

## RAK RAK12500

# RAK Wireless RAK12500 GNSS GPS Location Module and Antenna User Manual

Model: RAK12500

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## 1. INTRODUCTION

This manual provides essential information for the proper installation, operation, and maintenance of your RAK Wireless RAK12500 GNSS GPS Location Module and Antenna. The RAK12500 is a high-accuracy GNSS module designed for integration with compatible development boards, such as the RAK WisBlock Core and Meshtastic Starter Kit. It is important to note that this product is a component and not a standalone GPS device; it requires other separate parts to function.

## 2. PRODUCT OVERVIEW

The RAK12500 module utilizes the u-blox ZOE-M8Q chip, offering precise location and velocity data. It supports multiple satellite systems including GPS, GLONASS, QZSS, and BeiDou. Communication with a WisBlock Core is facilitated via Serial and I2C interfaces.

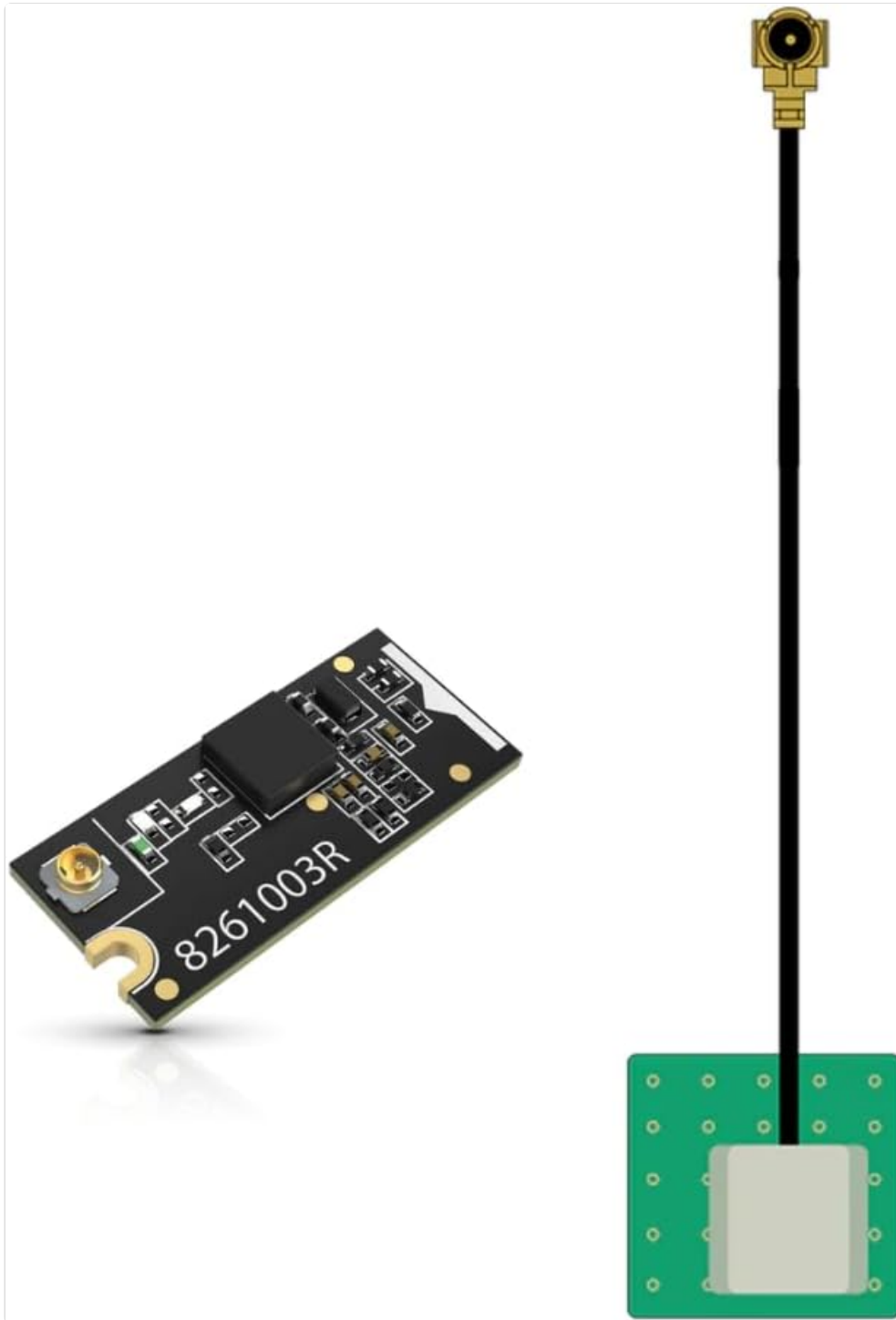


Figure 2.1: RAK12500 GNSS GPS Location Module with its accompanying antenna. The module is compact, designed for integration into larger systems.



