SparkFun 15136

SparkFun GPS-RTK2 Board ZED-F9P (Qwiic) High-Precision Breakout User Manual

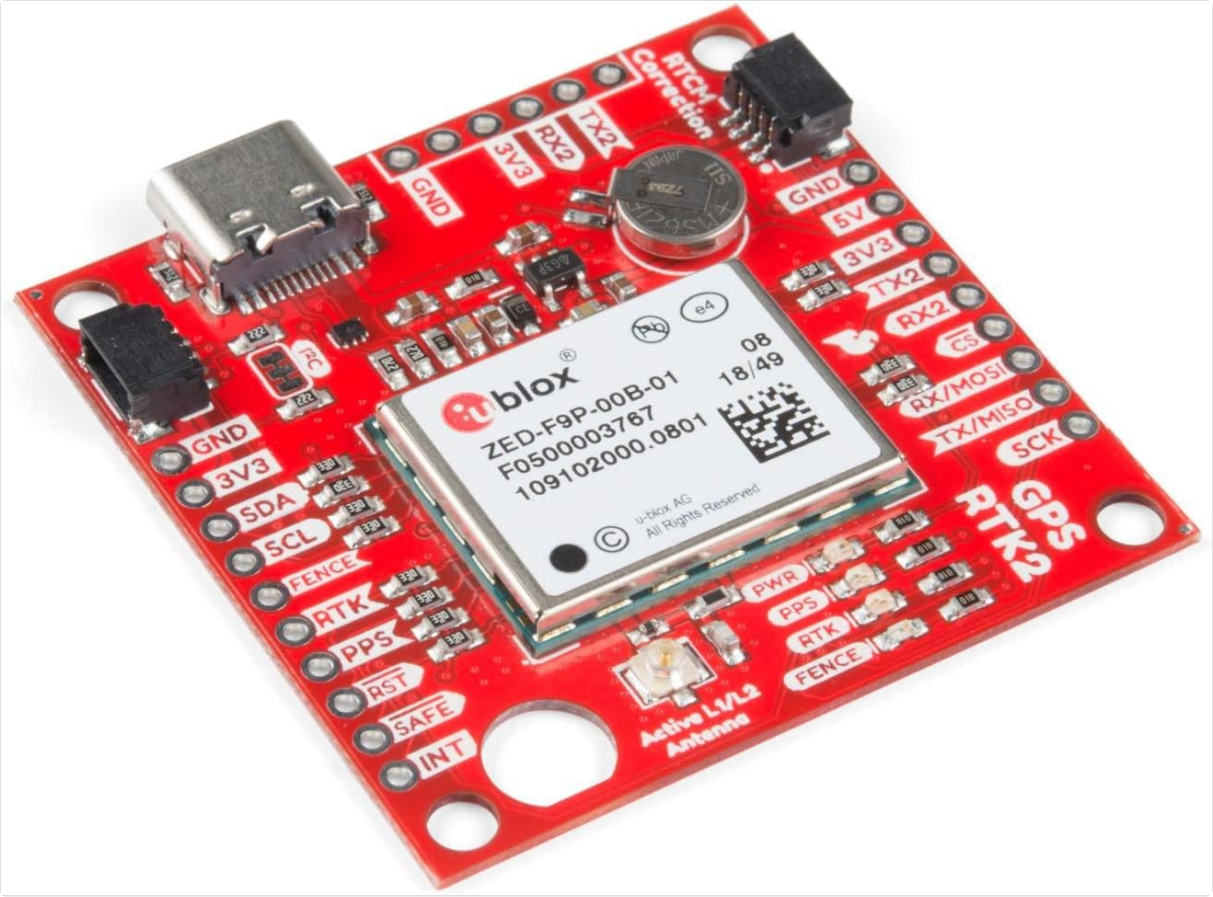
Model: 15136

1. Product Overview

The SparkFun GPS-RTK2 Board, featuring the u-blox ZED-F9P module, is a high-precision Global Positioning System (GPS) breakout board designed for Real-Time Kinematic (RTK) applications. This board offers centimeter-level accuracy for positioning and navigation, suitable for various projects requiring precise location data. It supports both rover and base station operations.

