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## WITMOTION WTGAHRS3-TTL

# WITMOTION WTGAHRS3-TTL 6-Axis Inertial Navigation GPS-IMU Sensor Instruction Manual

MODEL: WTGAHRS3-TTL

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## 1. Product Overview

The WITMOTION WTGAHRS3-TTL is an industrial-grade 6-axis inertial navigation GPS-IMU sensor. It integrates an accelerometer, gyroscopes, and angle measurement capabilities, providing precise static ( $0.05^\circ$ ) and dynamic ( $0.1^\circ$ ) angle data, along with latitude and longitude information.

This high-performance sensor offers rock-solid data output, including 3-axis acceleration, electronic gyroscope, angle, magnet, air pressure, height, GPS, altitude, longitude, and ground speed. It leverages 8 years of professional attitude measurement solution expertise, integrating dynamic fusion algorithms and Kalman filtering to ensure stable data output, excellent polarization stability, low noise levels, and increased measurement accuracy.

Designed for robustness, the sensor features an integrated accelerometer, magnetometer, gyroscope, barometer, NMEA-0183 standard GPS (UBLOX 6M), and a 32-bit high-performance core processor. Its durable aluminum housing provides IP67 waterproof, dustproof, and shockproof protection, making it suitable for various harsh test environments.

## 2. Key Features

- **6-Axis AHRS IMU:** Provides comprehensive motion data including 3-axis acceleration, electronic gyroscope, angle, magnet, air pressure, height, GPS, altitude, longitude, and ground speed.
- **Advanced Sensor Fusion:** Utilizes dynamic fusion algorithms and Kalman filtering for stable, accurate, and low-noise data output.

- **Integrated GPS:** Features NMEA-0183 standard GPS (UBLOX 6M) for precise positioning and navigation.
- **Robust Industrial Design:** Housed in high-quality aluminum, offering IP67 waterproof, dustproof, and shockproof protection.
- **High Precision:** Static angle accuracy of 0.05° and dynamic angle accuracy of 0.1°.
- **Multi-Constellation Support:** Supports BDS/GPS/QZSS/GLONASS satellite navigation systems.
- **Versatile Connectivity:** TTL/232 serial data interface.
- **PC Software Included:** Provides software for data recording, 3D model display, curve display, dashboard, and configuration.

### 3. What's in the Box

The product package typically includes:

- 1 x WTGAHRS3-TTL Sensor
- 1 x Instruction Card
- 1 x Connection Cable



Image: WTGAHRS3-TTL sensor and its included accessories, such as the instruction card and connection cable, neatly packed in a small box.

## 4. Setup and Installation

Follow these steps to set up your WTGAHRS3-TTL sensor:

1. **Install Serial Driver:** Ensure the necessary serial drivers are installed on your computer.
2. **Connect Sensor:** Connect the sensor to your computer or Android smartphone using the provided serial cable and appropriate adapter (USB-TTL cable, Type-C converter). Refer to the PIN definition for correct wiring: VCC to VCC, TX to RX, RX to TX, GND to GND.
3. **Connect GPS External Antenna:** For GPS functionality, connect the external GPS antenna to the sensor. Ensure the antenna has a clear view of the sky for optimal signal reception.
4. **Confirm COM Port:** Verify the assigned COM port in your device manager (for PC) or ensure the device is detected by the phone (only CH340 driver's device can be detected by phone).
5. **Open Software:** Launch the WitMotion software (Minimu.exe for PC or the WitMotion APP for Android). Data

should appear automatically after the auto-search finishes.

# Provides PC software

A high precision, high stability, small volume of attitude measuring module, provide rich a serial port example program for product connection and secondary development



Data Record



3D Model Display



Curve Display



Dashboard Display



Configuration



Compatible With Windows

Image: Detailed diagram showing the dimensions of the WTGAHRS3-TTL sensor and its pinout for VCC, RXD, TXD, and GND connections.

Video: Demonstrates how to connect the WTGAHRS2 (similar to WTGAHRS3-TTL) sensor to an Android smartphone and use the

WitMotion app for data display and logging. It covers app installation, serial connection, and basic data review.

