GR-903, Centimeter-level L1/L2 Dual-band GNSS Bluetooth/USB Smart Antenna



Overview

GR-903 is equipped with high-sensitivity, high precision engine of **u-blox ZED-F9P**, GNSS multi-band antenna, backup battery, SPP/BLE in a compact IP67 housing.

Mounted with wide-band antenna, this module supports dual band L1/L2 and multi-satellite systems GPS/GLONASS/BEIDOU/Galileo/QZSS simultaneously in one design.

This receiver exhibits fast RTK fix, reliable performance, high update rate for highly dynamic applications and centimeter accuracy in a small and energy-efficient way. **It could be served as either a RTK rover or RTK base**.

In addition to USB interface, **Bluetooth SPP** profile is also supported for your legacy applications. The BT device name is unique for clearly identification. The BT baud rate could be updated via air by user.

This all-in-one smart antenna allows just plug and play, fast time to market with outstanding performance.

Applications

- UAV
- Automatic farming
- Machine control
- Robotic guidance
- Photogrammetry

Features

- *Based on ZED-F9P high precision engine.*
- ***Plug and play cm-level smart antenna***
- *Dual-Mode Bluetooth Support*
  - *Only SPP enabled by default*
- Built-in L1/L2 band antenna and circuits supporting multiple constellations simultaneously
  - GPS+Galileo+GLONASS+BeiDou
  - SBAS, QZSS
- DGNSS RTCM 10403.3 version 3 messages support for RTK fix.
- High sensitivity^{+}:-167dBm tracking/-148dBm acquisition
- Up to 8Hz update rate for quad-GNSS constellation or 15Hz for dual-GNSS constellations.
- **Spoofing detection / monitoring**
  - Multiple constellatins should be enabled.
- **Jamming / interference indicator**
  - For continuous wave (narrow-band) jammers/interference only
- Magnet option available
  - Disk only without magnet inside
  - Disk and pedestal with embedded magnet
- Pole support for acting as an RTK base
  - Quad-M3x8 screw holes for pole fixing
  - 5/8” survey-pole adapter option available
- Ardupilot/PX4-compliant
- Windows location sensor support
- OMA SUPL compliant A-GPS support
- SBAS (WAAS, EGNOS, MSAS, GAGAN) support
- Excellent EMI protection

NaviSys Technology Corp. https://www.navisys.com.tw/
Tel : +886-3-5632598 Fax: +886-3-5632597
Sales contact: sales@navisys.com.tw Technical support: service@navisys.com.tw
Address: 2F, No.56, Park Ave. II, Hsinchu Science Park, 30844, Taiwan (R.O.C.)

Technical Specifications

Receiver Performance Data+

Supported GNSS Constellations	u-blox ZED-F9P GPS/SBAS/QZSS: (MHz) L1 C/A (1575.42), L2C (1227.60) GLONASS: (MHz) L1OF (1602+k*0.5625, k= -7,…,5,6), L2OF (1246+k*0.4375, k= -7,…,5,6), Galileo: (MHz) E1-B/C (1575.42), E5b (1207.140) BeiDou: (MHz) B1I (1561.098) B2I (1207.140)
Position Accuracy (RTK baseline up to 20km; 24 hours static)	Horizontal: RTK: 1 cm+1ppm CEP SBAS: 1 m CEP PVT: 1.5 m CEP Vertical: (result with 1km baseline) RTK: 1 cm+1ppm R50
Velocity Accuracy	<0.05 m/s (speed) <0.3° (heading) (50% @ 30 m/s for dynamic operation)
Time Pulse Signal	0.25Hz...10MHz3 RMS: 30ns, 99%: 60ns
Time To First Fix (TTFF) Hot start Aided start Cold start	Autonomous (All at -130dBm) 2sec (GPS+Glonass+Galileo+BeiDou) 2sec (GPS+Glonass+Galileo+BeiDou) 25sec (GPS+Glonass+Galileo+BeiDou)
Sensitivity	GPS+Glonass+Galileo+BeiDou Acquisition: -148 dBm Reacquisition: -160 dBm Tracking & navigation: -167 dBm
Max. Update Rate	a. GPS+Glonass+Galileo+BeiDou b. GPS+BeiDoui c. GPS RTK: 8Hz@a, 15Hz@b, 20Hz@c PVT: 10Hz@a, 25Hz@b, 25Hz@c RAW: 20Hz@a, 25Hz@b, 25Hz@c
RTK Convergence Time	<10s@a&b, <30s@c Depends on atmospheric conditions, baseline length, multipath conditions, satellite visibility and geometry
Moving Base RTK Performance	a. GPS+Glonass+Galileo+BeiDou b. GPS+BeiDoui c. GPS Max. update rate: 8Hz@a, 10Hz@b, 10Hz@c Heading accuracy: 0.4°@a,b,c
Max. Altitude	50,000 m
Max. Velocity	500 m/s
Protocol Support	NMEA 0183 up to v 4.11, ASCII GGA, GLL, GSA, GSV, RMC, VTG UBX: u-blox proprietary, binary RTCM 3.3: binary
Augmentation System Support	QZSS: Support L1S SLAS Correction data broadcasted on L1 SBAS: WAAS, EGNOS, MSAS, GAGAN DGNSS: RTCM 10403.3 ● Rover mode messages: (RTCM) 1001~1012, 1033, 1074, 1075, 1077, 1084, 1085, 1087,1094, 1095, 1097, 1124, 1125, 1127, 1230, 4072.0 ● Base mode messages: (RTCM) 1005, 1074, 1077, 1084, 1087, 1094, 1097, 1124, 1127, 1230, 4072.0, 4072.1
Dynamics	< 4g

