SW MAPS
GNSS SURVEYOR

Operating Manual
A1-Series

Designed and Manufactured in Nepal by

AVIYAAN
TECH (P) LTD

SW Maps GNSS Surveyor
A1 Series
L1/L2 Dual Frequency Survey GNSS Receiver

Hardware Version 4
Firmware Version 20

Designed and manufactured in Nepal.

Aviyaan Tech (P) Ltd.
254 Shree Ekata Marga, New Baneshwor
Kathmandu-31, Nepal
Phone: +977-1-4583568
Email: info@aviyaantech.com

Contents

Included Products and Accessories

- SW Maps GNSS Surveyor Receiver
- USB-C To USB-A Cable
- USB Charger
- SW Maps GNSS Carrying Case

Software Tools

1. SW Maps GNSS Setup

   The SW Maps GNSS Setup app for Android is used to configure the GNSS receiver settings. Can be downloaded from

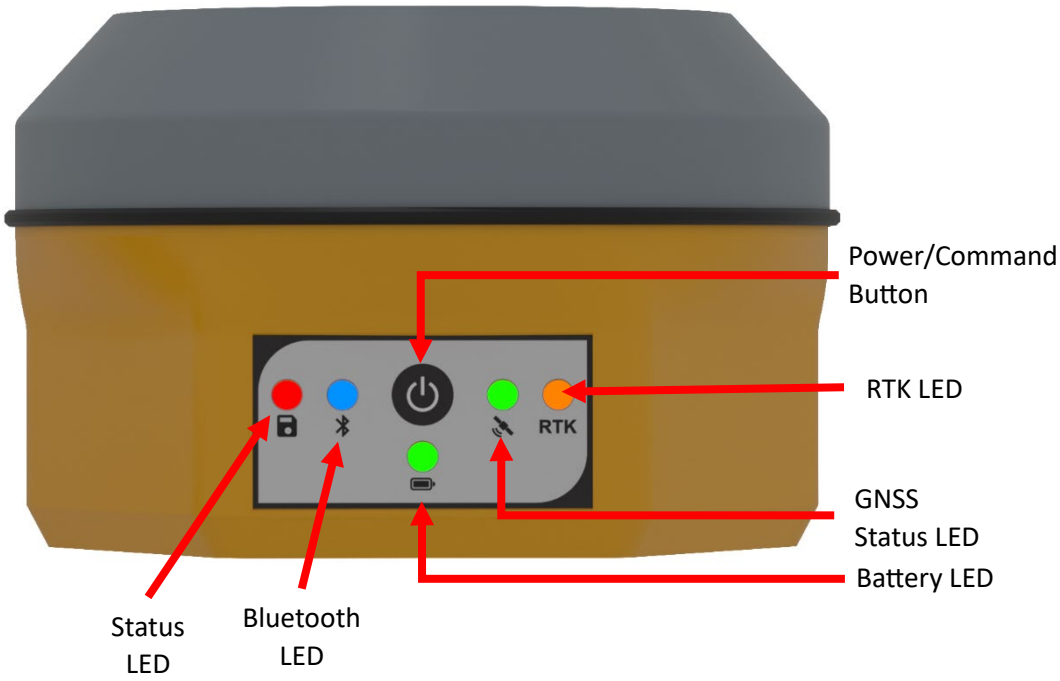
   https://aviyaantech.com/gnss/apps/SwGnssSetup_latest.apk

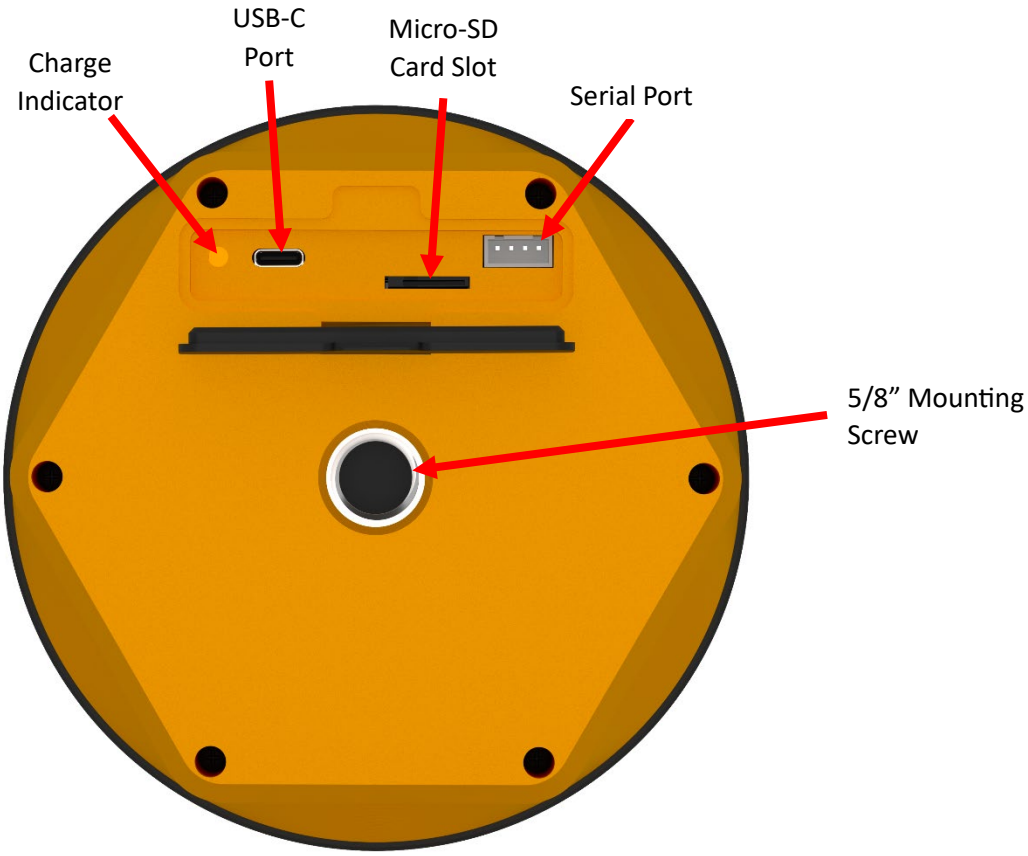
2. SW Maps

   SW Maps is a free Mobile GIS app for GNSS surveying. It is available for both Android and iOS and can be downloaded from the iOS App Store or the Google Play Store.

