User Guide: RTK Calibrated Surveyor Kit

Overview

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Traditional survey performance at affordable cost. Includes accessories.
With the RTK Calibrated Surveyor Kit you will have everything you need to start your surveying tasks with RTK and centimeter level accuracy.

Package

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You got your new RTK Calibrated Surveyor Kit? First, you are in the right page to get your kit set up quickly.

Remember all the component parts of RTK Calibrated Surveyor Kit includes:

- ZED-F9P RTK receiver with USB and Bluetooth inside a plastic case
- Survey calibrated antenna with 1.5m TNC-SMA cable
- -Mini USB cable
- USB OTG microUSB-B (14cm)
- USB OTG type C (22cm)
- Universal smartphone holder with 3M-Backed Rubber Pads, fits any smartphone from 5.3cm to 9.3cm with or without case
- Clamp to hold the smartphone holder to the pole
- Velcro strap (20cm) to fix the receiver to the back of the smartphone holder
- Surveying Pole for survey GNSS antenna

The kit is pre-configured to send NMEA data simultaneously via Bluetooth and USB.

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Unboxing

For building RTK Calibrated Surveyor Kit, there is no need for special tools nor nothing of the sort, by hand will be enough.

1. Start by mounting the receiver to the smartphone holder. You will need the velcro strap, the plastic case (ZED-F9P receiver with USB and Bluetooth 2.0 within) and the universal

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smartphone.

2. Place the case together with the smartphone holder with the SMA connector inversely positioned to the smartphone holder width adjusting screw. You may observe that the flat face of the case fits with the back of the smartphone holder. Fasten it together with the Velcro strap.

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3. Next, assemble the clamp that will hold the smartphone holder to the pole. There are 3 different components that form the clamp.

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4. Join the main parts of the clamp with the preferred screw. Each screw fits different screw holes within the clamp. You can screw in both and decide which may work best for you. Then, screw tightly together the rotating part of the clamp that will serve to rotate the smartphone holder to your preferred position.

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5. Screw in the clamp to the smartphone holder. You can remove the unused screw of the clamp if convenient.

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6. You can adjust freely the position of the smartphone holder by loosing up the rotating piece of the clamp and fixing it at your will.

7. You can adjust freely the position of the smartphone holder by loosing up the rotating piece of the clamp and fixing it at your will.

Now you have the first piece of your Surveyor Kit ready to connect with the other remaining two main pieces: your smartphone and the Calibrated Survey antenna.

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8. To connect your smartphone to the receiver, you may place first your smartphone to the smartphone holder, adjusting it to the width of your phone.

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9. You can now connect the smartphone to the receiver with the different cable sets of your kit. Connect the mini USB cable to the mini USB board connector of ZED-F9P receiver and the USB OTG cable suitable for your phone. Then, connect this to your phone.

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10. You can leave the cables loose (above) or you may wish to knot up the cables or fast them with the Velcro strap to tighten them in and get them out of the way (below).

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11. Now, you can proceed connecting the receiver to the Survey antenna. Connect the TNC-K to SMA cable (within Survey antenna box) to the SMA connector of ZED-F9P receiver

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12. Fasten the clamp to the surveying pole.

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13. Add on top of the pole the Survey antenna turning it delicately to the right until it stops.

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14. Finally, connect the TNC-K end of the cable to the Survey antenna and adjust the surveying pole to the convenient height.

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...ibrated Surveyor Kit built and ready to work!

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16.The kit can be used for about 6-8 hours with an average phone powering.

Note: If the you need more than this, use [USB-C on-the-go (OTG) with external USB-C power supply](#) (optional, not included in the package of the Surveyor kit) and a small external 1'000mAh powerbank.

How to connect to your smartphone?

We will explain how to use your Android device with [RTK Calibrated Surveyor Kit](#).

1. Make sure your device supports Bluetooth 2.0 or has USB OTG capabilities.
2. Make sure your Android language is set to English, since some users reported compatibility problems with other languages.
3. Place your [RTK Calibrated Surveyor Kit](#)-in a location with **good view of the sky**, or near a window for testing the functionality.

4. Download compatible software/app- which you prefer to use from Google Play and install it in your device. We prepared step-by-step instructions how to use[RTK Calibrated Surveyor Kit](#)-with several software/app:
    - [SW Maps – GIS & Data Collector](#). Use this-[link to download the app](#)-from Google Play and install it in your smartphone
    - [Mapit GIS](#).-Use this-[link to download the app](#)-from Google Play and install it in your smartphone
    - [Other app](#).- -The list of compatible software/app you can find [here](#).-

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How to use RTK Calibrated Surveyor Kit with SW Maps?
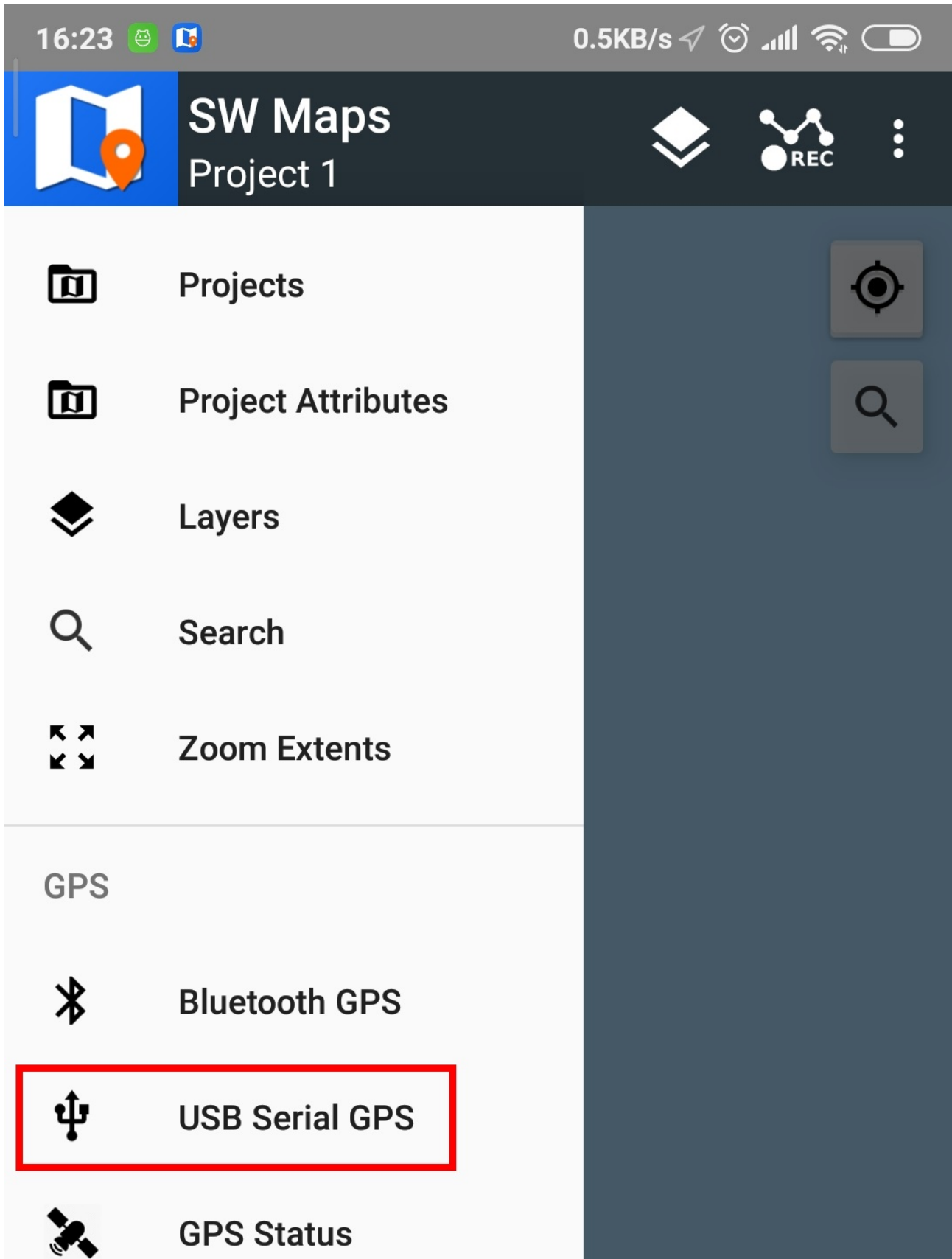
CONNECTION VIA USB OTG