Figure 2.2: Angled view of the RAK12500 module, highlighting its compact design and connection points.



Figure 2.3: The RAK12500 module with its dimensions indicated, measuring 10 mm x 23 mm.

### 3. SETUP

The RAK12500 is designed for easy integration into RAK Wireless WisBlock systems. Follow these steps for proper setup:

1. **Prepare your WisBlock Core:** Ensure your WisBlock Core module (e.g., RAK4631) is ready for module attachment.

2. **Connect the RAK12500 Module:** Carefully align the RAK12500 module with the appropriate slot on your WisBlock Base board (e.g., RAK19007). Gently press down until it is securely seated.
3. **Attach the GPS Antenna:** Connect the provided GPS antenna to the IPEX connector on the RAK12500 module. Ensure the connection is firm.
4. **Position the Antenna:** For optimal performance, position the GPS antenna with the top side facing towards the sky, ensuring an unobstructed view of satellites.

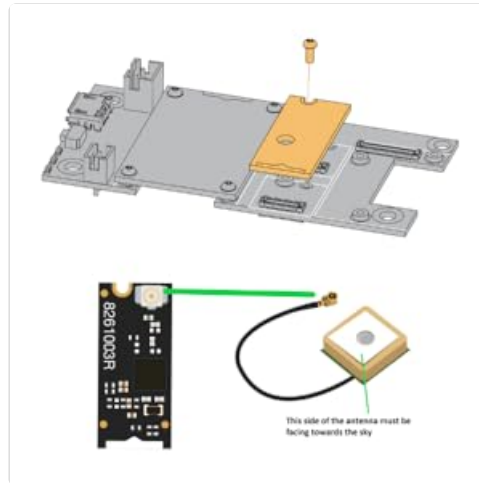


Figure 3.1: Diagram illustrating the connection of the RAK12500 module to a WisBlock base board and the proper orientation for the GPS antenna.

**Important: This module is not a standalone GPS receiver. It requires a compatible host device, such as a RAK WisBlock Core, to function.**

## 4. OPERATION

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Once properly connected to a compatible WisBlock Core and powered, the RAK12500 module will begin acquiring satellite signals. The module offers a 10 Hz update rate for location data.

- **Cold Start Fix:** A cold start, where the module has no prior satellite data, typically achieves a location fix within 29 seconds.
- **Hot Start Fix:** A hot start, where the module has recent satellite data, can achieve a location fix in approximately 1 second.
- **Accuracy:** The module provides a location accuracy of  $\pm 2.5$  meters and a velocity accuracy of  $\pm 0.05$  m/s.

Data communication occurs via Serial and I2C interfaces, allowing the host device to retrieve GNSS information.

## 5. MAINTENANCE

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The RAK12500 module is a low-maintenance electronic component. To ensure its longevity and optimal performance:

- **Keep Clean:** Avoid dust and debris accumulation on the module and its connectors. Use a soft, dry brush or compressed air for cleaning if necessary.
- **Handle with Care:** Electronic components are sensitive. Avoid dropping the module or subjecting it to excessive force.
- **Environmental Conditions:** Operate the module within its specified temperature and humidity ranges.

Avoid exposure to extreme temperatures or moisture.

- **Antenna Care:** Ensure the GPS antenna cable is not kinked or damaged. A damaged antenna can significantly reduce performance.

## 6. TROUBLESHOOTING

If you encounter issues with your RAK12500 module, consider the following:

- **No Location Fix:**
  - Verify the GPS antenna is securely connected and positioned with a clear view of the sky.
  - Ensure the RAK12500 module is correctly seated on the WisBlock Base board.
  - Check that the host device (WisBlock Core) is powered on and running the correct firmware/software to interface with the GNSS module.
- **Incorrect Location Data:**
  - Ensure the antenna has a clear, unobstructed view of the sky. Obstacles like buildings, dense foliage, or being indoors can degrade signal quality.
  - Allow sufficient time for a cold start fix if the module has been off for an extended period or moved a significant distance.
- **Module Not Detected by Host:**
  - Re-seat the RAK12500 module on the WisBlock Base board to ensure proper electrical contact.
  - Confirm that the host device's firmware supports the RAK12500 module and that the communication interfaces (Serial/I2C) are correctly configured.