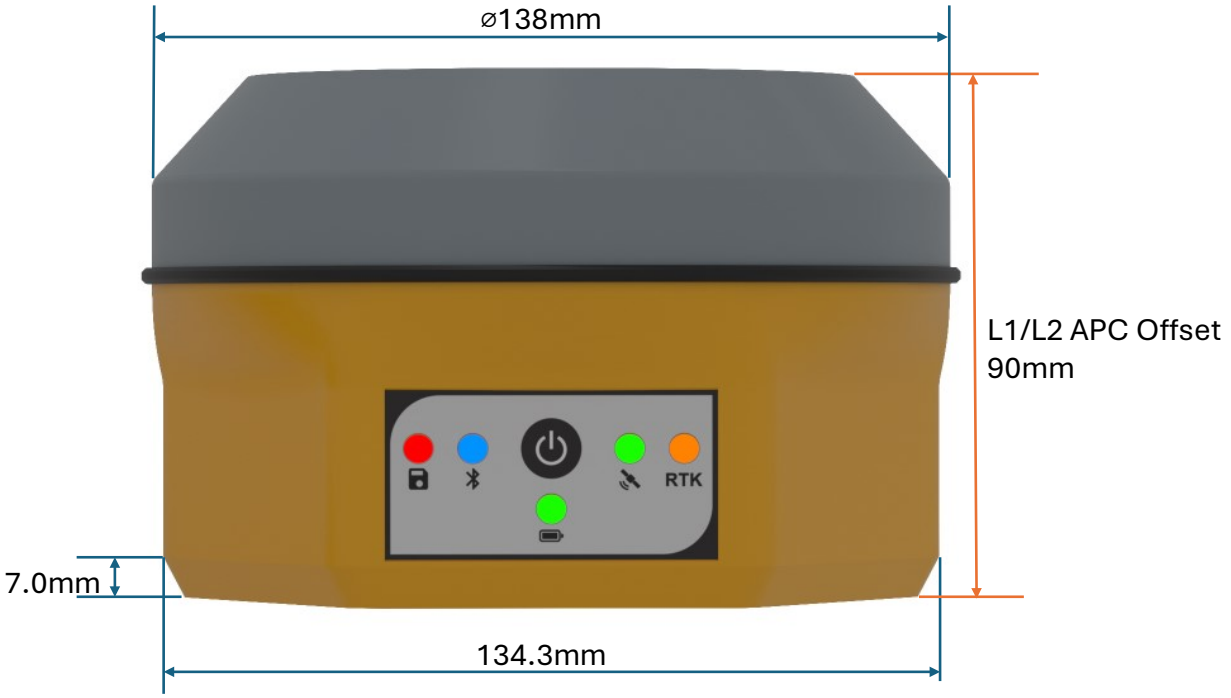
3. SW GNSS
   SW GNSS is a GNSS data post-processing tool. You may use this tool to process the data recorded using the SW Maps GNSS Surveyor.

GNSS Receiver Components





Mechanical Dimensions and Antenna Offset



$$Vertical\ Height = \sqrt{SH^2 - (\frac{0.1343}{2})\text{^}2} - 0.007 + 0.09$$

Basic Operation

Powering on/off the Device

To power on the device, hold the power button for 3 seconds. The LEDs on the front panel will light up.

To power off the device, hold the power button for 3 seconds.

Checking Battery Level

While the device is powered on, the Battery LED will indicate the battery level by different colors. If the battery level is more than 80% the LED glows green, and if less than 20% the LED glows red.

Warning: Do not operate the device when the battery level indicator is glowing red, without connecting an external power source. The battery will take a long time to charge (more than 24 hours) if discharged fully. Make sure that the receiver is turned off when storing it in the carrying bag.

Charging the Battery

The battery on the receiver may be charged using any USB-C charger operating at 5V. The maximum charging current is 1A.

The charge indicator turns on when the device is charging. The indicator turns off once the device is fully charged.

The device may be operated while charging as well. The external source will be used to operate the device while charging the batteries at the same time.

The SW Maps GNSS Surveyor contains a 9000mAh high-capacity battery, which will take a long time to fully charge. Expect charging time of more than 12 hours.

Logging GNSS Data

By default, the receiver is in Rover mode, with NMEA and UBX raw output. In this mode, you may log the data to the MicroSD card.

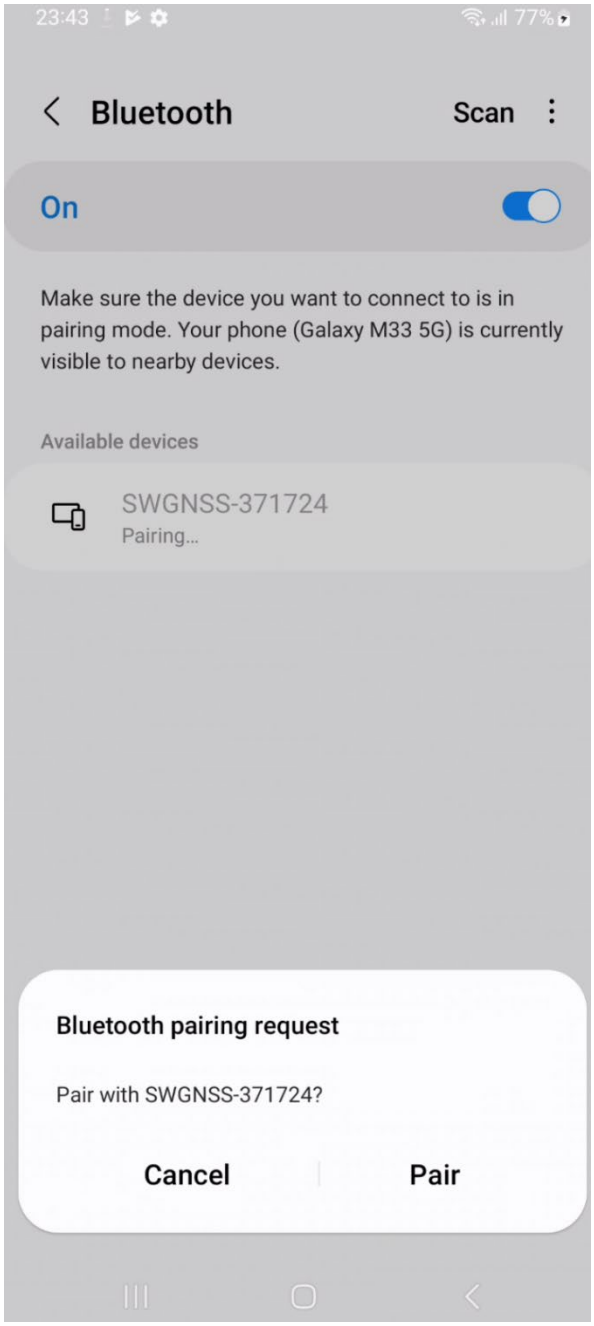
- Insert the MicroSD card into the MicroSD card slot.
- Power on the device
- Wait for a position lock. The GNSS Status LED will start blinking green.
- Tap the Power/Command button twice. The Status LED will glow red while the file is recording.
- Tap the Power/Command button twice again to stop recording.

