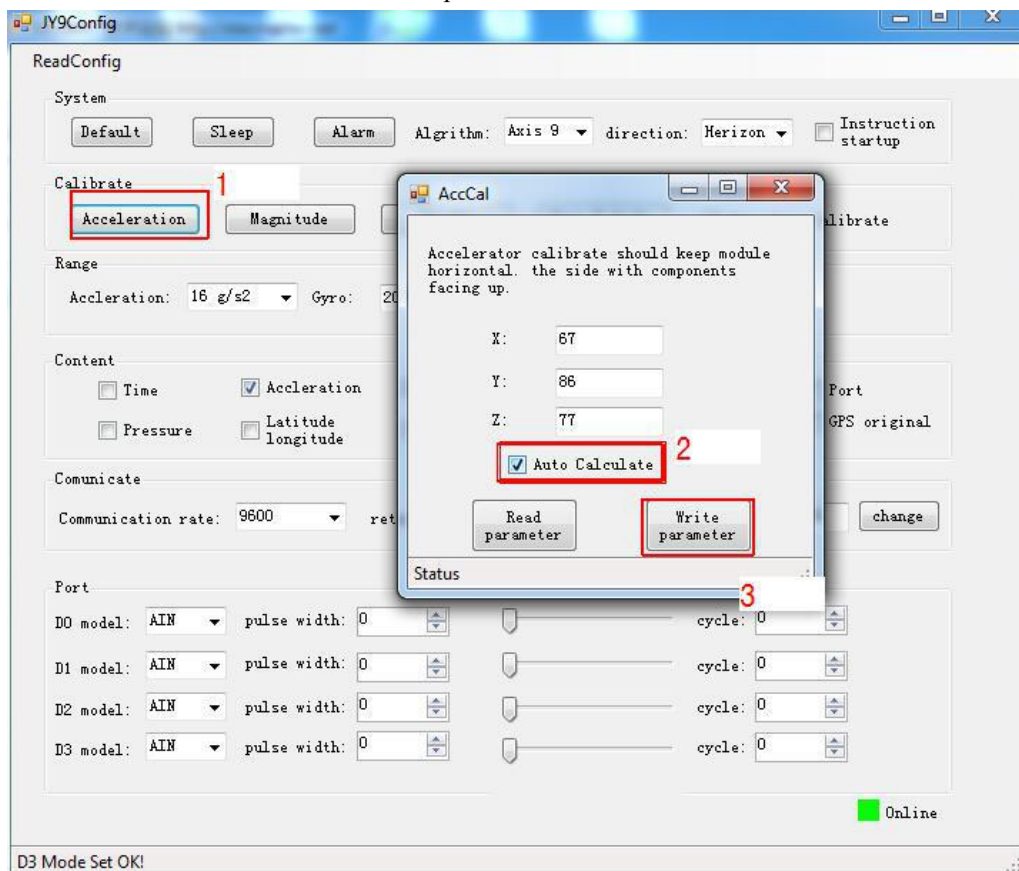
The module need to be calibrated before the module is used. The calibration of WTGAHRS2 includes accelerometer calibration and magnetic calibration.

5.2.1 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.

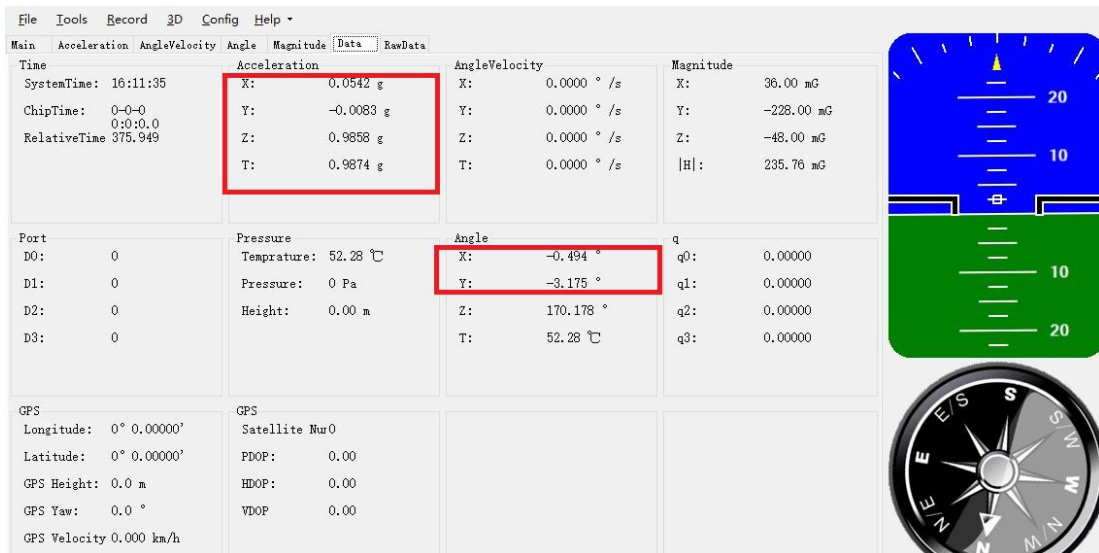
Methods as follow:

