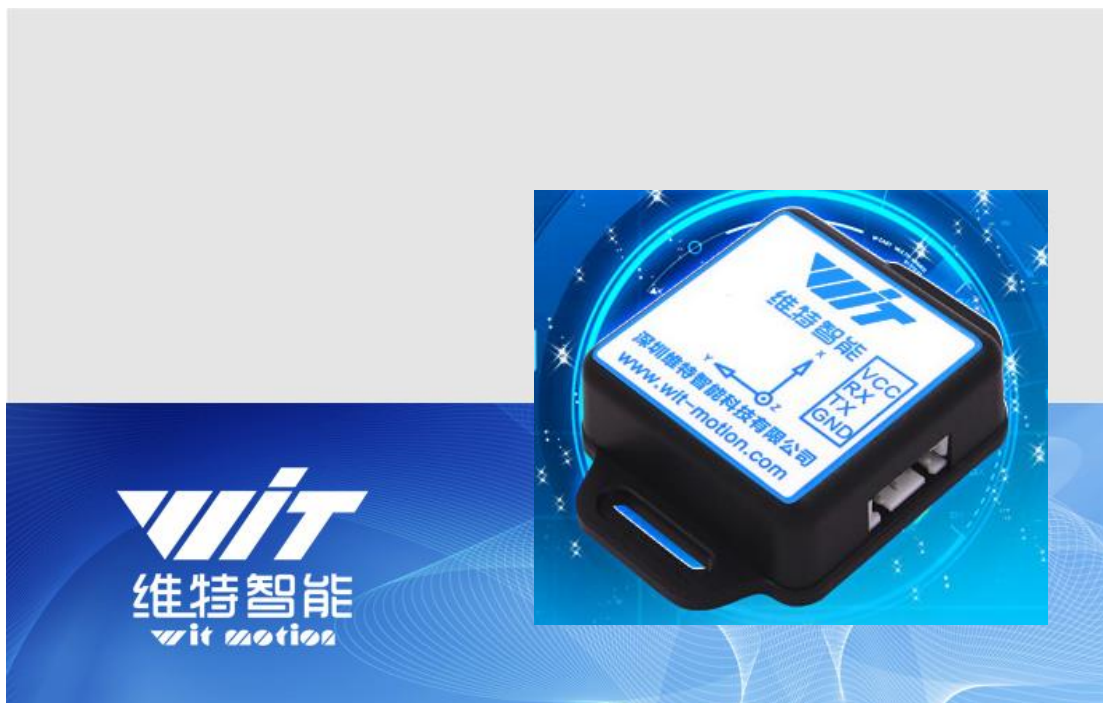


WT901C Digital Attitude Sensor SPECIFICATION



SPECIFICATION:

Model : WT901C (TTL) WT901C(232)

Description : Nine axis with shell digital attitude sensor

Production Standard

Enterprise quality system standard: ISO9001:2016

Sensor production standard: GB/T191SJ 20873-2016

Criterion of detection: GB/T191SJ 20873-2016

Revision date: 2017.10.19

Version	Update content	Author	Date
V1.0	Release	Kelsey	20171019

Catalog

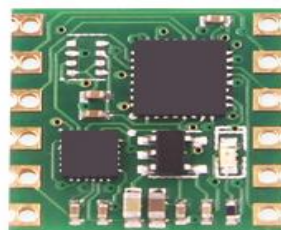
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1 Description

- ◆ The 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, performance is even better than some professional Inclinator.
- ◆ The module has its own voltage stabilization circuit, working voltage is 3.3v ~ 5v, pin level compatible 3.3V and 5V embedded system and connection convenience .
- ◆ Support serial port UART(TTL) or UART(232), interface to facilitate the user to choose the best way to connect. . Serial port rate is adjustable from 2400kbps ~ 921600 kbps(default 9600) .
- ◆ The maximum data output rate is 200Hz. Input content can be arbitrarily selected, output rate of 0.1 ~ 200HZ can be djusted(default 10Hz).

Built-in core module-WT901C



2 Features

- 1) Model:WT901CTTL WT901C232
- 2) Input voltage: 3.3V-5V
- 3) Consumption current: <40mA
- 4) Volume:51.3mm X 36mm X 15mm
- 5) Measuring:
 Acceleration: X Y Z, Angular Velocity: X Y Z
 Magnetic field: X Y Z Attitude angle: X Y Z
- 6) Range:
 Acceleration:±2/4/8/16g(optional),
 angular velocity:±250/500/1000/2000°/s(optional)

Attitude angle: X Z (-180°, 180°), Y(-90,90)

- 7) Precision: Angle: 0.05°.
- 8) Data output:
time, acceleration, angular velocity, angle, mag, port status, quaternion
- 9) The data output frequency 0.1Hz to 200Hz (default:10Hz) .
- 10) Data Interface:
UART(TTL) or UART(232)
baud rate 2400,4800,9600(default) ,19200,38400,57600,115200,230400,460800,921600)

3 Pin Description

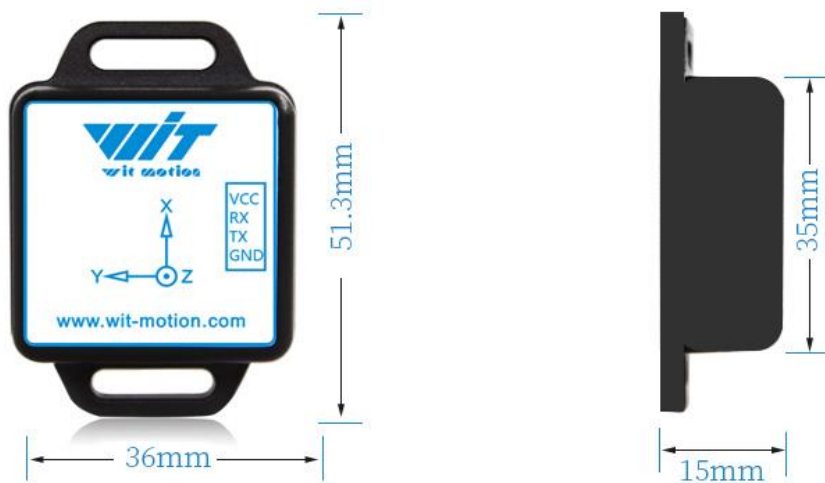


Figure 1

Volume	51.3mm X 36mm X 15mm
Weight	13g

Pin	Function
VCC	Power supply, 3.3V-5V input
RX	Serial date input, TTL/232 level
TX	Serial date output, TTL/232

	level
GND	GND

4 Axial Direction

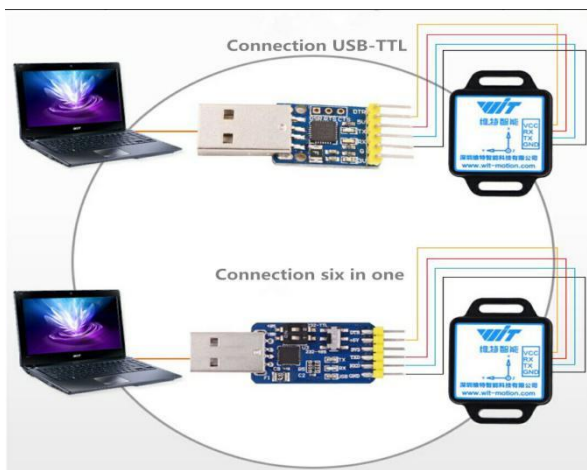
As shown in the figure 1 above, the coordinates of the module are indicated, and the upper is the X axis, the left is Y axis, the vertical module is Z axis outward. The direction of rotation is defined by the right hand rule, that is, the thumb of the right hand is pointed to the axial direction. The bending direction of four fingers is the direction of rotation around the axis. The angle of X axis is the angle of rotation direction around X axis and the angle of Y axis is the angle of rotation direction of Y axis and the angle of Z axis is the angle of rotation direction of Z axis.