Video: Instructions on how to use the TTL port of an IP68 accelerometer sensor, which is applicable to the WTGAHRS3-TTL for serial communication setup.

## 5. Operating Instructions

Once connected, the WitMotion software (PC or APP) will display real-time data from the sensor. You can monitor acceleration, angular velocity, angles, magnetic field, and GPS data. The software provides various display modes, including graphical representations and 3D models, to visualize the sensor's attitude and motion.

Ensure the sensor is placed on a stable, non-magnetic surface during operation to avoid interference with magnetic field readings. For GPS functionality, operate the sensor outdoors with a clear view of the sky.



Image: Screenshot of the WitMotion PC software interface, showing various data displays including data record, 3D model, curve display, dashboard, configuration, and Windows compatibility.

## 6. Calibration

Accurate calibration is crucial for optimal sensor performance. The WitMotion software provides tools for Acceleration, Magnetic Field, and Angle Reference calibration.

### 6.1. Acceleration Calibration

To decrease acceleration bias, place the sensor horizontally on an even surface and initiate acceleration calibration

through the software. The software will guide you through the process, typically requiring the sensor to remain still for a few seconds.

Video: Demonstrates acceleration calibration using the WitMotion Android app. The sensor is placed horizontally, and the calibration function is activated, showing the acceleration values stabilizing.

## 6.2. Magnetic Field Calibration

Magnetic field calibration compensates for local magnetic disturbances. This process involves rotating the sensor 360° around its X, Y, and Z axes respectively while connected to the software. Ensure no magnetic interference is present during this process.

Video: Shows magnetic field calibration using the WitMotion PC software. The sensor is rotated 360 degrees around each axis to collect data for calibration, ensuring accurate magnetic readings.

Video: Explains three methods of magnetic field calibration: Ellipse Fitting, Dual-Plane, and Octal Calibration. This video is highly relevant for understanding and performing magnetic calibration for the sensor.

## 6.3. Angle Reference Setting

The angle reference function allows you to define a specific orientation as the zero-degree reference for the X and Y axes. This is useful for applications where a custom reference point is needed.

Video: This video also covers setting the angle reference using the PC software, demonstrating how to define a custom zero-degree orientation for the sensor's X and Y axes.

# 7. Software Usage

The WitMotion software provides a comprehensive interface for interacting with your sensor. It allows for real-time data monitoring, configuration, and data logging.

- **Data Record:** Log sensor data to a TXT file for later analysis.
- **3D Model Display:** Visualize the sensor's orientation in a 3D environment.
- **Curve Display:** View real-time sensor data as dynamic graphs.
- **Dashboard Display:** An intuitive overview of all sensor attitude motion.
- **Configuration:** Adjust sensor parameters such as baud rate, output rate, and content.
- **Windows Compatibility:** The PC software is compatible with Windows operating systems.

Number	Data content	Meaning
0	0x55	Header of package
1	0x53	Identify this bag as an angular bag
2	RollL	X-axis angle low bit
3	RollH	X-axis angle high bit
4	PitchL	Y-axis angle low bit
5	PitchH	Y-axis angle high bit
6	YawL	Z-axis angle low bit
7	YawH	Z-axis angle high bit
8	VL	Firmware version low
9	VH	Firmware version high
10	Sum	Checksum

Image: Screenshot of the WitMotion PC software displaying various sensor data in graphical format, including acceleration, gyroscope, angle, and magnetic field data.

# Six-axis inertial navigation attitude sensor

Built-in American GPS + Chinese Beidou satellite navigation



Image: Icons representing the professional inertial navigation sensor's capabilities, including acceleration, gyroscope, angle, longitude, dimension, and ground speed.

