

# User Guide for HAT Boards with RtkBase

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## Description

**ELT\_RTKBase** is a stationary **GNSS** base using multi-system, multi-frequency receivers like Unicore **UM980** or **Bynav M20** or **Septentrio mosaic-X5**. It offers advanced connectivity options via the internet or local network, complete with a detailed guide for inexperienced users

**ELT\_RTKBase** can operate as an **NTRIP** server (2 connections), **NTRIP** caster, **TCP** server, or **TCP** client (2 connections as well), record measurements, and allow downloading in **RTCM3** and **RINEX** formats.

Typical Uses:

- Cryptocurrency mining with base station networks like **Onocoy** and **RtkDirect**.
- Providing data to other base station networks.
- Serving as a local base for dozens or hundreds of rovers.

Advantages:

- Modern multi-system multi-frequency receivers.
- Very detailed documentation with numerous images for beginner users.
- Four methods of determining the base coordinates.
- Ease of setup.
- Open source allows for custom modifications by advanced users.
- Low cost.

# Getting started

To begin, insert the **SD** card into your computer's card reader and download the files **WinRtkBaseConfigure.exe** and **WinRtkBaseUtils.exe** from it. For more details, refer to “Installation from a Preloaded SD Card”

If you are using **WiFi**, launch **WinRtkBaseUtils.exe** without removing the **SD** card. Check the boxes for “**WiFi**” and “**WiFi Country**”. Enter the **WiFi** details and your country name. Click **Save**. For more details, refer to “Configuring Raspberry Pi”.

Remove the **SD** card and insert it into the **Raspberry Pi**. Mount the antenna on the roof and connect its cable to the **SMA** connector on the **Raspberry Pi**. For details on antenna installation, refer to [our blog](#) and the “Connection” section.

If you are connecting via **Ethernet**, plug it into the port on the right. Then, insert the power cable into the **USB Type-C** port on the left, but **do not plug** the power adapter into the socket yet. The other **USB** and **HDMI** ports are disabled. For more details, refer to “Connection”.

If you wish, you can mount the **Raspberry Pi** to a table, wall, or rack as described in “Mounting”.

Turn on the **Raspberry Pi** and **wait** a couple of minutes (do not disconnect the power during this time).

Open your browser and go to <http://rtkbase.local> as described in “Address of Raspberry pi in the Local Network”. Enter the admin password and change it as described in “Changing the Password”.

Check the functionality and set rough coordinates as described in “Rough Coordinates”. If needed (for example, for **RtkDirect**), set the precise coordinates using one of the methods described in “Determining Coordinates”.

If you want to earn cryptocurrency mining with base station networks like **Onocoy** and **RtkDirect**, refer to “NTRIP Configuration for Onocoy” and “NTRIP Configuration for RtkDirect” for detailed instructions.

If you want to connect rovers directly to your base, configure the **NTRIP Caster** as described in “NTRIP Caster Setup”.

If you encounter any issues, read the relevant section or check “Troubleshooting”.

## Installation

There are three installation methods: using a preloaded **SD** card, using a system image, and installing on an existing system. Installing with a preloaded **SD** card is the simplest option. Installing from a system image is the most versatile method. And finally, using a script to install on an existing system is for those who already have a **Raspberry Pi** running **Raspbian** and are comfortable with command-line instructions.

### Installation from a Preloaded SD Card

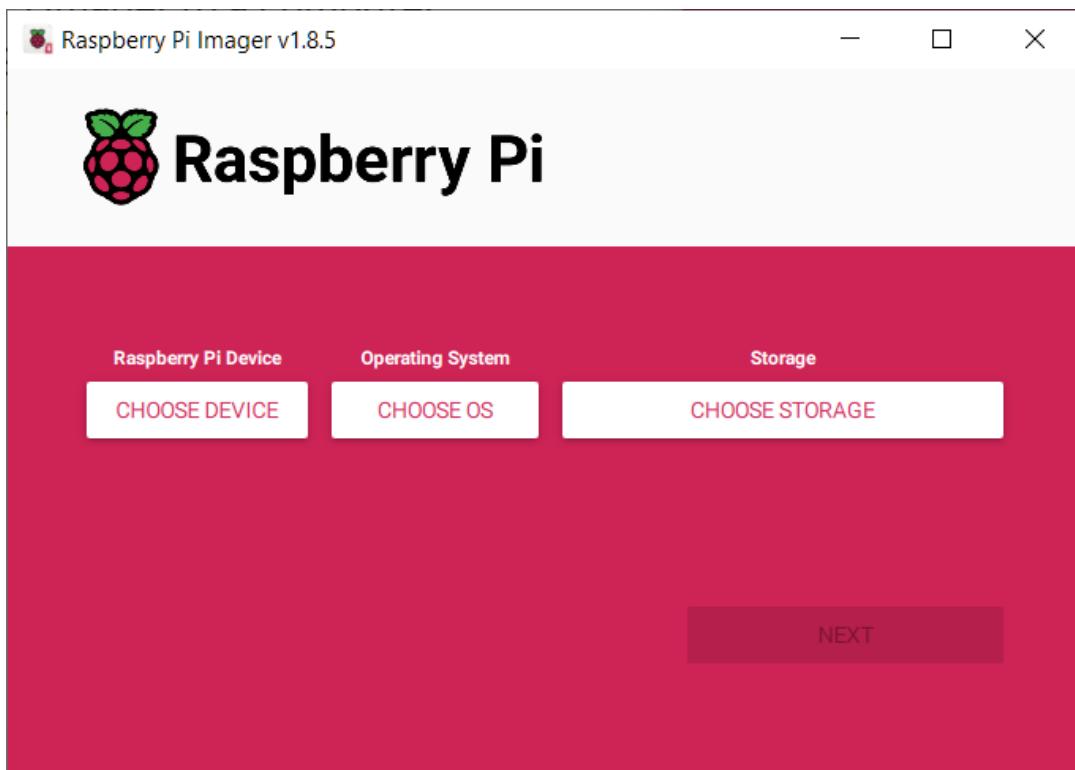
To begin, insert the **SD** card into your computer's card reader and download the files **WinRtkBaseConfigure.exe** and **WinRtkBaseUtils.exe** from it. If you don't have a card reader, you can get these files from [our repository](#) on **GitHub**.