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”



3. After 1 to 2 seconds, the three axes of the module acceleration will be around 0 0 1 and the X and Y axes will be around 0°. The X-axis angle after calibration is exactly the same.

Note: When the Z-axis is horizontally stationary, there is 1 G of gravitational acceleration.



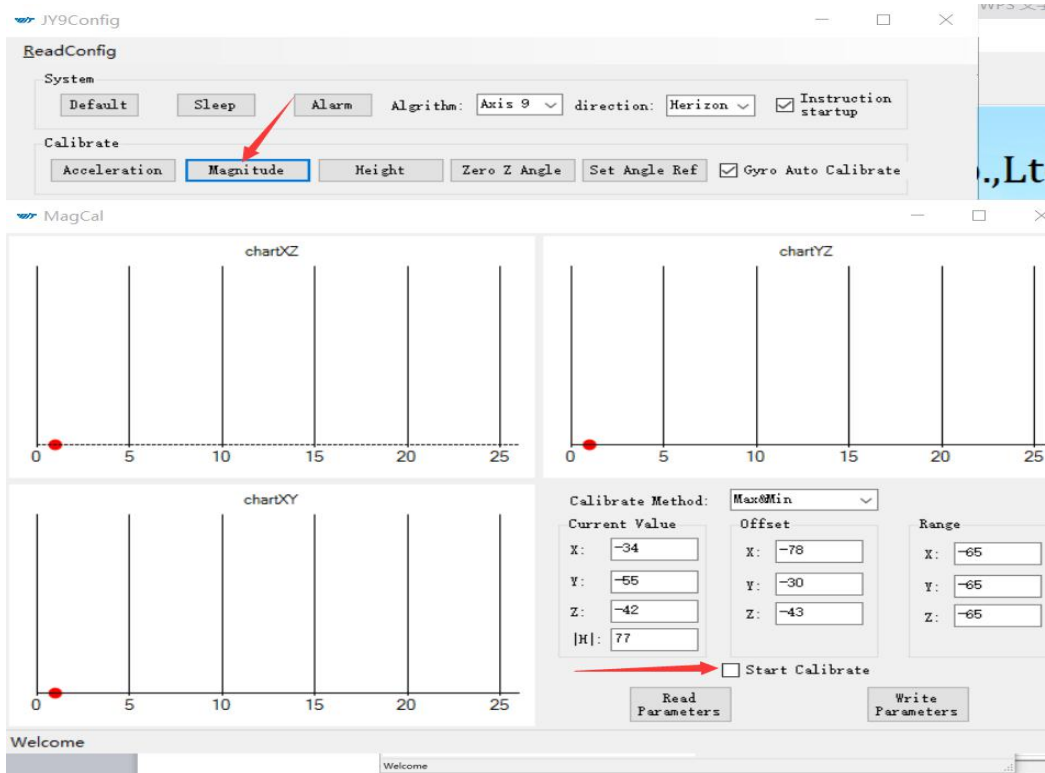
5.2.2 Magnetic Calibration

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.

