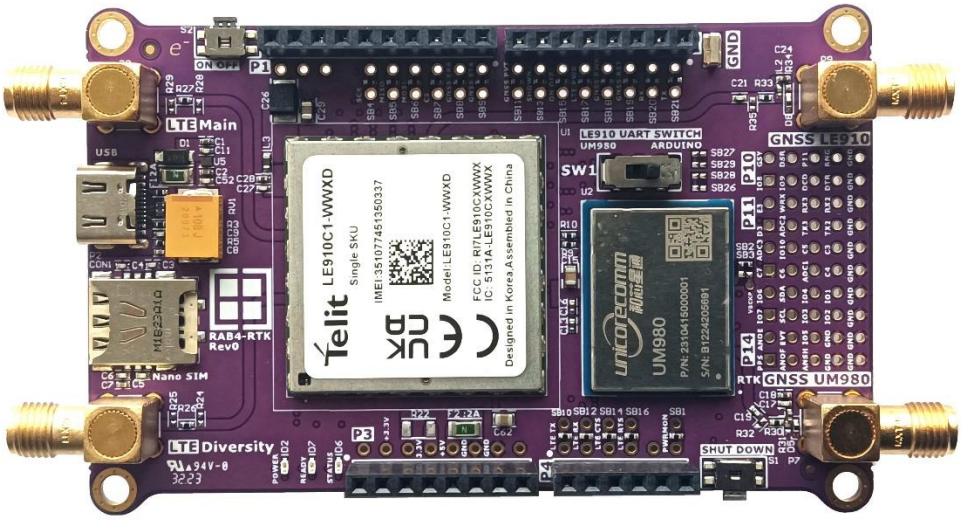
Application Note

Using RAB4-RTK and NTRIP Client for high precision positioning



Versions

Version	Date	Rationale
1.0	January 31, 2023	First release. Authors: ROJ, 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.

Table of Contents

Introduction

This application note describes how to enhance the positioning accuracy of RAB4-RTK´s Unicore UM980 module by using the desktop application developed by Rutronik to receive correction data from an NTRIP caster.

Overview of solution

NTRIP caster provides an access to GNSS correction data from base stations of different companies over Internet for a high precise positioning. The GNSS correction data are generally send using the RTCM SC-104 communication protocol. You can find a public (simplified) version of the NTRIP protocol by following this link.

To learn more about RTK positioning basics, check this document.

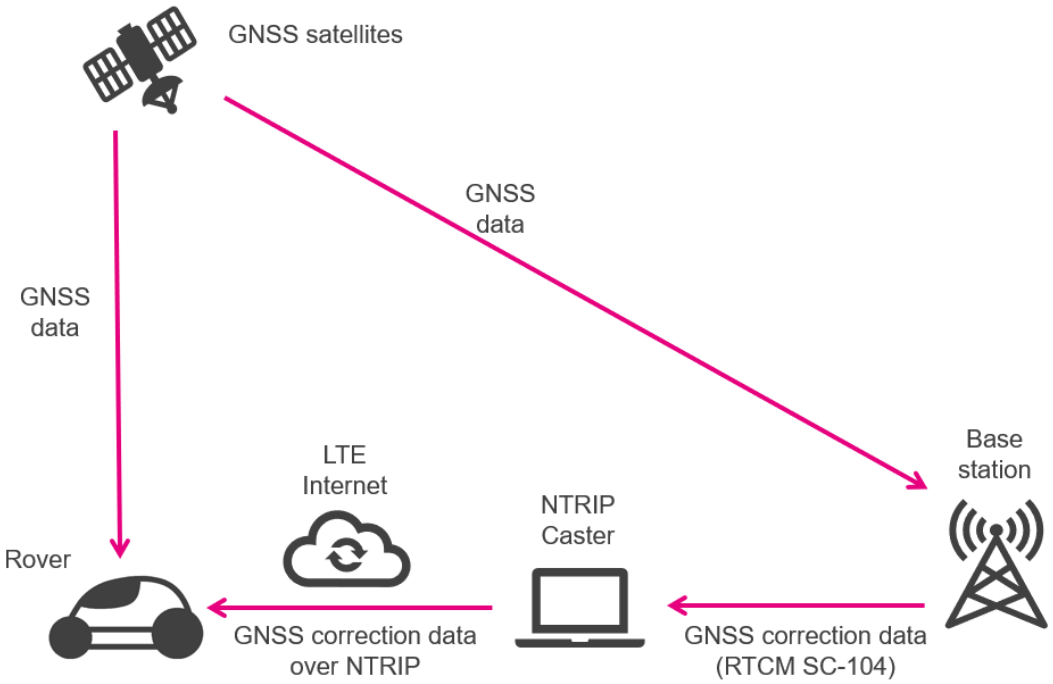


Figure 1. RTK navigation with NTRIP caster (using Internet)

RAB4-RTK board includes two major components:

- UM980 from Unicore Communication: a high precision RTK positioning module;
- Telit LE910C1-WWXD: an LTE module enabling connectivity. Telit module will not be used in that application note.