5 Hardware Connection

5.1 Serial (TTL) Connection

When connected to the PC software, you need a USB -TTL module. Recommend the following two USB -TTL module:

https://www.aliexpress.com/store/product/Usb-converter-cp2102-usb-ttl-485-232-3-3v-and-5v-out-put-three-multifunctional-functions/2029054_32873159970.html



1. USB -TTL Serial module : Firstly connect the module with the USB - TTL and then connect them to the computer. The ways of connecting module with USB -TTL are:

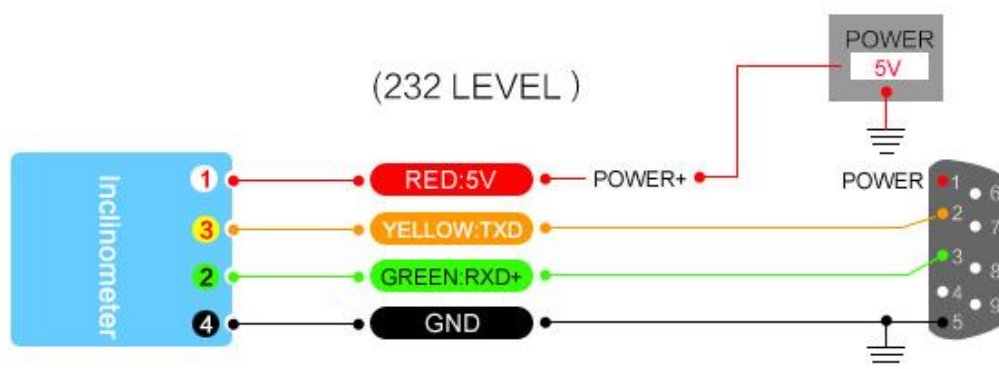
VCC TX RX GND of the module connected to +5/3.3V RX TX GND of the serial module respectively. It is noteworthy that TX and RX need to be crossed TX connected to RX, RX

connected to TX.

5.2 232 Level Connection

When connected to the PC software, you need a USB -232 module. Recommend the following USB -232 module:

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

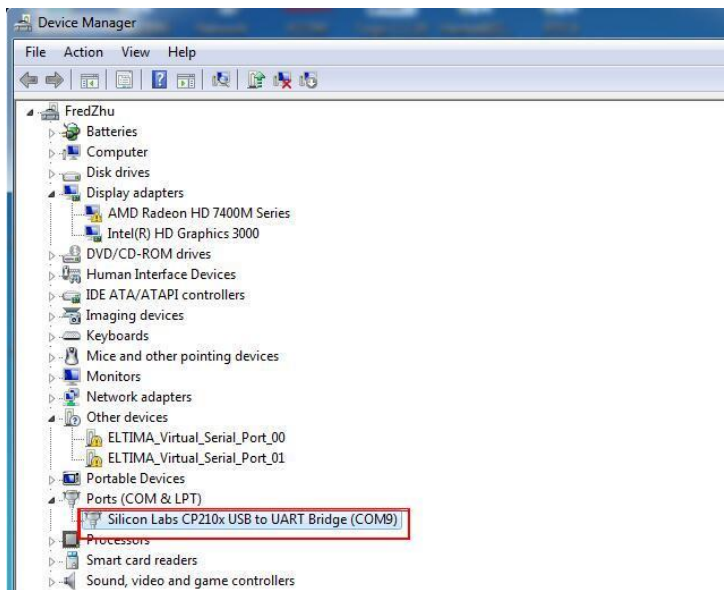


6 Software Methods

Note: when the PC software is not running ,download the installation. Net framework4.0:

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

First, the module is connected serial module to the computer, install the serial module driver. After installing the driver, and then Device Manager can query corresponding serial number, as below figure shows:



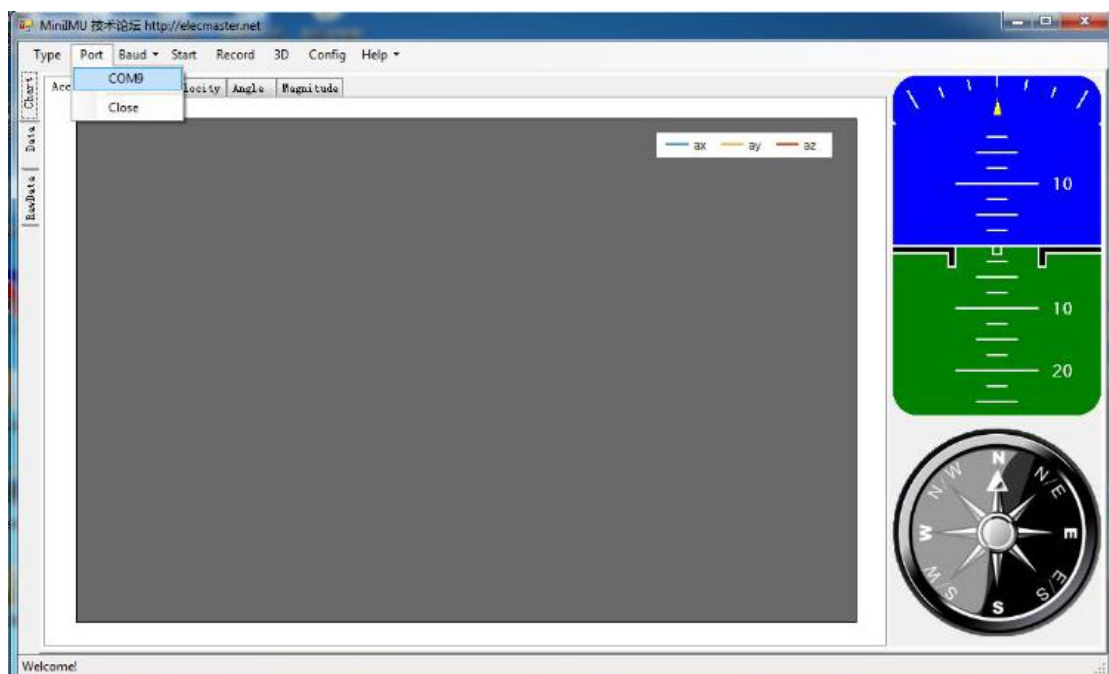
The drive:

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

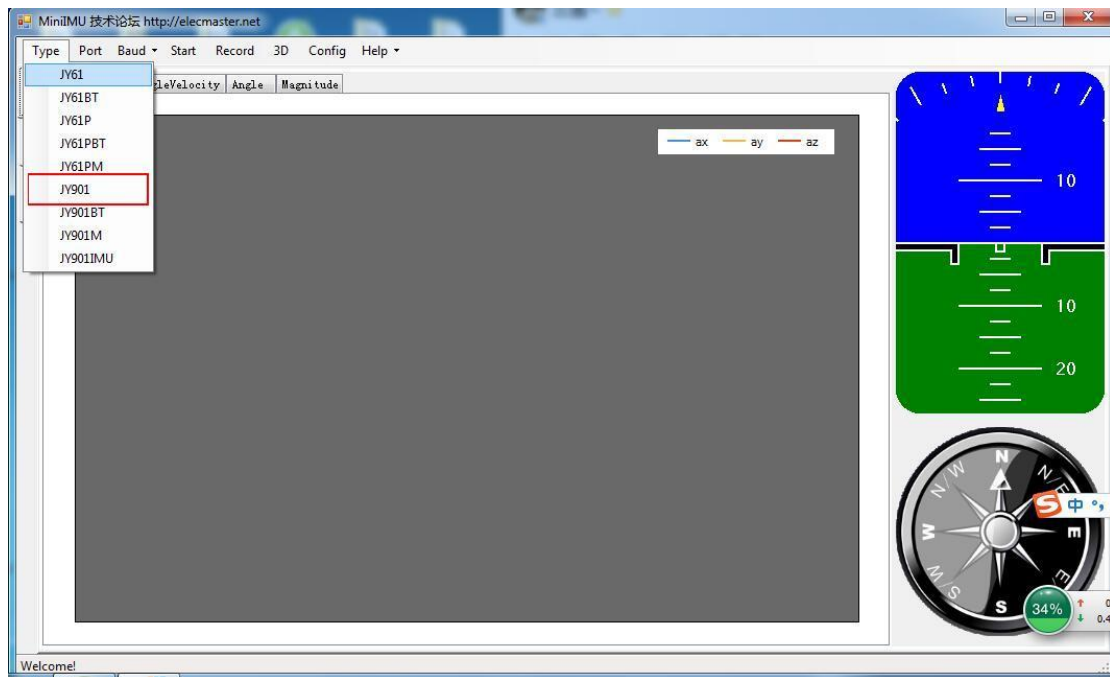
If choose the USB-TTL(CP2102),the driver is :

