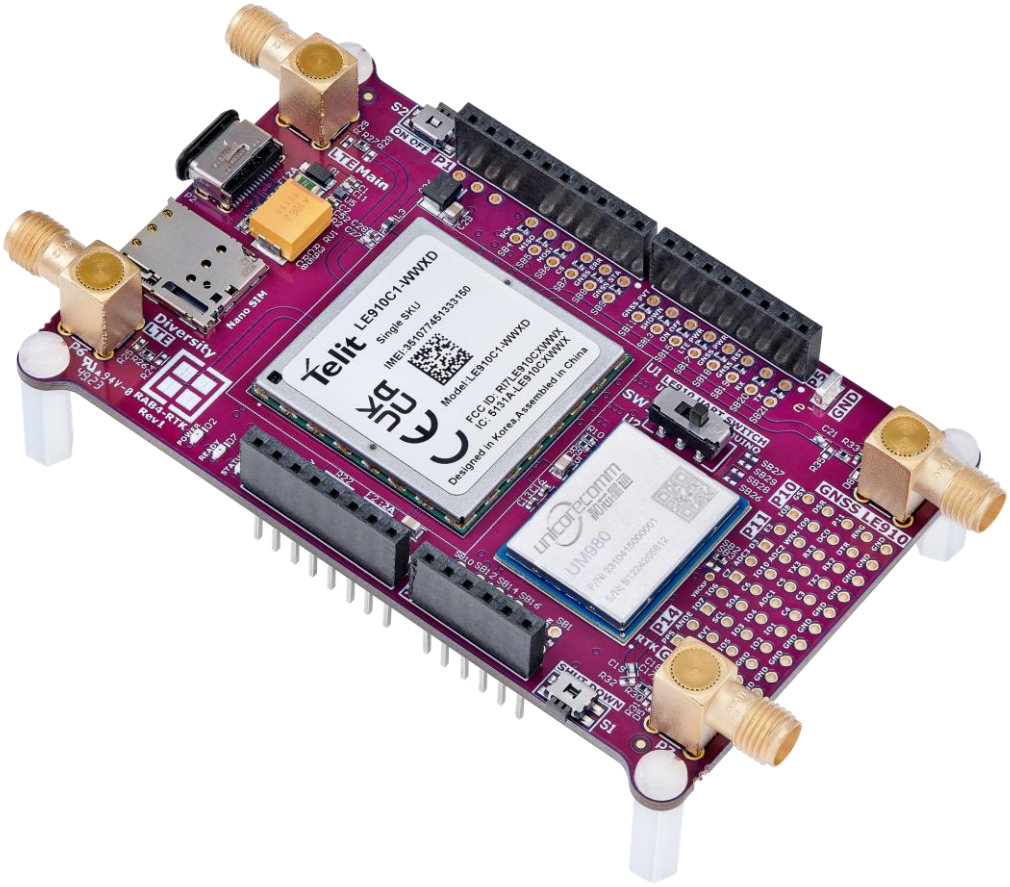
Quick Start Guide

Using RAB4-RTK as base and rover for high precision positioning



Versions

Version	Date	Rationale
1.0	July 12, 2024	First release. Authors: ROJ, KOA
1.1	November 25, 2025	PSOC 64 disclaimer added. Author: KOA

Legal Disclaimer

The evaluation board is for testing purposes only and, because it has limited functions and limited resilience, is not suitable for permanent use under real conditions. If the evaluation board is nevertheless used under real conditions, this is done at one's responsibility;
any liability of Rutronik is insofar excluded.

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Components

The demonstrator consists of a rover and a base station.

One rover requires:

- one USB battery,
- two LiPo batteries (mounted below the rover)
- two charging cables (to charge the LiPo batteries),
- one RDK3 + one RAB4-RTK.

One base station requires:

- one USB battery,
- one RDK3 + one RAB4-RTK.

Both base station and rover are using L1/L2 antenna of the RTK board. The small white inscription on the cable's antenna indicate this.

It´s important to disconnect the USB batteries and the LiPo batteries when not using the rover.

Infineon has discontinued the PSOC™ 64 Secured MCU product line. As a result, the CYB06447BZI-BLD53 MCU used in the RDK3 is not recommended for new designs. The Infineon CY8C6347BZI-BLD53 MCU may be considered a suitable alternative.