For further assistance, refer to the RAK Wireless documentation or contact their support channels.

## 7. SPECIFICATIONS

Feature	Detail
GNSS Chipset	u-blox ZOE-M8Q
Supported Satellites	GPS, GLONASS, QZSS, BeiDou
Location Accuracy	±2.5 meters
Velocity Accuracy	±0.05 m/s
Update Rate	10 Hz
Cold Start Fix Time	29 seconds
Hot Start Fix Time	1 second
Communication Interfaces	Serial, I2C (to WisBlock Core)
Module Dimensions (L x W x H)	23 mm x 10 mm x 2.54 mm (0.86" x 0.37" x 0.1")
Item Weight	0.634 ounces (0.02 Kilograms)
Connectivity Technology	IPEX (for antenna)

## 8. WHAT'S IN THE BOX

The RAK12500 package includes the following components:

- 1x RAK12500 GNSS GPS Location Module
- 1x GPS Antenna

## 9. WARRANTY INFORMATION

The RAK12500 GNSS GPS Location Module comes with a **1-year manufacturer's warranty**. Please retain your proof of purchase for warranty claims. For detailed warranty terms and conditions, please refer to the official RAK Wireless website or contact their customer service.

## 10. SUPPORT


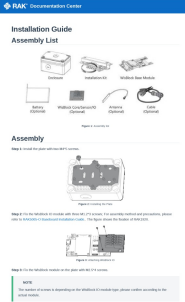



For technical support, additional documentation, or inquiries regarding your RAK Wireless RAK12500 module, please visit the official RAK Wireless website or their Amazon store page:

- [RAK Wireless Amazon Store](#)
- For general inquiries, you may also refer to the product page: [RAK12500 Product Page](#)

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### Related Documents - RAK12500

<div><div><div>RAK12500 Quick Start Guide</div><div>The quick start guide for the RAK12500 GNSS GPS Location Module and its accessories.</div><div><div>Prerequisite</div><div>What Do You Need?</div></div><div><div>Hardware</div><div>Software</div></div><div><div>Product Configuration</div><div>Overview</div></div><div><div>Block Diagram</div></div></div></div>	<div><div><a href="#">RAK19007 WisBlock Base Board 2nd Gen Quick Start Guide</a></div><div>A concise quick start guide for the RAK19007 WisBlock Base Board 2nd Gen, detailing hardware setup, module assembly, power connections, and software configuration for IoT development projects.</div></div>
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	<p><a href="#">RAK19003 WisBlock Base Board Quick Start Guide</a></p> <p>This guide introduces the RAK19003 WisBlock Base Board and provides instructions on its setup, hardware and software configuration, and module assembly/disassembly.</p>
	<p><a href="#">RAKBox-B2 WisBlock Enclosure Installation Guide</a></p> <p>Comprehensive installation and assembly guide for the RAKBox-B2 WisBlock enclosure, detailing component setup, wall mounting, and pole mounting procedures.</p>
	<p><a href="#">WisMesh Board ONE Pocket Quick Start Guide   RAKwireless</a></p> <p>Get started quickly with the RAKwireless WisMesh Board ONE Pocket, a compact Meshtastic node. This guide covers setup, package contents, button functions, and LED indications.</p>
	<p><a href="#">RAK WisMesh Board ONE Pocket Quick Start Guide   Meshtastic Node Setup</a></p> <p>Get started quickly with the RAK WisMesh Board ONE Pocket. This guide provides step-by-step instructions for setting up your Meshtastic node, understanding LED indicators, and button functions.</p>
	<p><a href="#">RAK4270 Module Quick Start Guide: Connecting to The Things Stack and ChirpStack</a></p> <p>A comprehensive quick start guide for the RAK4270 WisDuo LPWAN module, detailing setup, configuration, and integration processes for connecting to LoRaWAN networks like The Things Stack (TTN V3) and ChirpStack using OTAA and ABP methods.</p>