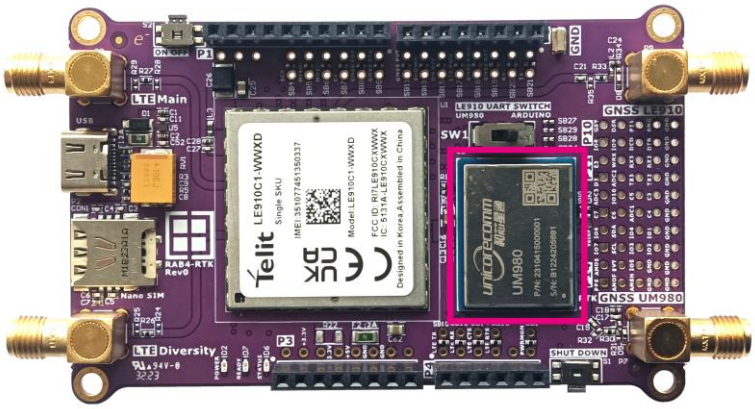


Figure 2. Unicore UM980 module on RAB4-RTK board

The connection to the NTRIP caster is performed by the computer, which must be connected to the Internet. The computer receives correction data from the NTRIP server over internet, and then, send the correction data to the UM980 module over USB. The correction of the localisation (longitude, latitude) – complex mathematics - is performed directly inside UM980.

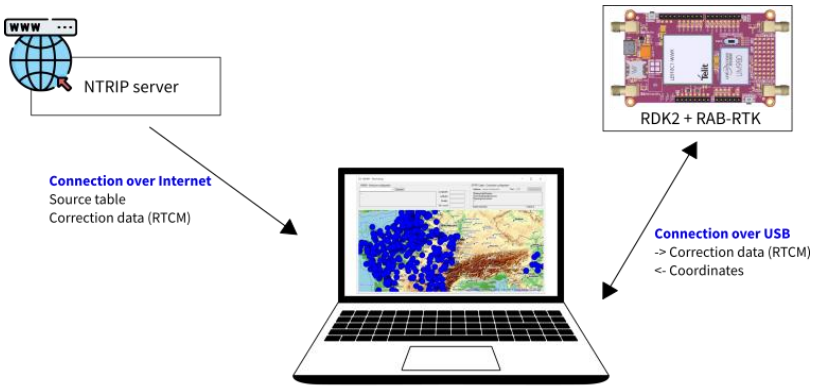


Figure 3. Diagram of NTRIP solution provided by Rutronik

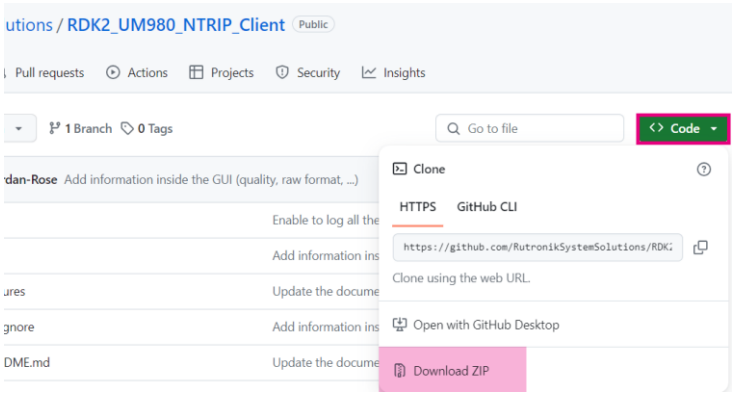
Requirements

- Windows based PC
- ModusToolbox™ software v3.x
- RDK2 board
- RAB4-RTK board
- GNSS Antenna
- Mini USB – USB cable
- USB type C – USB cable
- Internet connection