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

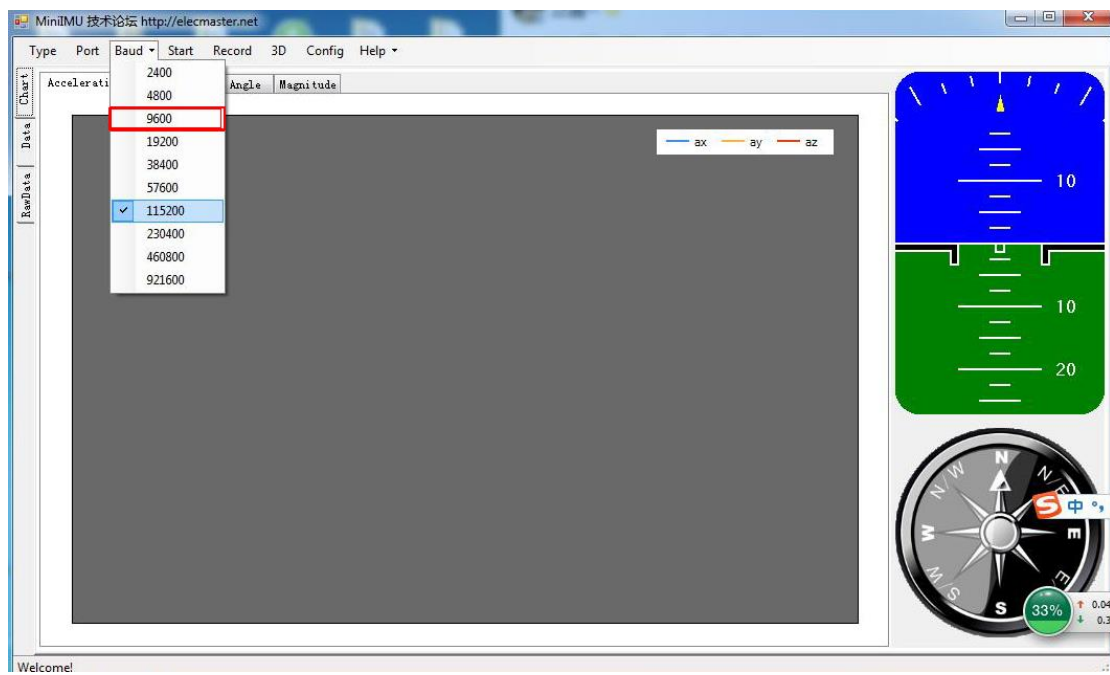
Open the software MiniIMU.exe,, click on the Serial Port selection menu to select the com number in device Manager

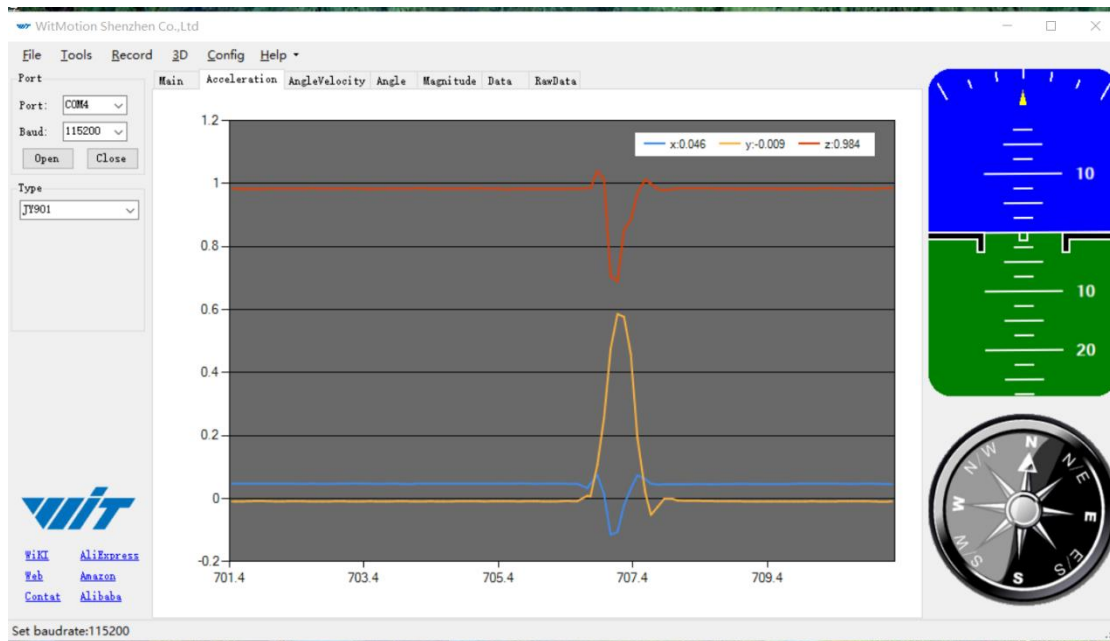


Click on the model menu on the PC software to select the product model JY901



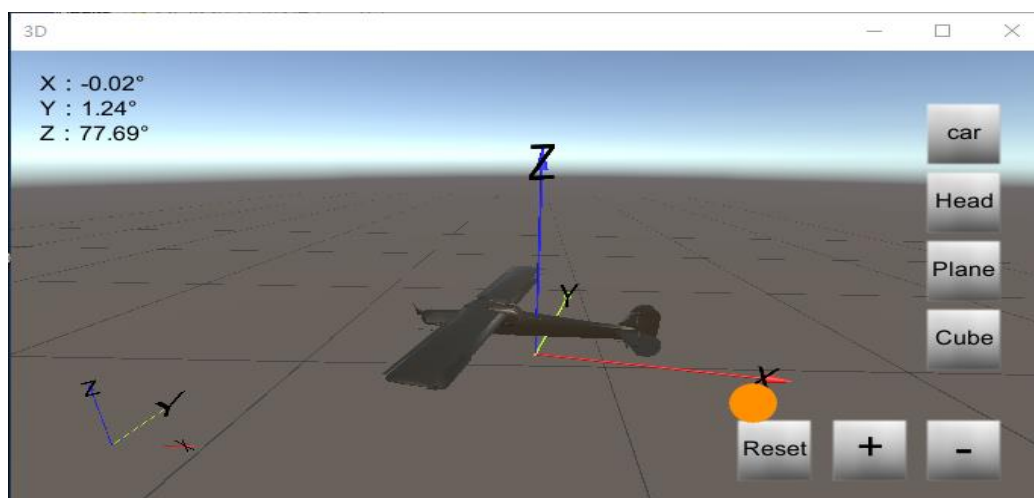
Click the “Baud” and select “9600”, , the software can display data.