Using the demonstrator

Base station

1. Starting condition: base station is not powered (i.e. USB battery not plugged).
2. Position the base station and make sure that it does not move during the demonstration. If possible, base station should be away from walls, trees etc.
3. You can place the antenna on the plastic box, or on a metal plate (better).
4. Plug the battery and close the box.
5. The LED1 should blink.

LED1: "heart-beat". Blinks to show that the SW is running.

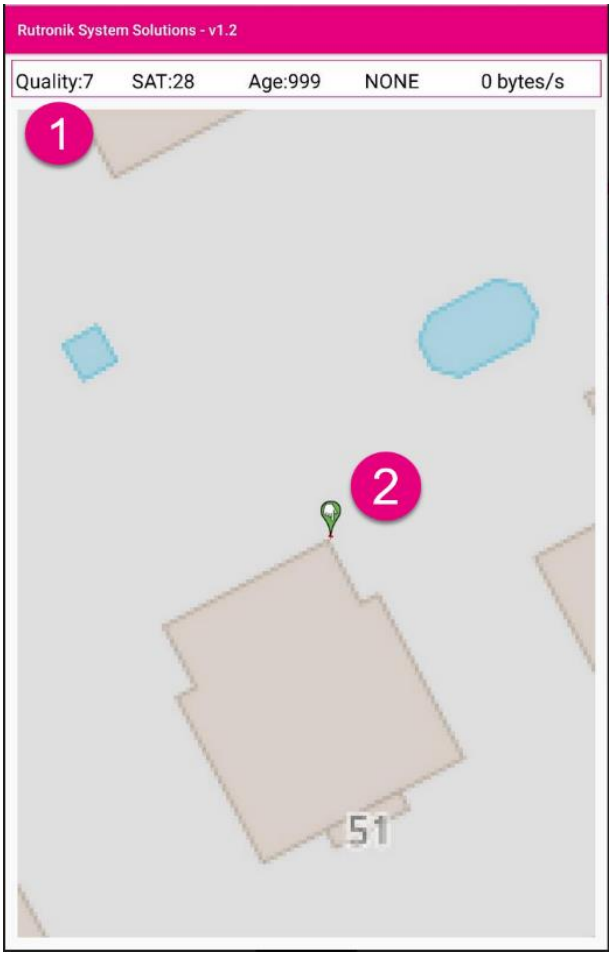
LED2: BLE connection state. Turned ON when a client is connected.

LED3: RTCM correction. Blinks when RTCM correction data are generated by the UM980.

6. After ~2 minutes the LED3 should blink as well (means that the base station is generating correction data).

The base station does an average of its position during 60 seconds and then considers the results as its position.

You can see this position using the Android app developed specially for this demonstrator. The APK file is stored at GitHub (private access to Rutronik System Solutions GitHub is required):
https://github.com/RutronikSystemSolutions/RDK3_Android_App/blob/MotorControl/bin/app-release_v1.2_rover_base_control.apk



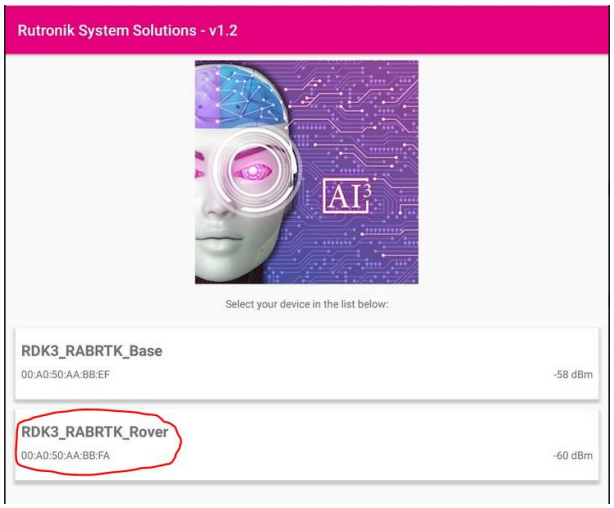
(1) **Quality 7** means that the position is fixed, and that the module is working as a base station.

(2) The green marker in the app shows the actual position of the base station.