How to use the solution

Getting Started

1. Download **RDK2_UM980_NTRIP_Client** project from [RSS GitHub page] and unzip it.

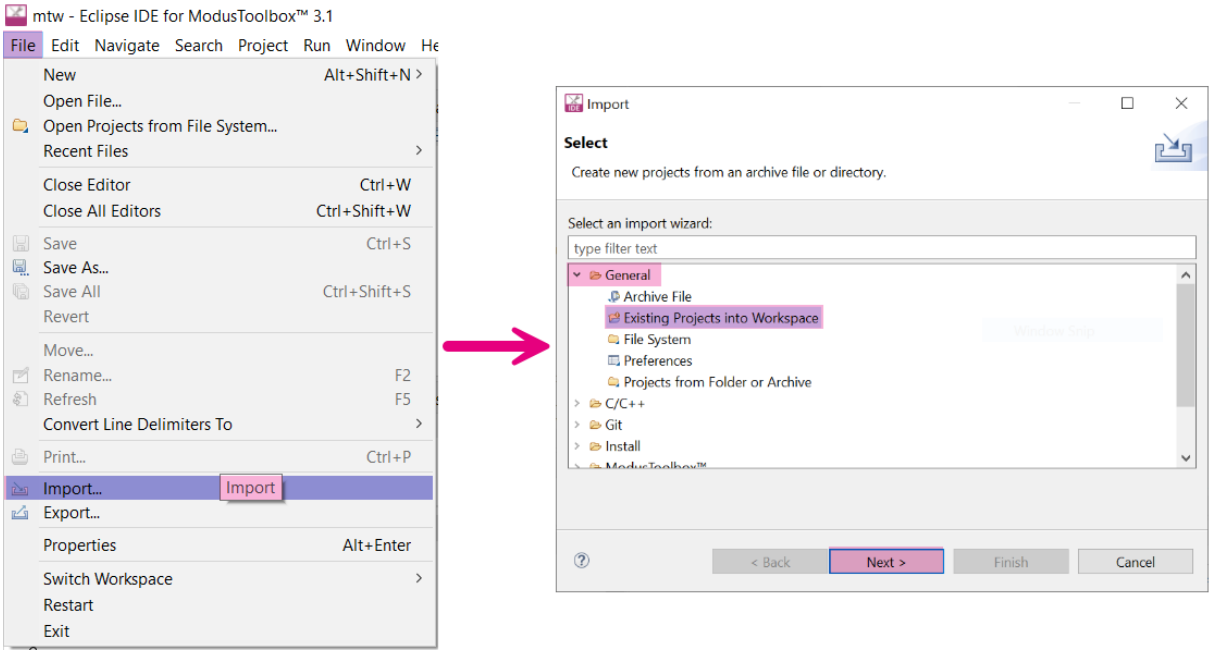


This repository stores 2 directories:

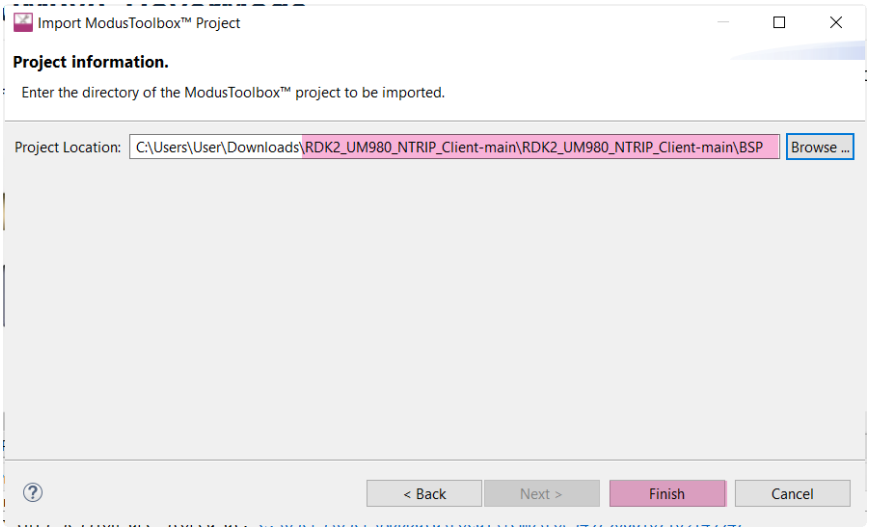
BSP - contains a project that can be imported into Modus Toolbox.

GUI - contains a Visual Studio project (C#). It also contains a binary data that can be executed if you do not want to compile the project yourself.