When the time interval between the data acquisition and the last data acquisition is long, the update of the chart will be slow. At this time, click the image right click, pop out the map bar, and click the clear map option to speed up the data refresh rate.

Click the “3D” and 3D will display, which displays the posture of the module.

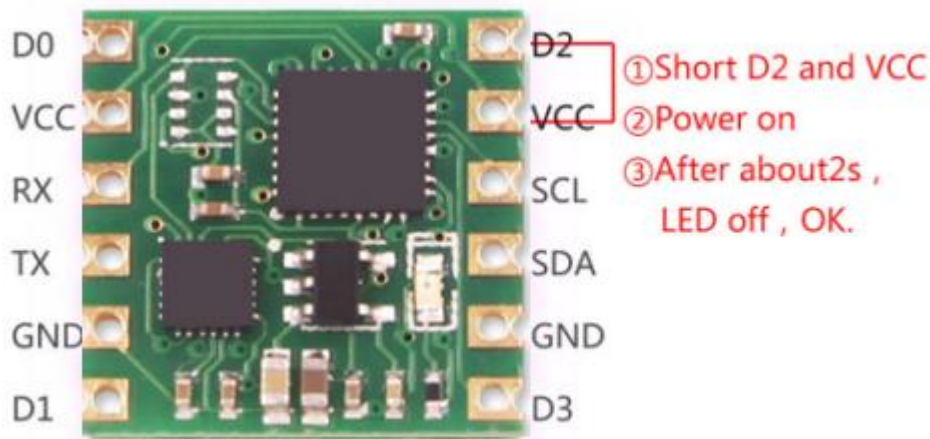


6.2 Restore Factory Setting

There are two methods, short circuit method and instruction methods.

Short Circuit Method :

Open the case, D2 pin are short to VCC pin, then power on the module, the module LED lights long bright, lasts about two seconds, LED light is off, complete restore factory settings operation.



Instruction method : WT901C connected to a PC via USB-serial port module , click the Settings tab, click “Recovery”. After restore the factory settings ,need to restart the module again. (This method requires advance knowledge to know baud rate of the module, if the baud rate does not match the command will not take effect, try using a short-circuit recovery method).

6.3 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. As shown below, offline shows that the PC software did not control to the module.

The module need to be calibrated before using.

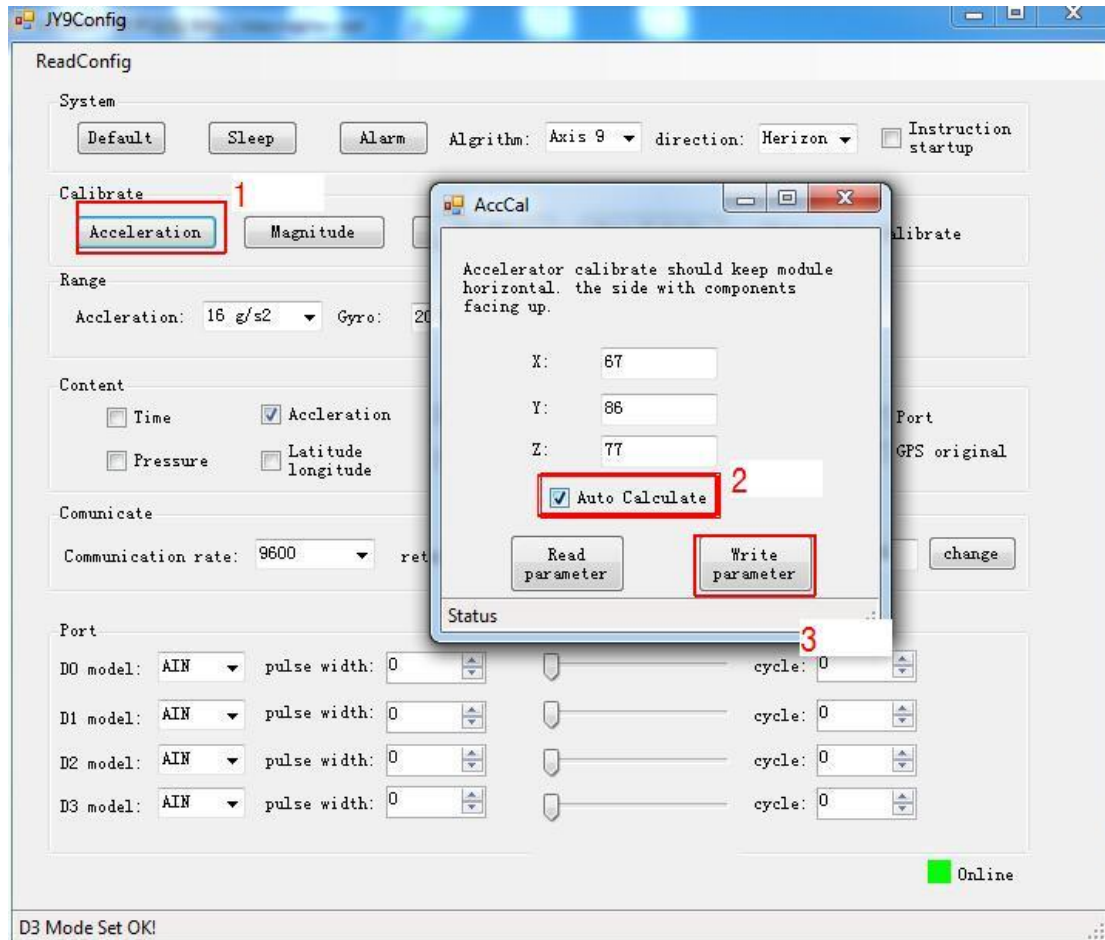
Accelerometer calibration and magnetic calibration.

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:

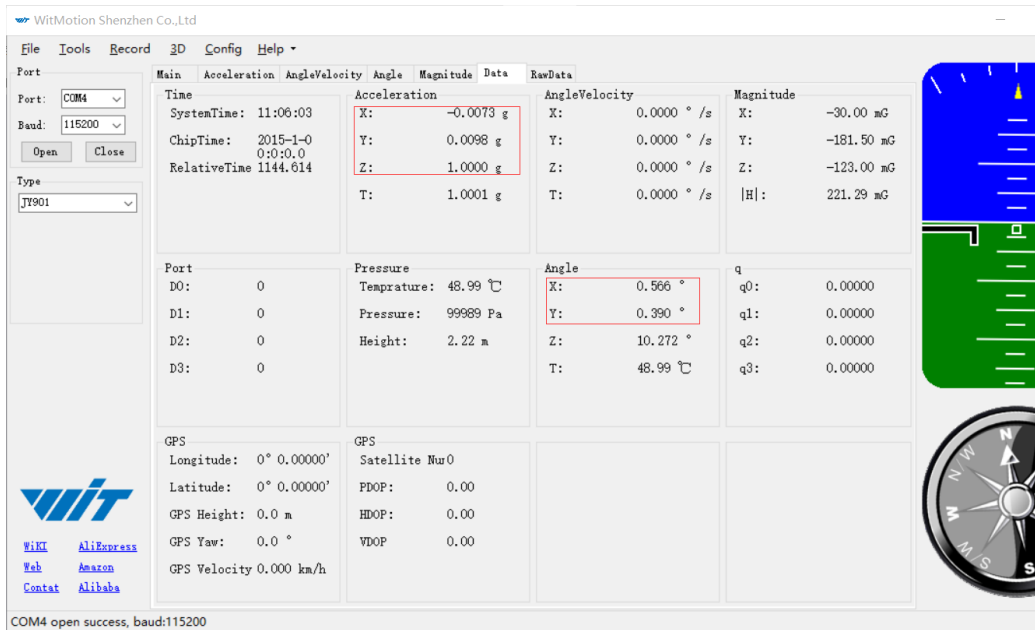
1. Firstly keep the module horizontally stationary, in the “Config” of the software click “Acceleration” and a calibration interface will pop up.
2. Check the “Auto Calculate” option, the software will automatically calculates the zero bias value and then click “Write parameter”



Click "data" on the left side of the PC software to see the Angle data as shown below:

3. 1 ~ 2 seconds after the module three axial acceleration value is about 0 , 0 , 1, the X and Y axis Angle around 0 °. After calibration, the x-y axis Angle is accurate.