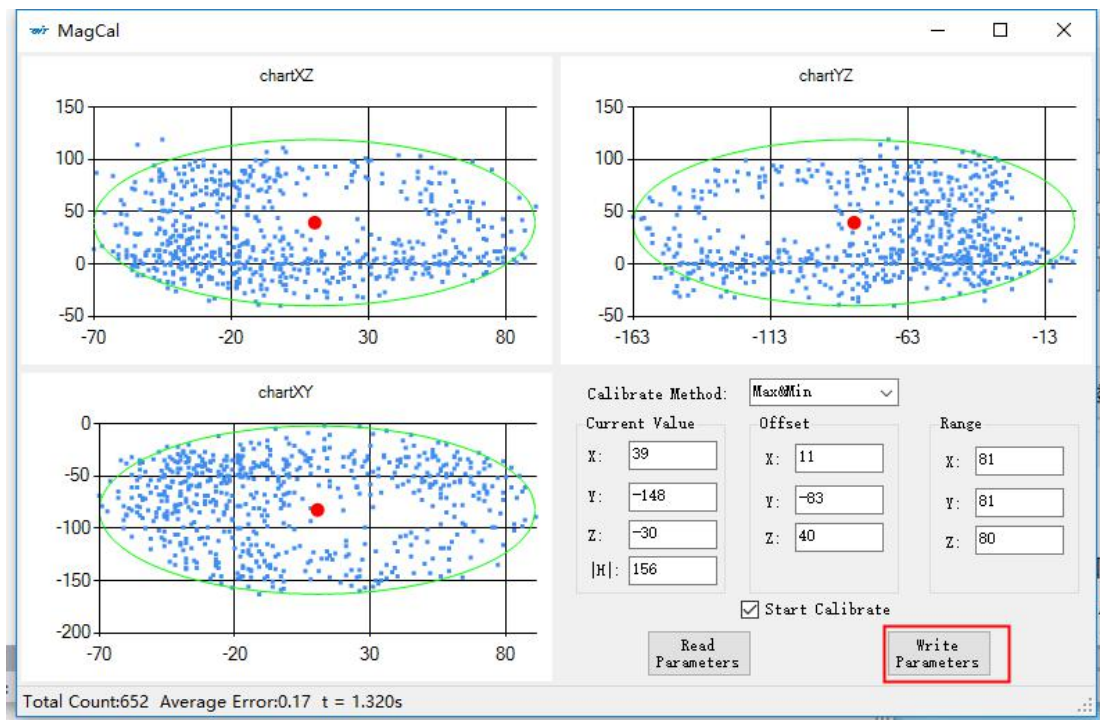
Calibration methods as follow:

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. Then refer to the calibration video and place the module on the north-south axis of the Earth's magnetic field.

Calibration video:

https://drive.google.com/drive/folders/ljQcYuTRDi_dPnlvVK5dITyqPTCkfYNaC

5.2.3 Height Setting 0

The height setting 0 is an operation to make the height of the module returns to 0, the height output of the module is calculated on the basic of the air pressure..

The altitude return to zero operation is to calculate the current barometric pressure as zero height position. To do this, click on the "Height" option in the configuration bar.