+ Note. According to IC Spec

BT Data+ -

Band	2.4 GHz ISM
Data Rate	350 kbps, Bluetooth LE 1 Mbps, Bluetooth BR/EDR
Output Power	8 dBm EIRP
Sensitivity	-88 dBm

Electrical Data

Power Supply	3.3 ~ 5.5 VDC
Power Consumption (10Hz update rate)	120mA/Average tracking (USB) # of SVs tracked: L1: 37, L2: 27

Environmental Data

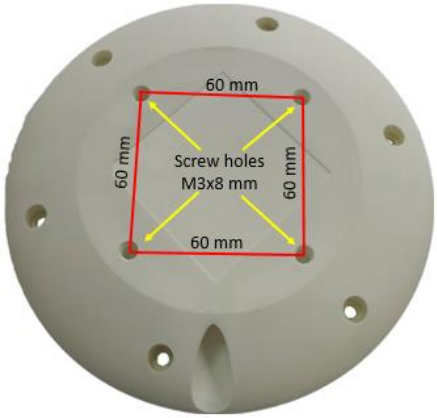
Operating temperature	-40 ~ 85℃ except battery: -20~60℃
Storage temperature	-40 ~ 85℃ except battery: -20~60℃
Waterproof	IPX7
Operating humidity	5% ~ 95% non-condensing

Mechanical Data:

- Φ116*24.6 (mm) for disk without pedestal
- Φ116*56.8 (mm) for disk with pedestal



- Fixing screw holes, bottom of disk:



5/8”-11 Pole Adapter



Other Data

Cable Length	1.5 m, default, customizable
Weight	191.6 g w/o pedestal, disk only 235.6 g w/ pedestal

Interface



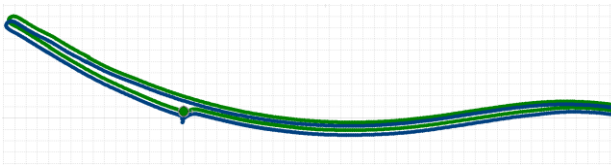
Pin	USB A type Male Plug
1	VDD 5V
2	D-
3	D+
4	GND

LED Indication

Green LED for GNSS fix	**ON**, position not fixed, **Blinking**, position fixed, **OFF**, power is OFF
Orange LED for RTK fix	**ON**, RTK fixed **Blinking**, RTK under fixing **OFF**, not in RTK mode, i.e. RTCM correction data is not available.

Road Test (Moving Base)

- Fix two GR-903Vs 50-cm apart on car roof. One configured as moving base (back), another as rover (front).
- Drive a round-trip along a city road.



- Around 24.7817339,121.0416466

- Check all the relative data for the validity.
- Result
  - Average relative distance is 49.91cm,
  - 1-sigma 0.36cm, 3-sigma 100%.
  - All the relative distance and heading shown by u-blox protocol are all valid
- It shows good validity for moving baseline of 50cm.

Mission Planner/ Ardupilot

- Serving as an RTK Rover



- Serving as an RTK Base



Ordering Information

GR-903X, X = U, V etc.

U	Disk Only, w/o Pedestal
V	Disk + Pedestal (w/ magnet)

*This document is subject to change without notice.