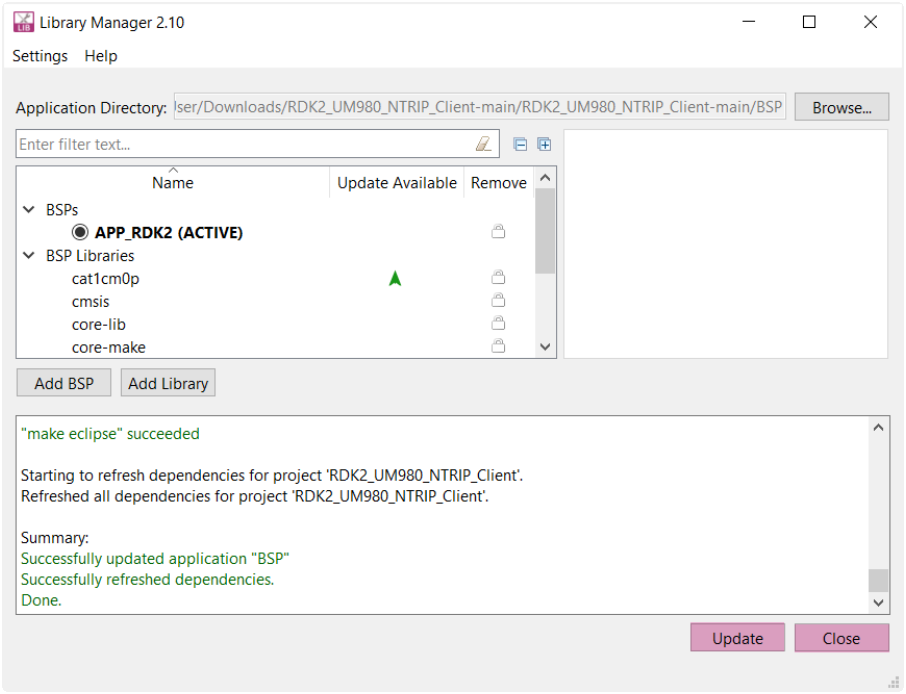
2. Run Modus Toolbox App. Press **File – Import**, select **Existing Projects into Workspace** and press **Next**.



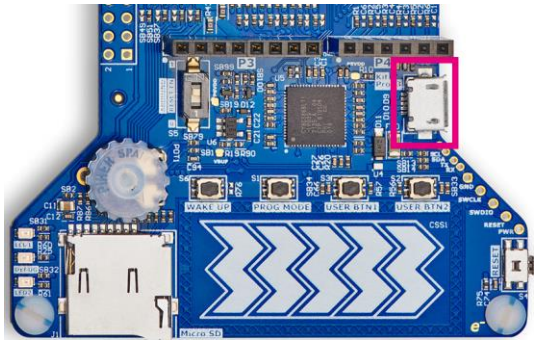
3. Select BSP folder that you´ve downloaded on the step 1 and press **Finish**.



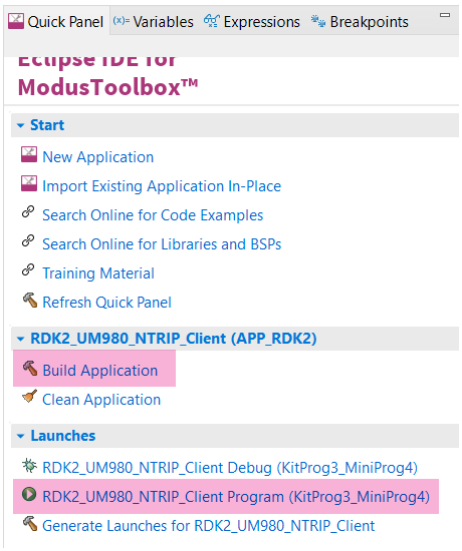
4. Run **Library Manager**, press **Update**, wait for a while until the success message appears and press **Close**.



5. Connect RDK2 to PC using mini USB cable.

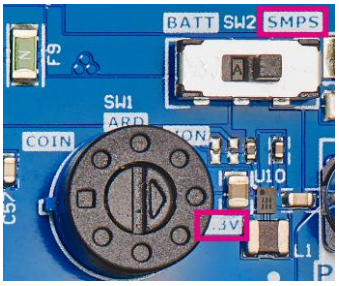


6. Build and program the binary file.

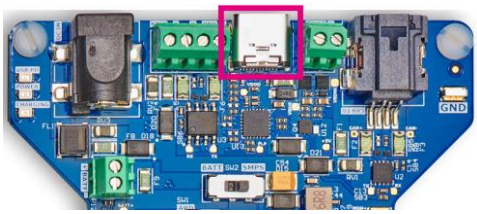


7. Disconnect RDK2 board from the PC.
8. Mount RAB4-RTK on RDK2´s Arduino headers, connect the antenna to highlighted connector of RTK.