Disconnect the **Raspberry Pi** from power. Simply insert the **SD** card with the preloaded system image into your **Raspberry Pi**, turn it on, and wait a couple of minutes (do not disconnect the power during this time). **RtkBase** will appear on the local network at <http://rtkbase.local>. This is the easiest method, and nothing else needs to be done. For setup, use the method described in the “Configuring Raspberry Pi” section.

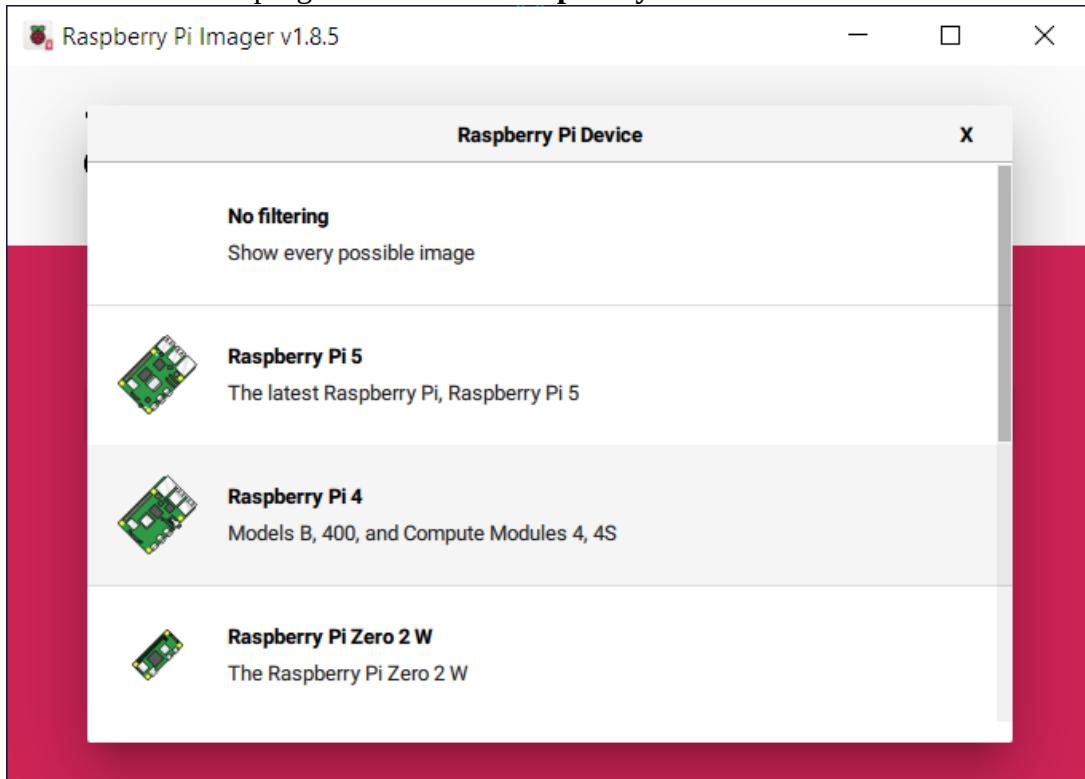
## Installing the System Image

This is the most versatile method but requires a **Windows** computer. Buy the most reliable **SD** card from a reputable brand. The size should be at least 8 **GB**. Download [Raspberry Pi Imager](#) and the [system image](#). If the system image does not open via the link, download it from our [ELT RTKBase](#) repository yourself.

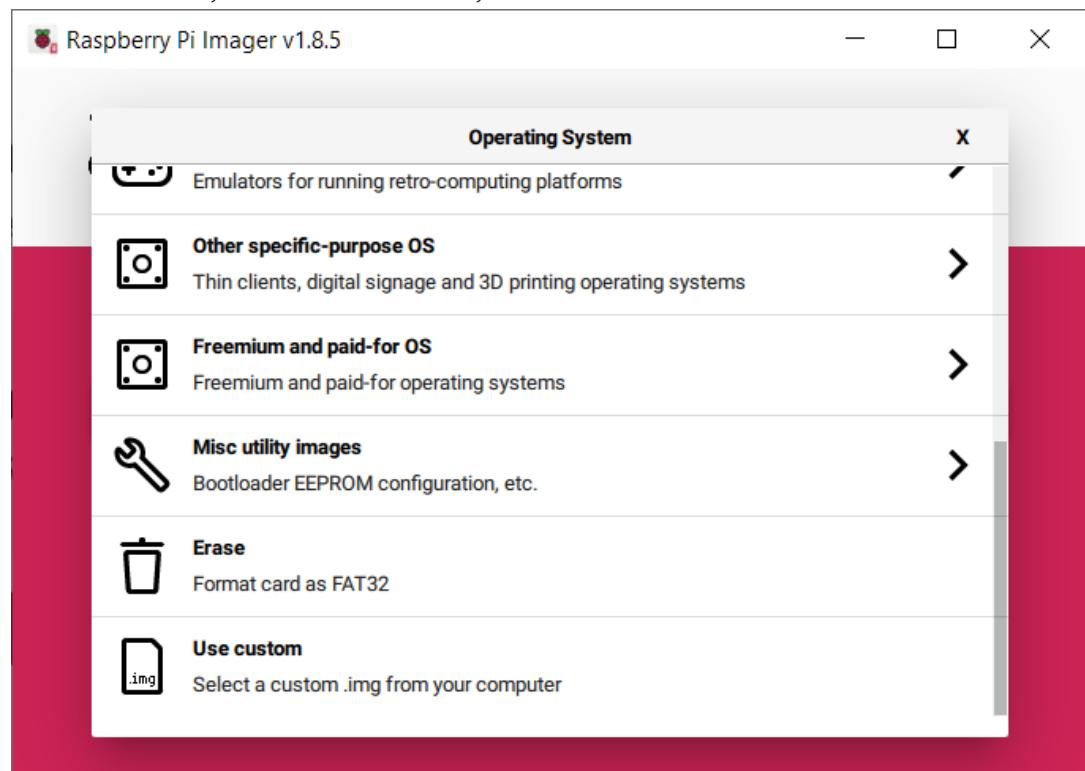
Launch **Raspberry Pi Imager**.