Key Features:

- **Dual Operations:** Capable of 10mm, three-dimensional accuracy for both rover and base station operations.
- **Multiple Configuration Options:** Supports geofencing, variable I2C addresses, and adjustable update rates, including up to 20Hz for high-precision RTK solutions.
- **Five Simultaneous Communication Ports:** Includes USB-C (enumerates as a COM port), UART1 (3.3V TTL), UART2 for RTCM reception (3.3V TTL), I2C (via Qwiic connectors or broken out pins), and SPI.
- **Arduino Library Compatibility:** Facilitates reading latitude, longitude, heading, and speed over I2C without constant serial polling.
- **Fast Time to First Fix:** Achieves a cold start in 25 seconds and a hot start in 2 seconds.



The SparkFun GPS-RTK2 Board, featuring the ZED-F9P module, is a compact, high-precision GPS breakout board designed for Real-Time Kinematic (RTK) applications. It includes a USB-C port, Qwiic connectors, and various pin headers for flexible integration.

2. Getting Started: Setup

2.1 Package Contents

The SparkFun GPS-RTK2 Board package includes:

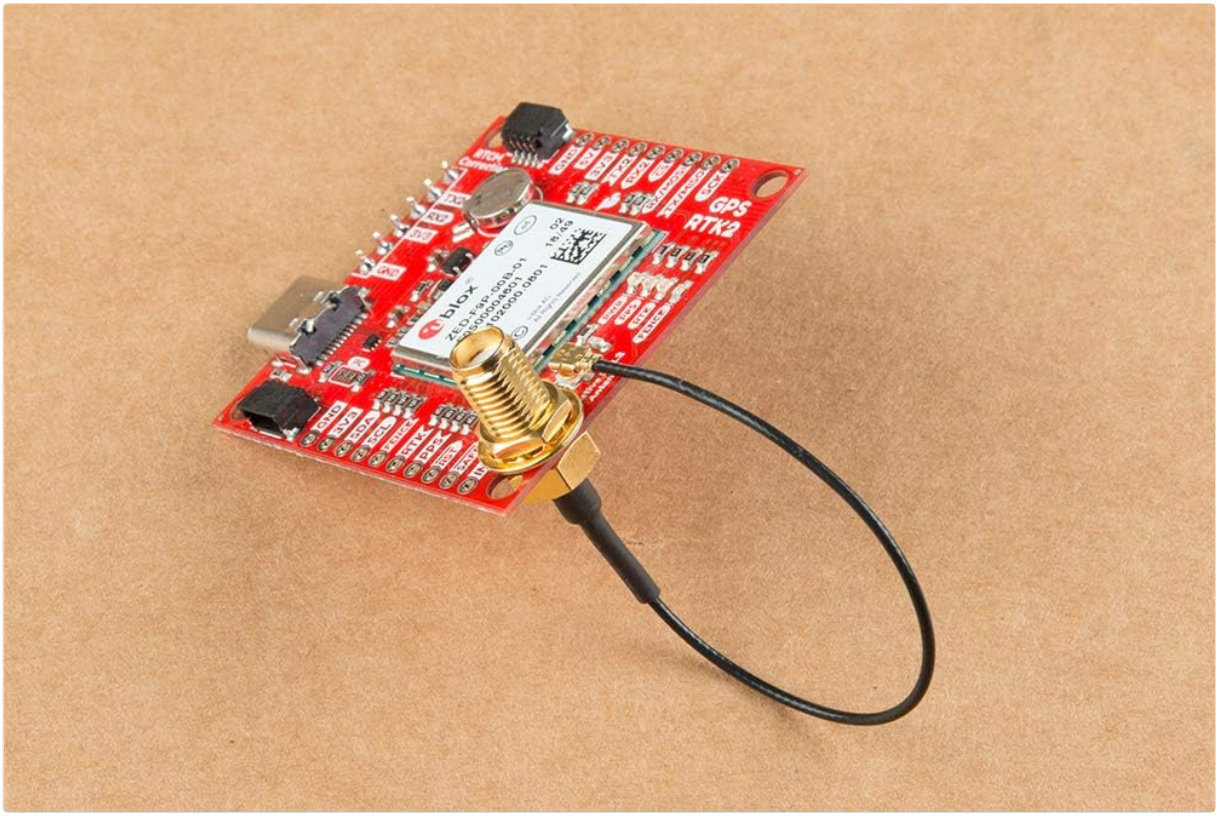
- SparkFun GPS-RTK2 Board (ZED-F9P)
- Rechargeable backup battery (pre-installed)