## 8. Specifications

Feature	Value
Item Weight	7 ounces (0.2 Kilograms)
Package Dimensions	3.15 x 1.97 x 1.97 inches
Model Name	WTGAHRS3-TTL
Special Feature	Advanced Sensor Fusion
Connectivity Technology	USB (via adapter)
Mounting Type	Panel Mount

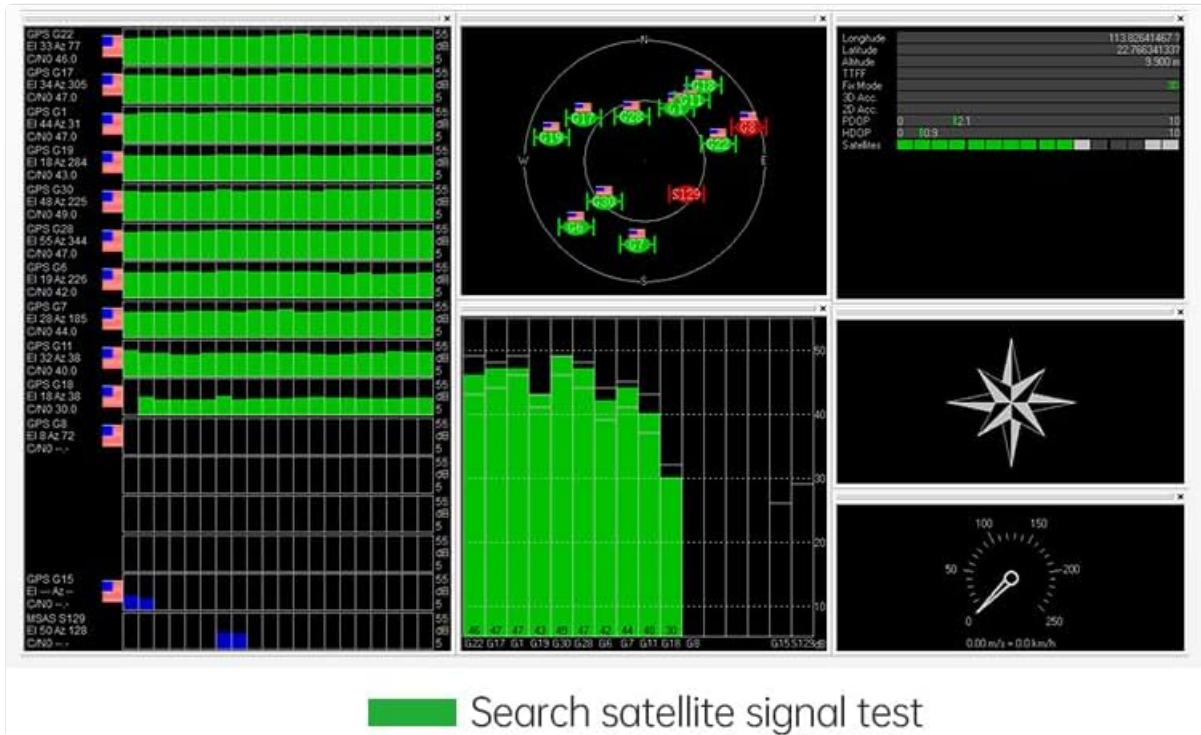


Image: A table detailing the parameters of the WTGAHRS3-TTL sensor, including measurement latitude, measuring range for acceleration, gyroscope, and angle, angle accuracy, output content, data interface, weight, and line length.

## 9. Troubleshooting

### • No Data Output:

- Check all physical connections (VCC, TX, RX, GND).
- Verify the correct COM port and baud rate are selected in the software.
- Ensure serial drivers are correctly installed.

### • Inaccurate Readings:

- Perform Acceleration and Magnetic Field calibration as described in Section 6.
- Ensure the sensor is placed on a stable, non-magnetic surface.
- For GPS, ensure the external antenna has a clear view of the sky.

### • Software Not Detecting Device:

- Restart the software and reconnect the sensor.
- Check device manager for any driver issues.

## 10. Warranty and Support

The WTGAHRS3-TTL sensor comes with a 12-month warranty. WITMOTION provides lifetime friendly customer service.

For detailed tutorials and support, you can:

- Refer to the tutorial link printed on the guide card inside the package.
- Search wit-motion.com to download the full tutorial and software.
- Contact customer support at [support@wit-motion.com](mailto:support@wit-motion.com) for assistance.