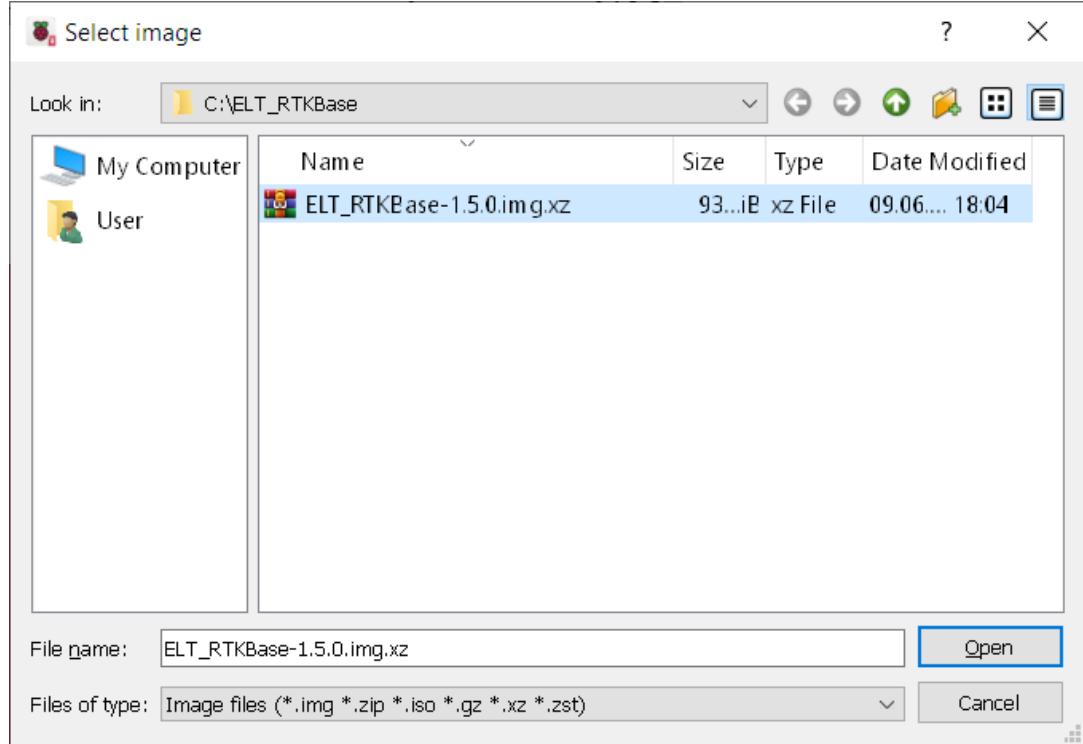
Click the left button of the program and select **Raspberry Pi 4**.



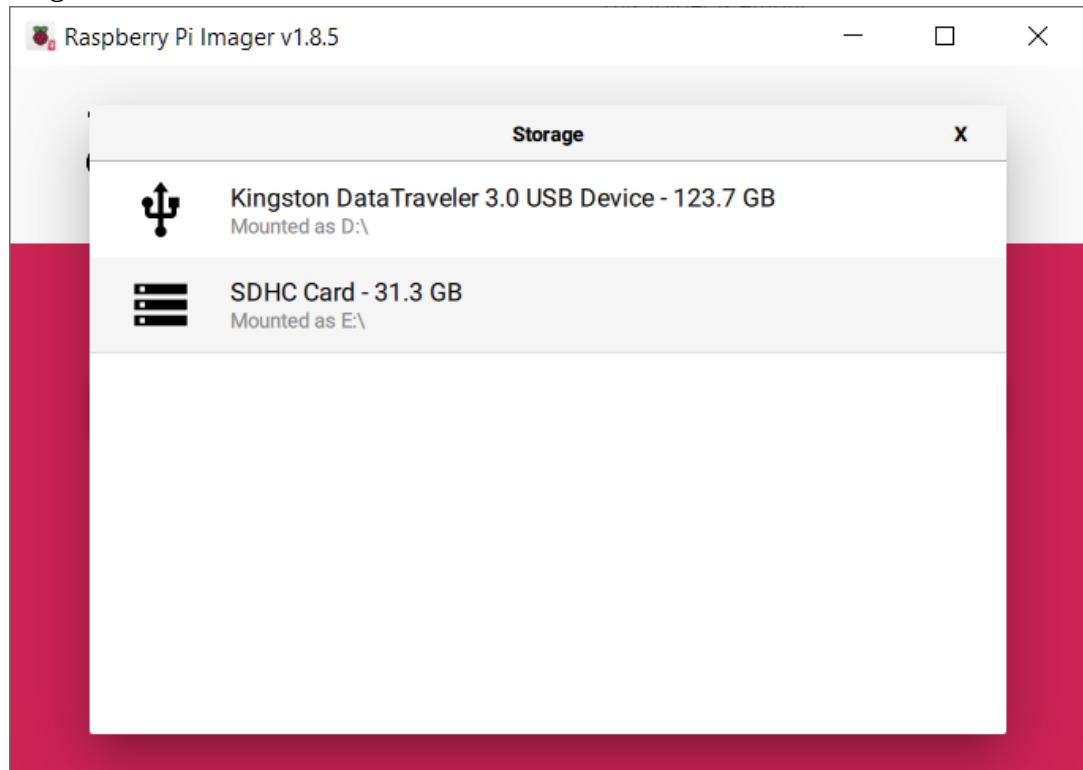
Click the middle button, scroll to the bottom, and select “Use custom”.



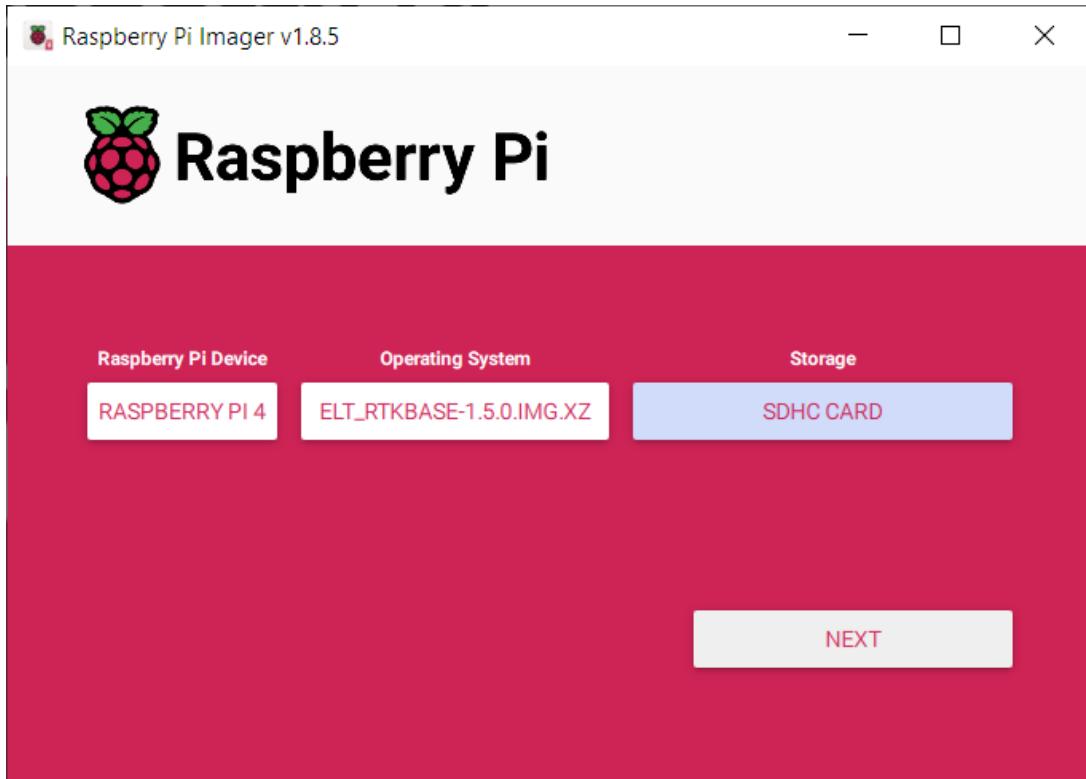
Choose **ELT\_RTKBase-1.5.0.img.xz** as the system image to load.