Note: when put the module horizontal , there is one G of gravitational acceleration.

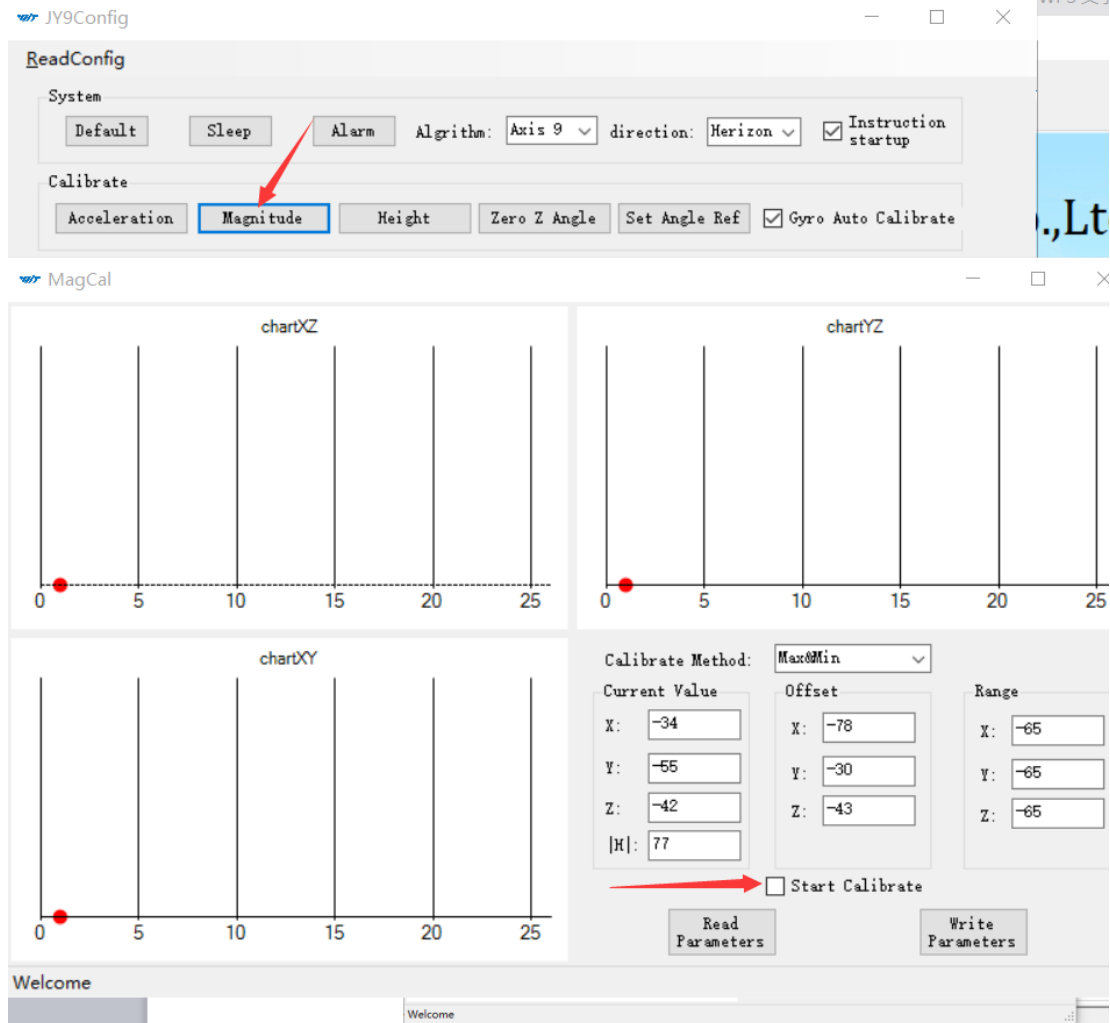


6.3.2 Magnetic Calibration

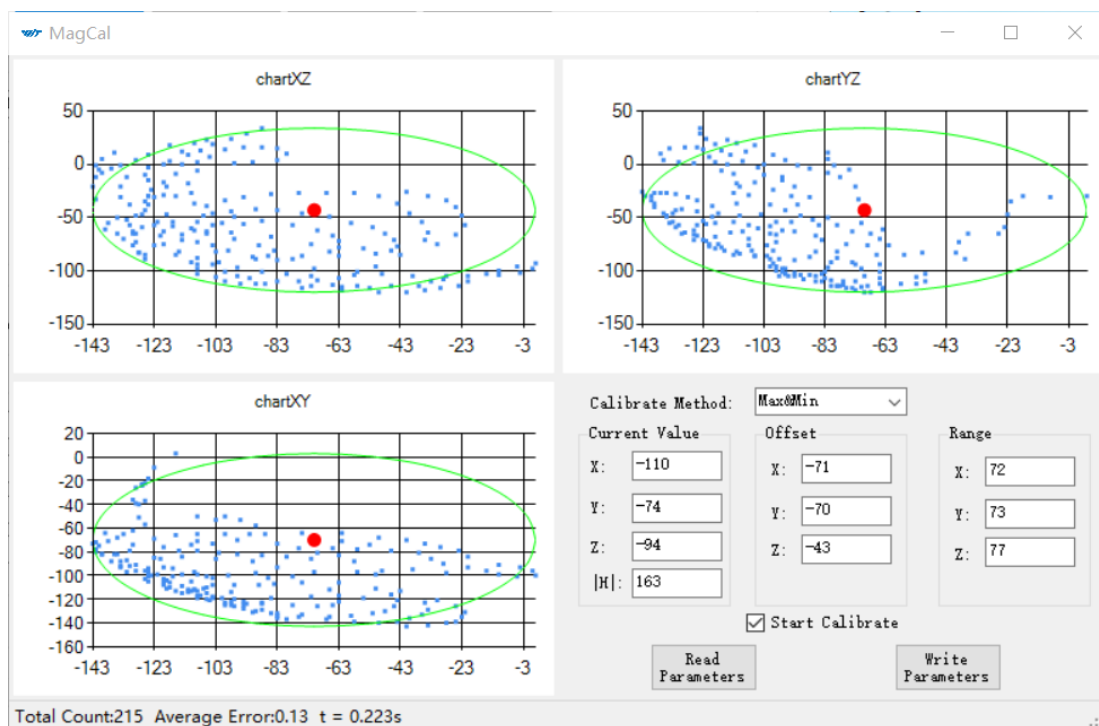
Magnetic calibration is used to remove the zero deviation of the magnetic field sensor. Usually, the magnetic field sensor will have a large zero error when it is manufactured. If it is not calibrated, it will bring a large measurement error, which will affect the accuracy of the measurement of the z-axis Angle of the heading Angle.

The magnetic calibration method is as follows:

1. When calibrating, firstly connect the module and computer, place the module far away from the interference magnetic (20CM away from magnetic and iron and other materials), and then open the PC software.
2. In the setting page, click the magnetic field button under the calibration bar to enter the magnetic field calibration mode. At this time, the MagCal window pops up and click to start the calibration.



4. Then, slowly rotate the module around the three axes so that the data points can be drawn in the three planes. The data points can be rotated several more times, and the calibration can be stopped after the regular ellipses are drawn. After the calibration is complete, click write parameters.



