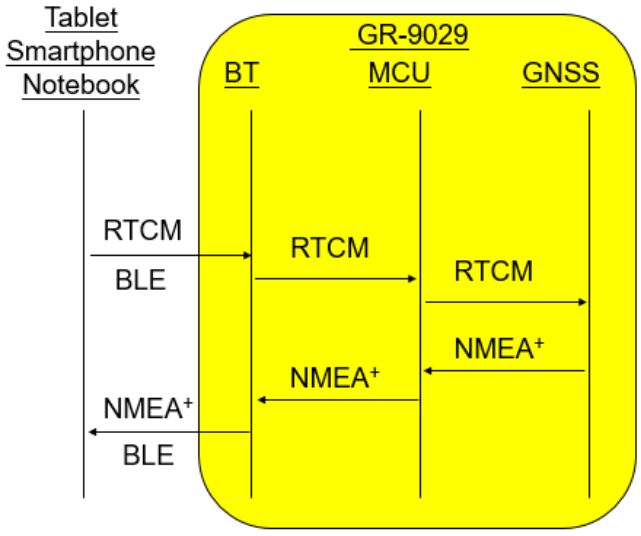
# GR-9029, BLE5, L1/L2 GNSS RTK Receiver w/ Buttons & Rechargeable Battery

## Overview

GR-9029 is a cm-level high-precision GNSS receiver with Bluetooth Low Energy (BLE) communication capability. Under normal open-sky working environment, the precise RTK[!] fix could be achieved in seconds.

GR-9029 is based on **u-blox ZED-F9P** multiband GNSS receiver, integrated with multiband GNSS antenna, BLE5 module & antenna, rechargeable battery, charging circuit, POI button, power switch, and USB-type C interface to make it a self-contained cm-level GNSS receiver.

APP on devices like smartphones, tablets, notebooks etc. could communicate with GR-9029 via BLE to get the RTK precise positions which could be used for precise **measurement**, navigation, data logging etc.




In addition to the receiver, the **BLERTK** APP for iOS and Android is provided for easy setup, position/path log, log file management, log display with different maps, stakeout, and many other functions.




iOS Android

A control cable with button on it could be used to control power ON/OFF, tag POI (Point Of Interest) position etc.

[!] GR-9029 plays as a RTK rover and requires RTCM calibration data from a private base or a public NTRIP caster. The matching GR-9028 plays the role of a private RTK base. GR-9028 is portable and easy to setup with BLERTK. Precise known position could be entered to GR-9028 to save the time required for accurate survey-in.

## Applications

- Precise positioning
- Precise distance measurement
- Precise route navigation
- Precise data logger with 3D stakeout

## Features

- *Based on high-performance components*
  - *u-blox ZED-F9P multi-band GNSS*

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- *BLE5 module with antenna*
- *Made in Japan rechargeable battery cell*

- *All in one small compact UFO style device*
  - *Disk with size of Φ116*24.6 (mm)*
- *Magnet mount option with a pedestal*
- *Supported GNSS Constellations*
  - *GPS: L1C/A, L2C*
  - *GLONASS: L1OF, L2OF*
  - *Galileo: E1-B/C, E5b*
  - *BeiDou (BDS): B1I, B2I*
- Supported Augmentation Systems
  - QZSS over L1 C/A, L2C, L1S
  - SBAS (WAAS, EGNOS, MSAS, GAGAN)
- *Accuracy of RTK rover:* 1 cm+1ppm CEP
- High sensitivity+:-167dBm tracking/-148dBm acquisition
- Up to 10Hz update rate for quad-GNSS constellation
- **Spoofing detection / monitoring**
  - Multiple constellatins should be enabled.
- **Jamming / interference indicator**
  - For continuous wave (narrow-band) jammers/interference only
- BLE 5.2
  - Up to 2 Mbps
  - Advertising extensions
  - Channel Selection Algorithm #2 (CSA #2)
- Rechargeable battery
  - Lithium-ion, 900mAh
  - Charged by USB type-C connector
- A button on control cable for power switch and POI
- LED to indicate working status

## Technical Specifications

### Receiver Performance Data+ - u-blox ZED-F9P

| | |
|---|---|
| Supported | GPS/SBAS/QZSS: (MHz) |
| GNSS Constellations | L1 C/A (1575.42),<br>L2C (1227.60)<br>GLONASS:<br>L1OF (1602+k*0.5625, k= -7,…,5,6),<br>L2OF (1246+k*0.4375, k= -7,…,5,6),<br>Galileo:<br>E1-B/C (1575.42),<br>E5b (1207.140)<br>BeiDou:<br>B1I (1561.098)<br>B2I (1207.140) |
| Position Accuracy (RTK baseline up to 20km; 24 hours static) | Horizontal:<br>RTK: 1 cm+1ppm CEP<br>SBAS: 1 m CEP<br>PVT: 1.5 m CEP<br>Vertical: (result with 1km baseline)<br>RTK: 1 cm+1ppm R50 |
| Velocity Accuracy | <0.05 m/s (speed) GPS+GLONASS/BDS<br><0.3° (heading) GPS+GLONASS/BDS<br>(50% @ 30 m/s for dynamic operation) |
| Time Pulse Signal | 0.25Hz...10MHz<br>RMS: 30ns, 99%: 60ns |
| Time To First Fix (TTFF)<br>Hot start<br>Aided start<br>Cold start | Autonomous (All at -130dBm)<br><br>2sec (GPS+Glonass+Galileo+BeiDou)<br>2sec (GPS+Glonass+Galileo+BeiDou)<br>25sec (GPS+Glonass+Galileo+BeiDou) |
| Sensitivity | GPS+Glonass+Galileo+BeiDou<br>Acquisition: -148 dBm<br>Reacquisition: -160 dBm<br>Tracking & navigation: -167 dBm |
| Max. Update Rate | a. GPS+Glonass+Galileo+BeiDou<br>b. GPS+BeiDoui<br>c. GPS<br>RTK: 8Hz@a, 15Hz@b, 20Hz@c<br>PVT: 10Hz@a, 25Hz@b, 25Hz@c |