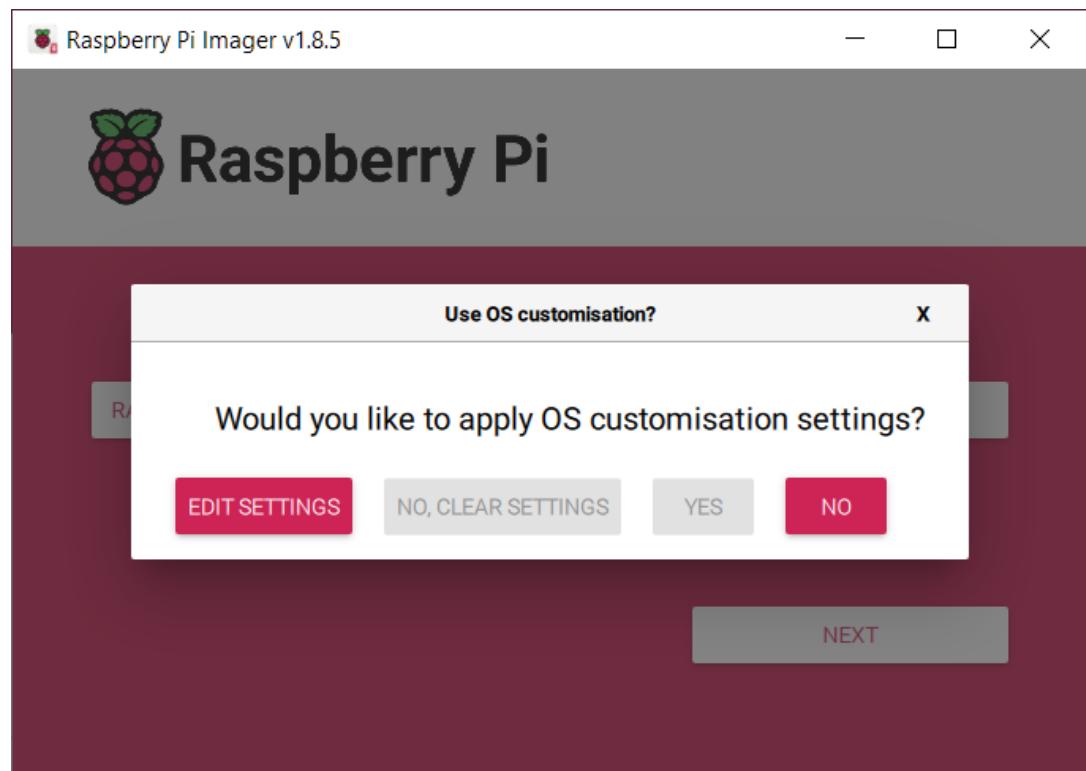
Click the right button and select the **SD card**.



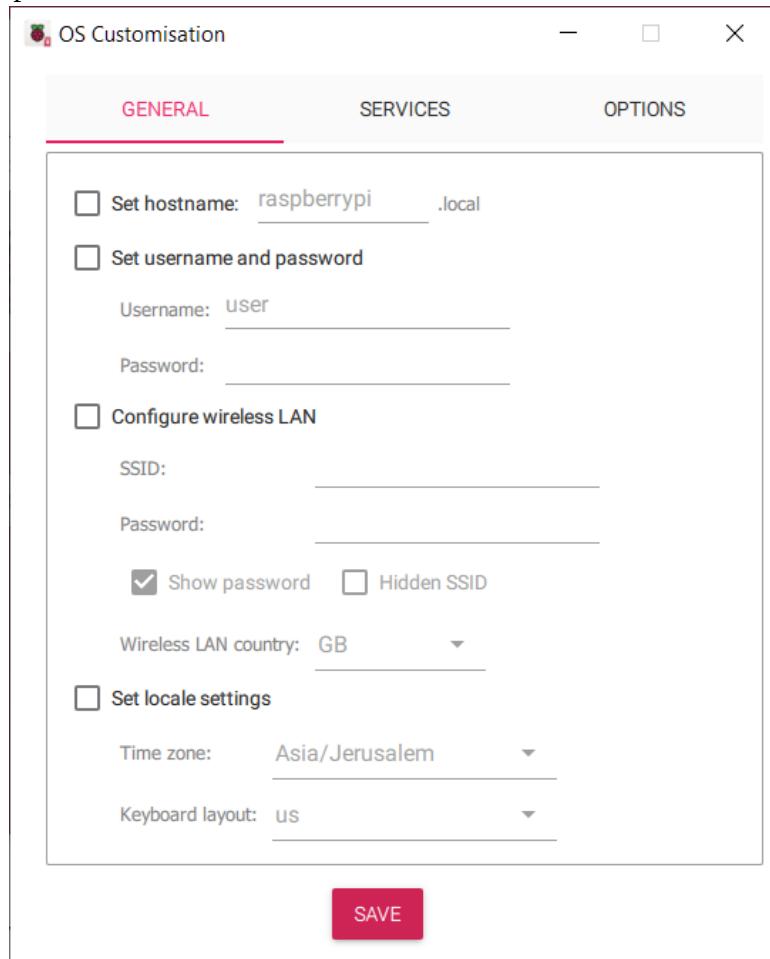
Click **NEXT**.