Note: data points within the ellipse, as far as possible can't oval outside, if you can't draw the ellipse, please stay away from the magnetic field interference, reference calibration video again, slowly put the module in the earth's magnetic field on the north-south axis.

Calibration video: <https://youtu.be/C1g59WFHuCI>

6.3.3 Z axis To 0

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

The WT901C 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.

The method of returning Z axis to zero of PC software is as follows: firstly put the module placed horizontally, and then click "Config" to open the configuration bar, choose the "Zero Z Angle" option, the z-axis angle inside the module data column returns to 0.

JY9Config

ReadConfig

System: Algorithm: direction: ☐ Instruction startup

Calibrate: ☒ Gyro Auto Calibrate

Range: Acceleration: Gyro: Bandwidth:

Content: ☐ Time ☒ Acceleration ☒ Velocity ☒ Euler angle ☒ Magnetism ☐ Port
☒ Pressure ☒ Latitude longitude ☐ Ground velocity ☐ Quaternion ☐ Positioning accuracy ☐ GPS original accuracy

Communicate: Communication rate: retrieval rate:

Port: D0 model: pulse width: cycle:
D1 model: pulse width: cycle:
D2 model: pulse width: cycle:
D3 model: pulse width: cycle:

☒ Online

D3 Mode Set OK!

Click "data" on the left side of the host computer to see the angle data as shown in the following figure:

MiniIMU 技术论坛 <http://elecmaster.net>

Type Port Baud Start Record 3D Config Help

Chart

Time: SystemTime: 10:43:57
ChipTime: 0-0-0
0:0:0.0
RelativeTime: 623.683

Acceleration: X: -0.0010 g
Y: 0.0000 g
Z: 1.0010 g
T: -12.76 °C

AngleVelocity: X: 0.0000 °/s
Y: 0.0000 °/s
Z: 0.0000 °/s
T: -12.76 °C

Magnitude: X: 0 mG
Y: 0 mG
Z: 0 mG
|H|: 0 mG

Port: D0: 0
D1: 0
D2: 0
D3: 0

Pressure: Temperature: -12.76 °C
Pressure: 0 Pa
Height: 0.00 m

Angle: X: -0.016 °
Y: -0.005 °
Z: 0.000 °
T: -12.76 °C

q: q0: 0.00000
q1: 0.00000
q2: 0.00000
q3: 0.00000

GPS: Longitude: 0° 0.00000'
Latitude: 0° 0.00000'
GPS Height: 0.0 m
GPS Yaw: 0.0 °
GPS Velocity: 0.000 km/h

GPS: Satellite Num: 0
PDOP: 0.00
HDOP: 0.00
VDOP: 0.00

SA

34%

6.3.5 Gyroscope Automatic Calibration

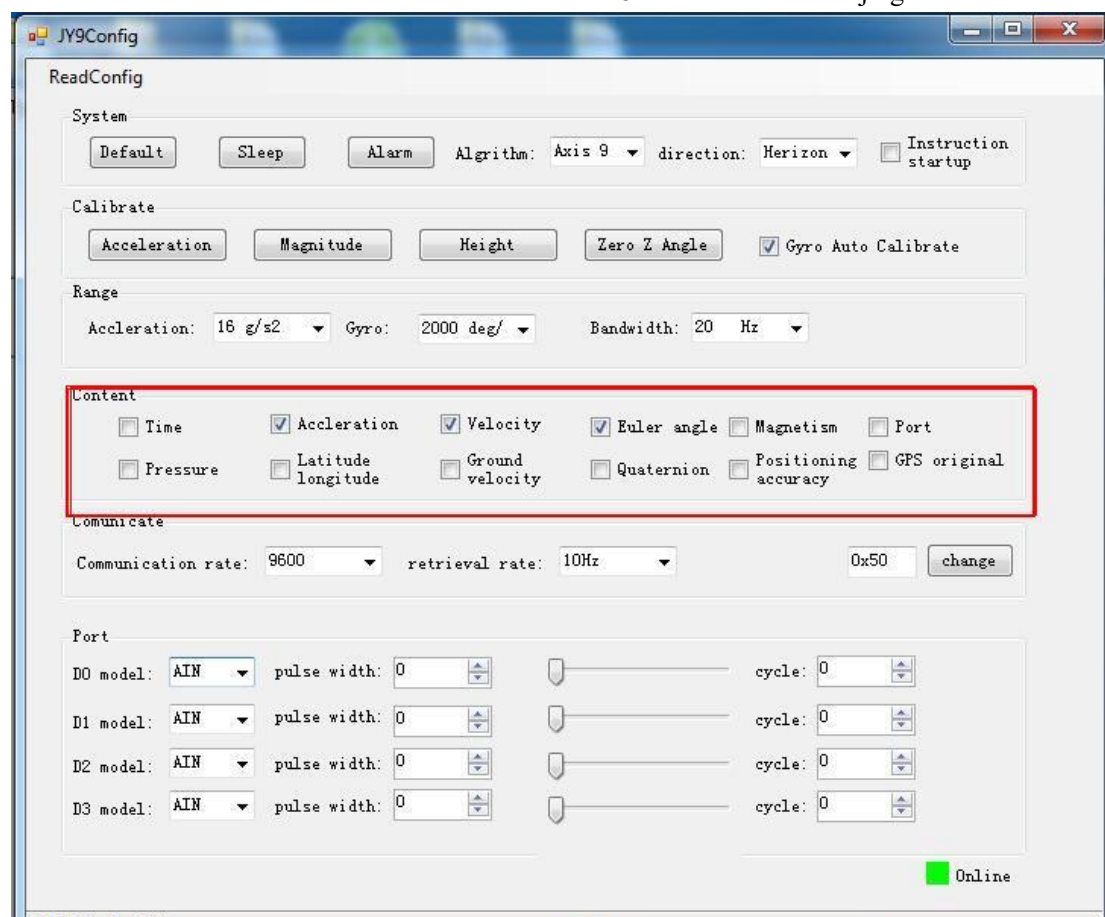
The gyroscope calibration is to calibrate the angular velocity, and the sensor will calibrate automatically.

The automatic calibration of gyroscopes can be removed only if the module rotates at a constant speed

6.4 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.

The time is the time inside the module, the default is that the above electricity initial time is January 1, 2015 0: 0: 0. 0. If the GPS module is connected, the time received by the GPS is taken as the time of the module. Note that GPS time will be 8 hours later than Beijing time.



JY9Config

ReadConfig

System

Default Sleep Alarm Algrithm: Axis 9 direction: Merizon ☐ Instruction startup

Calibrate

Acceleration Magnitude Height Zero Z Angle ☒ Gyro Auto Calibrate

Range

Acceleration: 16 g/s2 Gyro: 2000 deg/ Bandwidth: 20 Hz

Content

☐ Time ☒ Acceleration ☒ Velocity ☒ Euler angle ☐ Magnetism ☐ Port

☐ Pressure ☐ Latitude longitude ☐ Ground velocity ☐ Quaternion ☐ Positioning accuracy ☐ GPS original accuracy