CONNECTION VIA BLUETOOTH

CONNECTION VIA USB OTG

The best option (if your device supports it) since you can power and communicate with it at the same time
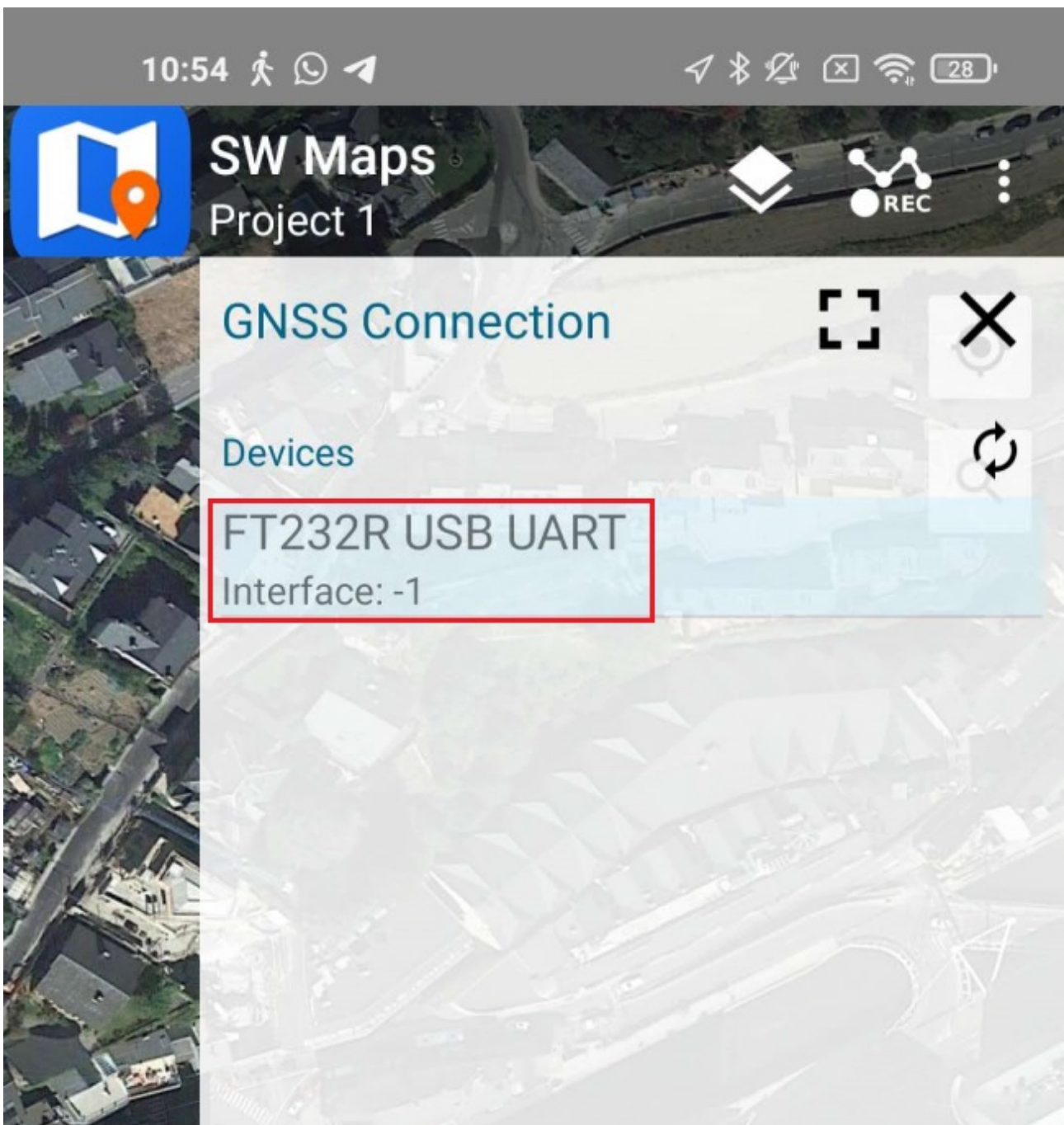
5. Open SW Maps app and give permissions (first time only).
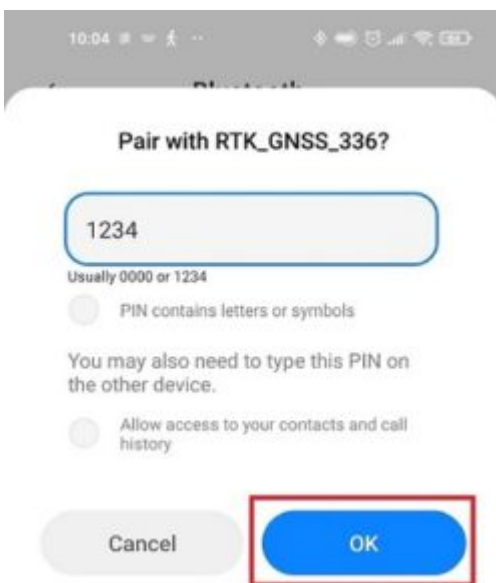6. Click on the SW Maps icon to show the app menu.

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7. Select-**USB Serial GPS**.

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8. Under **Devices**, you should see **FT232R USB UART**. Set **BaudRate** to **115200-** bps (if you ordered your Professinal kit before 09.10.2023, set BaudRate-to-38400-bps).

9. Set **Instrument Model** to **u-blox RTK**. Set the **Instrument Height** according to the height of your pole or antenna, if you want to measure the location of the ground.

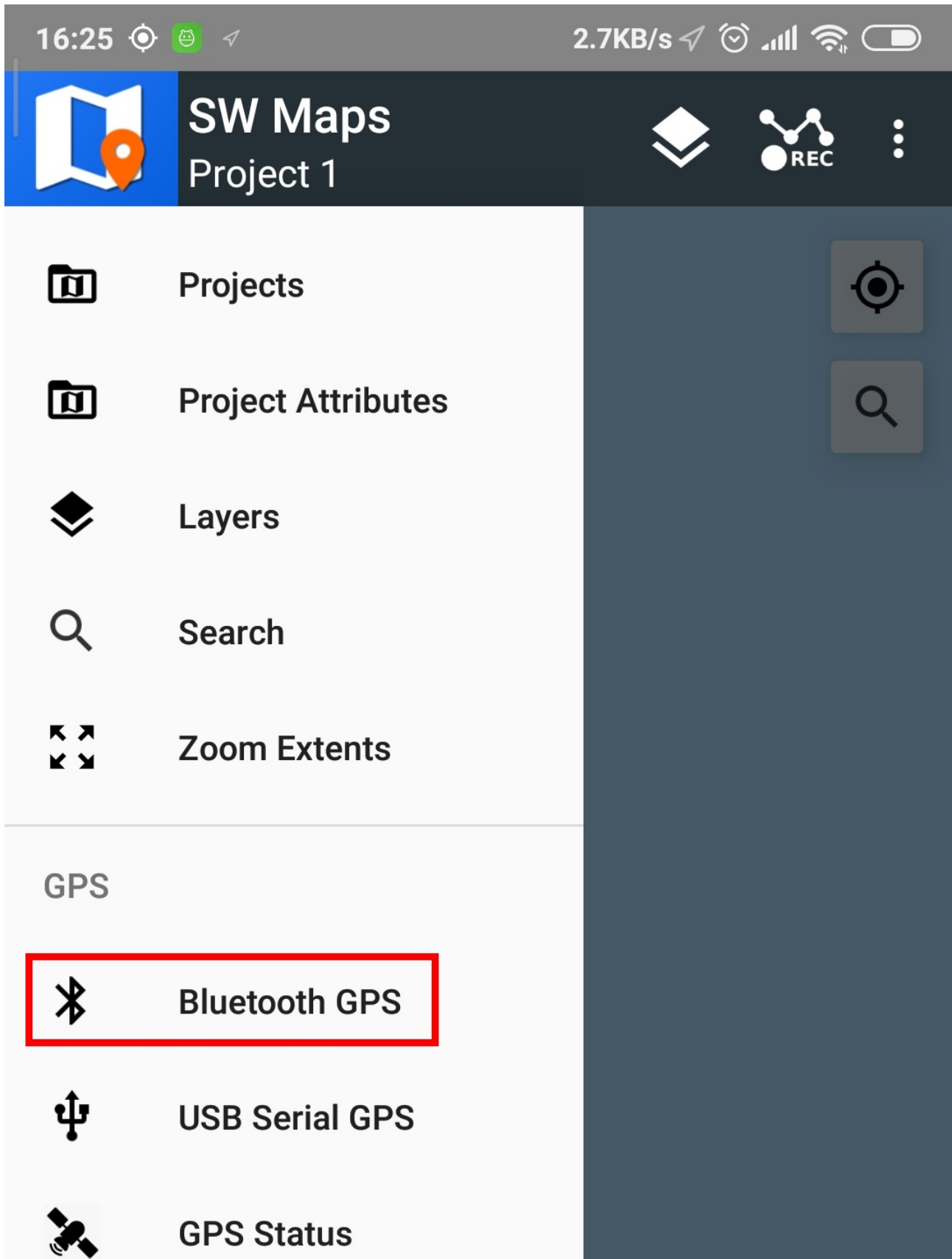10. Click **CONNECT** button. When you click the CONNECT button, grant permissions (if asked).

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CONNECTION VIA BLUETOOTH

5. Power your Ardusimple kit using its USB connector. Use a USB power bank, power wall adapter, smartphone, laptop etc.

6. Enable the Bluetooth connection on your device.

7. Pair the Ardusimple board in the Android Bluetooth menu. When searching for devices, you may see only the MAC address, but once paired the name will update to **RTK_GNSS_XXX**, where *XXX* is a random number. Password is **1234**. *The pairing only needs to be done once. Unlike other Bluetooth devices, it won´t show as "connected" until you click "connect" button in an app.*


8. Open SW Maps app and give permissions (first time only). Click on the SW Maps icon to show the app menu.
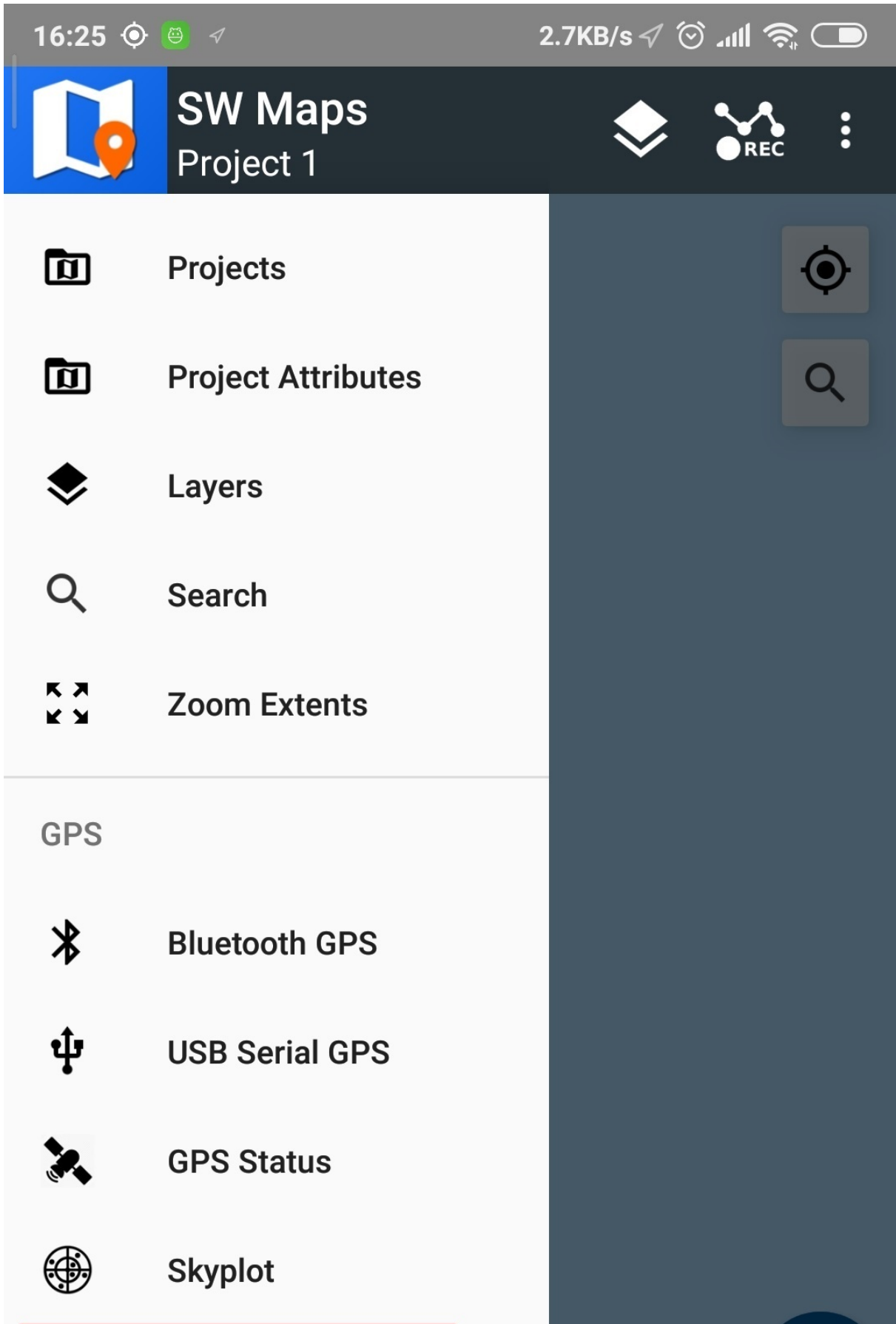

