



SW MAPS GNSS SURVEYOR



Operating Manual P1-Series

Designed and Manufactured in Nepal by



SW Maps GNSS Surveyor

P1 Series

Multi Frequency Survey GNSS Receiver with Satellite PPP

Hardware Version 4

Firmware Version 24

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

1	Included Products and Accessories.....	2
2	Software Tools	2
3	GNSS Receiver Components	3
4	Mechanical Dimensions and Antenna Offset.....	4
5	Basic Operation	5
5.1	Powering on/off the Device.....	5
5.2	Checking Battery Level	5
5.3	Charging the Battery	5
5.4	Logging GNSS Data	6
5.5	Pairing to Android using Bluetooth.....	7
5.6	Using the Receiver with SW Maps Android.....	8
5.7	Using the Receiver with SW Maps iOS	9
5.8	Connecting External Equipment to the Serial Port.....	10
6	SW Maps GNSS Setup App	11
6.1	User Interface	11
6.2	Connecting to the Receiver	12
6.3	Rover Configuration.....	13
6.4	Base Configuration.....	14
6.5	Setup Serial Port Output	15
6.6	Turn on/off File Recording	16
6.7	Turn on Wi-Fi Download Mode.....	17
6.8	Co-ordinate Converter.....	18
7	Receiver LED Indicators.....	19
7.1	Startup and Error Codes	19
7.2	Rover Modes.....	20
7.3	NTRIP Base Mode.....	21
7.4	Internal Radio Status	21
7.5	Battery Level Indicator	22
7.6	Wi-Fi Data Download Mode.....	23

1 Included Products and Accessories

- SW Maps GNSS Surveyor Receiver
- USB-C To USB-A Cable
- USB Charger
- SW Maps GNSS Carrying Case
- 16GB Memory Card

2 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

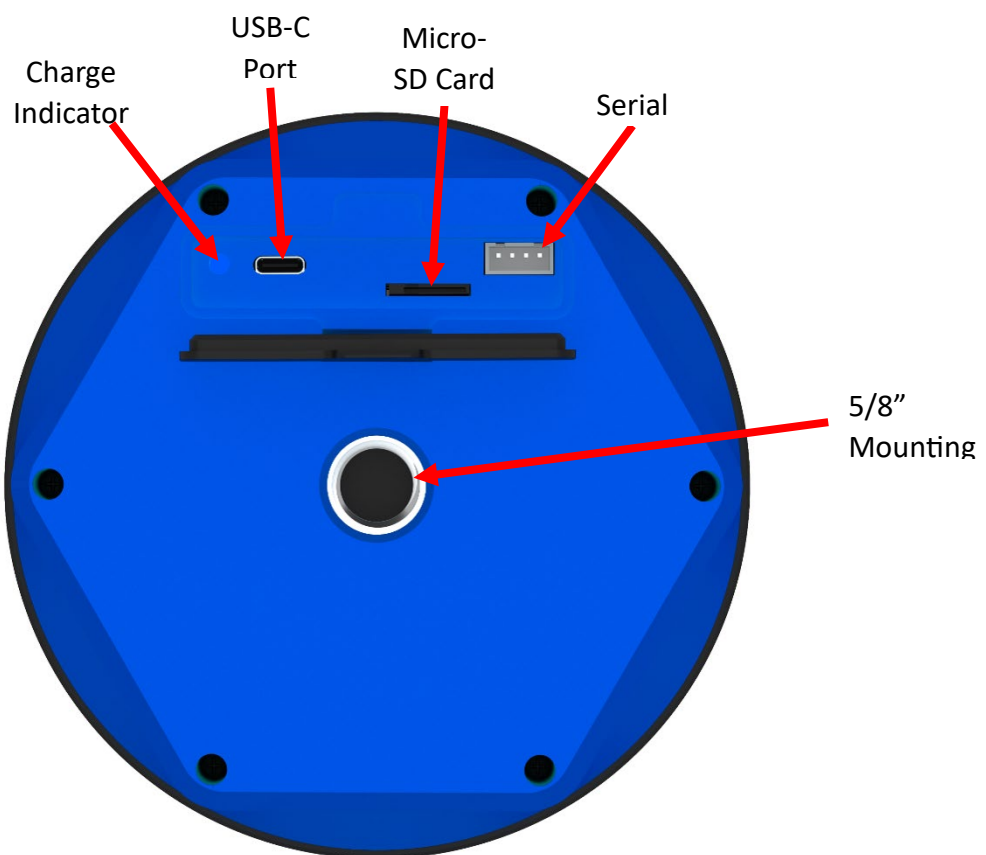
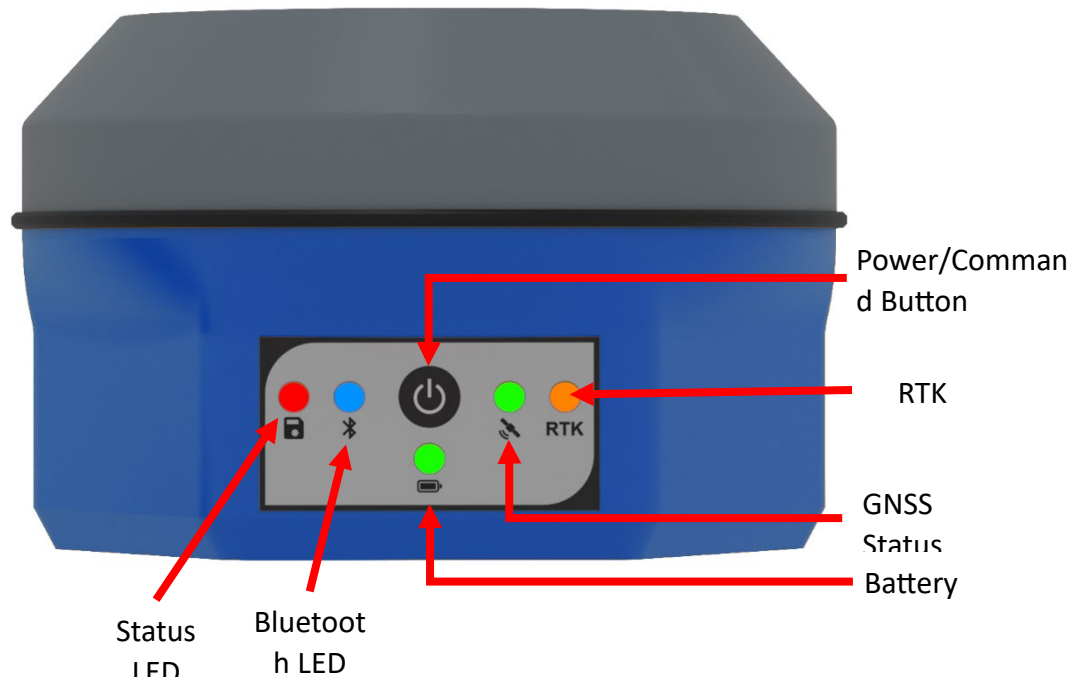
2. SW Maps