Warning: Do not insert or remove the MicroSD card while the receiver unit is powered on.

The MicroSD card used with the receiver must be formatted as FAT32. When formatting through Windows, also set the allocation size to "Default Allocation Size". Memory cards up-to 32GB are supported.

Pairing to Android using Bluetooth

The receiver can be paired to Android using the Bluetooth Settings. No passcode is required.



Using the Receiver with SW Maps Android

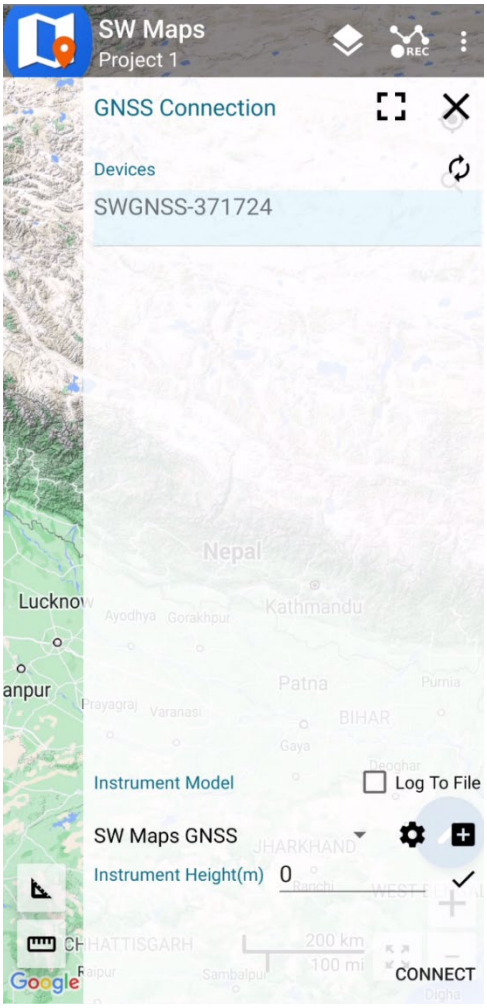
To use the receiver with SW Maps for Android, you must first pair the receiver to the Android device through the Bluetooth settings.

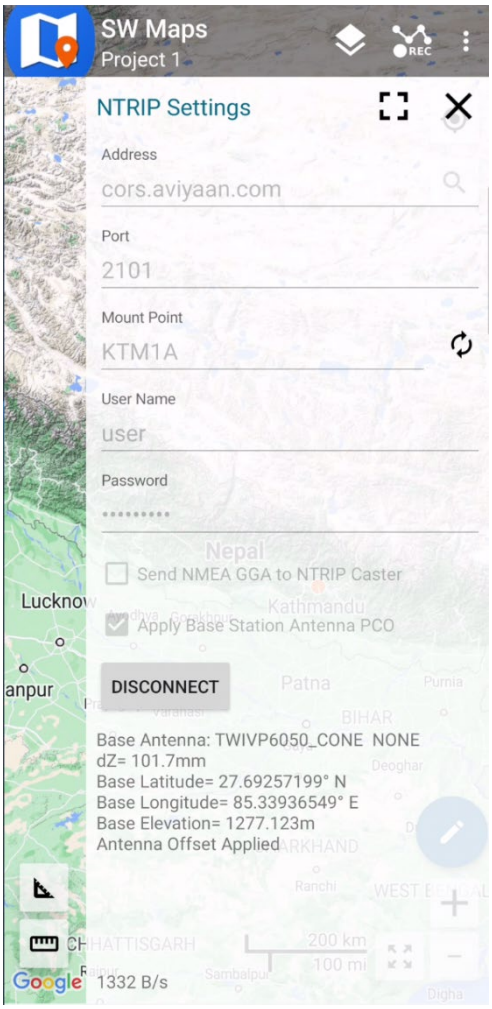
Once paired, you can see the device listed in the Bluetooth GNSS Connection sidebar in SW Maps. Select the receiver, then select “SW Maps GNSS” as the instrument model, enter the antenna height and press “Connect”.

Note: Make sure to add the antenna offset when setting the instrument height. The height of instrument is the sum of the vertical height from the ground to the base of the receiver, and the antenna offset. The antenna offset is indicated on a sticker on the bottom of the receiver.

Once connected to the receiver, you can use the SW Maps built-in NTRIP Client for RTK corrections.

Make sure to enable the “Apply Base Station Antenna PCO” option.

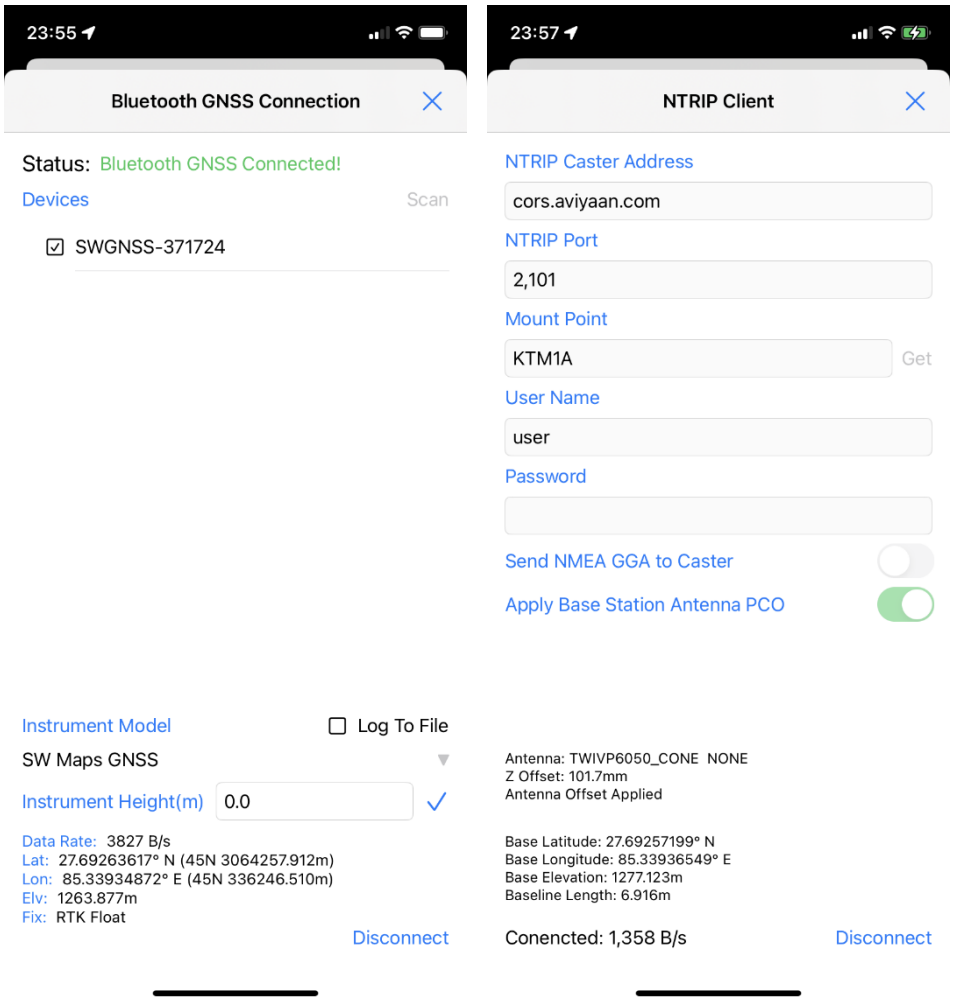




Using the Receiver with SW Maps iOS

To connect the receiver with SW Maps iOS, open the “Bluetooth GNSS Connection” option in SW Maps. Then, press the “Scan” button. The device should appear on the list.