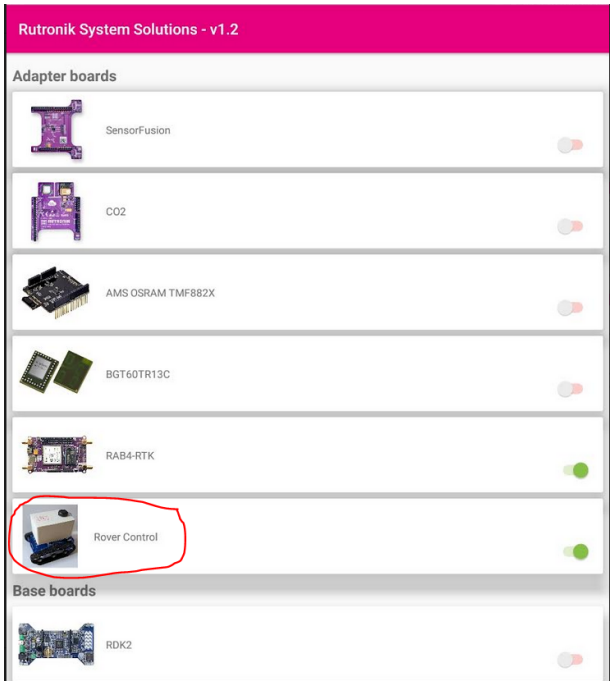
By doing a “long press” on the map, you can manually set up this position. It is useful if the calculated position of the base is inaccurate.

Rover

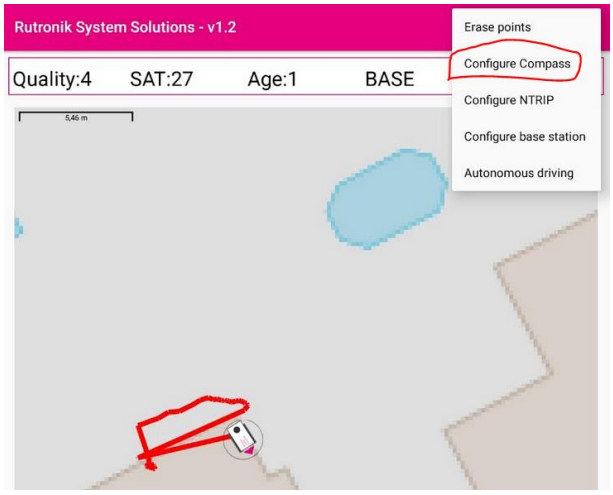
1. Place the USB battery in the special section of the rover box and connect it to the RDK3 via USB cable.
2. Connect two LiPos battery below the rover.



3. Run the app and open connection with RDK3_RABRTK_Rover.

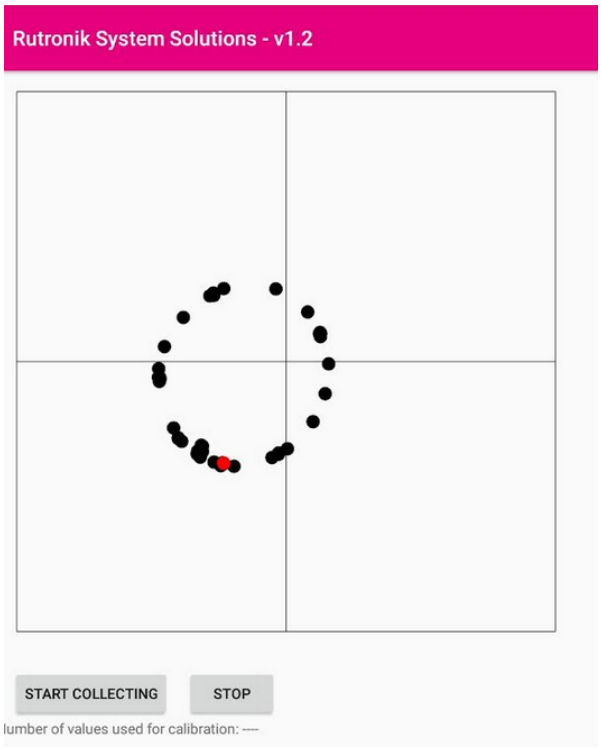


4. Press **Rover Control**.



5. Press on **[…]** button and then **Configure Compass**.

Steps 5 and 6 are required at the first time you start the rover with your smartphone, or if the rover direction is incorrect.

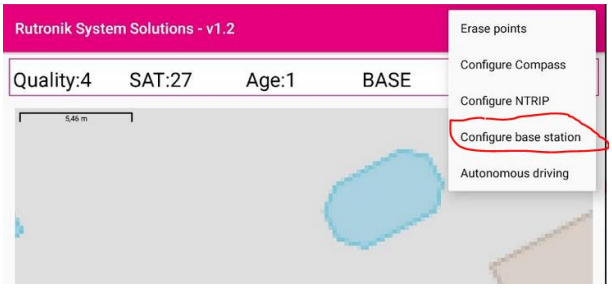


6. Press **Start collecting** button, and turn the rover manually (you should see black points, and they should form a circle).