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.

3 GNSS Receiver Components



4 Mechanical Dimensions and Antenna Offset



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

5 Basic Operation

5.1 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.

5.2 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.

5.3 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.

5.4 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.

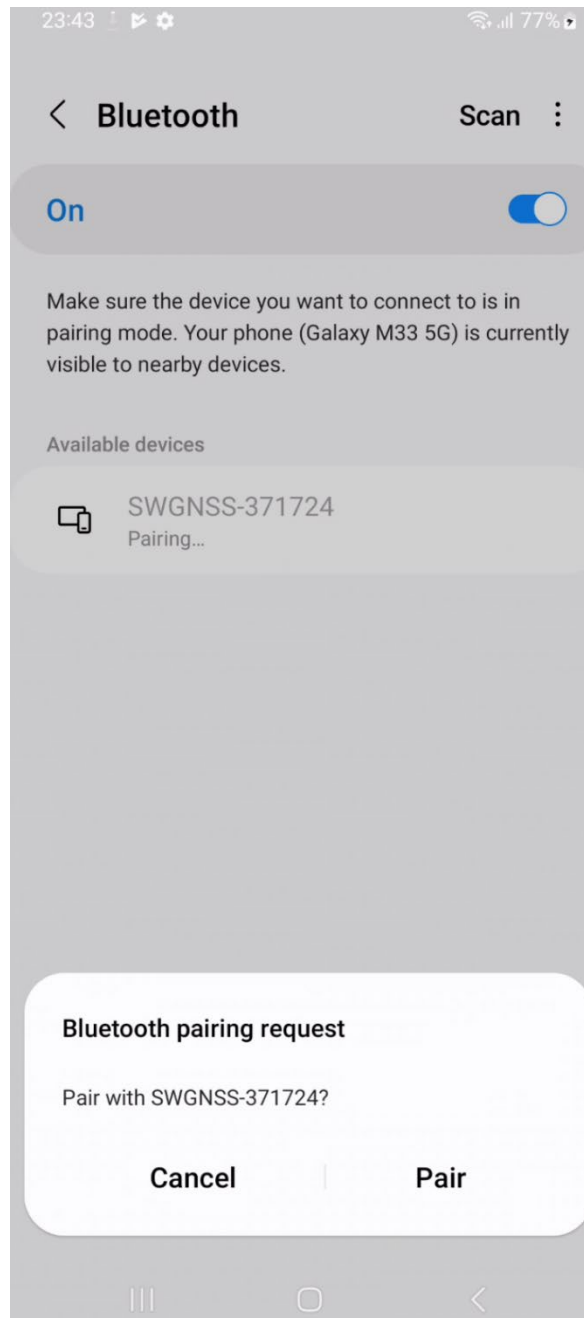
- Insert the MicroSD card into the MicroSD card slot.
- Power on the device
- Wait for a position lock. The GNSS Status LED will start blinking green.
- Tap the Power/Command button twice. The Status LED will glow red while the file is recording.
- Tap the Power/Command button twice again to stop recording.

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.