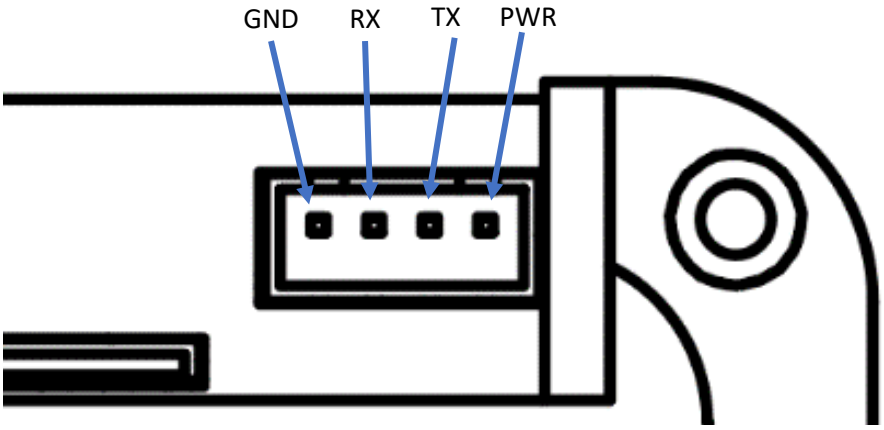
Once connected to SW Maps, you can view the GNSS Status and Skyplot, and also use the built-in NTRIP client for RTK corrections.



Connecting External Equipment to the Serial Port

You can use the serial port to connect any external equipment and provide data to it, or to receive corrections.

The serial port uses a 4-pin JST-XH connector. The pinout is as follows:



The RX and TX pins are at 3.3V logic level. The PWR pin provides 5V when USB is connected, and the battery voltage (3.5-4.2V) when not. The maximum output current is 1A.

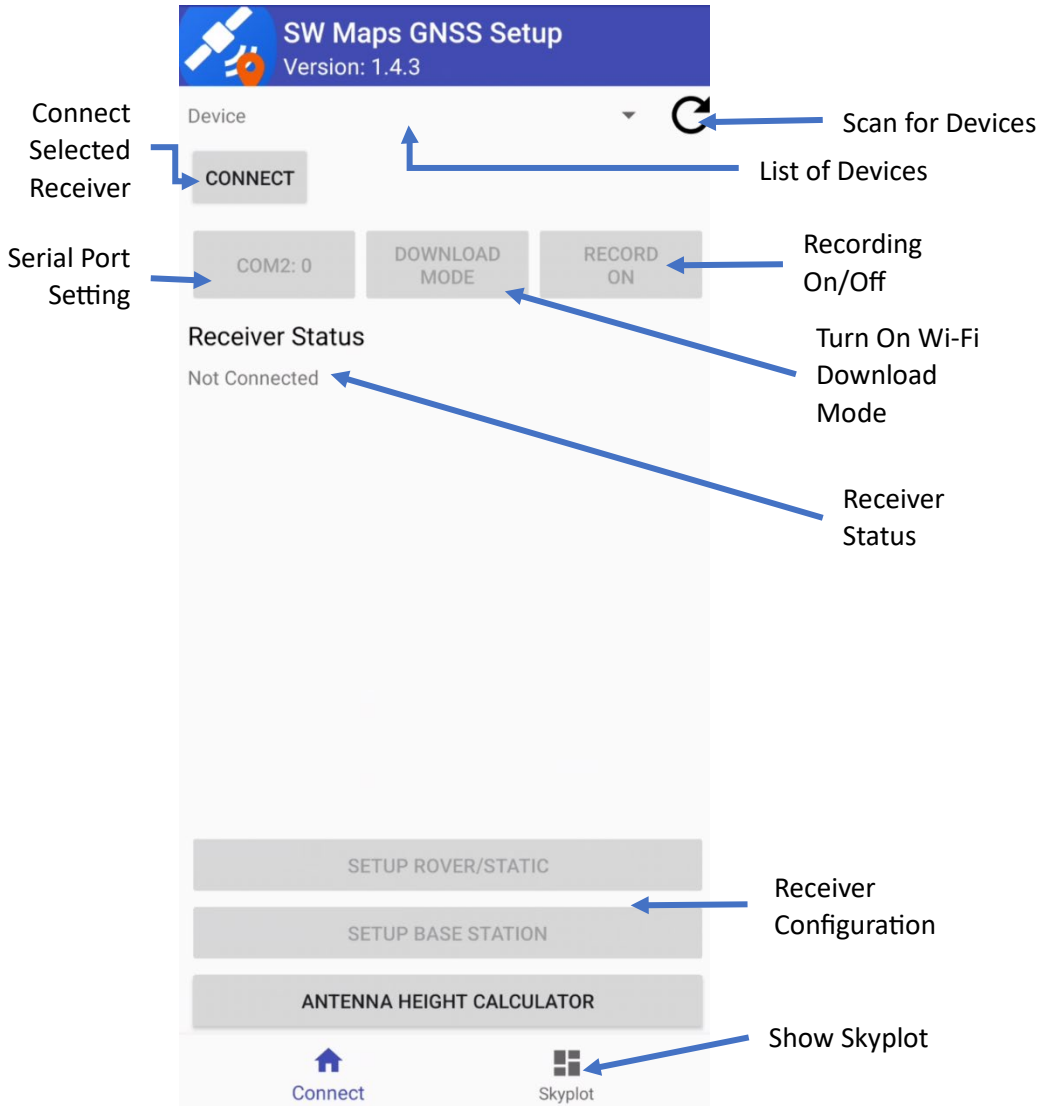
You can use the serial port to connect external radio units for carrying out RTK survey in areas with no internet access. You can also use the port to connect to an RS232 adapter, which is available separately.

SW Maps GNSS Setup App

The SW GNSS Setup app for Android is required to control and configure the GNSS receiver. The following tasks can be performed using the app.