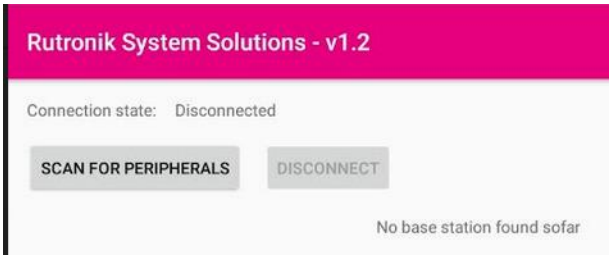
Then press on **Stop** button → the compass is now calibrated.

Press on the return button to go back to the previous activity.

When starting, the rover will only use GNSS signal to compute its position (quality will be 1 ->, precision of the position +/- 5 meters). To enhance the precision of the position, the rover needs correction signal from the base station. Follow next steps to configure it:

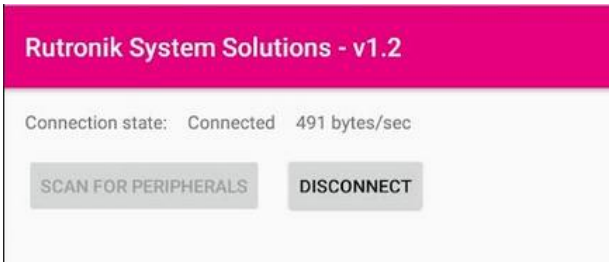


7. Press on **[…]** button and then **Configure base station**.

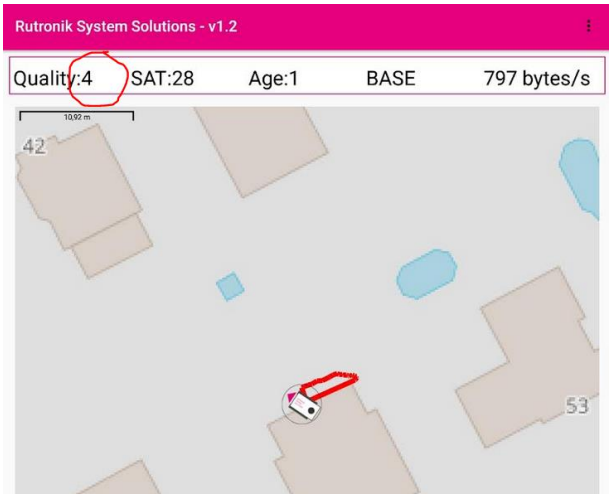


8. Press **Scan for peripherals**. It activates the search of a base station around.
The search is performed within a 20 meters range because of BLE limitations.

9. If the base is found, it appears in the list. Press on it to open the connection.



10. When connected, a corresponding **State** and the **data speed** are shown.
Go back to the previous activity.



11. After some time (around 2 minutes) you will see a **Quality 4** that is the best one with precision about 1.5 cm.

At this point, you can use the commands (top and down arrows) to control the rover, or you can do a long press on the map to set a position to reach. The rover will automatically drive to this position.

Firmware

The rover is already programmed, the Firmware section is for documentation purposes only.

Getting access to firmware

1. You need a private access to Rutronik System Solutions GitHub to get the firmware (one is for the base station, another one for the rover):
   https://github.com/RutronikSystemSolutions/RDK3_UM980_Rover_Base/tree/RobotEmbeddedWorld
2. Import the project inside the Modus Toolbox.
3. For this project, the current work goes in the “RobotEmbeddedWorld” branch.

Use the same antenna type for both base station and rover (L1/L2 or L1/L5 for both). Ensure you have an open overview of the sky.

Base station

There are two ways to configure the position of the base station:

- let the base station “discover” its position,
- set the position “by hand”.

```
int um980_app_set_mode_base()
{
	return send_command_and_wait("mode base time 60");
}

int um980_app_set_mode_base_with_position(double latitude, double longitude,
double altitude)
{
	char buffer[MAX_CMD_LEN];
	sprintf(buffer, "mode base %.11f %.11f %.6f", latitude, longitude,
altitude);
	return send_command_and_wait(buffer);
}
```