Communicate

Communication rate: 9600 retrieval rate: 10Hz 0x50 change

Port

D0 model: AIN pulse width: 0 cycle: 0

D1 model: AIN pulse width: 0 cycle: 0

D2 model: AIN pulse width: 0 cycle: 0

D3 model: AIN pulse width: 0 cycle: 0

Online

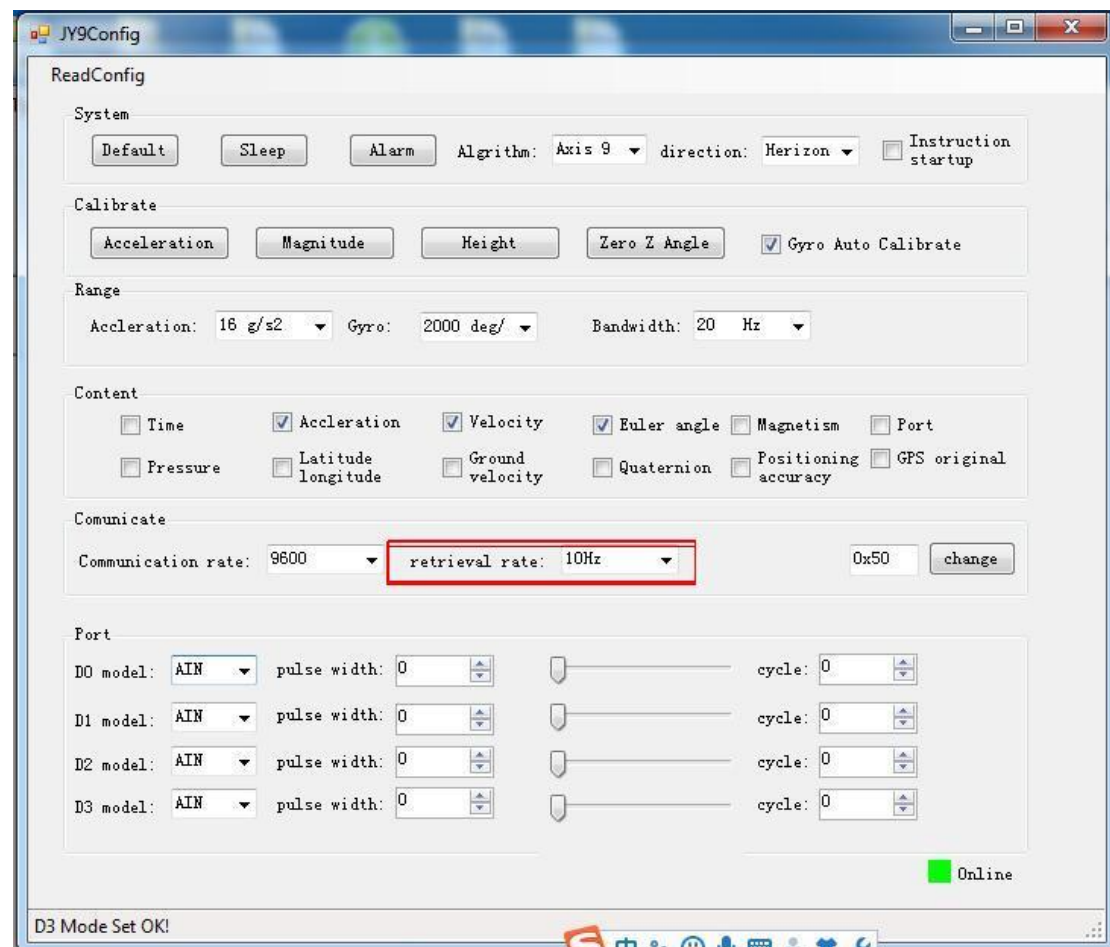
6.5 Set Return Rate

Setting methods: click “Config” to open configuration bar and then 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.

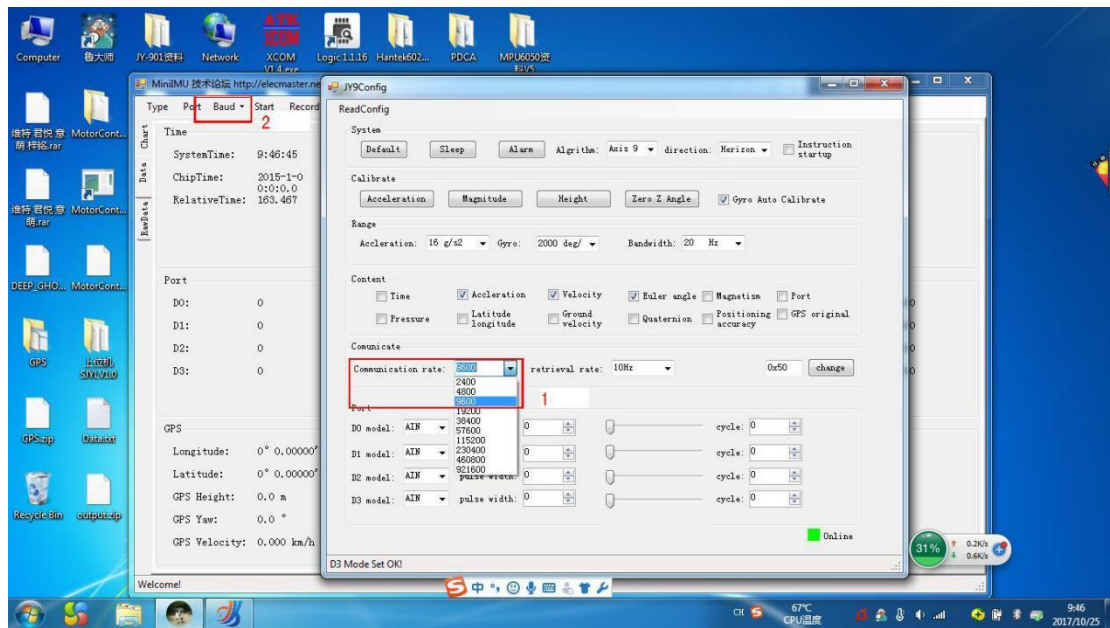
Reminder: If there being a lot of return content and low baud rate of communication, the module will automatically reduce the frequency and output at a maximum allowable output rate. The default baud rate is 115200.



6.6 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.

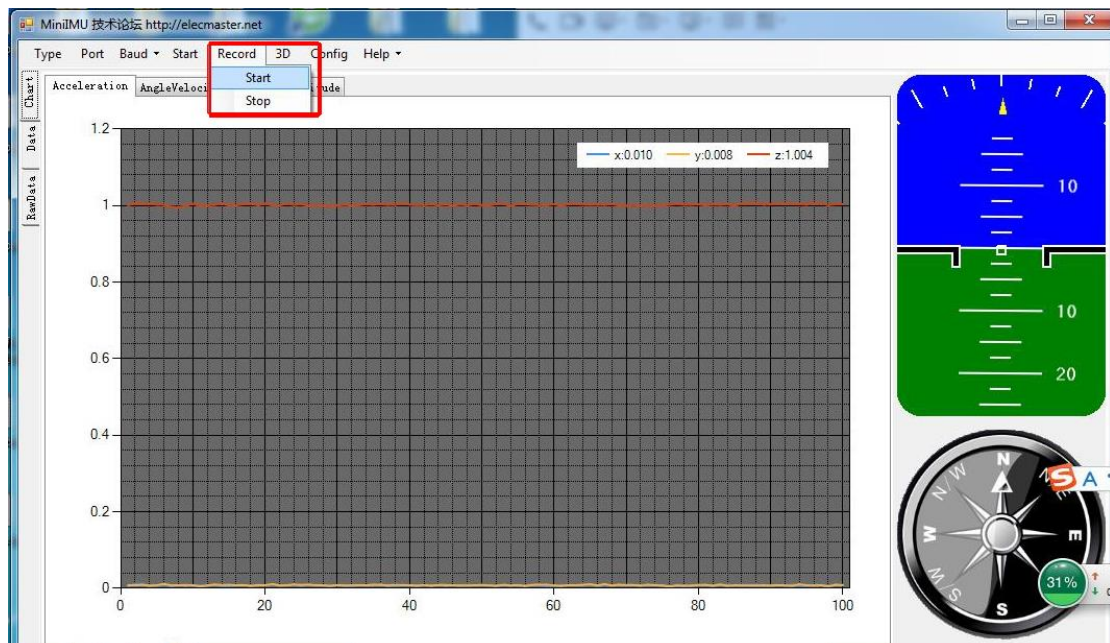
Reminder: After changing the baud rate, the module does not immediately take effect, need to re-power and then it will take effect.