5.5 Pairing to Android using Bluetooth

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



5.6 Using the Receiver with SW Maps Android

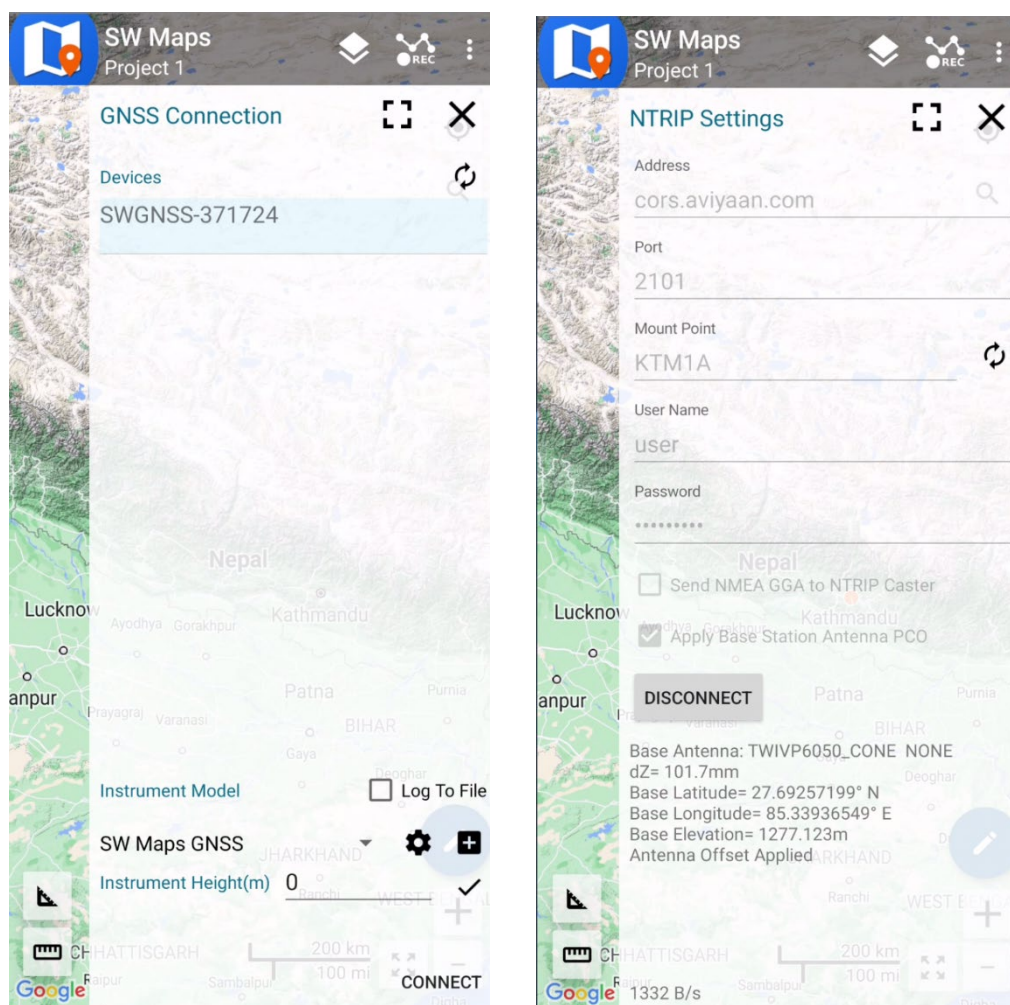
To use the receiver with SW Maps for Android, you must first pair the receiver to the Android device through the Bluetooth settings.

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.



5.7 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 use the built-in NTRIP client for RTK corrections.

Bluetooth GNSS Connection

Status: **Bluetooth GNSS Connected!**

Devices Scan

☒ SWGNS-371724

Instrument Model ☐ Log To File

SW Maps GNSS

Instrument Height(m) 0.0 ✓

Data Rate: 3827 B/s
Lat: 27.69263617° N (45N 3064257.912m)
Lon: 85.33934872° E (45N 336246.510m)
Elv: 1263.877m
Fix: RTK Float

Disconnect

NTRIP Client

NTRIP Caster Address
cors.aviyaan.com

NTRIP Port
2,101

Mount Point
KTM1A Get

User Name
user

Password

Send NMEA GGA to Caster ☐

Apply Base Station Antenna PCO ☒

Antenna: TWIVP6050_CONE NONE
Z Offset: 101.7mm
Antenna Offset Applied

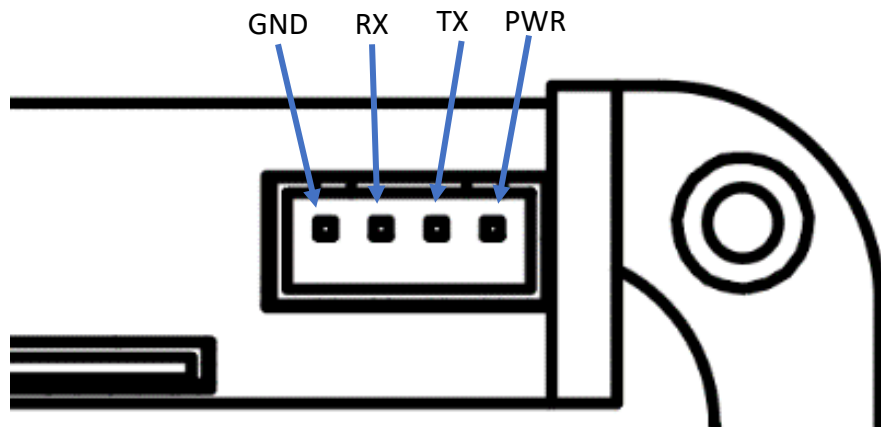
Base Latitude: 27.69257199° N
Base Longitude: 85.33936549° E
Base Elevation: 1277.123m
Baseline Length: 6.916m

Conencted: 1,358 B/s Disconnect

5.8 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.