9. Make sure the position of switches SW1 on RTK and SW1, SW2 on RDK2 boards match the pictures.



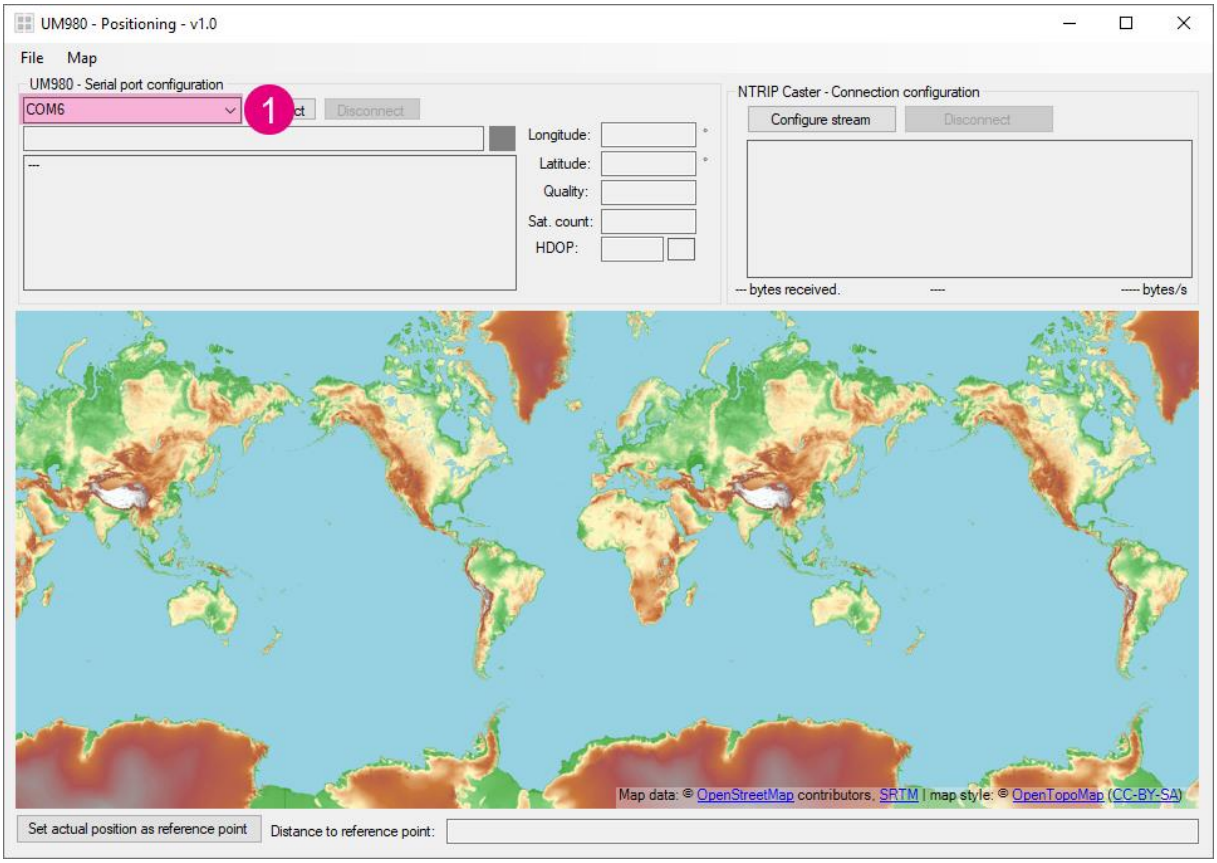
10. Connect RDK2 to the PC using USB type C cable.



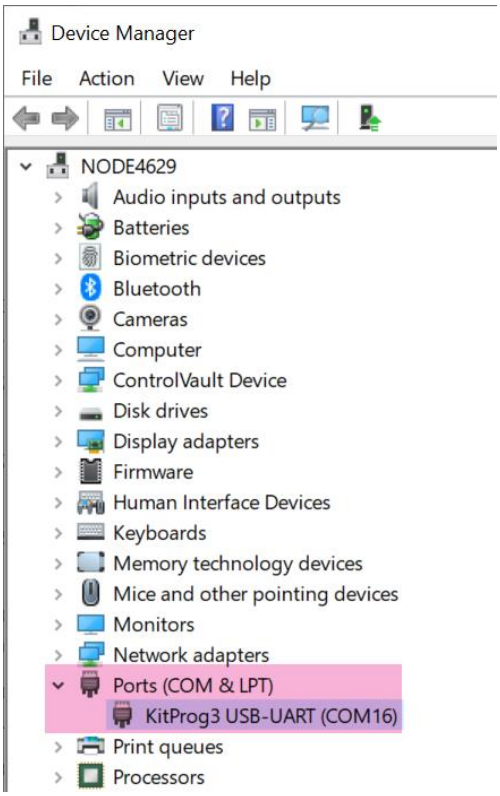
11. Run exe file from GUI folder:
    RDK2_UM980_NTRIP_Client-main\GUI\binary**UM980PositioningGUI.exe**