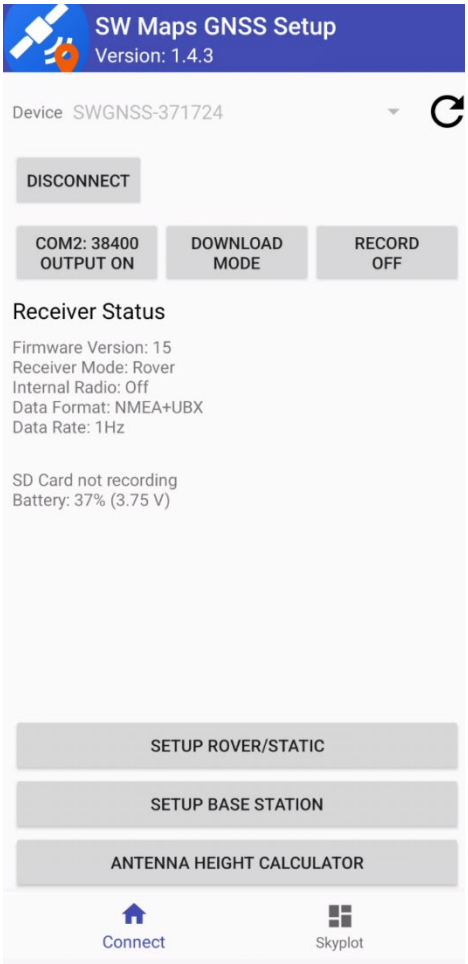
- Configure the receiver as rover/base
- Setup output messages and data rates
- Enable or disable the internal radio
- Setup the serial port input/output and baud rate
- Turn on and off file recording to SD Card
- Enable Wi-Fi download mode to transfer files from SD card

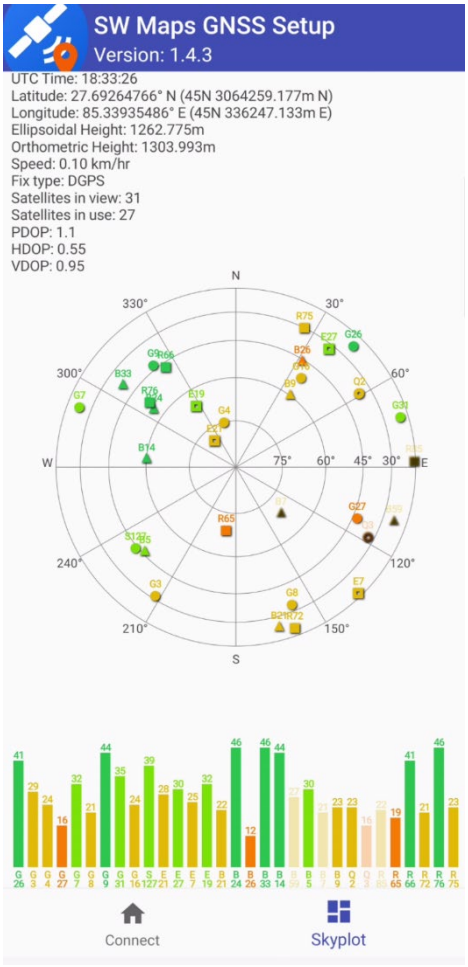
User Interface



Connecting to the Receiver

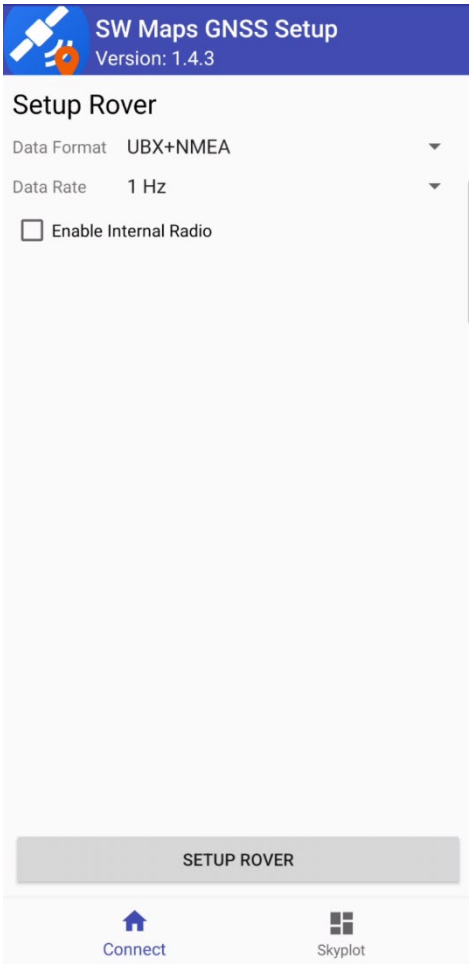
1. Press the “Scan for Devices” Button. The device will be shown on the list
2. Select the device to connect to and press “Connect”
3. Once connected, the app will show the receiver status. You can now configure the receiver using the app.





Rover Configuration

1. To configure as a rover, press the “Setup Rover/Static” button.
2. Select the data format
    a. For RTK, you must have NMEA. Select either NMEA or UBX+NMEA
    b. For post processing (static/kinematic), you must enable UBX. Select UBX or UBX+NMEA.
    c. Select UBX+NMEA if using SW Maps, and also logging raw data at the same time. This is the default option.
3. Select the data rate.
4. You can also enable the internal radio. In rover mode, this turns on the internal radio in receive mode. If any base stations are transmitting RTK corrections in the area, the receiver will pick them up.
5. Press “Setup Rover”.
6. The device will now restart with the new settings and the app will disconnect from the device.