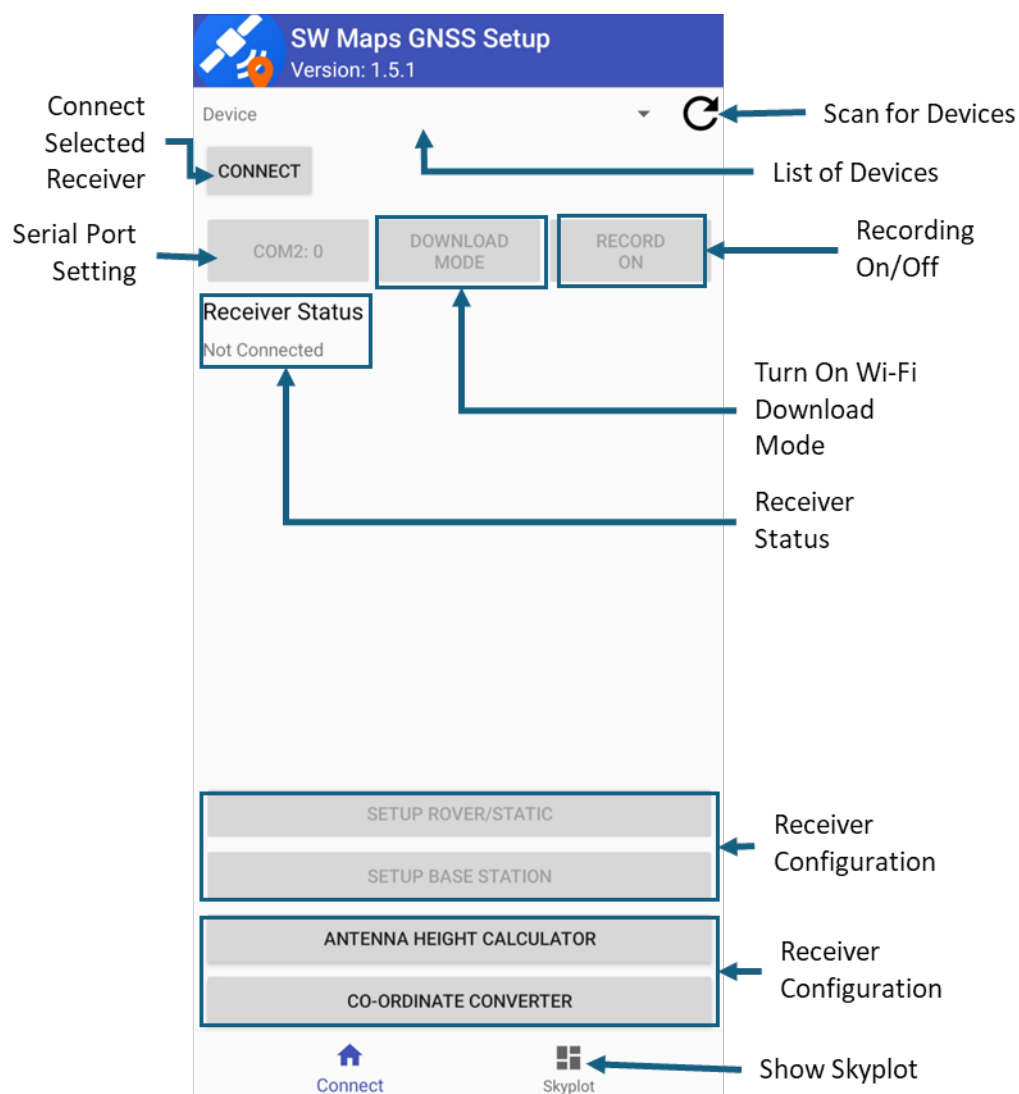
You can use the serial port to connect external radio units for carrying out RTK survey in areas with no internet access. You can also use the port to connect to an RS232 adapter, which is available separately.

6 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.

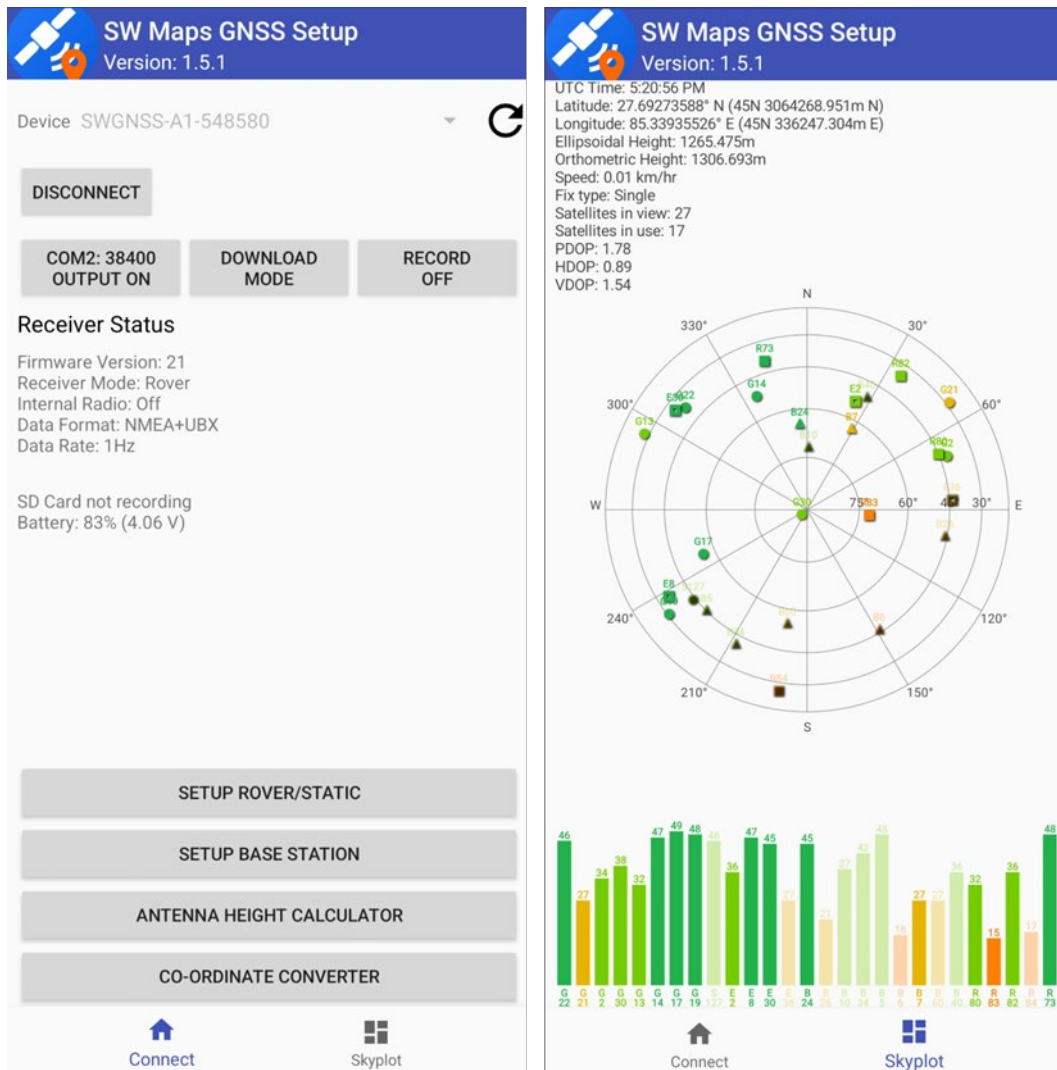
- Configure the receiver as rover/base.
- Setup output messages and data rates
- Enable or disable the internal radio.
- Setup the serial port input/output and baud rate
- Turn on and off file recording to SD Card
- Enable Wi-Fi download mode to transfer files from SD card.