Note: Cables, external antennas, and microcontrollers are not included and must be acquired separately.

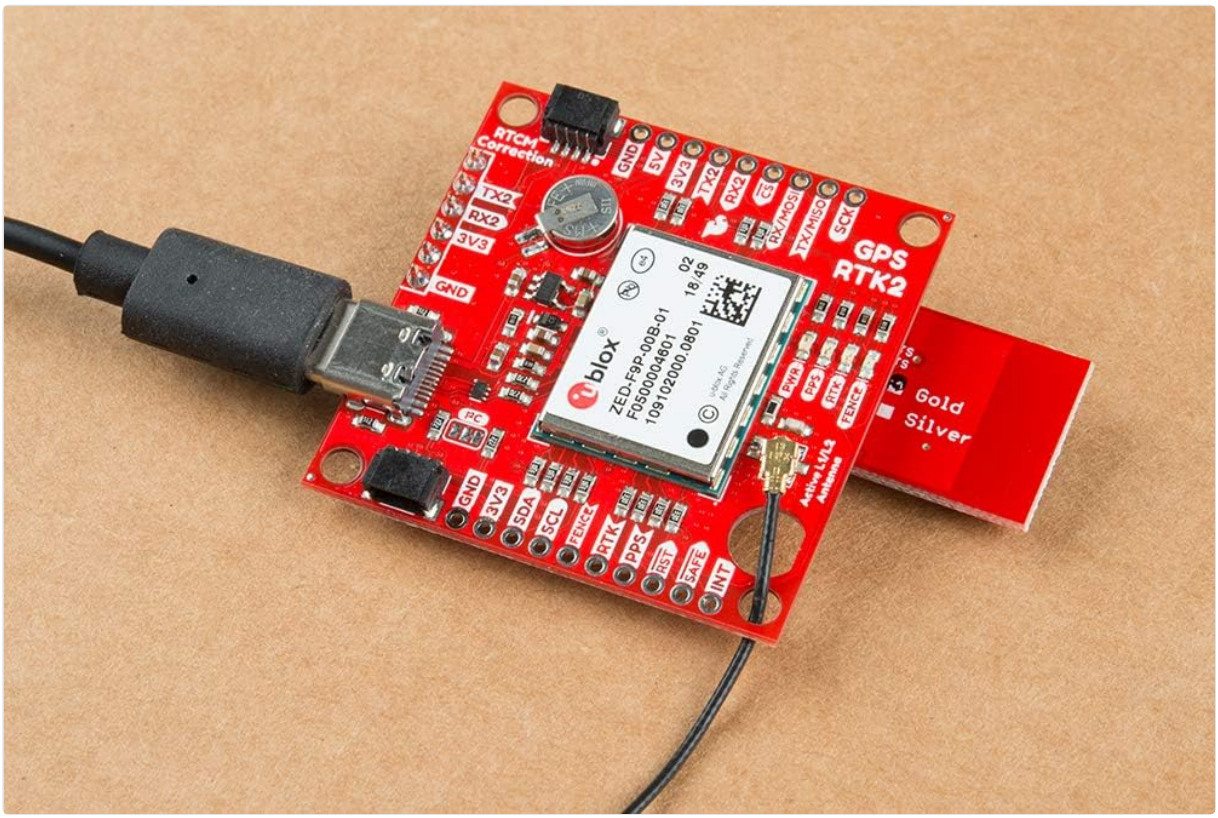
2.2 Hardware Connections

To begin using your GPS-RTK2 board, connect the necessary components:

1. **Antenna Connection:** Connect a compatible L1/L2 GNSS antenna to the u.FL connector on the board. Ensure the connection is secure.
2. **Power and Data (USB-C):** Connect the board to a computer or power source using a USB-C cable. The USB-C port provides power and allows communication with the board, enumerating as a COM port.
3. **Qwiic Connection (Optional):** For easy I2C communication, use a Qwiic cable to connect the board to a Qwiic-enabled microcontroller or host device.
4. **Other Interfaces (Optional):** Utilize the broken-out pins for UART, SPI, or additional I2C connections as required by your application.



The SparkFun GPS-RTK2 Board is shown with an external antenna securely connected, ready for operation.



The SparkFun GPS-RTK2 Board is connected to a USB-C cable, illustrating its power and data interface with a host computer or microcontroller.

2.3 Powering the Board

The board can be powered via the USB-C port or through the 3.3V or 5V pins. Ensure your power supply provides stable voltage within the specified operating range. The onboard rechargeable backup battery helps maintain satellite data for faster warm starts.

3. Operating Instructions

3.1 Basic Operation

The ZED-F9P module can operate as both a rover and a base station. For RTK functionality, a base station is required to provide correction data to the rover. The module automatically detects and utilizes available satellite signals (L1 and L2 bands) to achieve high-precision positioning.