Click “**EDIT SETTINGS**”.



The settings editor opens.



Fill in the “**General**” page. If you will connect the **Raspberry Pi** via **WiFi**, enter the **WiFi SSID** and password, and whether the **SSID** is hidden. If you do not enter a **hostname**, you can access it as <http://rtkbase.local>. If you do enter a hostname, access it by the entered name with the suffix local, <http://myname.local>.

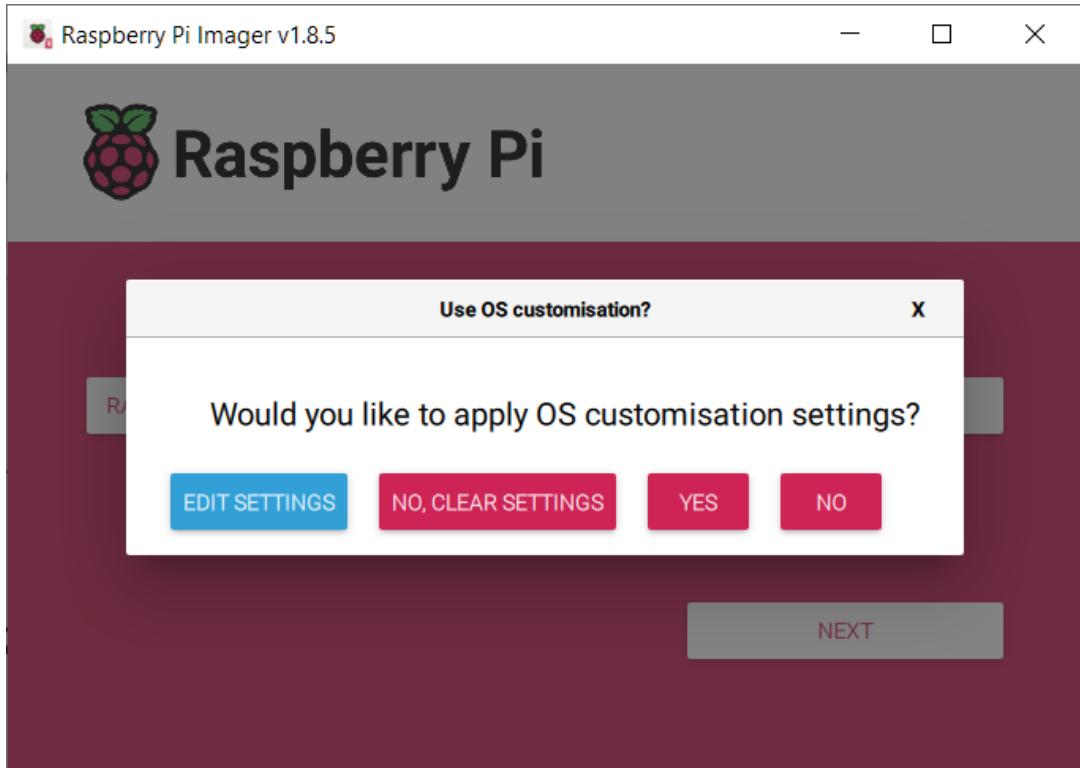
The screenshot shows the "OS Customisation" window with the "GENERAL" tab selected. The window has three tabs: GENERAL, SERVICES, and OPTIONS.

**GENERAL Settings:**

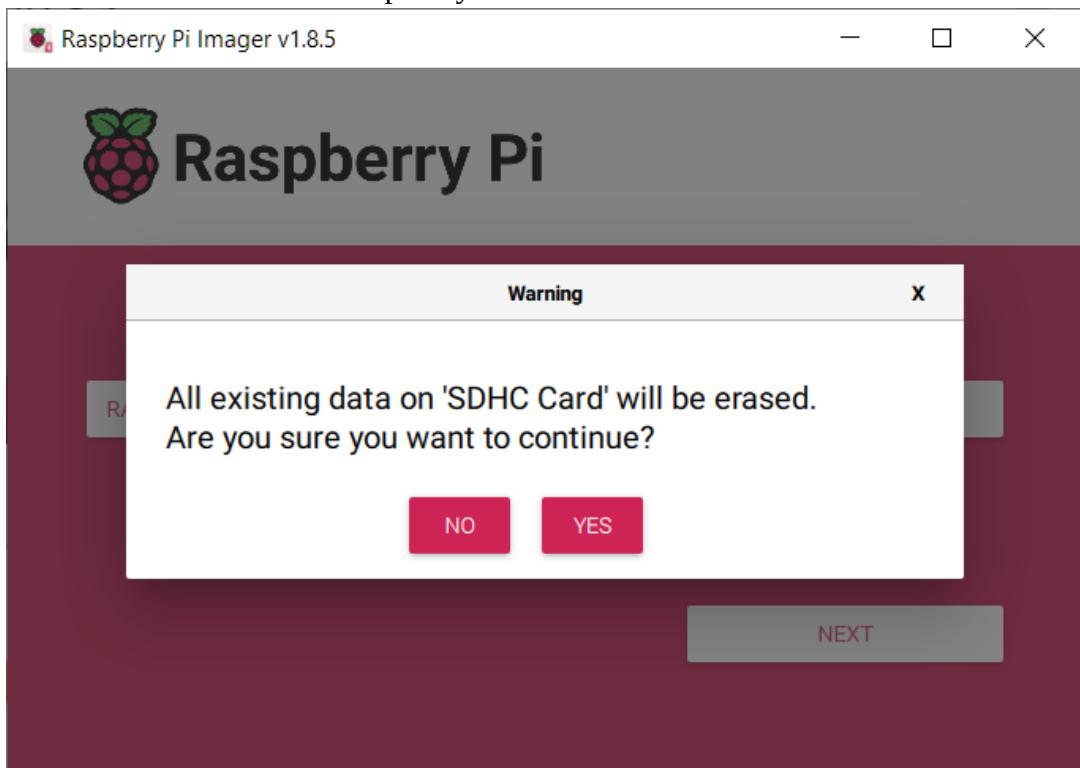
- Set hostname: raspberry .local
- Set username and password  
Username: user
- Password:
- Configure wireless LAN  
SSID: myWifi  
Password: 1234567890
- Show password     Hidden SSID
- Wireless LAN country: GB
- Set locale settings  
Time zone: Asia/Jerusalem  
Keyboard layout: us