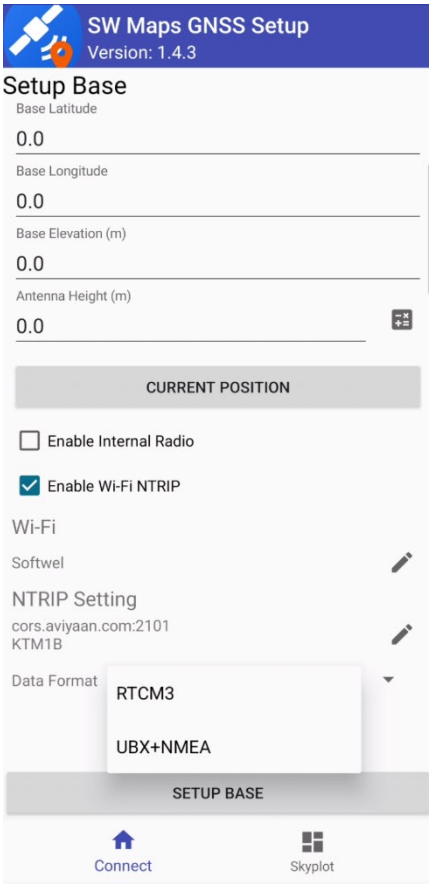


Base Configuration

1. To configure as a base station, press the “Setup Base Station” button.
2. Enter the base station coordinates. The base elevation must be the ellipsoidal height. Antenna height is the height to the antenna phase center (APC).
3. You can then enable either the internal radio or the Wi-Fi NTRIP.
4. To setup as radio base, check “Enable Internal Radio” and press “Setup Base”
5. To setup Wi-Fi NTRIP:
    a. Check “Enable Wi-Fi NTRIP”
    b. Select a Wi-Fi Connection by pressing the edit icon next to Wi-Fi. You can now add a new Wi-Fi connection by pressing the + button on the top, or select a previously added one.
    c. Select an NTRIP caster to send data to. You can select from previously added casters, or add a new one.
    d. Select the data format. Use RTCM3 for sending out corrections to rovers, or UBX+NMEA if you would like to access raw data from this receiver remotely.
    e. Press “Setup Base”

The receiver remembers its configuration. Once set as a base station, the receiver will automatically set itself up as a base station when restarted. To switch to rover mode or to change base coordinates, please reconfigure the receiver using the app.

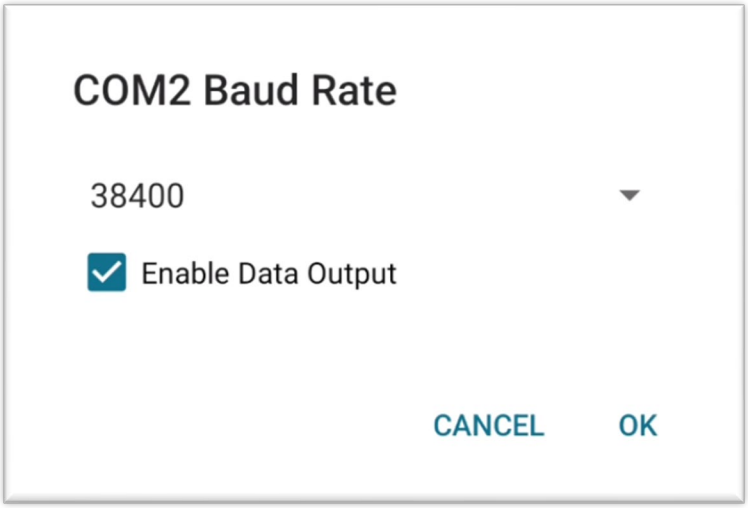
Note: The Bluetooth connection to the receiver may not be reliable when Wi-Fi NTRIP mode is enabled. To turn off Wi-Fi NTRIP mode, press the Power button three times.



Setup Serial Port Output

The external serial port is connected directly to the UART2 port on the internal u-blox ZED-F9P module.

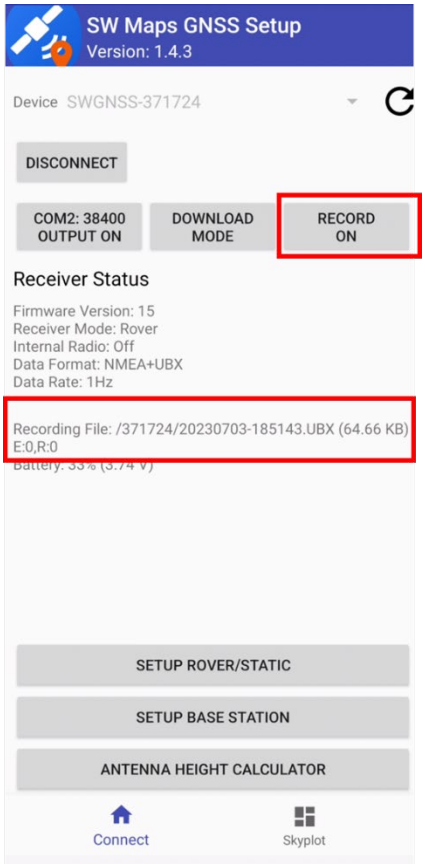
You can configure the baud rate and output mode of this port by pressing the “COM2” button.



Uncheck the “Enable Data Output” option when connecting to an external radio as a rover.

Turn on/off File Recording

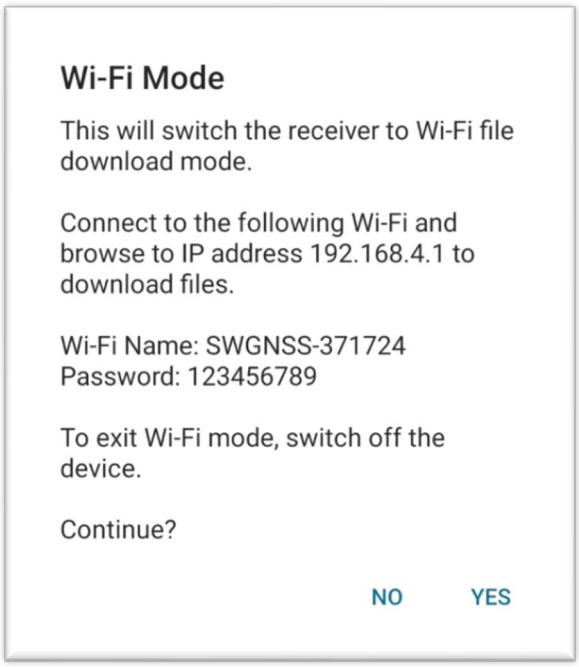
To toggle file recording, press the “Record” button. The app also shows the status of the currently recording file.



Turn on Wi-Fi Download Mode

The Wi-Fi download mode lets you transfer files from the receiver MicroSD card to your phone or computer without removing the MicroSD card.

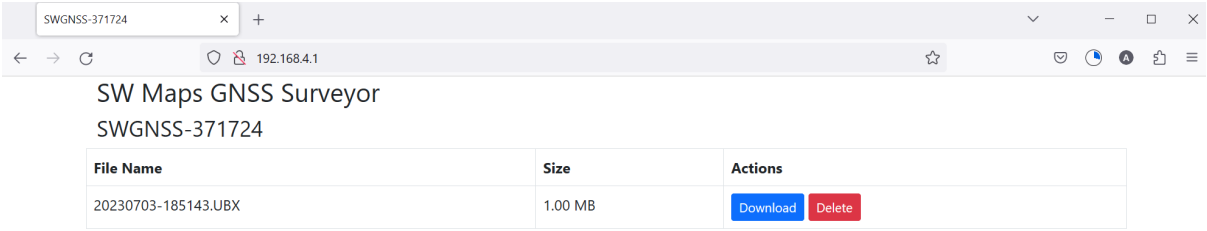
To enable Download mode, press the “Download Mode” button. A message is then displayed.