6.7 Data Recording

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

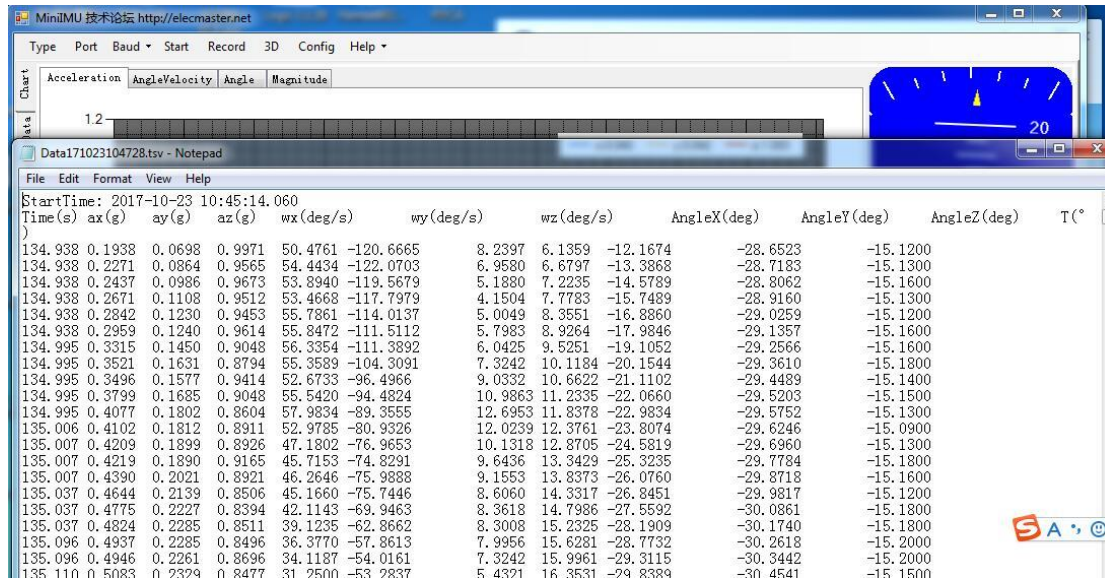
Method are as follows: Click “Record” and “Start” will save the data as a file.



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. “hx,hy,hz” respectively represents the magnetic of the X,Y, Z.



6.8 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.



Vertical installation

6.9 Sleep/ Wake up

Sleep: The module paused working and entered the standby mode. Power consumption is reduced after sleeping.

Wake up: The module enters the working state from standby state.

Setting methods: The module defaults to a working state, in the “Config” of the software, click

“Sleep” option to enter the sleep state, click “Sleep” again to release sleep.

6.10 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

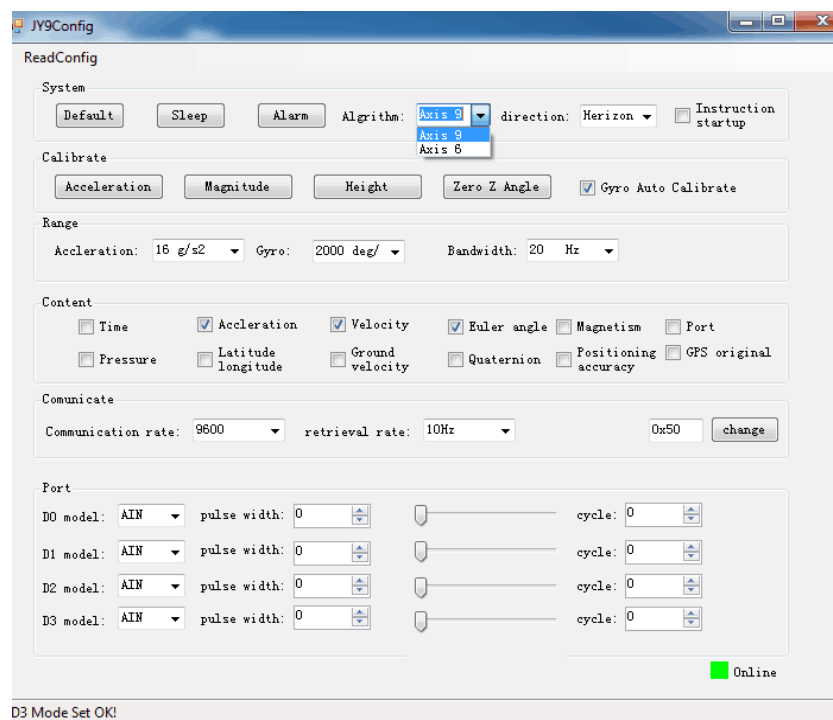
JY61P uses the 6 axis algorithm, and the z axis angle is calculated mainly according to the angular velocity integral.

WT901C(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 WT901C 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: WT901C can do the algorithm conversion, and the system defaults to the 9 axis algorithm. JY61P is unable to convert algorithms.



7 Serial 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

7.1 Module 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:

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

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

7.1.2 Acceleration Output:

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

Calculate formula:

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

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

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

Temperature calculated formular:

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

Checksum:

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

Note:

- the data is transmitted in accordance with the 16 hexadecimal, not ASCII code
- 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.

Detailed solution example:

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

7.1.3 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:

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

Checksum:

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

7.1.4 Angle Output:

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

Calculated formular:

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

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

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

Temperature calculated formular:

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

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 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

7.1.5 Magnetic output:

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

Calculated formular:

Magnetic (x axis) $H_x = ((H_{xH} \ll 8) | H_{xL})$

Magnetic (y axis) $H_y = ((H_{yH} \ll 8) | H_{yL})$

Magnetic (z axis) $H_z = ((H_{zH} \ll 8) | H_{zL})$

Temperature calculated formular:

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

Checksum:

$Sum = 0x55 + 0x53 + H_{xH} + H_{xL} + H_{yH} + H_{yL} + H_{zH} + H_{zL} + TH + TL$

7.2 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
------	------	---------	-------	-------

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	GPSTime	GPS Time
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 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 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.

7.2.6 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

7.2.7 Gyroscope automatic calibration

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

GYRO: gyroscope automatic calibration

0: set to gyroscope automatic calibration

1: removed to gyroscope automatic calibration

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

7.2.9 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.

7.2.10 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

7.2.11 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

7.2.12 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.

7.2.13 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 <<8) | AZOFFSETL

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

7.2.14 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 <<8) | GXOFFSETL

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

7.2.15 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 <<8) | GYOFFSETL

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

7.2.16 Set Z axis Angular velocity bias

0xFF	0xAA	0x0a	GZOFFSETL	GZOFFSETH
------	------	------	-----------	-----------

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.

7.2.17 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

$\text{HXOFFSET} = (\text{HXOFFSETH} \ll 8) | \text{HXOFFSETL}$

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

7.2.18 Set 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

$\text{HXOFFSET} = (\text{HXOFFSETH} \ll 8) | \text{HXOFFSETL}$

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

7.2.19 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

$\text{HXOFFSET} = (\text{HXOFFSETH} \ll 8) | \text{HXOFFSETL}$

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

8 Application Area

Agricultural machinery



Internet of things



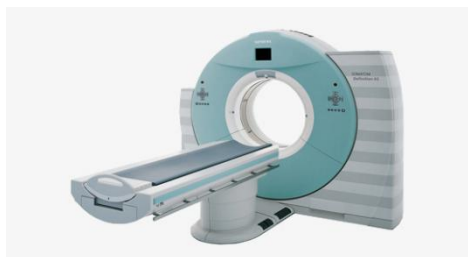
Solar energy



Power monitoring



Medical instruments



Construction machinery



Geological monitoring





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