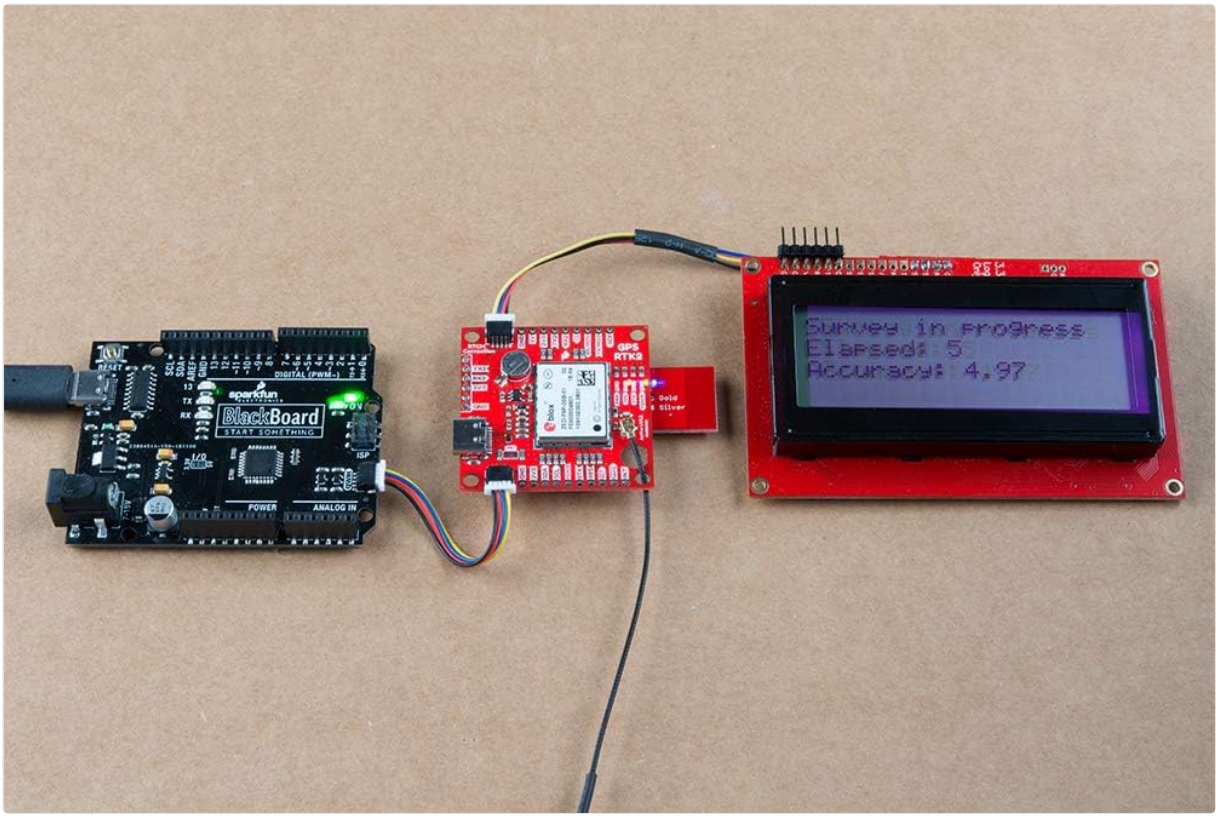
3.2 Communication Interfaces

The board offers multiple communication options:

- **USB-C:** Primary interface for configuration and data output. Connects to a computer and appears as a virtual COM port.
- **UART1 (3.3V TTL):** General-purpose serial communication for NMEA or UBX protocol data.
- **UART2 (3.3V TTL):** Dedicated for receiving RTCM correction data from a base station.
- **I2C (Qwiic):** Simplifies connection to Qwiic-enabled devices for data retrieval.
- **SPI:** High-speed serial interface for advanced applications.

3.3 Arduino Library Integration

SparkFun provides an Arduino library for easy integration with microcontrollers. This library allows you to read essential GPS data such as latitude, longitude, heading, and speed over the I2C interface, reducing the need for constant serial polling and simplifying code development.



A comprehensive setup featuring the SparkFun GPS-RTK2 Board connected to an Arduino microcontroller and an LCD display, which shows 'Survey in progress', indicating active RTK positioning.

3.4 Configuration Options

The ZED-F9P module offers extensive configuration options via u-center software or through commands sent over its communication interfaces. These options include:

- **Geofencing:** Define virtual boundaries for location-based alerts or actions.

- **Variable I2C Address:** Adjust the I2C address to avoid conflicts with other devices on the bus.
- **Update Rates:** Configure the frequency at which position data is output, up to 20Hz for RTK.
- **Message Configuration:** Enable or disable specific NMEA or UBX messages.

4. Maintenance

The SparkFun GPS-RTK2 Board is designed for durability, but proper care ensures longevity and optimal performance:

- **Environmental Protection:** Avoid exposing the board to extreme temperatures, moisture, or corrosive environments.
- **Physical Handling:** Handle the board by its edges to prevent damage to components or static discharge.
- **Backup Battery:** The onboard rechargeable backup battery helps maintain satellite data for faster warm starts. No user maintenance is typically required for this component.
- **Cleaning:** If necessary, gently clean the board with a soft, dry brush or compressed air. Avoid liquids.

5. Troubleshooting

If you encounter issues with your SparkFun GPS-RTK2 Board, consider the following:

- **No Fix/Poor Accuracy:**
    - Ensure the antenna is properly connected and has a clear view of the sky.
    - Verify that the antenna is an L1/L2 compatible GNSS antenna.
    - Check for obstructions that might block satellite signals.
    - For RTK, confirm the base station is operational and transmitting RTCM correction data, and the rover is receiving it.
- **Communication Issues:**
    - **USB-C:** Ensure correct drivers are installed on your computer. Verify the COM port is recognized.
    - **UART/I2C/SPI:** Double-check wiring connections, baud rates, and I2C addresses. Ensure your microcontroller code is correctly configured for the chosen interface.
- **Power Problems:**
    - Confirm the power supply is providing the correct voltage (3.3V or 5V) and sufficient current.
    - Check for any short circuits or incorrect wiring.
- **Slow Time to First Fix (TTFF):**
    - A cold start (first power-up or after long periods without power) can take up to 25 seconds. Subsequent hot starts should be faster (around 2 seconds) due to the backup battery.
    - Ensure the backup battery is charged (it charges when the main power is applied).