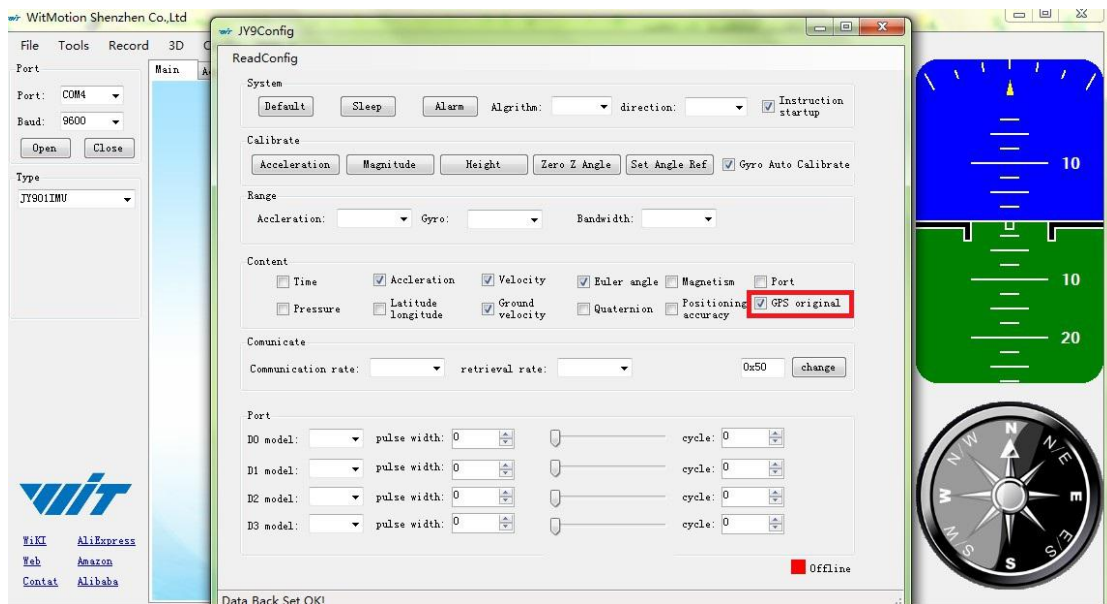
5.2.4 Gyro automatic calibration

The gyroscope calibration is to calibrate the angular velocity, and the sensor is calibrated by default.

The gyroscope automatically calibrated can be removed only when the module is rotating at a constant speed.

5.3 GPS Raw Data

Before using the module, you need to check whether the GPS has original data output. The method is as follows: Open the configuration bar and check the “GPS original” in the output content. The original data of the GPS will be displayed in the original data of the computer.



Note: After the check is completed, the GPS original should be removed. Otherwise, the module only outputs the GPS raw data and does not output other data.

5.4 Set Return Content

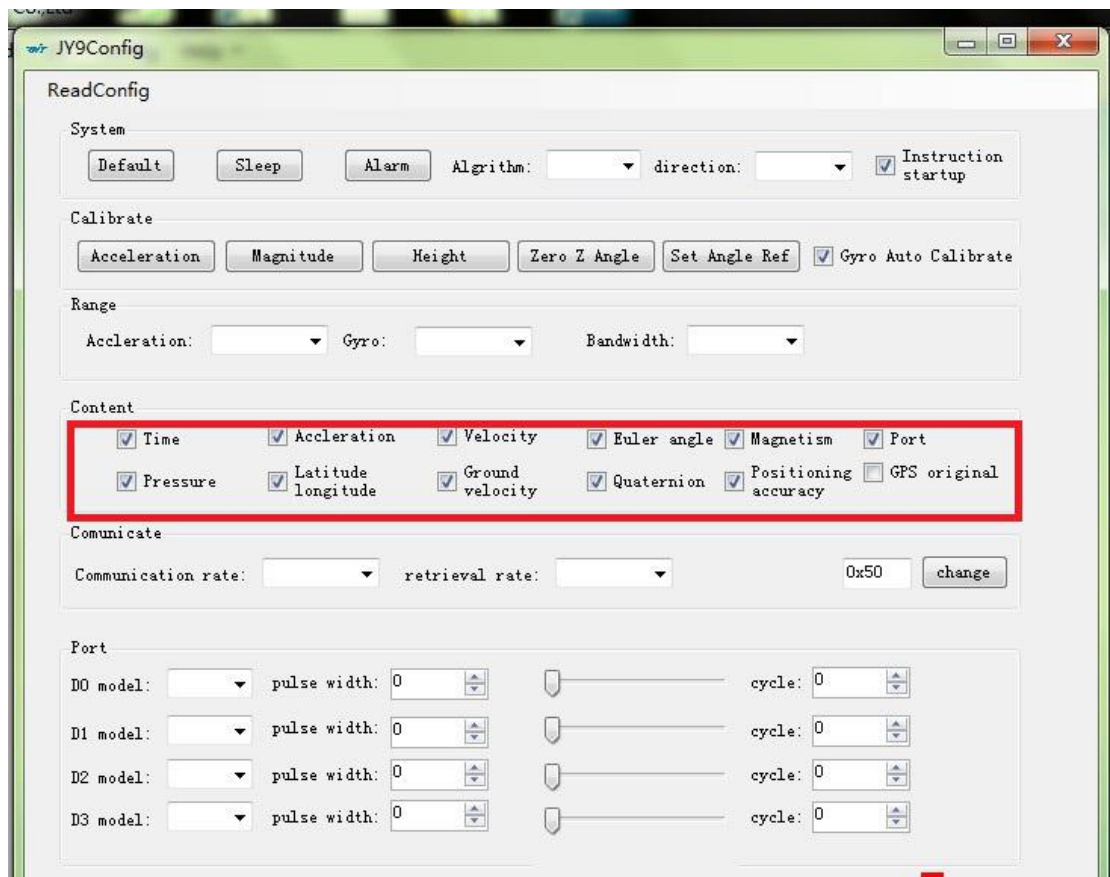
Method: The content can be returned what users need. Click “Config” and select the content what you need. The module default content is Angle, Angular velocity, Acceleration, Magnetic field.