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9. Select-**Bluetooth GPS**.

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10. Under-Devices, select the one you paired in step 3. Set-Instrument Model-to-**u-blox RTK**. Set the Instrument Height according to the height of your pole or antenna, if you want to measure the location on the ground. Click-**CONNECT**-button.-When you click the CONNECT button, grant permissions (if asked).
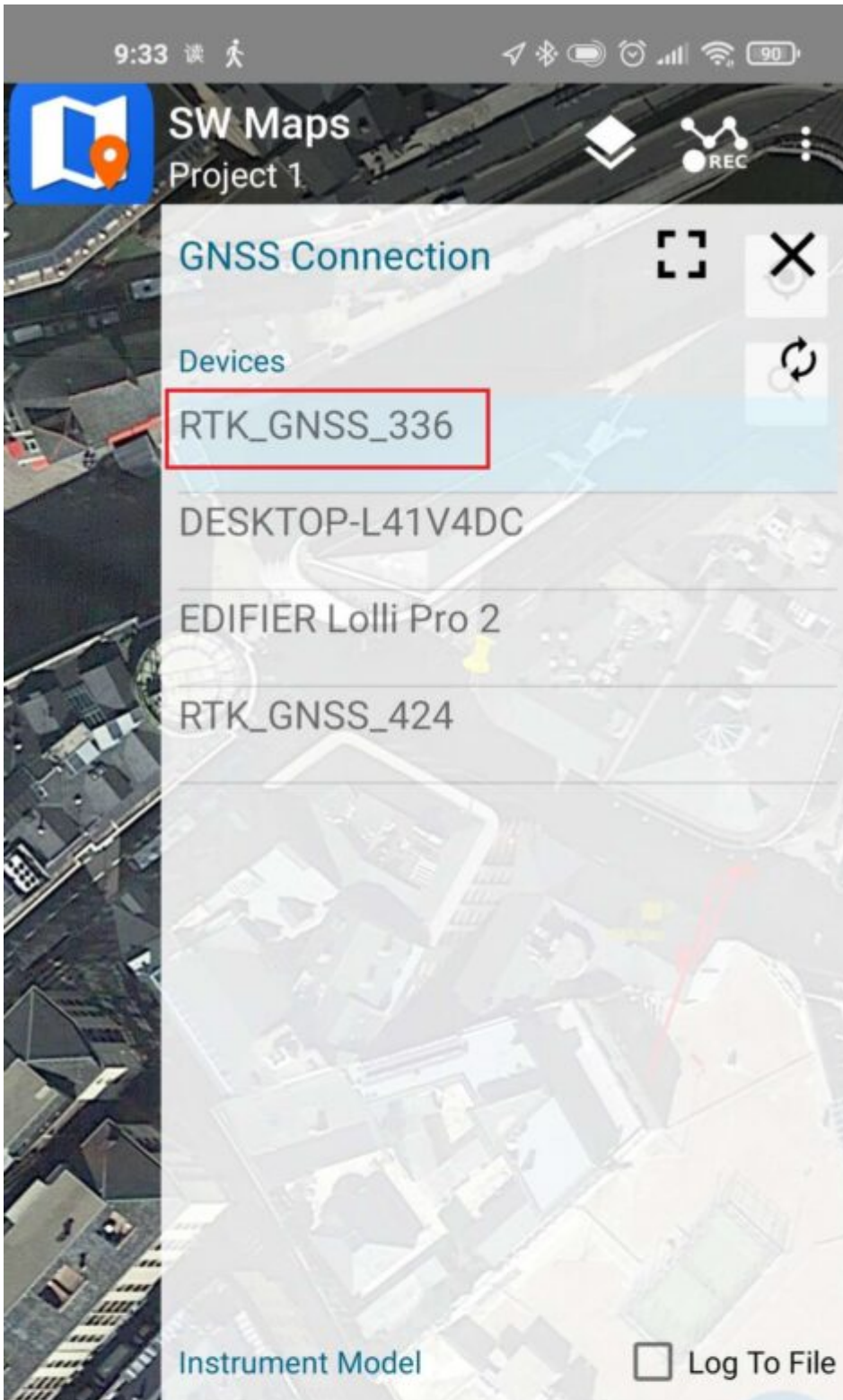
11. Since you have a RTK capable GNSS receiver, let's connect it to a NTRIP server to get cm accuracy. Go back to SW Maps menu and select **NTRIP Connection.**

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SW Maps
Project 1

Projects

Project Attributes

Layers

Search

Zoom Extents

GPS

Bluetooth GPS

USB Serial GPS

GPS Status

Skyplot

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12. Fill all the fields with your NTRIP provider data. Make sure to check **Send NMEA GGA to NTRIP Caster** if you are connecting to a VRS. If you do not know how to find NTRIP provider in your area, we have prepared a list of [RTK Correction Services in your Country](#), check the page to find suitable service for you.

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13. When you click **CONNECT**, if everything worked, you will see the data stream alive.

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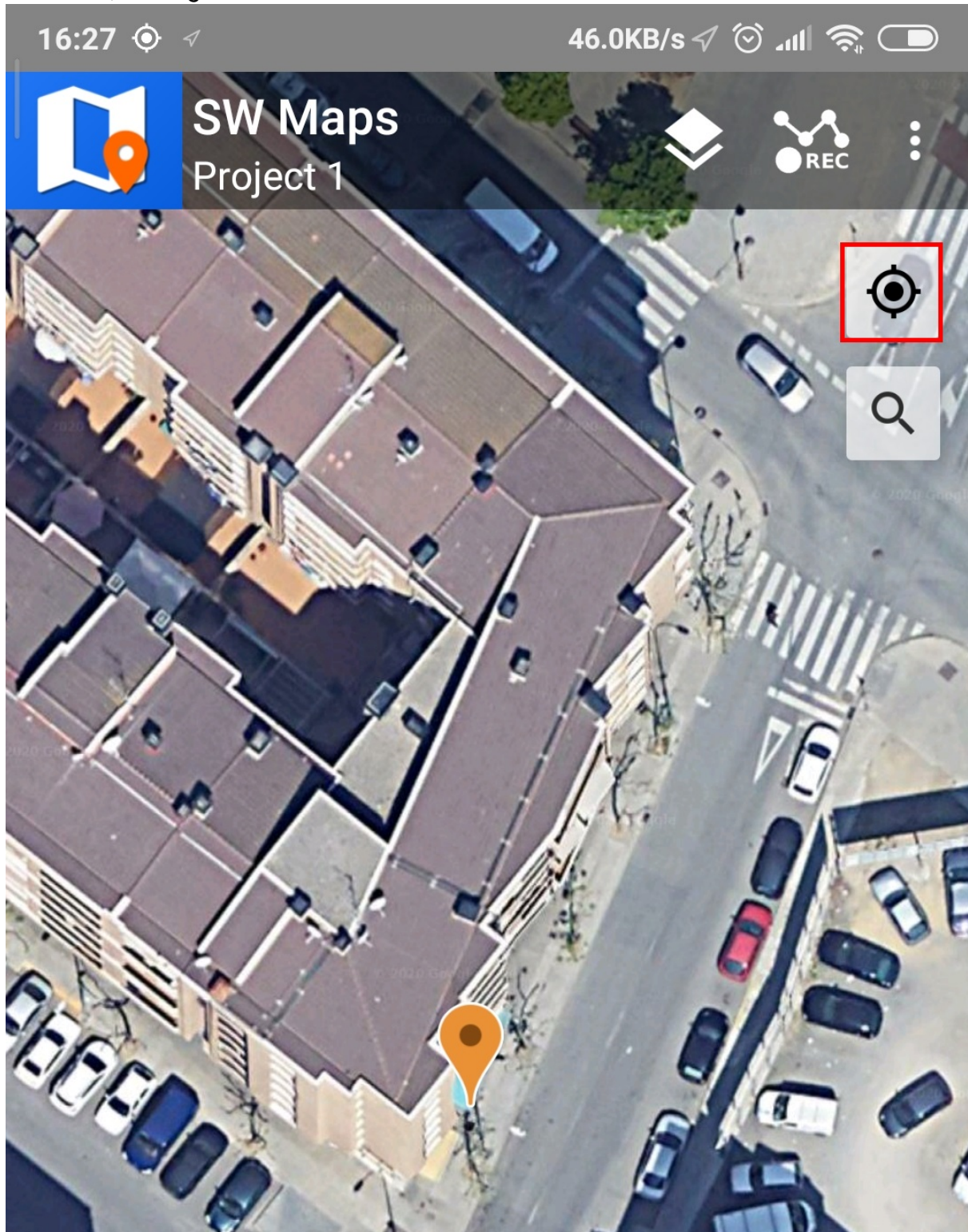14. Go to the SW Maps menu and select **GPS S**... position with centimeter accuracy in text fo...
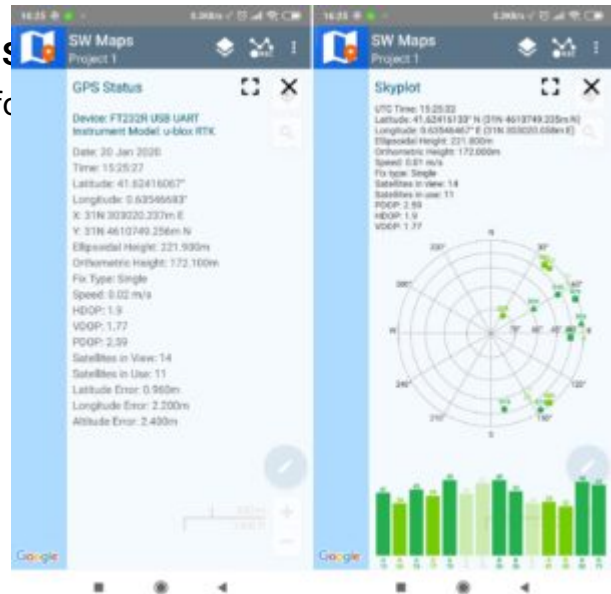
and information about the satellites there.