6. Specifications

Feature	Specification
Brand	SparkFun

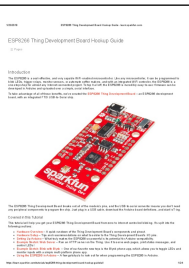
Feature	Specification
Model Name	GPS-RTK2
Item Model Number	15136
Product Dimensions (LxWxH)	1.77 x 1.77 x 0.51 inches
Item Weight	0.32 ounces
Connectivity Technology	USB
Wireless Type	Bluetooth (Note: This refers to the module's capability, not necessarily an active Bluetooth interface on the breakout board itself without additional components)
Processor Brand	Atmel (likely referring to a supporting microcontroller, not the ZED-F9P itself)
Number of Processors	1
Batteries	1 Lithium Metal battery required (included, for backup)
Included Components	Rechargeable backup battery

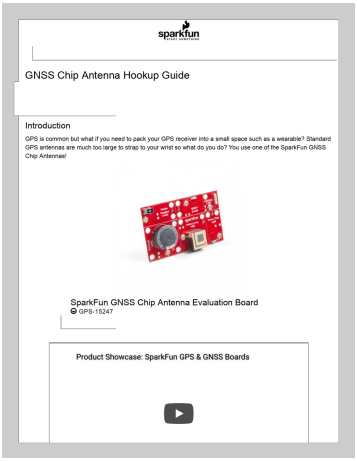
7. Warranty and Support

For warranty information and technical support, please refer to the official SparkFun Electronics website or contact their customer service directly. Product documentation, tutorials, and community forums are also available on the SparkFun website to assist with setup and advanced usage.
Visit the SparkFun Store on Amazon for more products and information.

Related Documents - 15136

	SparkFun MicroMod Asset Tracker Carrier Board Hookup Guide A comprehensive guide to setting up and using the SparkFun MicroMod Asset Tracker Carrier Board, featuring LTE-M, GNSS, and various sensors for IoT applications. Learn about hardware overview, pinouts, solder jumpers, processor compatibility, assembly, software setup, and examples.

	[SparkFun Tinker Kit Circuit Guide: Your Introduction to Electronics and Programming] Discover the SparkFun Tinker Kit, an educational electronics toolkit. This guide offers 11 circuits with the RedBoard Qwiic, teaching programming, robotics, and physical computing for beginners.
	[SparkFun Inventor's Kit SIK Guide: Your Introduction to Electronics and Physical Computing] Explore the world of electronics with the SparkFun Inventor's Kit (SIK) for the SparkFun RedBoard. This comprehensive guide provides step-by-step instructions for 16 circuits, teaching programming, physical computing, and DIY electronics for beginners and educators.
	[SparkFun Inventor's Kit SIK Guide: Learn Electronics with RedBoard] Explore 16 hands-on circuits with the SparkFun Inventor's Kit for the RedBoard. This guide provides step-by-step instructions for beginners to learn electronics, programming, and physical computing using Arduino.
	[ESP8266 Thing Development Board Hookup Guide: Get Started with IoT] Learn how to set up and use the ESP8266 Thing Development Board with Arduino. This guide covers hardware overview, setup, programming examples for web servers and Blynk, and troubleshooting for your IoT projects.
	[Getting Started with SparkFun Blynk Board and Blynk App] A step-by-step guide to setting up the SparkFun Blynk Board with the Blynk mobile application, covering project creation, hardware selection, and Wi-Fi connection.



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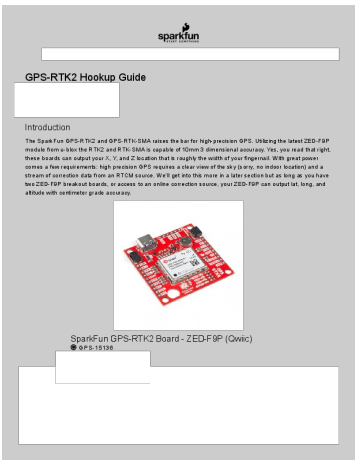