Using the App

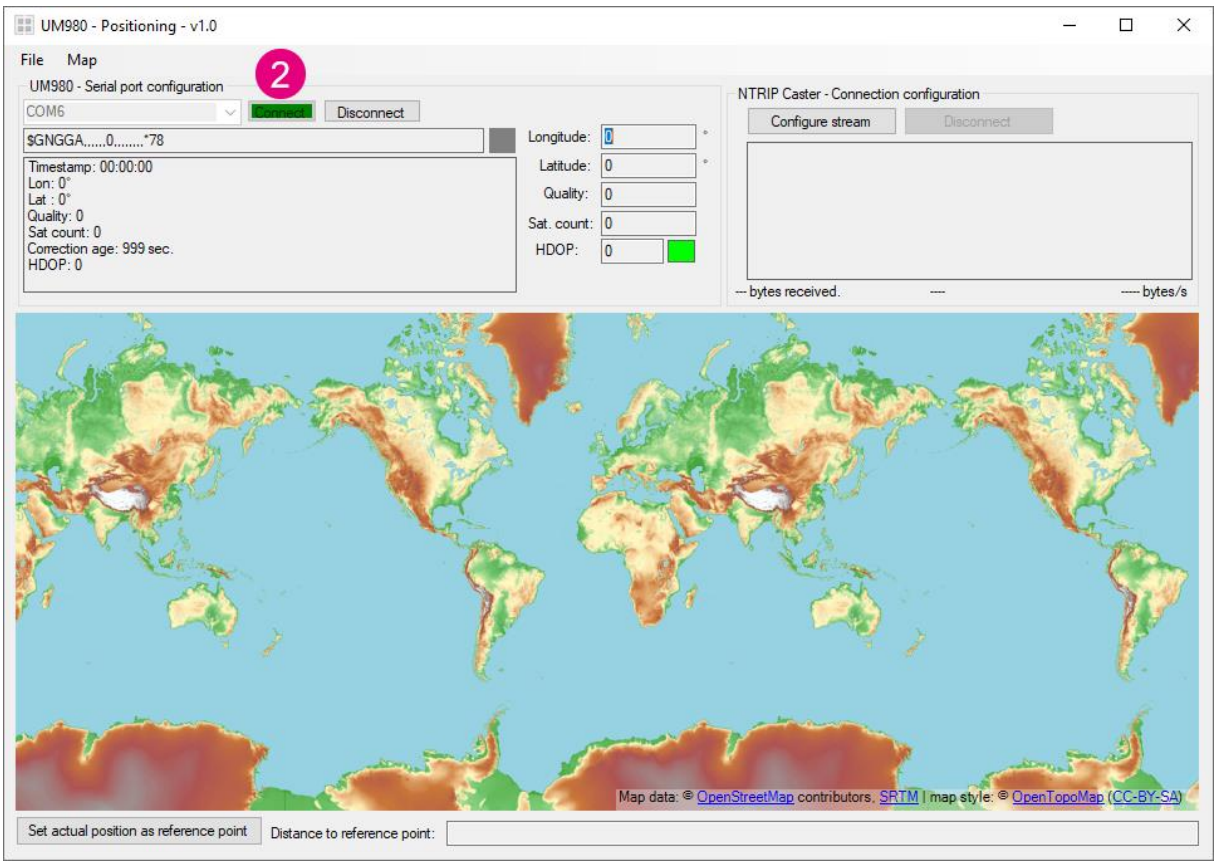
After launching the application, check that the serial port (1) selected in the list is correct.



Information can be found in Device Manager.



When the port is selected, click **Connect** (2) to receive the coordinates from the RDK2/UM980 sensor.



After the connection is established, the raw data received by GPS sensor (3) and corresponding positioning parameters will be displayed:

(4) Timestamp – a time received from satellite (UTC 0).

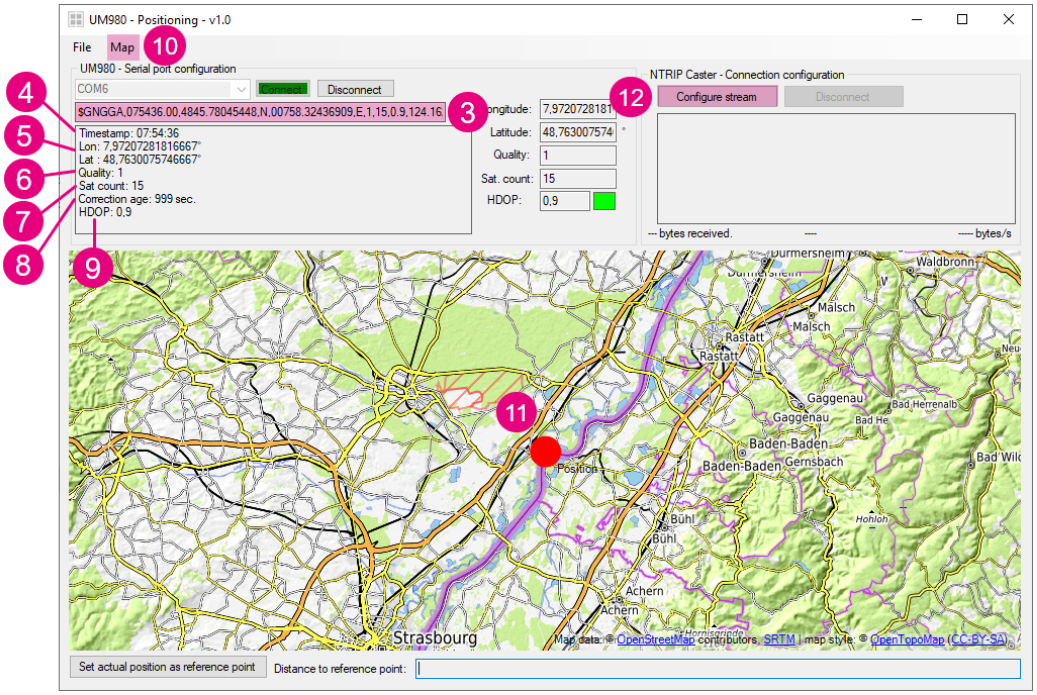
(5) Longitude, Latitude – GPS antenna location coordinates.