Press “Yes” to enable the file download mode. The receiver will restart.

Then, on your phone or tablet, connect to the SWGNSS-XXXXXX Wi-Fi network where XXXXXX is the device serial number. Wi-Fi password is 123456789.

Then, open a web browser and navigate to address 192.168.4.1. You will be shown a list of files with the option to download or delete them.



To exit Wi-Fi file download mode, restart the receiver.

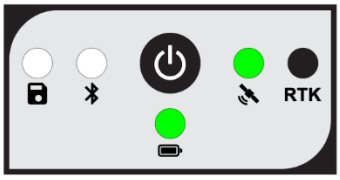
Receiver LED Indicators

The SW Maps GNSS Surveyor uses RGB LEDs to indicate the receiver status. The LEDs may be off, on or blinking.

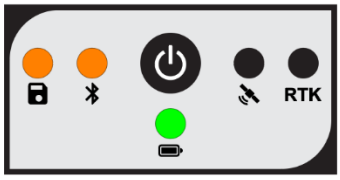
In this document, the following convention is used to show the LED status.

Startup and Error Codes

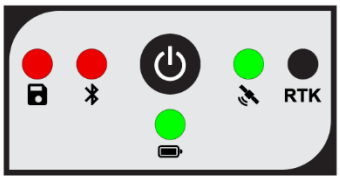
The following LED states are shown when the receiver is starting up. If the LED status at startup indicates an error, the receiver must be sent for repair to the service center.



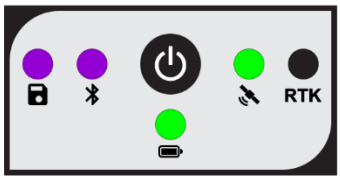
Normal Startup



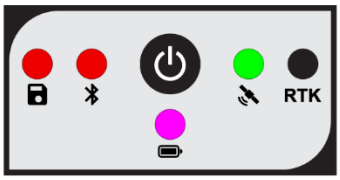
GNSS Module Hardware Error



System Firmware Error

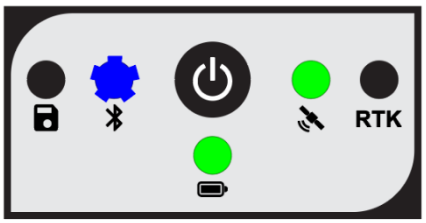


GNSS Module Firmware Error

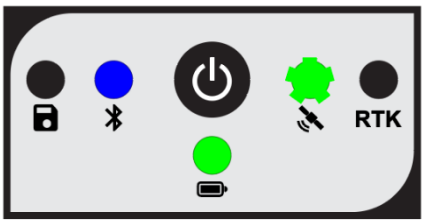


Battery Monitor Error

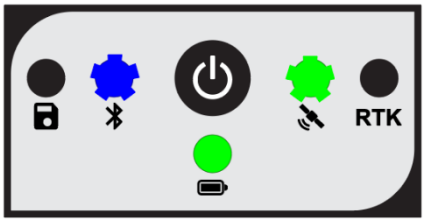
Rover Modes



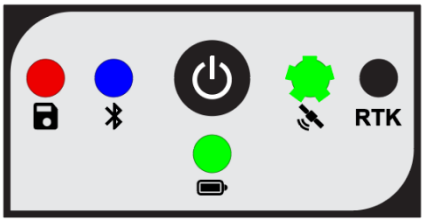
Bluetooth Not Connected,
No GNSS Signal



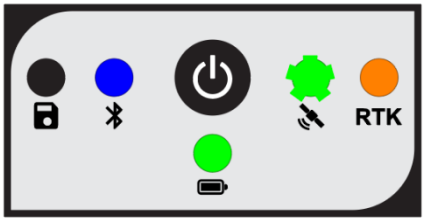
Bluetooth Connected,
GNSS Single Fix



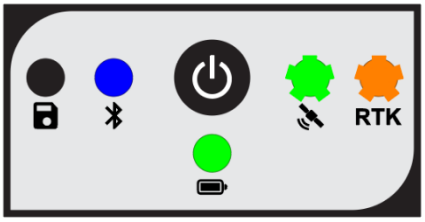
Bluetooth Not Connected,
GNSS Single Fix



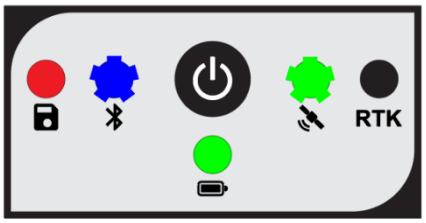
Bluetooth With File Recording



ROVER RTK Fix



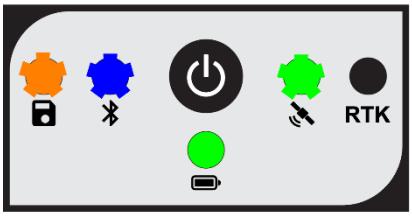
ROVER RTK Float



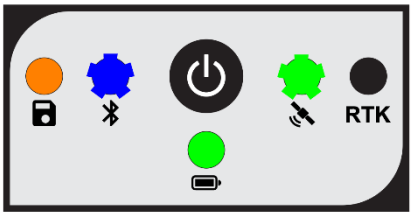
File Recording (STATIC Mode)

NTRIP Base Mode

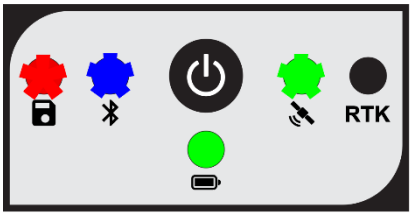
If the receiver indicates NTRIP base setting error, please check your Wi-Fi and NTRIP settings.



NTRIP Base Connecting

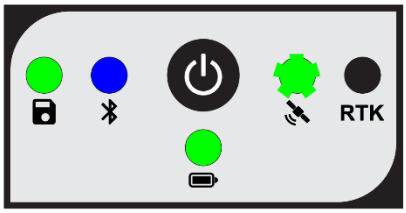


NTRIP Base Connected

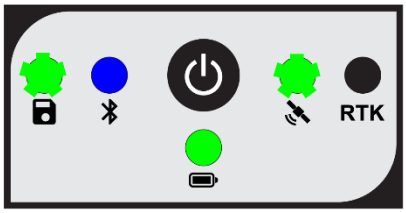


NTRIP Base Setting Error

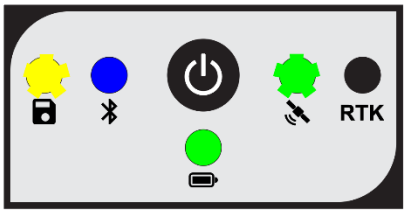
Internal Radio Status



Receiving Radio (ROVER)