6.1 User Interface



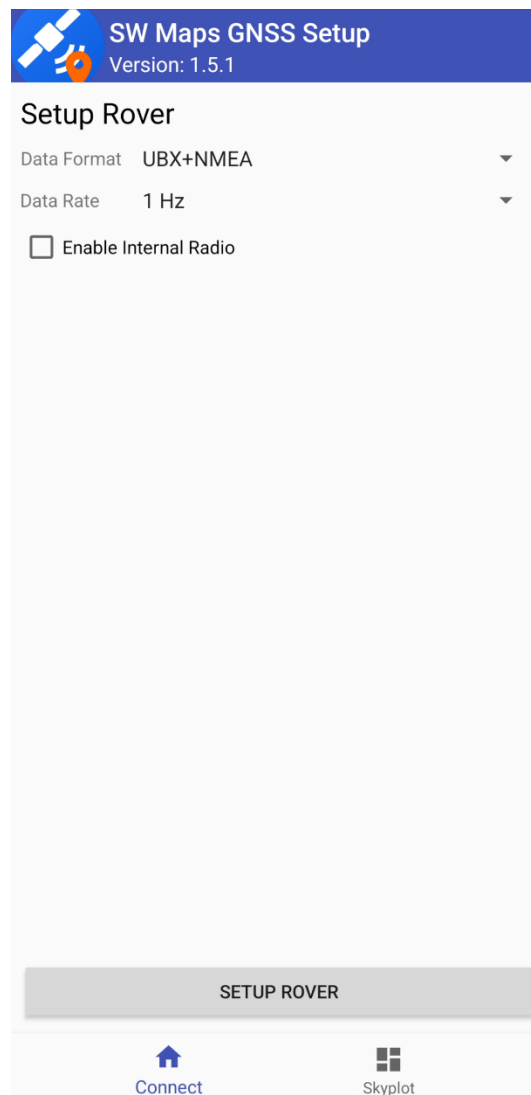
6.2 Connecting to the Receiver

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.



6.3 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 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.



6.4 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 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.

SW Maps GNSS Setup
Version: 1.5.1

Setup Base

Base Latitude
27.69257368

Base Longitude
85.33935927

Base Elevation (m)
1277.176

Antenna Height (m)
0.0

ENTER XYZ

CURRENT POSITION

☐ Enable Internal Radio

☒ Enable Wi-Fi NTRIP

Wi-Fi

Softwel

NTRIP Setting

cors.aviyaan.com:2101

KTM1B

Data Format RTCM3

SETUP BASE

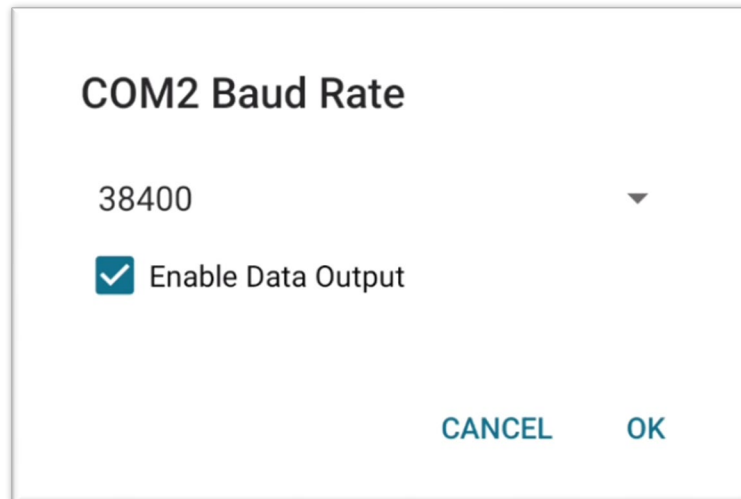
Connect Skyplot

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.

6.5 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.