Time is the module internal time. Default: 0:0:0.0 January 1, 2015

If the GPS module is connected, the time received by the GPS is taken as the time of the module.

The latitude and longitude and ground speed information is valid only after the module is connected to the GPS module. To get the correct data, you also need to check the "latitude and longitude", "ground speed" and "positioning accuracy" in the settings.

Note: After checking “GPS Original”, the module only outputs the original GPS information, and other data will not be output.



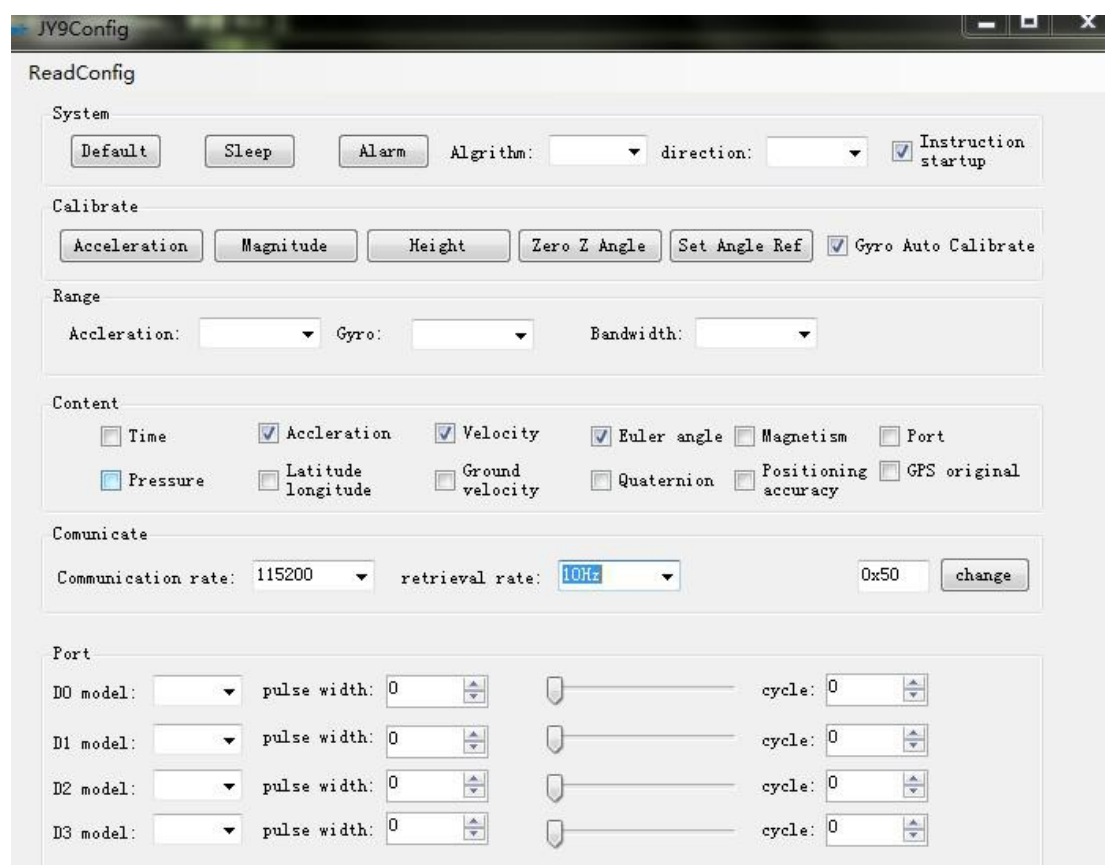
After completing the above settings, after waiting for a few minutes of GPS positioning, you can see the GPS information.