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15. You can click the button that is highlighted in red to make the app center the map in your receiver location. The pointer showing your location will change its color depending on the fix status of your receiver. Additionally, you have the option to adjust the map layer, include points, tracks, as well as import or export recorded locations, among other features.
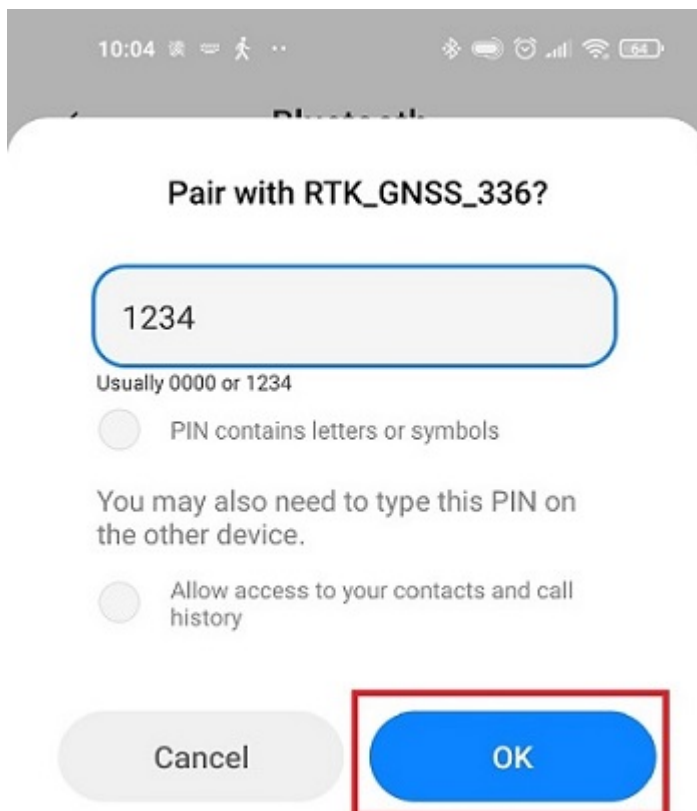
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16. You can get used to the SW Maps app by exploring its various options.- If you prefer a guide, you can access the User Manual here.

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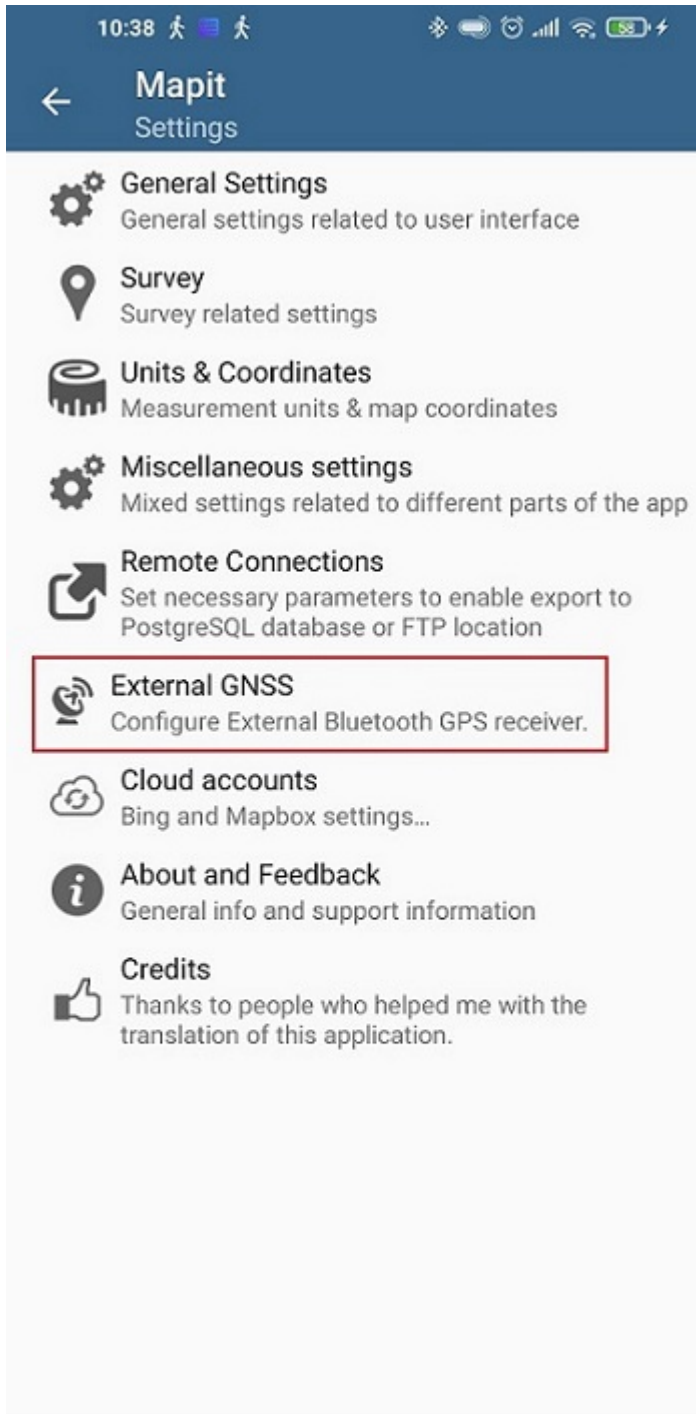## How to use RTK Calibrated Surveyor Kit with Mapit GIS?

Firstly, pair your receiver to your Android smartphone or tablet.

1. Power your RTK receiver-by connecting USB cable to the power supply (smartphone/tablet/ compatible powerbank). If you get any pop-up message to connect the USB device with any app, you can ignore it.
2. Enable the Bluetooth of your smartphone or tablet , and pair it with your RTK receiver. When pairing your device, notice that it will appear as RTK_GNSS_***. The password *e other Bluetooth devices, it won´t show n in an app.*
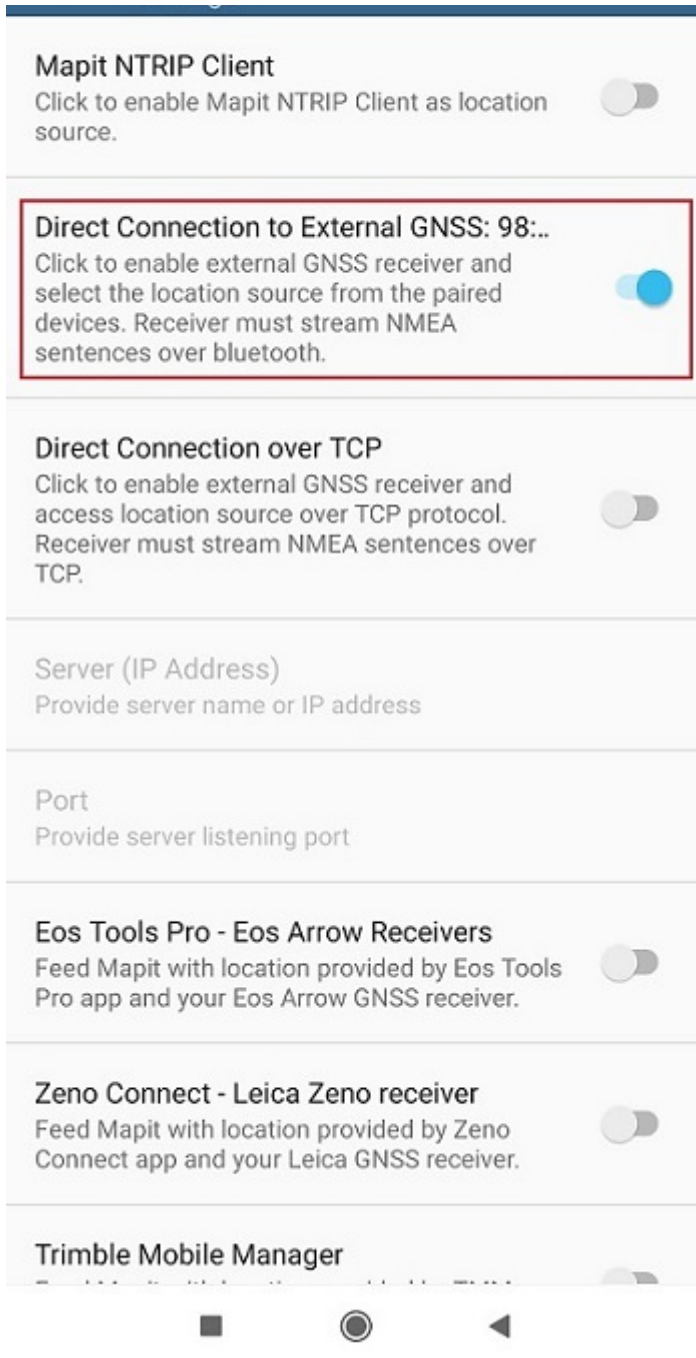
3. Place RTK antenna in a location with good view of the sky or near a window for testing the functionality.

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Bluetooth.

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Mapit NTRIP Client
Click to enable Mapit NTRIP Client as location source.