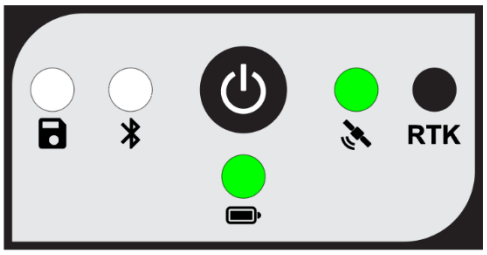


Receiving Radio Weak Signal (Packet Loss)

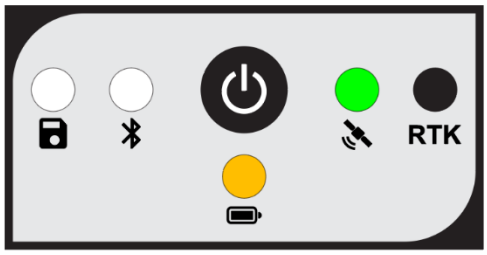


Transmitting Radio (BASE)

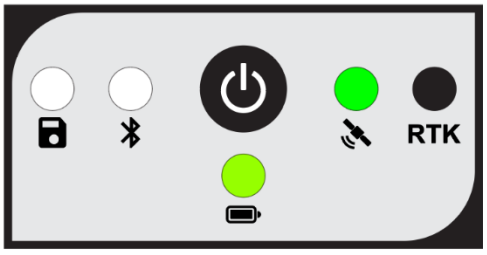
Battery Level Indicator



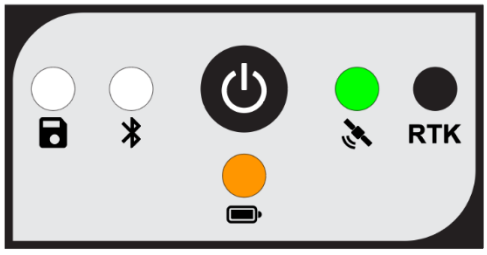
Battery > 80%



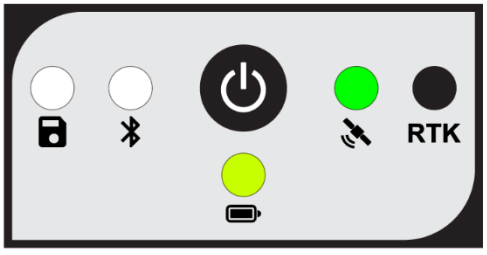
Battery 40-50%



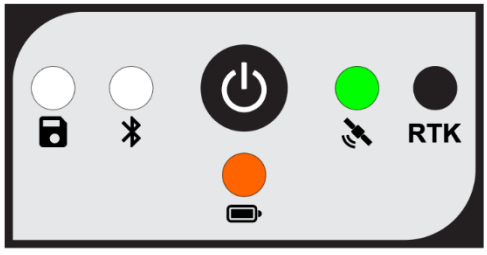
Battery 70-80%



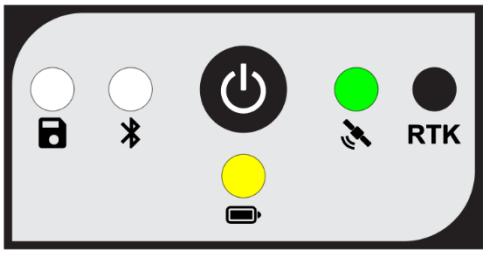
Battery 30-40%



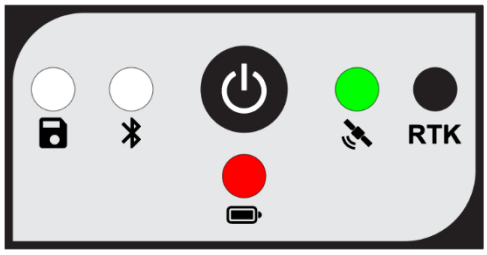
Battery 60-70%



Battery 20-30%

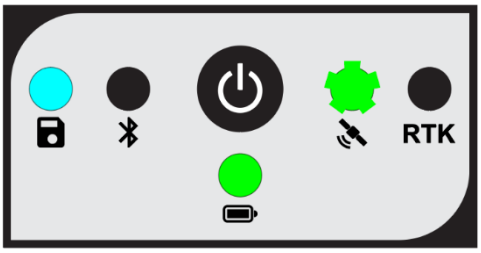


Battery 50-60%

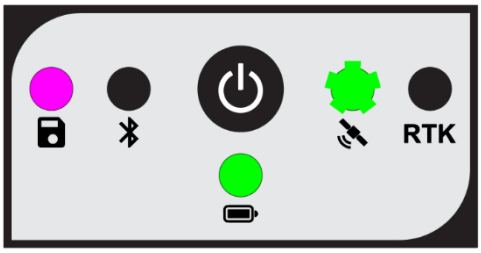


Battery < 20%

Wi-Fi Data Download Mode



Preparing WiFi Download Mode



WiFi Ready

Technical Specifications

Receiver Module		**u-blox ZED-F9P**	
Signals Tracked	GPS	L1C/A, L2C	
	QZSS	L1C/A, L1S, L2C	
	GLONASS	L1OF, L2OF	
	Galileo	E1B/C, E5b	
	Beidou	B1I, B2I	
	SBAS	L1	
Position Accuracy (CEP)		Horizontal	Vertical
	Standalone	1.5m	2m
	SBAS	1m	1m
	RTK	10mm + 1ppm	15mm+1ppm
	Static	4mm + 0.5 ppm	8mm + 1 ppm
Number of Channels	184		
Update Rate	Up to 8Hz (All GNSS), 20Hz (GPS Only)		
Receiver	Dimensions	ø138x90mm	
	Weight	625g	
	Mounting	Standard 5/8" screw	
Internal Radio	Frequency	2.4GHz	
	Range	Up To 300m (Range extenders available separately)	
Connectivity	Wi-Fi	2.4GHz 802.11 b/g/n	
	Bluetooth	Bluetooth 5.0	
Ports	USB	USB-C port	
	Serial	4-pin JST-XH UART serial port	
Battery	Internal Battery	3.7V Li-Ion, 3 cells, 9000mAh	
	Running Time	Up To 24 Hours (Static), 20 Hours (RTK)	
	Charging	USB, 1A charge current	
Data Output	Rover	NMEA 4.10, UBX	
	Base	RTCM 3.3	
Data Recording	Format	NMEA 4.10, UBX	
	Storage	Micro-SD card slot	
RTK Correction Input	RTCM 3		
Included Accessories	SW Maps GNSS Surveyor Bag		
	16 GB Micro-SD Card		
	USB-C Battery Charger		
Mobile App	Android	GNSS Setup App for Base/Rover configuration	
		SW Maps for surveying	
	iOS	SW Maps for surveying	