(6) Quality – quality indicator of connection (can take values 1, 2, 4, 5). To learn more about the quality indicators, check this document.

(7) Sat count – the number of satellites involved in determining the current location.

(8) Correction age is available for quality indicators 2, 4 and 5 and indicates how long ago the last correction data was received.

(9) HDOP - horizontal dilution of precision. The degree of precision is additionally marked with color (green – the measurement result can be trusted, yellow – the measurement result can be used, but it has errors, red – the measurement result is unreliable).



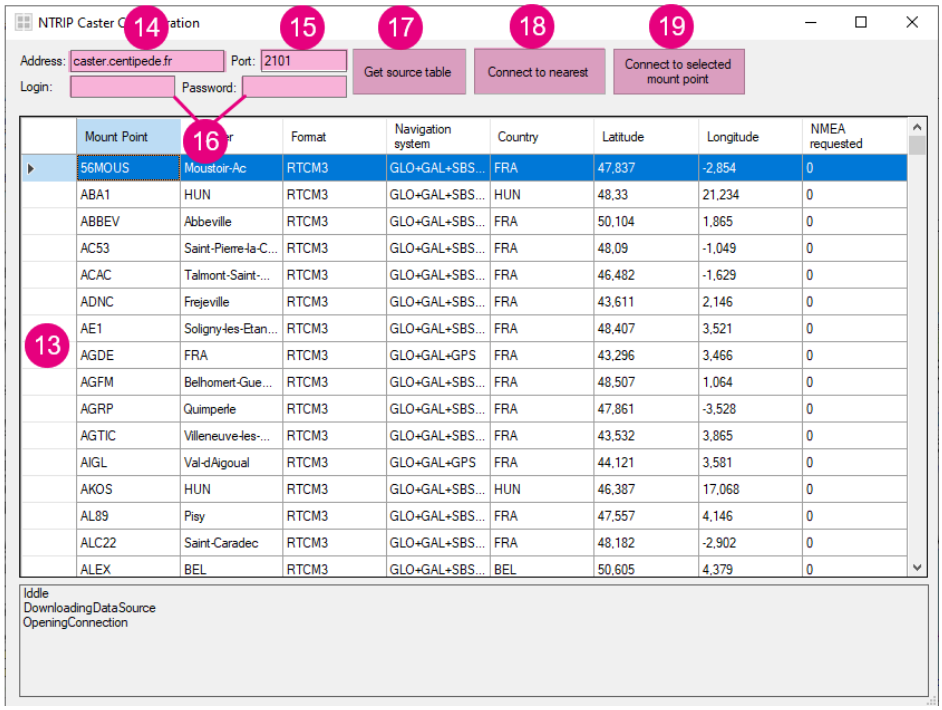
According to the default **Map** setting (10), the current position (red dot,11) will be displayed in the map center.

To run high-precision positioning mode using correction data (RTK), press **Configure Stream** (12). By default, the list of base stations (13) will be empty. Enter the address (14), port (15), and optional credentials (16). A list of correction data providers can be found here.

Example for France: caster.centipede.fr / Port: 2101 (no credentials).