**SAVE** button at the bottom right.

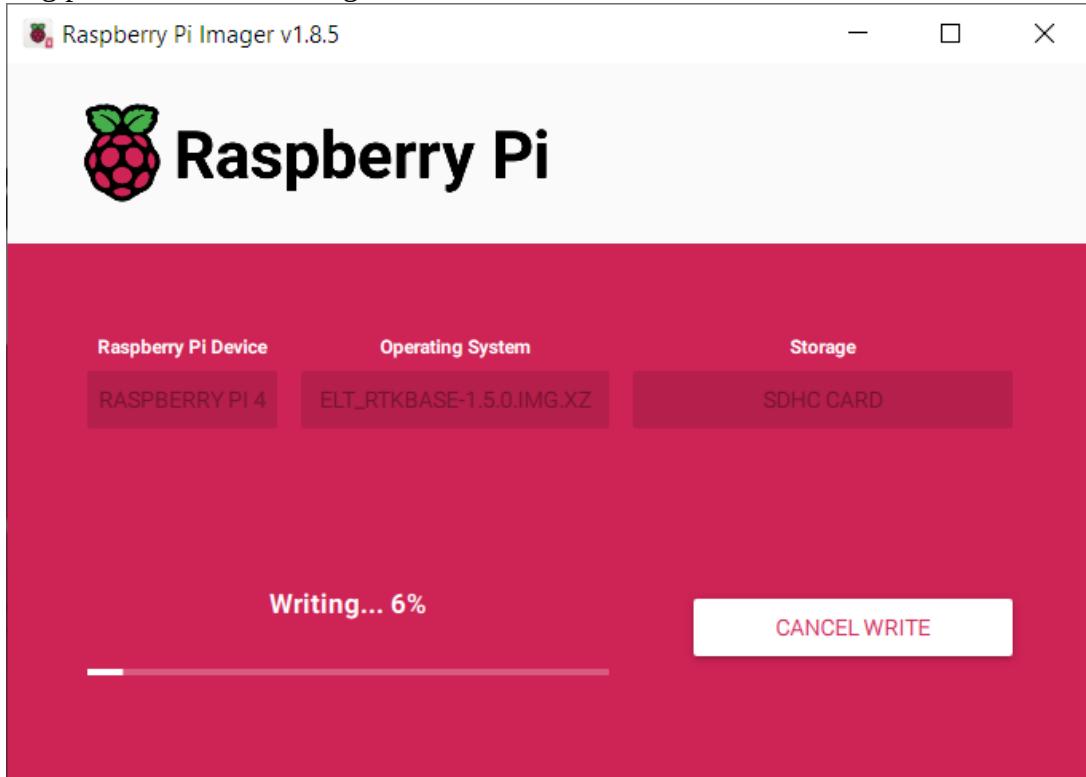
After editing, click **SAVE**, then **YES**.



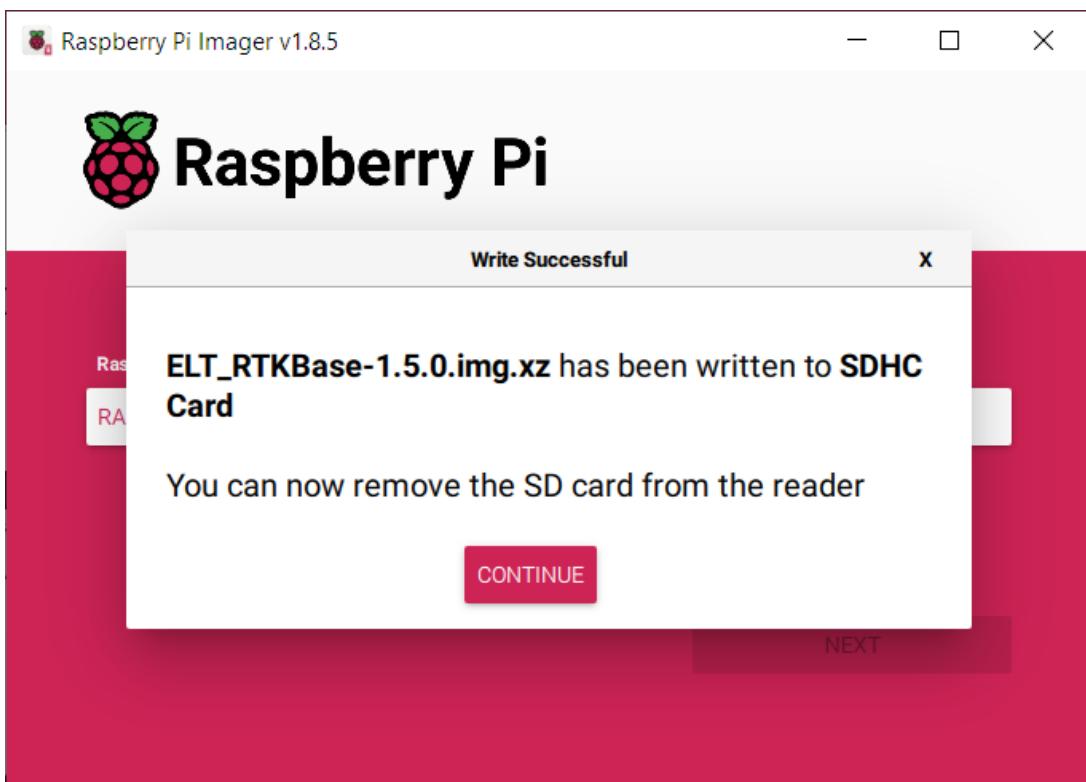
Confirm that the **SD** card will be completely erased.