Direct Connection to External GNSS: 98:..
Click to enable external GNSS receiver and select the location source from the paired devices. Receiver must stream NMEA sentences over bluetooth.

Direct Connection over TCP
Click to enable external GNSS receiver and access location source over TCP protocol. Receiver must stream NMEA sentences over TCP.

Server (IP Address)
Provide server name or IP address

Port
Provide server listening port

Eos Tools Pro - Eos Arrow Receivers
Feed Mapit with location provided by Eos Tools Pro app and your Eos Arrow GNSS receiver.

Zeno Connect - Leica Zeno receiver
Feed Mapit with location provided by Zeno Connect app and your Leica GNSS receiver.

Trimble Mobile Manager

6. In the pop-up window choose the device you paired in step 2.

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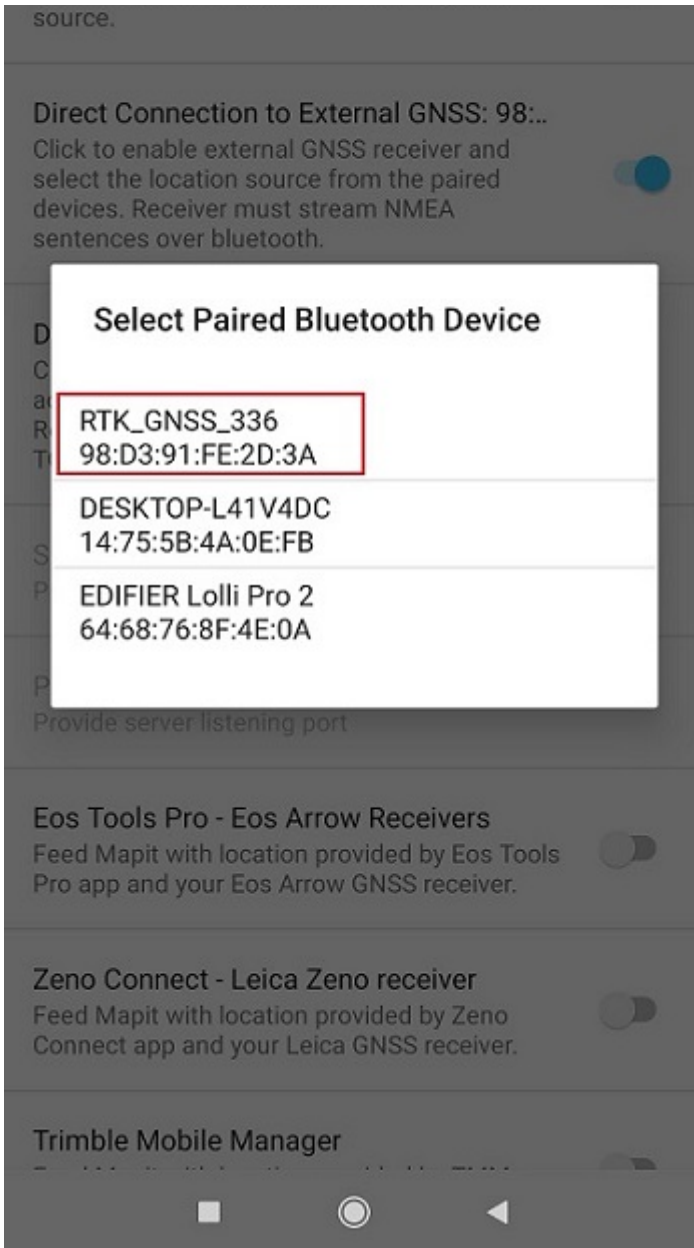
7. Back to the main screen, tap on the **antenna icon** you will see you are using External GNSS and with location and satellites information.

Thirdly, reach centimeter level accuracy.

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In step 6, we can see the accuracy is not satisfactory yet. Because RTK receiver will need a base station or a correction service to reach centimeter level accuracy.

There is a build in NTRIP Client function in Mapit GIS, but it is not compatible with new Android version and it is not free. If it doesn't work on your android device don't worry, we have alternative GNSS Master app to overcome this limitation.

NTRIP Client function in Mapit
GNSS Master app
NTRIP Client function in Mapit

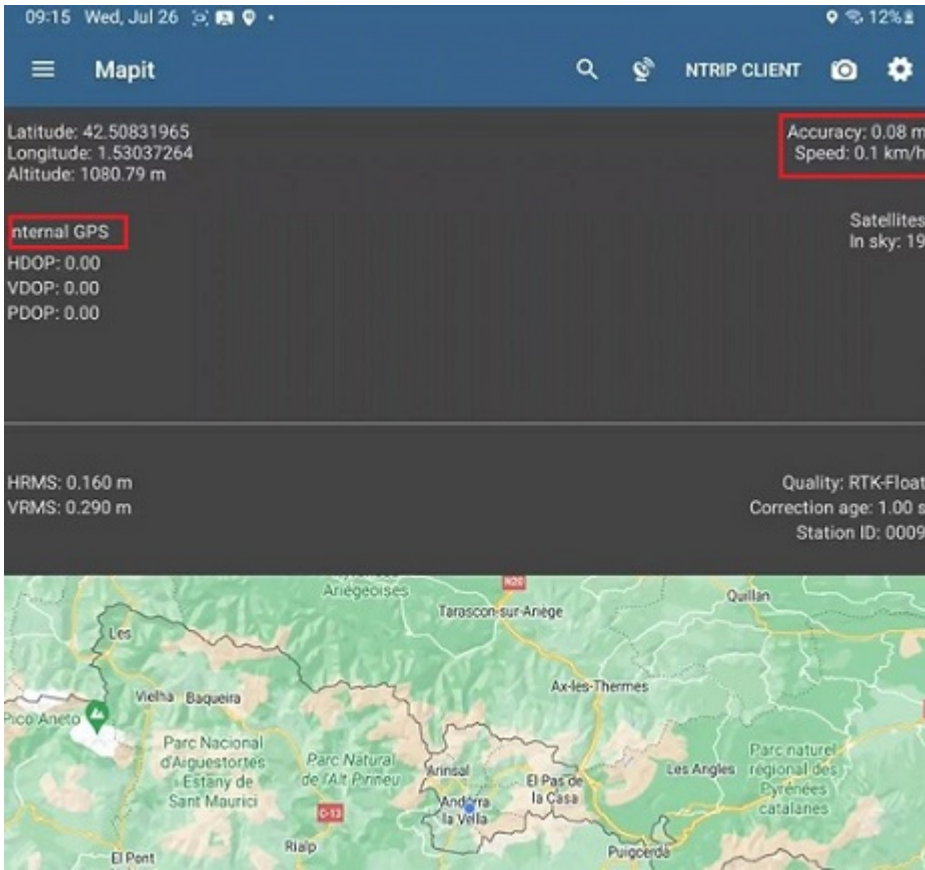8. In the menu tap **NTRIP Client** and set your corrections.

GNSS Master app

8. -GNSS Master app has built in NTRIP and PointPerfect capability to send corrections directly to your GNSS receiver.
    "Mock Location" is a functionality of Android OS that allows you to "fake" the position of the internal GPS, and use instead the position of your fancy external RTK GNSS receiver.By using Mock location, you can receive centimeter accuracy on MapitGIS.
    Follow ArduSimple tutorial [How to use centimeter GPS with any Android app (mock location)](#) to enable correction service on GNSS Master app and use mock location on MapitGIS.

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MapitGIS that the

Now you are ready to map and survey in a variety of applications from agriculture and forestry to road construction, geology, land surveying with centimeter level accuracy on your Android device.

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How to use RTK Calibrated Surveyor Kit with Other software?

If you need to use Surveyor kit with any other software, we will explain how to configure Ardusimple RTK receivers to be used as mock location for Android smartphones/tablets in order to get centimeter position accuracy.

If you are not familiar with the term, mock location means that you cheat your Android device to use an external GNSS receiver as if it was its own internal one. This has the advantage that any GPS/GNSS app that works with your Android device can benefit of centimeter level accuracy.

Firstly, install GNSS Master app and enable mock location in your Android Device.
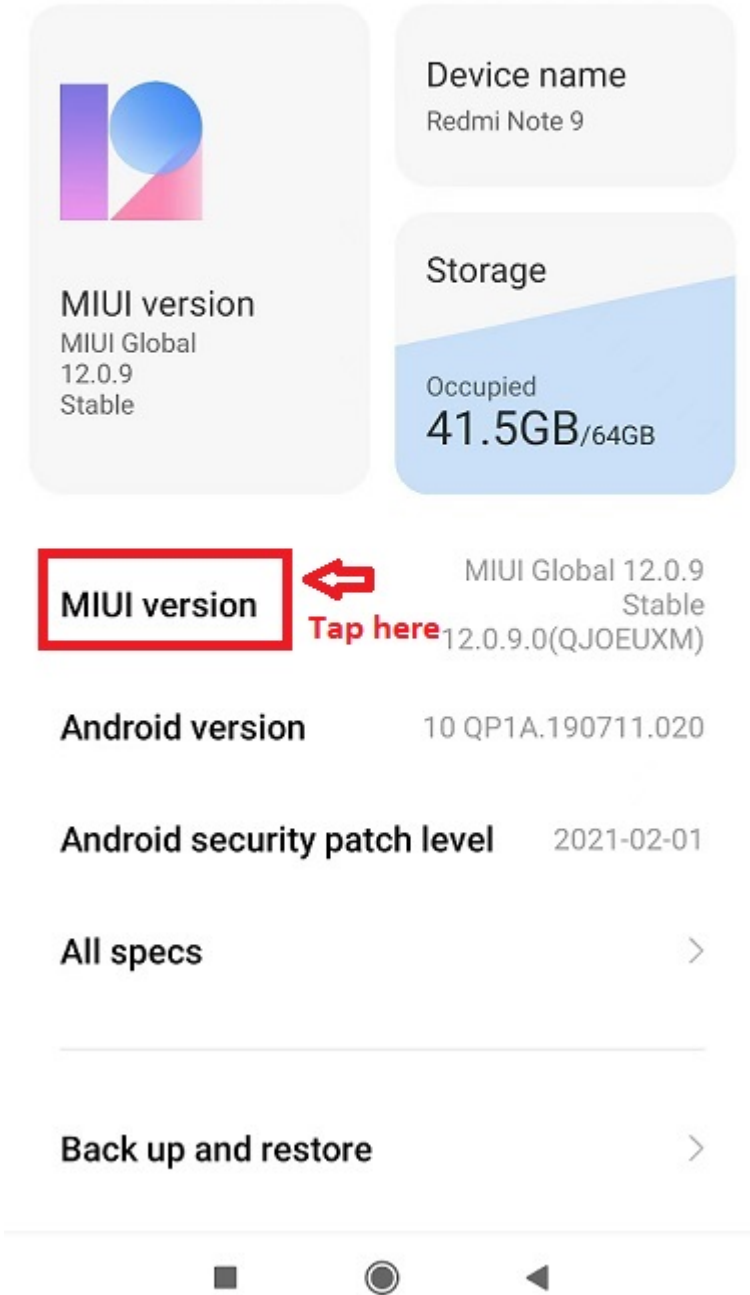
This step only needs to be done once.