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| | |
|---|---|
| RTK Convergence Time | RAW: 20Hz@a, 25Hz@b, 25Hz@c<br><10s@a&b, <30s@c<br>Depends on atmospheric conditions, baseline length, GNSS antenna, multipath conditions, satellite visibility and geometry |
| Moving Base RTK Performance | a. GPS+Glonass+Galileo+BeiDou<br>b. GPS+BeiDoui<br>c. GPS<br>Max. update rate:<br>8Hz@a, 10Hz@b, 10Hz@c<br>Heading accuracy: 0.4°@a,b,c |
| Max. Altitude | 50,000 m |
| Max. Velocity | 500 m/s |
| Protocol Support<br><br><br><br>Default Settings | NMEA 0183 up to v 4.11, ASCII<br>GGA, GLL, GSA, GSV, RMC, VTG, TXT<br>UBX: u-blox proprietary, binary<br>RTCM 3.3: binary<br>● GNRMC output once per second<br>● PUBX 10Hz<br>● Button pressed or not indication |
| Augmentation System Support | QZSS: Support L1S SLAS<br>Correction data broadcasted on L1<br>SBAS:<br>WAAS, EGNOS, MSAS, GAGAN<br>DGNSS: RTCM 10403.3<br>● Rover mode messages: (RTCM) 1001~1012, 1033, 1074, 1075, 1077, 1084, 1085, 1087, 1094, 1095, 1097, 1124, 1125, 1127 |
| Dynamics | < 4g |

**+ Note. According to IC Spec**

## BLE Data+ - nRF52832

| | |
|---|---|
| Band | 2.4 GHz ISM |
| Data Rate | 2 Mbps and 1 Mbps Bluetooth LE |
| Output Power | Programmable: +4 to -20 dBm in 4 dB steps |
| Sensitivity | -96 dBm Bluetooth LE 1 Mbps<br>-89 dBm Bluetooth LE 2 Mbps |
| RSSI | 1 dB resolution |
| Link Budget | 100 dB |

## Environmental Data

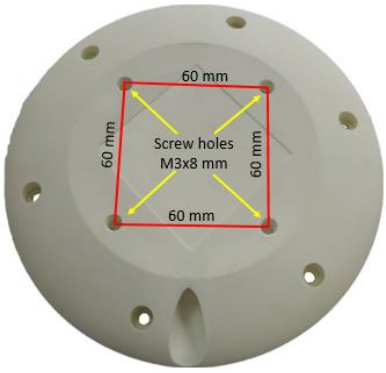
| | |
|---|---|
| Operating temperature | -40 ~ 85℃<br>except battery: -10~60℃ |
| Storage temperature | -40 ~ 85℃ |
| Waterproof | IPX7 |

## Mechanical Data:

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




  - Magnet inside pedestal for fixing
- Fixing screw holes, bottom of disk:




  - E.g. to fix the pedestal (magnets embedded) via screw holes (GR-9029Q).
  - E.g. to fix a metal plate via screw holes and then connect it to a rod or a tripod for measurement.
  - E.g. to fix to a GNSS pole via female 5/8”x11 screw thread connector.



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- Control cable length could be customized

**Other Data** (For Indicative Reference Only)

| | |
|---|---|
| Working time | 6 hours, fully charged new device |
| Charging time | 1.5 hours with 2A charger |
| BLE distance | 36m line of sight |

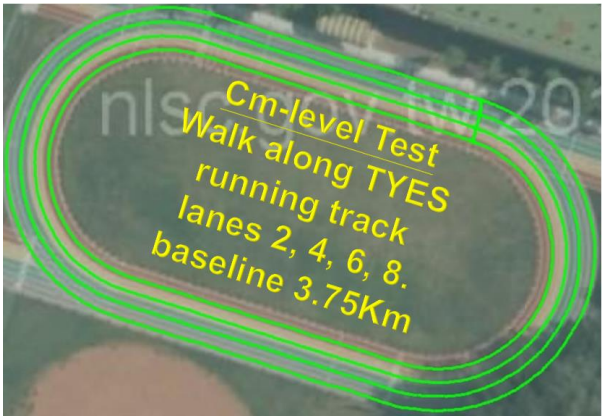
## Interface




- USB type-C connector for charging
- Button
  - Power on: a tapping for power on
  - Power off: hold until LED OFF
  - POI tagging: a tapping as power is on

**Walk Test** (Field Test Example)

- The used RTK Base was setup with GR-901 at Navisys office.
- Bring a self-powered RTK rover GR-9029 to the running track of Tong Yuan Elementary School at Hsinchu City, Taiwan.
- The baseline is 3.75km.
- Log the walking path with BLERTK APP.
- Walk along left side of lanes 2, 4, 6, 8
- Display the log with BLERTK using NLSC map.




- The logged walking path coincides with the map pretty well as shown above.

## Ordering Information

GR-9029X:

| X= | Pedestal |
|---|---|
| E | - |
| Q | V |

Optional Accessory

| Female 5/8”x11 screw thread connector |
| --- |
|  |

*This document is subject to change without notice.