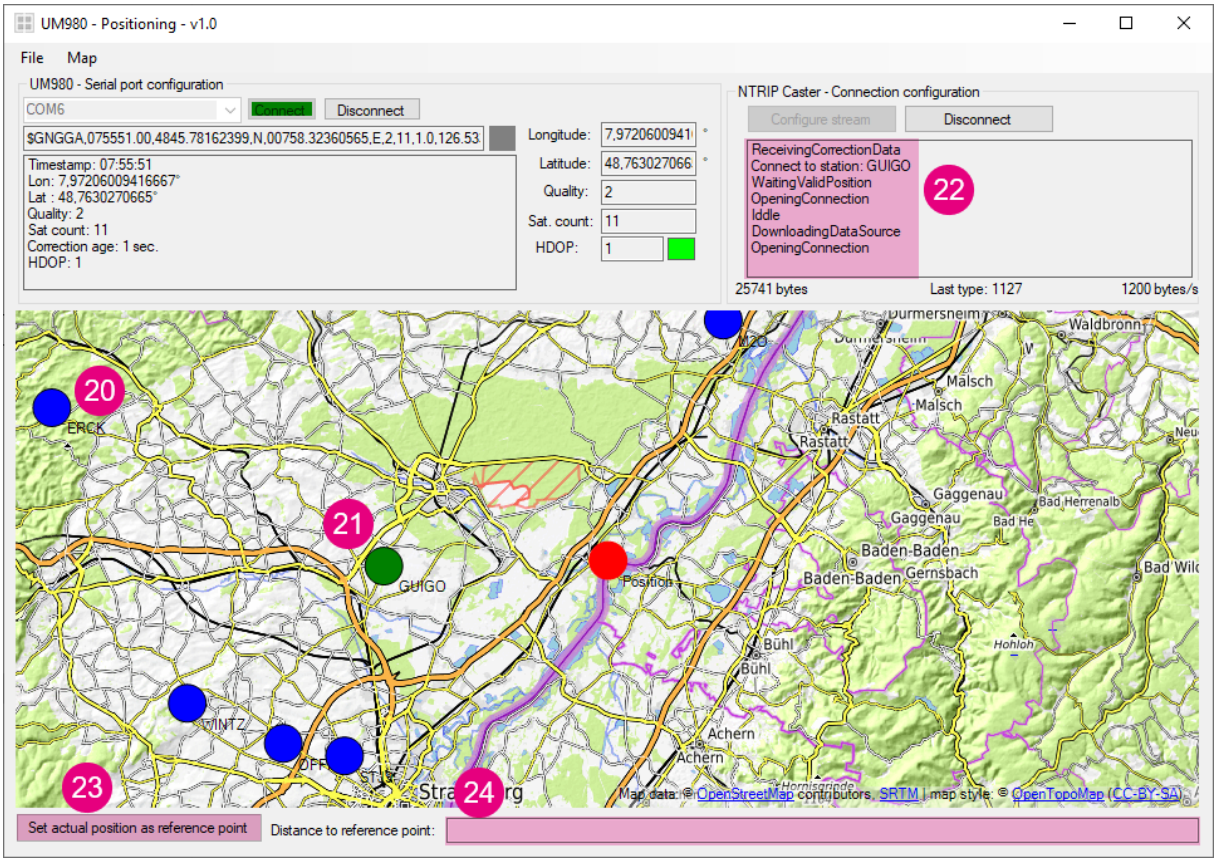
Example for Europe: euref-ip.net / Port: 2101 (no credentials).

After that, click **Get source table** (17) to download the list of available stations.



To automatically detect the nearest station and connect to it, click **Connect to nearest** (18). To connect to one of the stations in the list, select it and click **Connect to selected mount point** (19).

All stations of the selected provider will be loaded onto the map (blue dots, 20), the current position will be marked as before with a red dot, and the base station transmitting correction data will be marked with green (21).

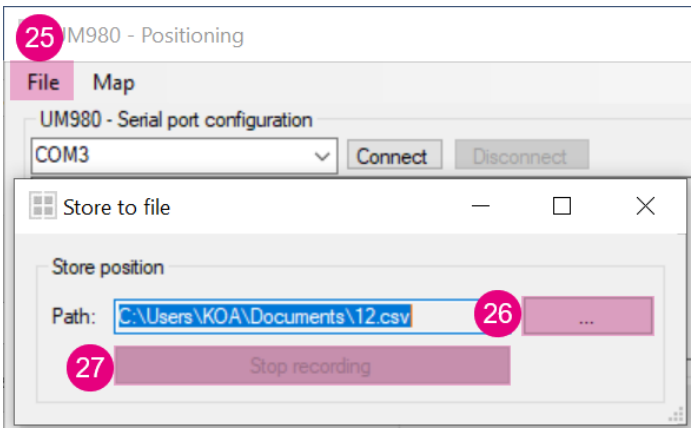


The log of connection to the base station will start to display (22).

To make sure that the sensor can handle the correction data, check the values of **Correction age** and **Quality**. If the **Correction age** is not measured and remains equal to 0, the sensor does not “understand” the correction data. Be sure that the RTCM version is OK, check UM980 datasheet for more details. If the correction works right, the **Quality indicator** will switch to 4 (or 5 in some cases).

Set actual position as reference point button (23) allows you to add a point to the map corresponding to the current sensor position. After its creation, **Distance to reference point field** (24) will display the distance from the current location to the reference point.

To save the positioning history into a separate file, click **File – Save to file** (25). Click on **[…]** (26) to set the name and path to the .csv file where the data will be saved.



After confirmation, saving data to a file will begin (one new line per second); to stop the saving process, click **Stop recording** (27).