1. Install GNSS Master app on your Android device from the Google Play Store. When you first open the app, you will be asked to allow certain permissions to GNSS Master.

- Location Permission
- Display Notifications

   Once you accept the permissions, the *Status* page will load, showing the current status of the app. We will configure it later.

2. To enable mock locations in Android we will need to get Developer permissions. The procedure may vary slightly between different Android versions and smartphone models (you can Google your *"Smartphone model + enable mock location"* if you can't find the exact options).
3. On Android 4.1 and lower, the **Developer options** screen is available by default. On Android 4.2 and higher, you must enable this screen. To enable developer options, tap the **Build Number, MIUI version or similar** option 7 times.

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4. You can find this option in one of the following locations, depending on your Android version:

- **Settings –> About Phone –> Build Number**
- **Settings –> System –> About Phone –> Build Number**

5. Once you have access to Developer options, you can go to **Settings –>Additional Settings** and at the bottom you will find Developer options. In this big list, tap **Select mock location app** and select **GNSS Master** from the list.

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Revoke USB debugging authorisations >

Install via USB
Allow installing apps via USB

USB debugging (Security settings)
Allow granting permissions and simulating input via USB debugging

Select mock location app >
Mock location app: GNSS Master

Force full GNSS measurements
Track all GNSS constellations and frequencies with no duty cycling

Enable view attribute inspection

Select debug app >
No debug application set

Wait for debugger
Debugged application waits for debugger to attach before executing

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6. Connect the GNSS antenna to your device, in a location-with good view of the sky, or near a window for testing the functionality.

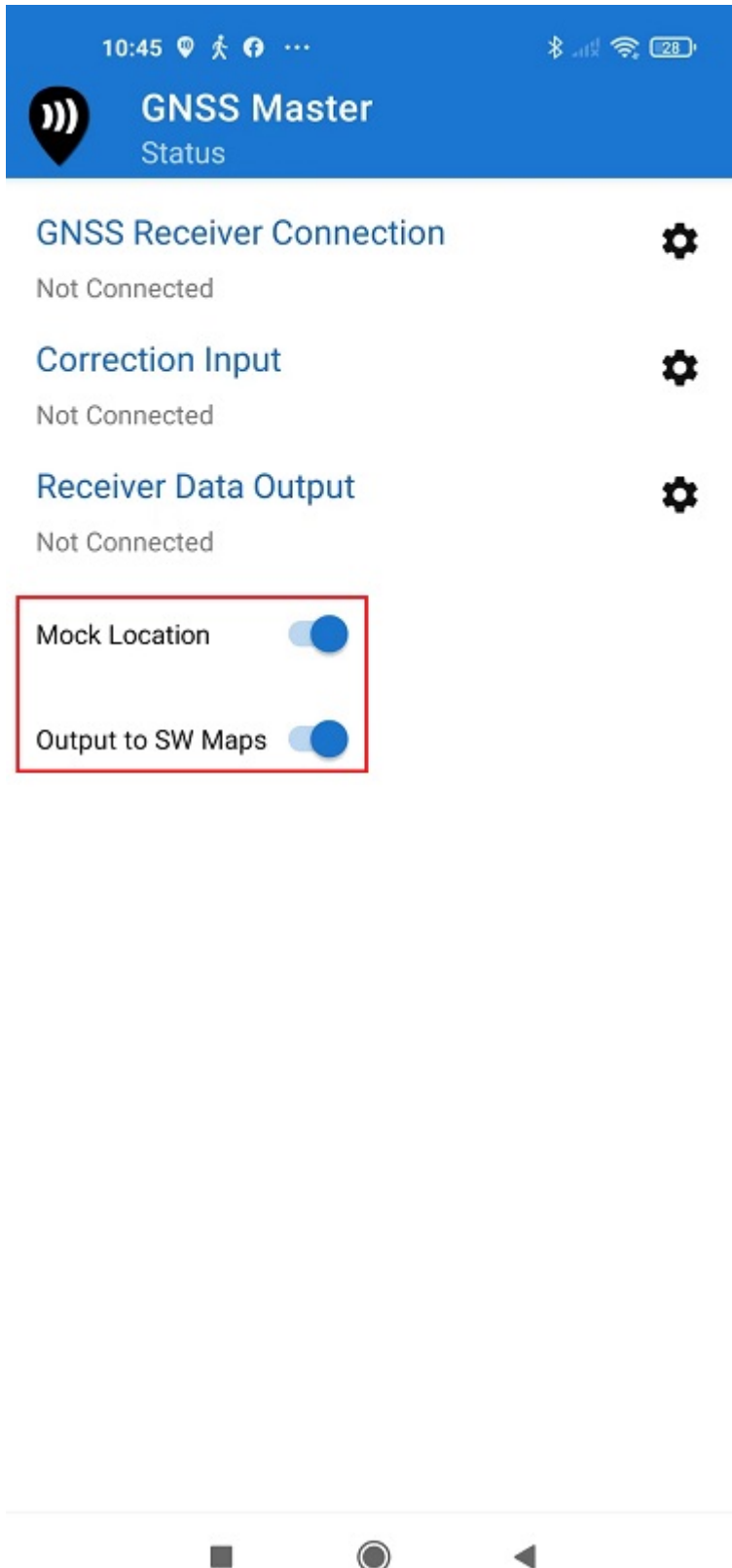**Secondly, connect the RTK receiver to your Android device.**

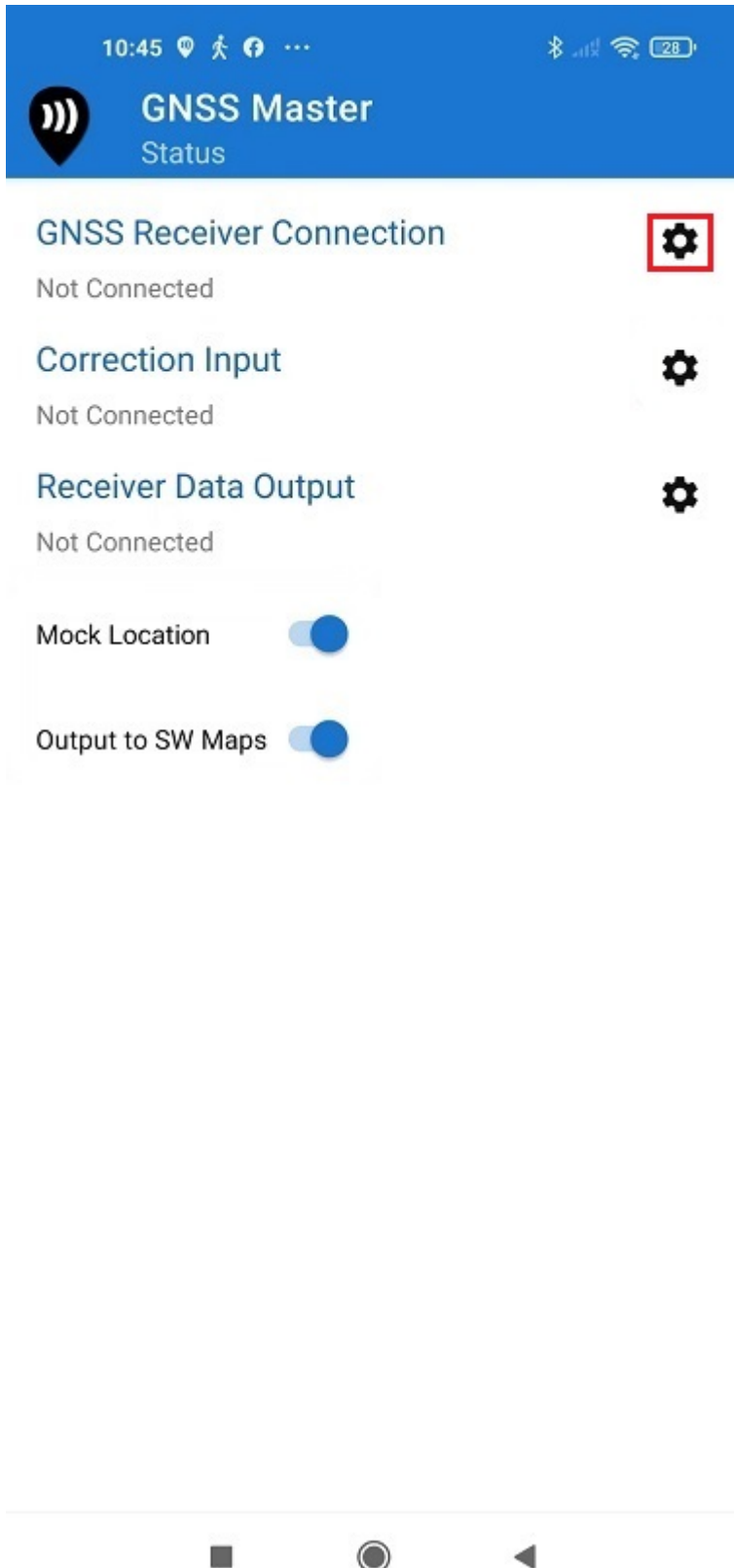Connection via USB OTG
Connection via Bluetooth
Connection via USB OTG

The best option (if your device supports it) since you can power and communicate with it at the same time.

7. Connect RTK receiver with your Android device with USB OTG cable.
8. Open GNSS Master app. Check Mock Location and Output to SW Maps.

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9. Click the gear icon on the right side of **GNSS Receiver Connection** to enter the setup menu.