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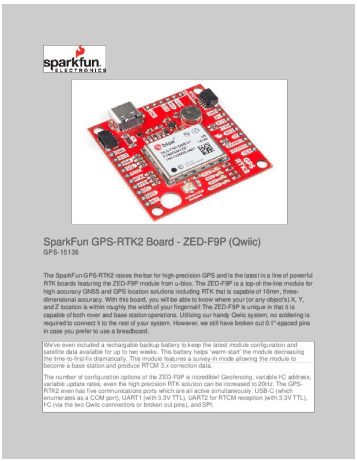

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SparkFun GPS-RTK2 Board - ZED-F9P Qwiic GPS-**15136** The SparkFun GPS-RTK2 raises the bar for high-precision GPS and is the latest in a line of powerful RTK boards featuring the ZED-F9P module from u-blox. The ZED-F9P is a top-of-the-line module for high accuracy GNSS and GPS location solutions inclu...

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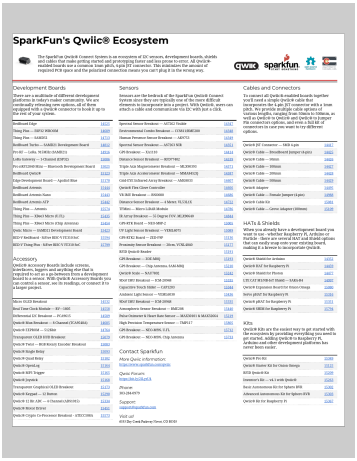

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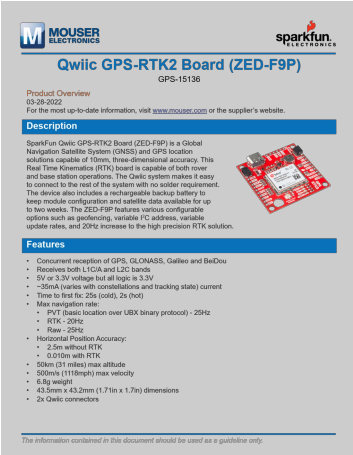
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Qwiic GPS-RTK2 Board (ZED-F9P)

GPS-15136

Product Overview
03-28-2022
For the most up-to-date information, visit www.mouser.com or the supplier's website.

Description

SparkFun Qwiic GPS-RTK2 Board (ZED-F9P) is a Global Navigation Satellite System (GNSS) and GPS location solutions capable of 10mm, three-dimensional accuracy. This Real Time Kinematics (RTK) board is capable of both rover and base station operations. The Qwiic system makes it easy to connect to the rest of the system with no solder requirement. The device also includes a rechargeable backup battery to keep module configuration and satellite data available for up to two weeks. The ZED-F9P features various configurable options such as geofencing, variable I²C address, variable update rates, and 20Hz increase to the high precision RTK solution.

Features

- Concurrent reception of GPS, GLONASS, Galileo and BeiDou
- Receives both L1C/A and L2C bands
- 5V or 3.3V voltage but all logic is 3.3V
- ~35mA (varies with constellations and tracking state) current
- Time to first fix: 25s (cold), 2s (hot)
- Max navigation rate:
  - PVT (basic location over UBX binary protocol) - 25Hz
  - RTK - 20Hz
  - Raw - 25Hz
- Horizontal Position Accuracy:
  - 2.5m without RTK
  - 0.010m with RTK
- 50km (31 miles) max altitude
- 500m/s (1116mph) max velocity
- 6.8g weight
- 43.5mm x 43.2mm (1.71in x 1.7in) dimensions
- 2x Qwiic connectors

The information contained in this document should be used as a guideline only.

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Product Overview Qwiic GPS RTK2 Board ZED F9P SparkFun Mouser ProductOverview mouser ee Docs |||

Qwiic GPS-RTK2 Board ZED-F9P GPS-**15136** Product Overview 03-28-2022 For the most up-to-date information, visit www.mouser.com or the supplier s website. Description SparkFun Qwiic GPS-RTK2 Board ZED-F9P is a Global Navigation Satellite System GNSS and GPS location solutions capable of 10mm, thr...