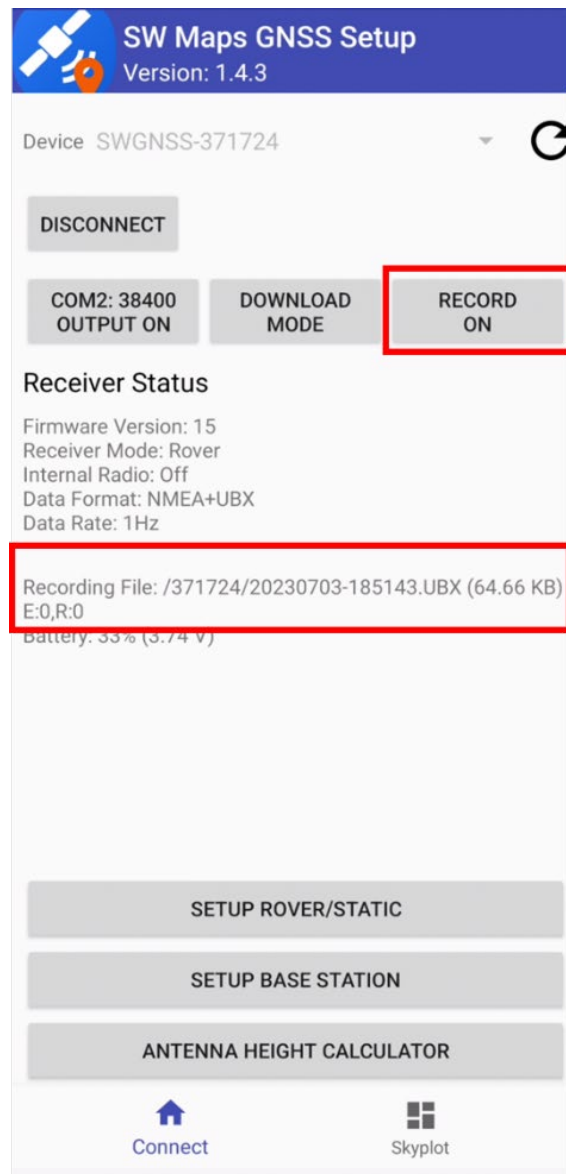


A configuration dialog box titled "COM2 Baud Rate". It features a dropdown menu showing "38400" with a downward arrow to its right. Below this is a checked checkbox labeled "Enable Data Output". At the bottom right, there are two buttons: "CANCEL" and "OK".

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

6.6 Turn on/off File Recording

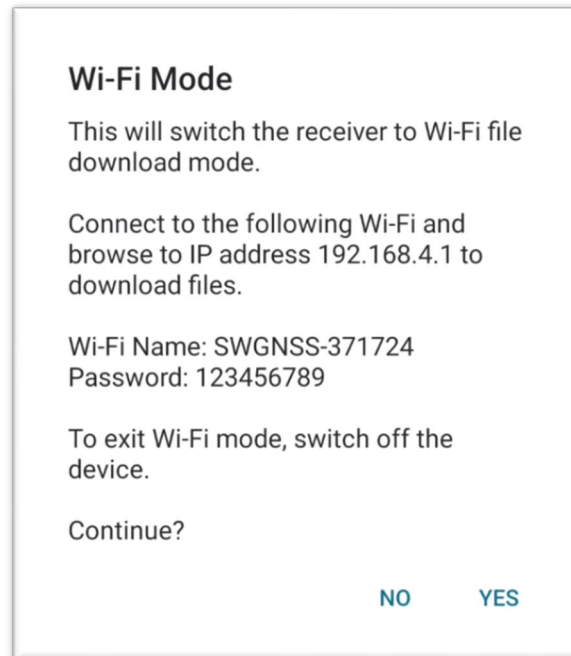
To toggle file recording, press the “Record” button. The app also shows the status of the current recording file.



6.7 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

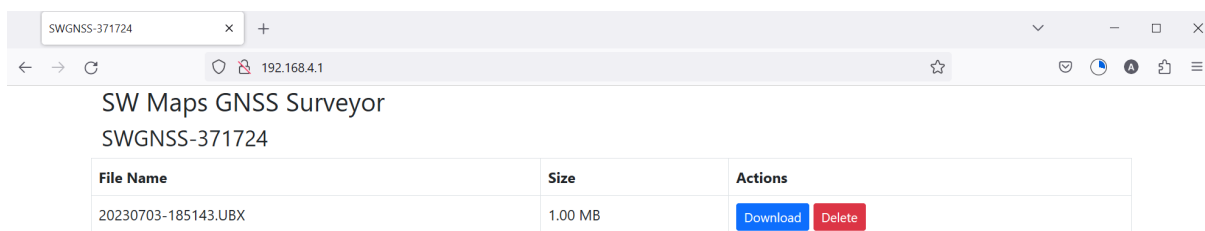


displayed.

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.

6.8 Co-ordinate Converter

The SW Maps GNSS Setup app has a co-ordinate converter to convert co-ordinates between a projected system to latitude and longitude. It also allows you to enter base station coordinates in a different system.

To open the co-ordinate converter, press the **Coordinate Converter** button on the home screen.

The screenshot displays the 'SW Maps GNSS Setup' app interface, specifically the 'Co-ordinate Converter' section. The app title and version (1.5.1) are at the top. The interface is divided into two main panels. The left panel, titled 'Co-ordinate Converter', shows a 'CRS' dropdown set to 'UTM-45N'. It features input fields for 'X' (336251.364) and 'Y' (3064242.757) to be converted to 'Lat' (27.6925) and 'Lon' (85.3394), and vice versa. The right panel, titled 'Set Coordinates', has an 'ENTER XYZ' button highlighted with a red box. Below it is a 'CURRENT POSITION' section with checkboxes for 'Enable Internal Radio' and 'Enable Wi-Fi NTRIP'. It also has input fields for 'X' (0.0), 'Y' (0.0), and 'Z' (0.0). Both panels have 'APPLY' buttons at the bottom.

You can define projected co-ordinate systems by pressing the **+** button.

To enter base coordinates in projected system, press the **Enter XYZ** button when setting up the base station.

7 Receiver LED Indicators

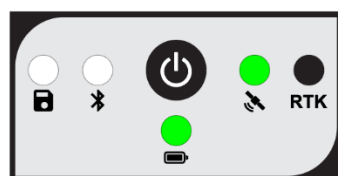
The SW Maps GNSS Surveyor uses RGB LEDs to indicate the receiver status. The LEDs may be off, on or blinking.

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

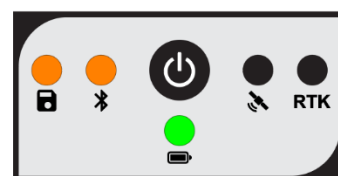
- LED Off
- LED On
- LED Blinking

7.1 Startup and Error Codes

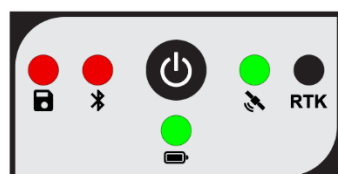
The following LED states are shown when the receiver is starting up. If the LED status at startup indicates an error, the receiver must be sent for repair to the service center.