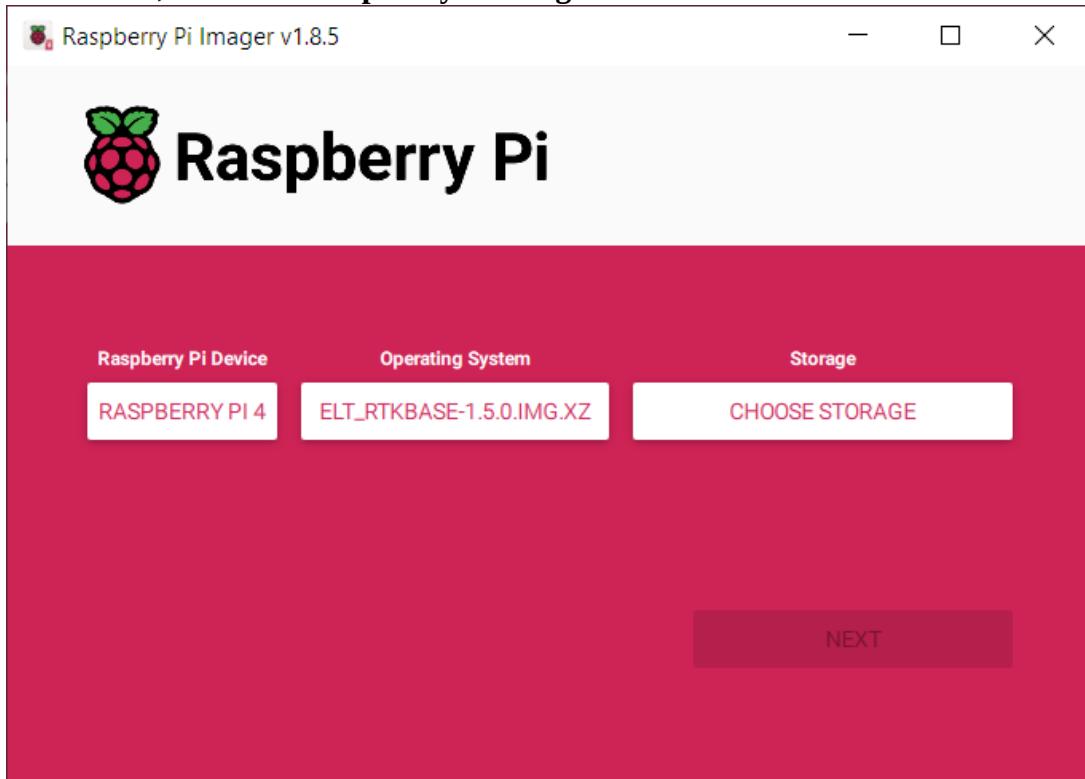
The writing process to the card begins.



After writing completes, a message appears.



Click **CONTINUE**, then close **Raspberry Pi Imager**.

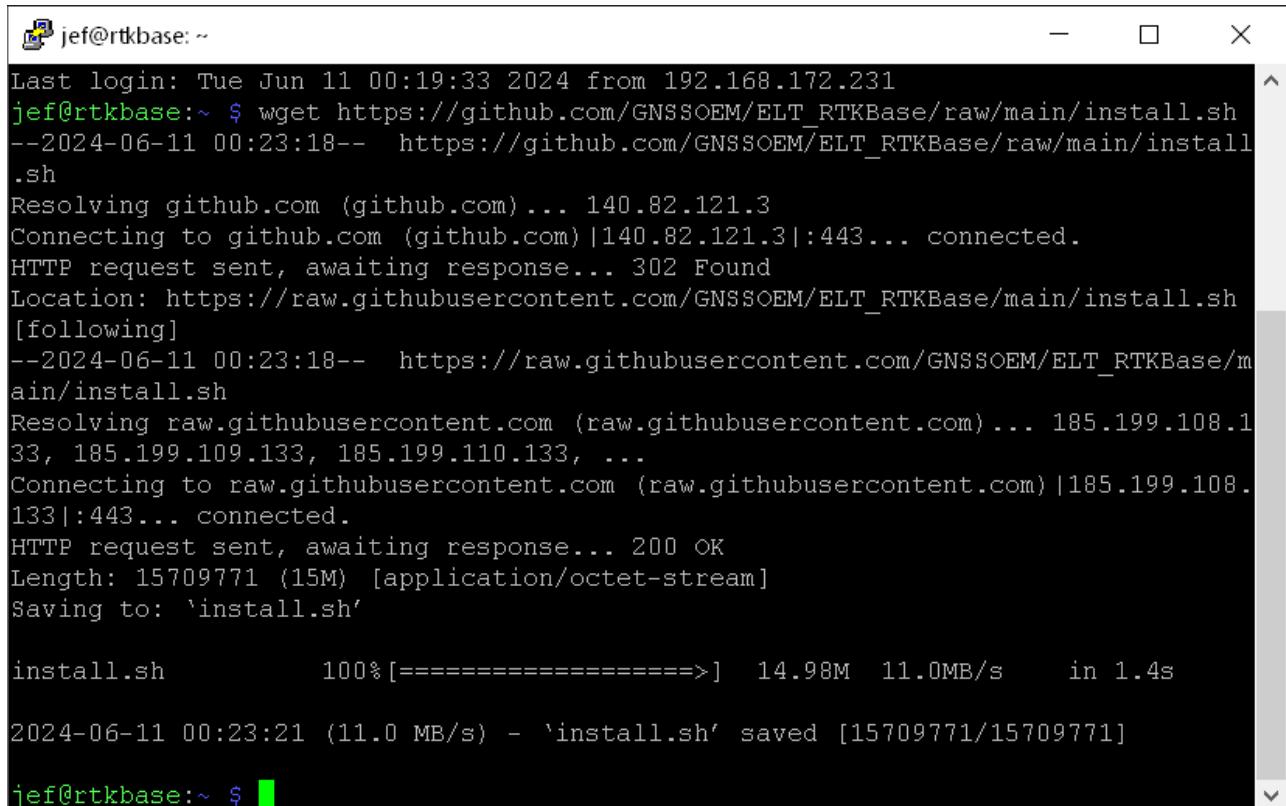


Disconnect the power from the **Raspberry Pi**. Remove the **SD** card from the computer and insert it into the **Raspberry Pi**. Turn it on and **wait a few minutes** (do not disconnect the power during this time). **RtkBase** will appear on the local network at <http://rtkbase.local> (if you changed the hostname, the name will be different).

# Installation on an Existing System

This method is for geeks who know how to use the **Linux** command line. No special knowledge is required, just the ability to access the command line and copy commands into it. The installation is designed for **Raspbian** with the **aarch64** architecture, i.e., the 64-bit version on an **ARM** processor.