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10. Choose **USB Serial** at Mode**.**

Set **Baud Rate** to 115200 bps (if you ordered your ArduSimple Proofessional kit before 09.10.2023, set Buad Rate to 38400 bps. If you use a different receiver, the Baud Rate should match with your receiver configuration).

At **Connected USB Device**, it will automatically recognize your receiver with name ******* USB UART**.

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11. Press **CONNECT**.

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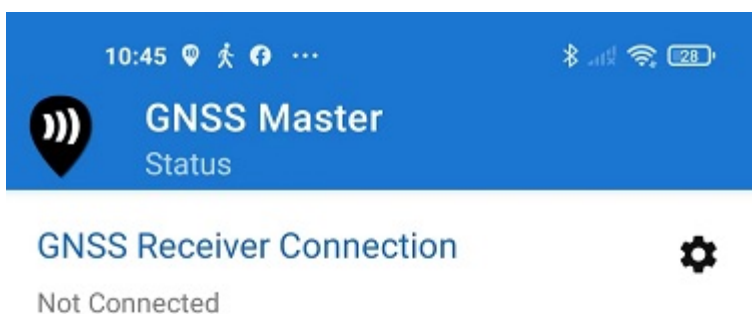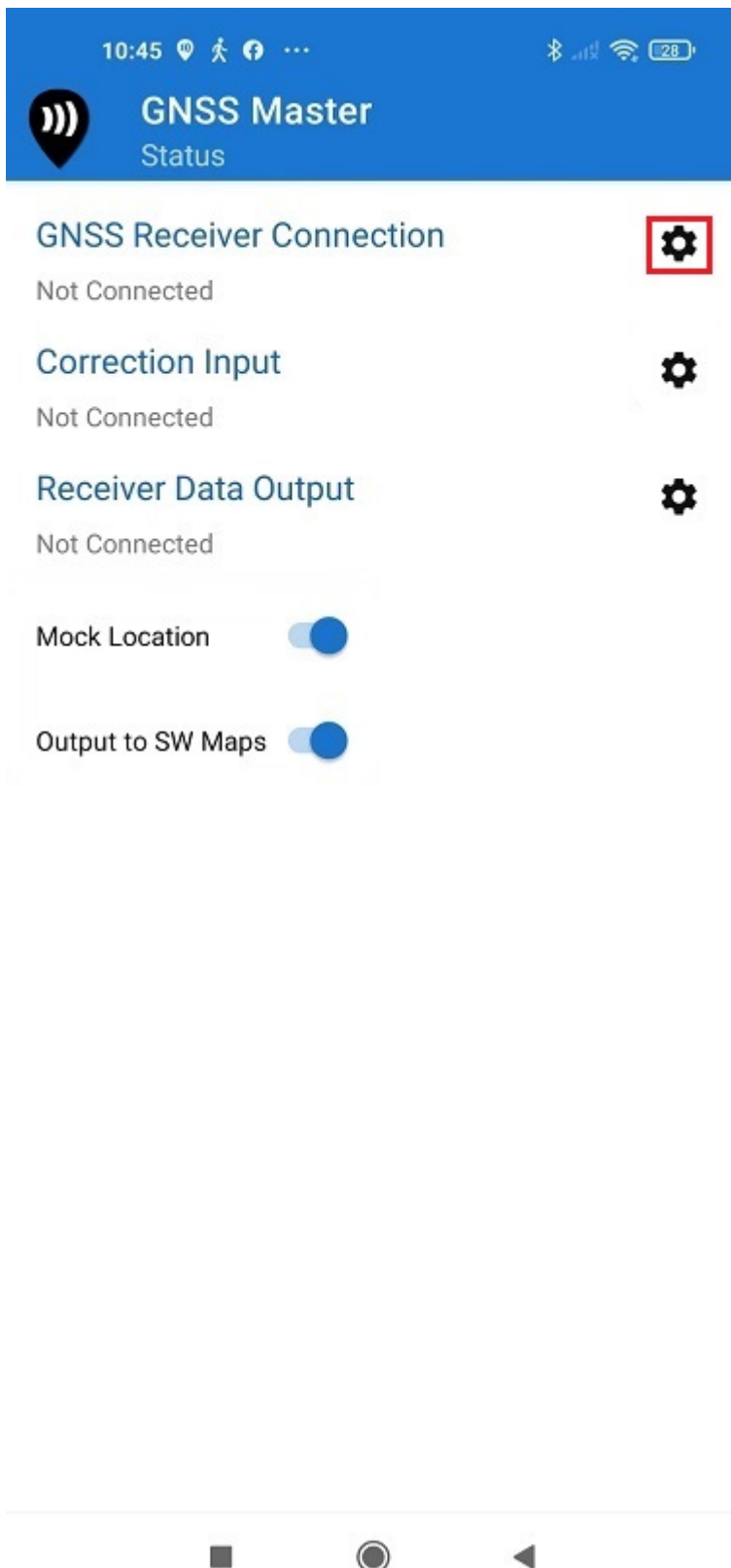
Connection via Bluetooth

7. Power your <u>RTK receiver</u> by connecting USB cable to the power supply (smartphone/tablet/ compatible powerbank). If you get any popup message to connect the USB device with any app, you can ignore it.

8. Enable your smartphone/tablet Bluetooth, and pair it with your <u>RTK receiver</u>. When pairing your device, notice that it may appear as **RTK_GNSS_***** or as a generic MAC number (e.g.: F0:0A:95:9D:68:16). The password is always 1234.-*The pairing only needs to be done once.*
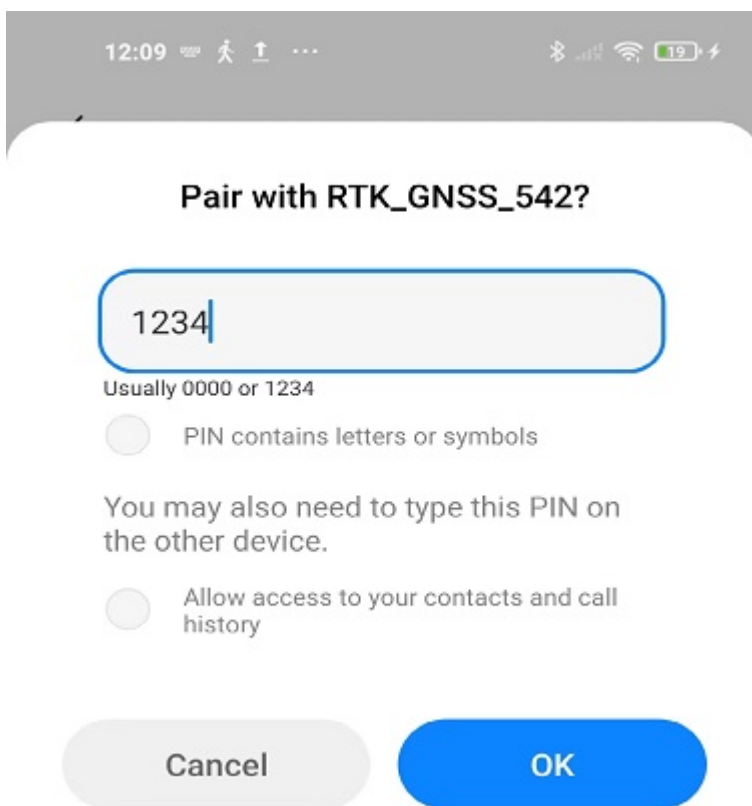
9. Open GNSS Master app.Check Mock Location and Output to SW Maps.

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10. Click the gear icon on the right side of **GNSS Receiver Connection** to enter the setup menu.

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11. Choose **Bluetooth** at Mode. In Paired Devices chose the one you paired in step 8. Press **CONNECT**.

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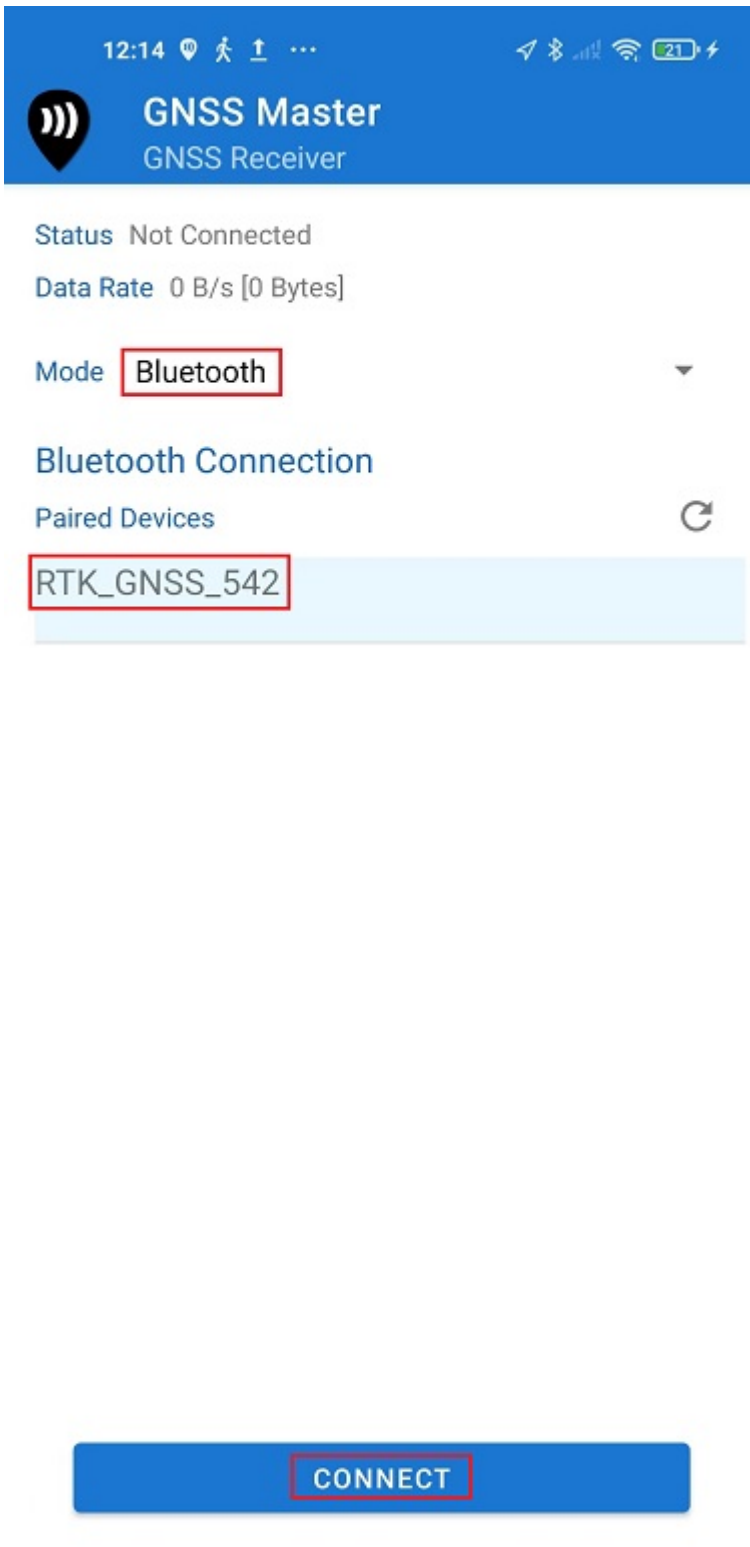
12. Go back to main menu. Now you should see in GNSS Receiver Connection it says Connected and with data transfer.