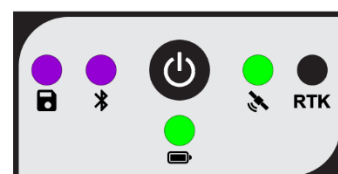
Normal Startup



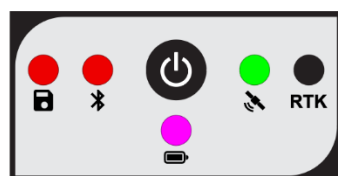
GNSS Module Hardware Error



System Firmware Error

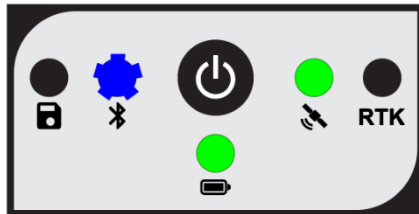


GNSS Module Firmware Error

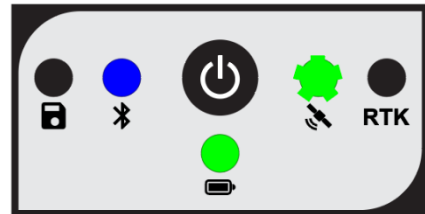


Battery Monitor Error

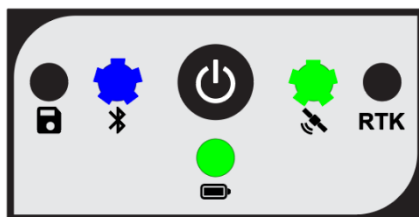
7.2 Rover Modes



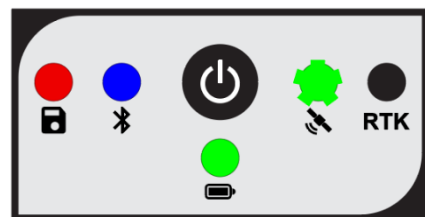
Bluetooth Not Connected,
No GNSS Signal



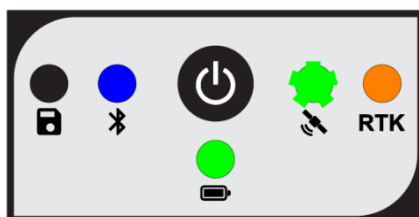
Bluetooth Connected,
GNSS Single Fix



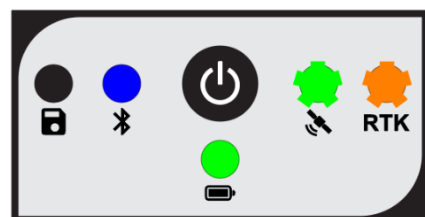
Bluetooth Not Connected,
GNSS Single Fix



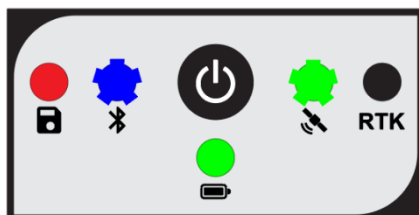
Bluetooth With File Recording



ROVER RTK Fix



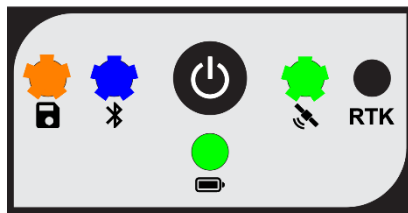
ROVER RTK Float



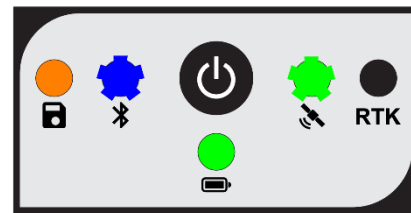
File Recording (STATIC Mode)

7.3 NTRIP Base Mode

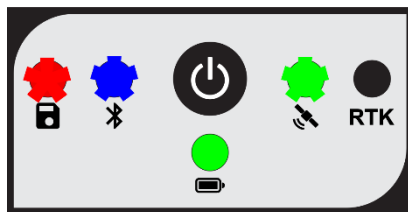
If the receiver indicates NTRIP base setting error, please check your Wi-Fi and NTRIP



NTRIP Base Connecting



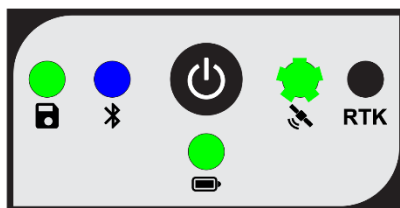
NTRIP Base Connected



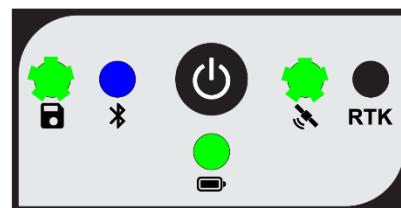
NTRIP Base Setting Error

settings.