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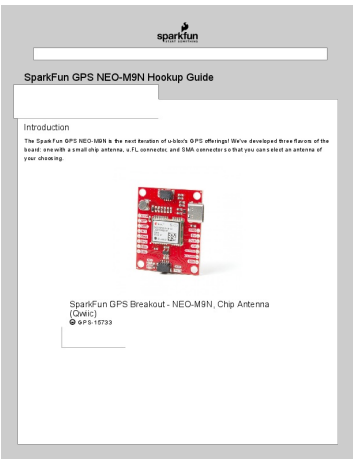
sparkfun

SparkFun GPS NEO-M9N Hookup Guide

Introduction

The SparkFun GPS NEO-M9N is the next iteration of u-blox's GPS offerings! We've developed three flavors of the board: one with a small chip antenna, u.FL connector, and SMA connector so that you can select an antenna of your choosing.

SparkFun GPS Breakout - NEO-M9N, Chip Antenna (Qwiic)
GPS-15733

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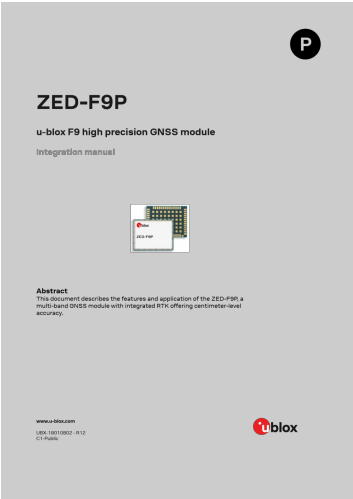
ZED-F9P

u-blox F9 high precision GNSS module

Integration manual

Abstract
This document describes the features and application of the ZED-F9P, a multi-band GNSS module with integrated RTK offering centimeter-level accuracy.

www.u-blox.com

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u-blox ZED-F9P Interface Description Abstract The Interface Description describes the UBX version 27. 11 , NMEA and RTCM protocols and serves as a reference manual for the u-blox ZED-F9P high precision positioning receiver. www.u-blox.com UBX-18010854 - R07 u-blox ZED-F9P Interface Description - ...

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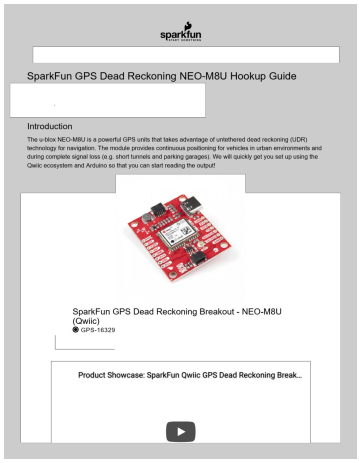

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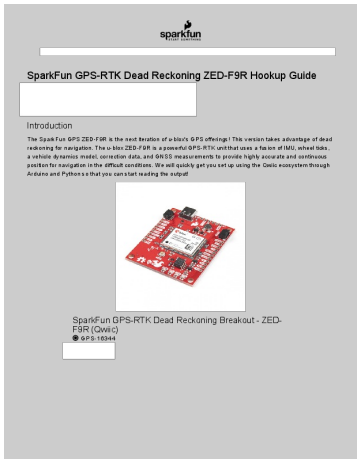

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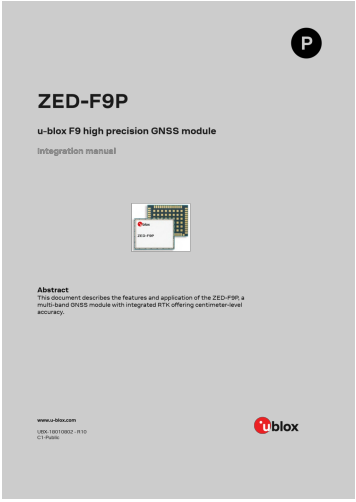

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ZED-F9P u-blox F9 high precision GNSS module Integration manual Abstract This document describes ... butor Click to View Pricing, Inventory, Delivery Lifecycle Information: SparkFun Electronics: GPS-**15136** ...

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