Connected
RTK_GNSS_542 [Bluetooth]
201 B/s[31 KB]

Correction Input ⚙

Not Connected

Receiver Data Output ⚙

Not Connected

Mock Location ⬤

Output to SW Maps ⬤

13. Open **Correction Input** by clicking on the gear icon.

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Connected
RTK_GNSS_542 [Bluetooth]
201 B/s[31 KB]

Correction Input 🗄

Not Connected

Receiver Data Output ⚙

Not Connected

Mock Location 🔵

Output to SW Maps 🔵

■ ◉ ◀

14. In **Mode** choose **NTRIP Client** and press the **+** button next to NTRIP Connections.

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A)))S
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Mode   NTRIP Client ▾

NTRIP Connections   +

No Connections Found

CONNECT

■   ●   ◀

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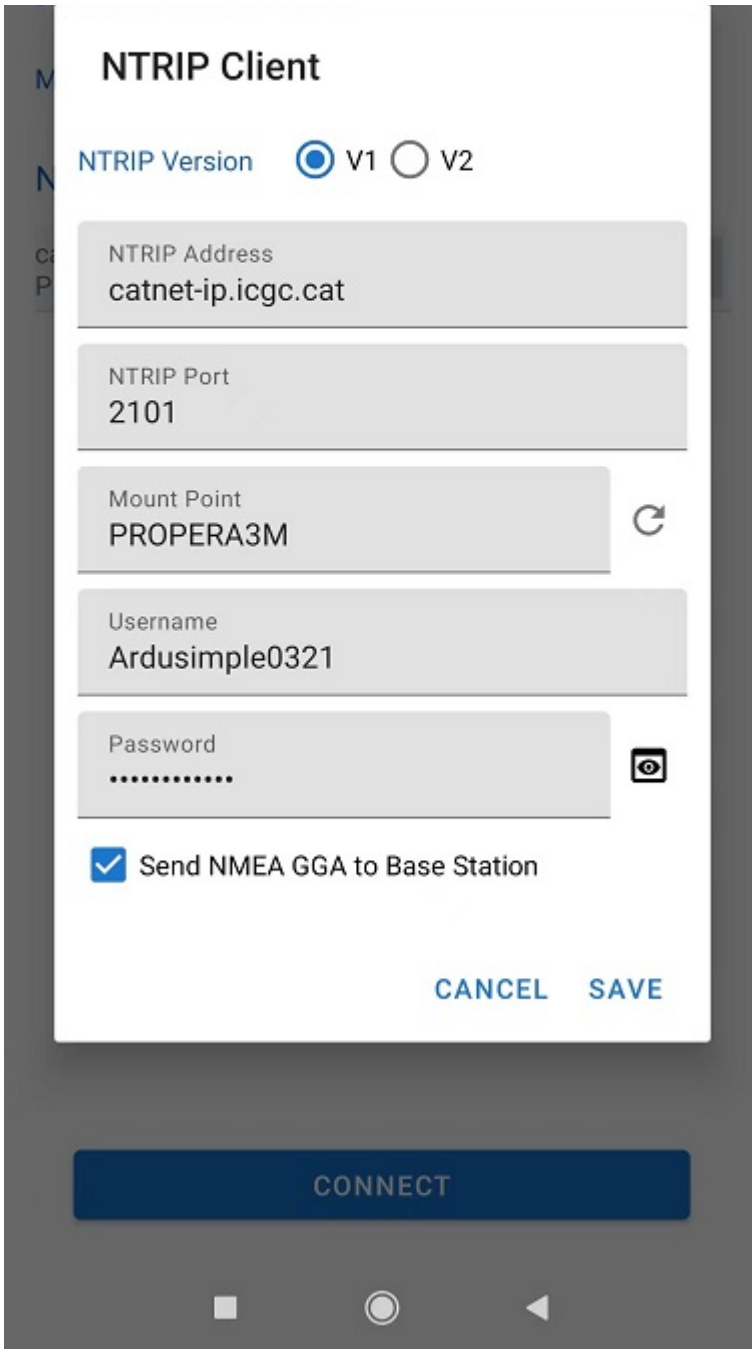15. Set your NTRIP Client credentials (Caster IP, Caster Port, Username and Password).
    If you don´t know how to do it, have a look at this [tutorial](#).
    Press **SAVE**.

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NTRIP Client

NTRIP Version ⦿ V1 ◯ V2

NTRIP Address
catnet-ip.icgc.cat

NTRIP Port
2101

Mount Point
PROPERA3M ↻

Username
Ardusimple0321

Password
••••••••••• 👁

☑ Send NMEA GGA to Base Station

CANCEL SAVE

CONNECT

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16. Press **CONNECT**. In Status you will see **GNSS Receiver Connection** and **Correction Input** showing Connected and with data communication.

Connected
FT232R USB UART [USB Serial]
1832 B/s[186 KB]

Correction Input ⚙

Connected
catnet-ip.icgc.cat:2101
PROPERA3M / Ardusimple0321 [NTRIP Client]
1224 B/s[276 KB]
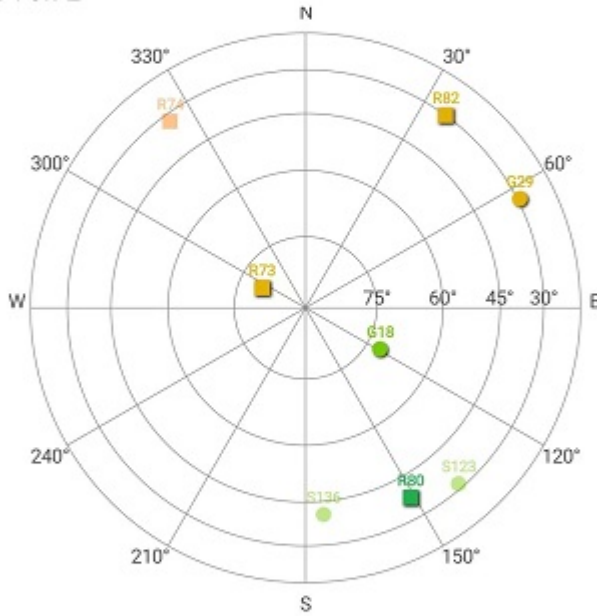
Receiver Data Output ⚙

Not Connected

Mock Location 🔵

Output to SW Maps 🔵

17. You can check your location and available satellites in Skyplot.

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Ellipsoidal Height: 1108.620m
Speed: 0.09 m/s
Fix type: Single
Satellites in view: 8
Satellites in use: 5
PDOP: 4.65
HDOP: 2.8
VDOP: 3.72

18. Open your favorite GPS/GNSS application and use it as usual.

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You will be using the external RTK GNSS receiver instead of the smartphone/tablet internal GPS receiver. Following image is the example of SW Maps.

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Device: External App
Instrument Model: External App

Date: 8 Jun 2023
Time: 08:53:49

Latitude: 42.50852780°
Longitude: 1.53072049°
X: 31N 379290.217m E
Y: 31N 4707285.915m N
Ellipsoidal Height: 1087.398m
Orthometric Height: 1038.361m
Speed: 0.01 m/s
Bearing: 331.0

Fix Type: DGPS
PDOP: 1.21
HDOP: 0.64
VDOP: 1.03
Satellites in View: 16
Satellites in Use: 12

Latitude Error: N/A
Longitude Error: N/A
Horizontal Accuracy: N/A
Vertical Accuracy: N/A

100 m
200 ft

Google

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19. We have tested this functionality with many apps, you can find them in this-link.
    If you test it in other apps, you can send us an email at info@ardusimple.com and we
    will add it to the list.
    The Android robot is reproduced or modified from work created and shared by Google
    and used according to terms described in the-Creative Commons 3.0 -Attribution
    License.

Now you are ready to survey and map!

Related tutorials

- How to connect RTK receiver to iOS device (iPhone or iPad) via BT+BLE Bridge?
- Mock location with USB OTG
- How to configure your simpleRTK2B receiver on your Android smartphone via GNSS master?
- How to export your survey work from your Android device to QGIS and AutoCAD
- How to use custom geoid for orthometric height measurements in Android with Mapit GIS or Mapit Spatial
- Ellipsoidal, orthometric and geoid height 101
- How to use Ardusimple products with iOS smartphones/tablets via WiFi
- How to use Ardusimple products with SW Maps on Android smartphones/tablets

Accessories

Here you can find affordable accessories for RTK Calibrated Surveyor Kit.-

Accessories

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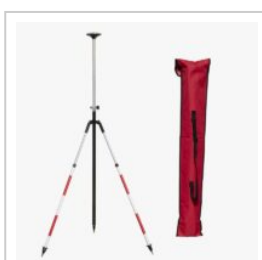Page 69 of 71

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119,00€ Add to cart

Accessories
Waterproof Transport Case IP67
From 59,00€
Select options
This product has multiple variants. The options may be chosen on the product page

Accessories
Bipod for surveying pole
169,00€ Add to cart

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Cables
USB-C on-the-go (OTG) with external USB-C power supply
10,00€ Add to cart

EU Conformity & RoHS Certificates

Here you will find a summary of the EU Conformity Certificates of all our products.

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