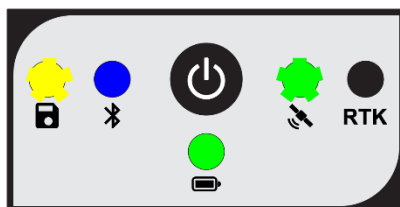
7.4 Internal Radio Status



Receiving Radio (ROVER)

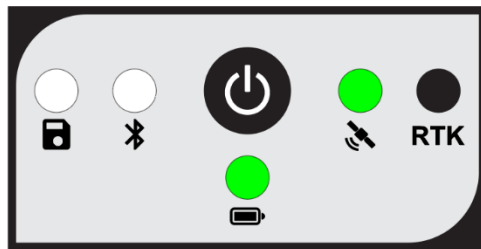


Receiving Radio Weak Signal
(Packet Loss)

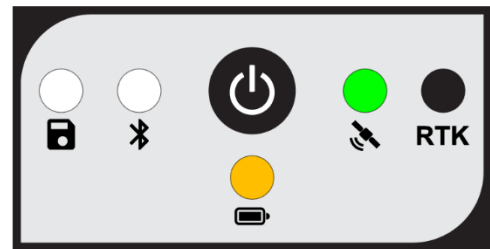


Transmitting Radio (BASE)

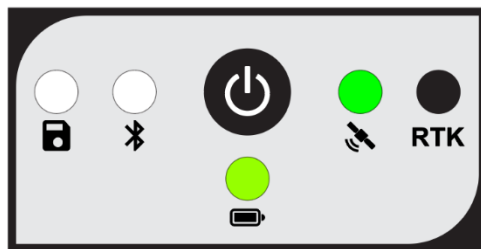
7.5 Battery Level Indicator



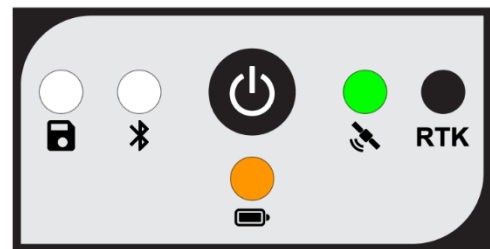
Battery > 80%



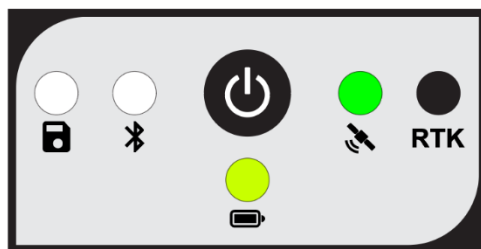
Battery 40-50%



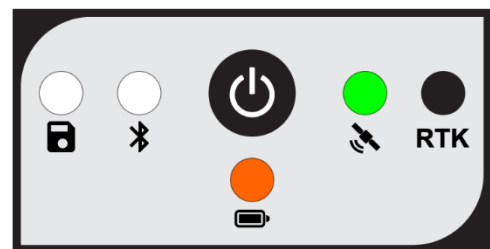
Battery 70-80%



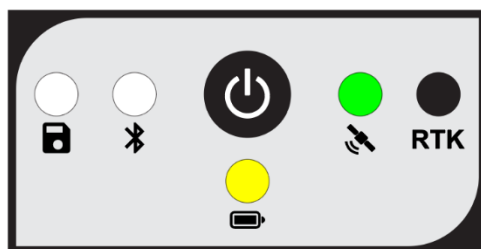
Battery 30-40%



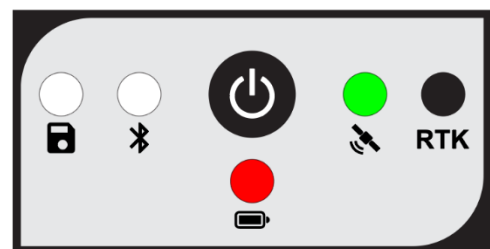
Battery 60-70%



Battery 20-30%

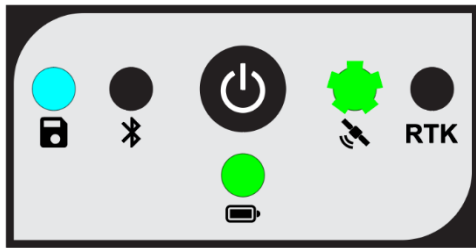


Battery 50-60%

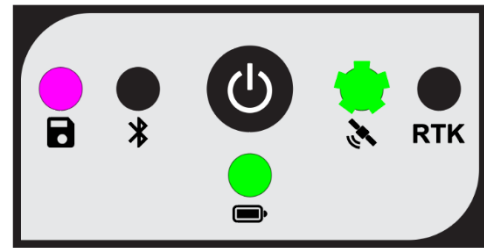


Battery < 20%

7.6 Wi-Fi Data Download Mode



Preparing WiFi Download Mode



WiFi Ready

P1 SPECIFICATIONS

Receiver Module	Unicore UM980		
Signals Tracked	GPS	L1C/A, L1C, L2C, L2P(Y), L5	
	QZSS	L1C/A, L1C, L2C, L5	
	GLONASS	G1, G2, G3	
	Galileo	E1, E5a, E5b, E6	
	BeiDou	B1I, B2I, B3I, B1C, B2a, B2b	
	SBAS	L1C/A	
	NavIC	L5	
PPP	BeiDou B2b PPP, Galileo E6-HAS		
Position Accuracy (CEP)	Mode	Horizontal	Vertical
	Standalone	1.5m	2.5m
	SBAS	0.6m	1m
	PPP (B2b/E6-HAS)	5cm	10cm
	RTK	8mm + 1ppm	15mm+1ppm
	Static	3mm + 0.5 ppm	5mm + 0.5 ppm
Number of Channels	1408		
Update Rate	Up to 10Hz		
Receiver	Dimensions	ø138x90mm	
	Weight	625	
	Mounting	Standard 5/8" screw	
Internal Radio	Frequency	2.4GHz	
	Range	Up To 300m	
Connectivity	Wi-Fi	2.4GHz 802.11 b/g/n	
	Bluetooth	Bluetooth 4.0	
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 20 Hours (Static), 16 Hours (RTK)	
	Charging	USB, 1A charge current	
Data Output	Rover	NMEA 4.10, Unicore	
	Base	RTCM 3.3	
Data Recording	Format	NMEA 4.10, Unicore	
	Storage	Micro-SD card slot	
RTK Correction Input	RTCM 3		
Included Accessories	SW Maps GNSS Surveyor Bag		
	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	

Designed and Manufactured in Nepal by