5.5 Set Return Rate

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

The default return rate of the module is 10HZ, the highest return rate supports 200HZ. GPS module return rate is 1Hz, can not change.

Note: 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 baud rate is 115200 as normal.



6 Communication Protocol

6.1 Module to PC Software

6.1.1 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:

$ms = ((msH \ll 8) | msL)$

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

6.1.2 Acceleration Output:

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

Calculate formula:

$a_x = ((AxH \ll 8) | AxL) / 32768 * 16g$ (g is Gravity acceleration, 9.8m/s²)

$a_y = ((AyH \ll 8) | AyL) / 32768 * 16g$ (g is Gravity acceleration, 9.8m/s²)

$a_z = ((AzH \ll 8) | AzL) / 32768 * 16g$ (g is Gravity acceleration, 9.8m/s²)

Temperature calculated formular:

$T = ((TH \ll 8) | TL) / 100$ °C

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: $Data = ((short) DataH \ll 8) | DataL$. 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.

Detailed solution example:

<http://elecmaster.net/forum.php?mod=viewthread&tid=812&page=1&extra=#pid1582>

6.1.3 Angular Velocity Output

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

Calculated formular:

$$w_x = ((w_{xH} \ll 8) | w_{xL}) / 32768 * 2000 (^{\circ}/s)$$

$$w_y = ((w_{yH} \ll 8) | w_{yL}) / 32768 * 2000 (^{\circ}/s)$$

$$w_z = ((w_{zH} \ll 8) | w_{zL}) / 32768 * 2000 (^{\circ}/s)$$

Temperature calculated formular:

$$T = ((T_H \ll 8) | T_L) / 100 \text{ } ^{\circ}\text{C}$$

Checksum:

$$\text{Sum} = 0x55 + 0x52 + w_{xH} + w_{xL} + w_{yH} + w_{yL} + w_{zH} + w_{zL} + T_H + T_L$$

6.1.4 Angle Output:

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

Calculated formular:

$$\text{Roll (x axis)} \text{ Roll} = ((\text{RollH} \ll 8) | \text{RollL}) / 32768 * 180 (^{\circ})$$

$$\text{Pitch (y axis)} \text{ Pitch} = ((\text{PitchH} \ll 8) | \text{PitchL}) / 32768 * 180 (^{\circ})$$

$$\text{Yaw (z axis)} \text{ Yaw} = ((\text{YawH} \ll 8) | \text{YawL}) / 32768 * 180 (^{\circ})$$

Temperature calculated formular:

$$T = ((T_H \ll 8) | T_L) / 100 \text{ } ^{\circ}\text{C}$$

Checksum:

$$\text{Sum} = 0x55 + 0x53 + \text{RollH} + \text{RollL} + \text{PitchH} + \text{PitchL} + \text{YawH} + \text{YawL} + T_H + T_L$$

Note:

1. Attitude angle use the coordinate system for the Northeast sky coordinate system, the X axis is upper ,the Y axis is left, Z axis is Vertical module toward , 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. Although the range of rolling angle is ± 180 degrees, in fact, because the coordinate rotation order is Z-Y-X, the range of pitch angle (Y axis) is only ± 90 degree when the attitude is expressed, and the angle of X axis is larger than 180 degree after 90 degrees. Detailed principle of Baidu Euler angle and posture of the relevant information . 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

6.1.5 Magnetic output:

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

Calculated formular:

$$\text{Magnetic (x axis)} \text{ Hx} = ((\text{HxH} \ll 8) | \text{HxL})$$

$$\text{Magnetic (y axis)} \text{ Hy} = ((\text{HyH} \ll 8) | \text{HyL})$$

$$\text{Magnetic (z axis)} \text{ Hz} = ((\text{HzH} \ll 8) | \text{HzL})$$

Temperature calculated formular:

$$T = ((TH \ll 8) | TL) / 100 \text{ } ^\circ\text{C}$$

Checksum:

$$\text{Sum} = 0x55 + 0x53 + HxH + HxL + HyH + HyL + HzH + HzL + TH + TL$$

6.2 PC 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
------	------	---------	-------	-------

6.2.1 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
------	----	---------------

6.2.2 Save Configuration

0xFF	0xAA	0x00	SAVE	0x00
------	------	------	------	------

SAVE: Save

- 0: Save current configuration
- 1: set to default setting

6.2.3 Calibrate

0xFF	0xAA	0x01	CALSW	0x00
------	------	------	-------	------

CALSW: Set calibration mode

- 0: Exit calibration mode
- 1: Enter Accelerometer calibration mode
- 2: Enter magnetic calibration mode
- 3: Set height to 0

6.2.4 Set Installation direction

0xFF	0xAA	0x23	DIRECTION	0x00
------	------	------	-----------	------

DIRECTION: set installation direction

- 0: set to horizontal installation
- 1: set to vertical installation

6.2.5 Sleep/ Wake up

0xFF	0xAA	0x22	0x01	0x00
------	------	------	------	------

Sent this instruction to enter sleep state, sent it once again, module enter the working state from the standby state.

6.2.6 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

6.2.7 Gyroscope automatic calibration

0xFF	0xAA	0x63	GYRO	0x00
------	------	------	------	------

- GYRO: gyroscope automatic calibration
 0: set to gyroscope automatic calibration
 1: removed to gyroscope automatic calibration

6.2.8 Set return content

0xFF	0xAA	0x02	RSWL	RSWH
------	------	------	------	------

RSWL 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

RSWH byte definition

byte	7	6	5	4	3	2	1	0
Name	X	X	X	X	X	0x5A pack	0x59 pack	0x58 pack
default	0	0	0	0	0	0	0	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

6.2.9 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.

6.2.10 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

6.2.11 Set X axis Acceleration bias

0xFF	0xAA	0x05	AXOFFSET L	AXOFFSET H
------	------	------	---------------	---------------

AXOFFSETL: X axis Acceleration bias low byte

AXOFFSETH: X axis Acceleration bias high byte

$AXOFFSET = (AXOFFSETH \ll 8) | AXOFFSETL$

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

6.2.12 Set Y axis Acceleration bias

0xFF	0xAA	0x06	AYOFFSETL	AYOFFSETH
------	------	------	-----------	-----------

AYOFFSETL: Y axis Acceleration bias low byte

AYOFFSETH: Y axis Acceleration bias high byte

$AYOFFSET = (AYOFFSETH \ll 8) | AYOFFSETL$

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

6.2.13 Set Z axis Acceleration bias

0xFF	0xAA	0x07	AZOFFSETL	AZOFFSETH
------	------	------	-----------	-----------

AZOFFSETL: Z axis Acceleration bias low byte

AZOFFSETH: Z axis Acceleration bias high byte

$AZOFFSET = (AZOFFSETH \ll 8) | AZOFFSETL$

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

6.2.14 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

$GXOFFSET = (GXOFFSETH \ll 8) | GXOFFSETL$

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

6.2.15 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

$GYOFFSET = (GYOFFSETH \ll 8) | GYOFFSETL$

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

6.2.16 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 high byte

$GZOFFSET = (GZOFFSETH \ll 8) | GZOFFSETL$

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

6.2.17 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

$HXOFFSET = (HXOFFSETH \ll 8) | HXOFFSETL$

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

6.2.18 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

$HXOFFSET = (HXOFFSETH \ll 8) | HXOFFSETL$

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

6.2.19 Set Z axis magnetic bias

0xFF	0xAA	0x0d	HXOFFSETL	HXOFFSETH
------	------	------	-----------	-----------

HXOFFSETL: Set Z axis magnetic bias low byte

HXOFFSETH: Set Z axis magnetic bias high byte

$HXOFFSET = (HXOFFSETH \ll 8) | HXOFFSETL$

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

7 Application Area

Agricultural machinery



Internet of things



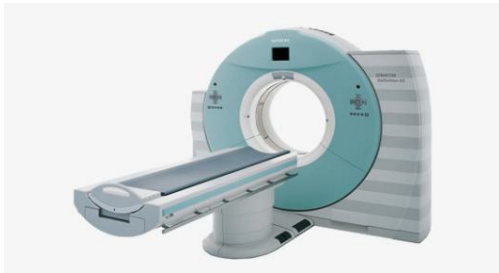
Solar energy



Power monitoring



Medical instruments



Construction machinery



Geological monitoring





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