First, download **install.sh** using the command  
**wget [https://github.com/GNSSOEM/ELT\\_RTKBase/raw/main/install.sh](https://github.com/GNSSOEM/ELT_RTKBase/raw/main/install.sh)**



```
jef@rtkbase:~ Last login: Tue Jun 11 00:19:33 2024 from 192.168.172.231 jef@rtkbase:~ $ wget https://github.com/GNSSOEM/ELT_RTKBase/raw/main/install.sh --2024-06-11 00:23:18-- https://github.com/GNSSOEM/ELT_RTKBase/raw/main/install.sh Resolving github.com (github.com) ... 140.82.121.3 Connecting to github.com (github.com) |140.82.121.3|:443... connected. HTTP request sent, awaiting response... 302 Found Location: https://raw.githubusercontent.com/GNSSOEM/ELT_RTKBase/main/install.sh [following] --2024-06-11 00:23:18-- https://raw.githubusercontent.com/GNSSOEM/ELT_RTKBase/main/install.sh Resolving raw.githubusercontent.com (raw.githubusercontent.com) ... 185.199.108.133, 185.199.109.133, 185.199.110.133, ... Connecting to raw.githubusercontent.com (raw.githubusercontent.com) |185.199.108.133|:443... connected. HTTP request sent, awaiting response... 200 OK Length: 15709771 (15M) [application/octet-stream] Saving to: 'install.sh' install.sh 100%[=====] 14.98M 11.0MB/s in 1.4s 2024-06-11 00:23:21 (11.0 MB/s) - 'install.sh' saved [15709771/15709771] jef@rtkbase:~ $
```

Give it execution rights with the command **chmod +x install.sh**

```
jef@rtkbase:~ $ wget https://github.com/GNSSOEM/ELT_RTKBase/raw/main/install.sh
--2024-06-11 00:23:18-- https://github.com/GNSSOEM/ELT_RTKBase/raw/main/install.sh
Resolving github.com (github.com) ... 140.82.121.3
Connecting to github.com (github.com)|140.82.121.3|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://raw.githubusercontent.com/GNSSOEM/ELT_RTKBase/main/install.sh
[following]
--2024-06-11 00:23:18-- https://raw.githubusercontent.com/GNSSOEM/ELT_RTKBase/main/install.sh
Resolving raw.githubusercontent.com (raw.githubusercontent.com) ... 185.199.108.1
33, 185.199.109.133, 185.199.110.133, ...
Connecting to raw.githubusercontent.com (raw.githubusercontent.com)|185.199.108.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 15709771 (15M) [application/octet-stream]
Saving to: 'install.sh'

install.sh          100%[=====] 14.98M 11.0MB/s    in 1.4s

2024-06-11 00:23:21 (11.0 MB/s) - 'install.sh' saved [15709771/15709771]

jef@rtkbase:~ $ chmod +x install.sh
jef@rtkbase:~ $
```

Run the script with the command **./install.sh**. The first run may cause a reboot, do not be alarmed.

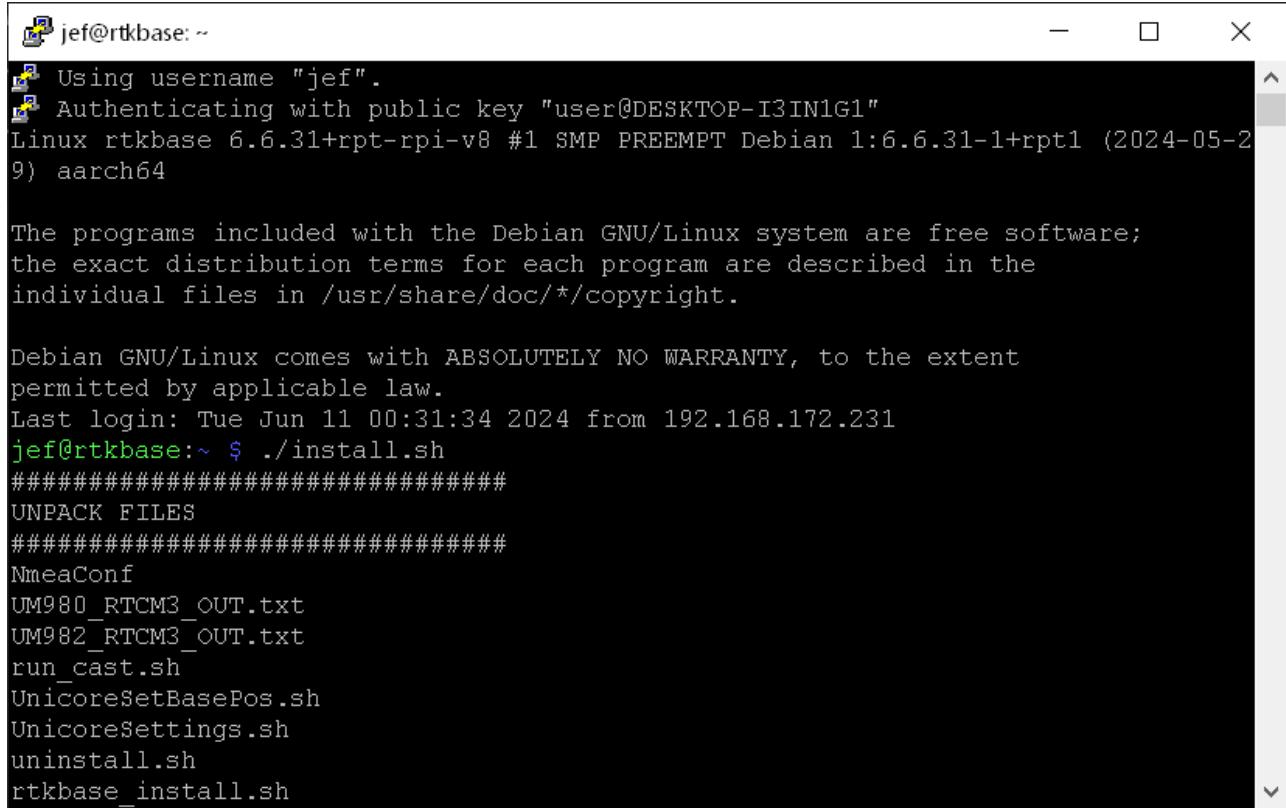
```
RtkbaseSystemConfigureProxy.sh
server_py.patch
status_js.patch
tune_power.sh
config.txt
rtklib/convbin
rtklib/rtkrcv
rtklib/str2str
version.txt
settings_js.patch
base_html.patch
settings_html.patch
Bynav_RTCM3_OUT.txt
#####
CHECK BOOT CONFIGURATION
#####
Cnahged /boot/firmware/cmdline.txt
Please try again ./install.sh after reboot

Broadcast message from root@rtkbase on pts/1 (Tue 2024-06-11 00:53:36 BST):

The system will reboot now!

jef@rtkbase:~ $
```

The next run of **./install.sh** begins the installation.

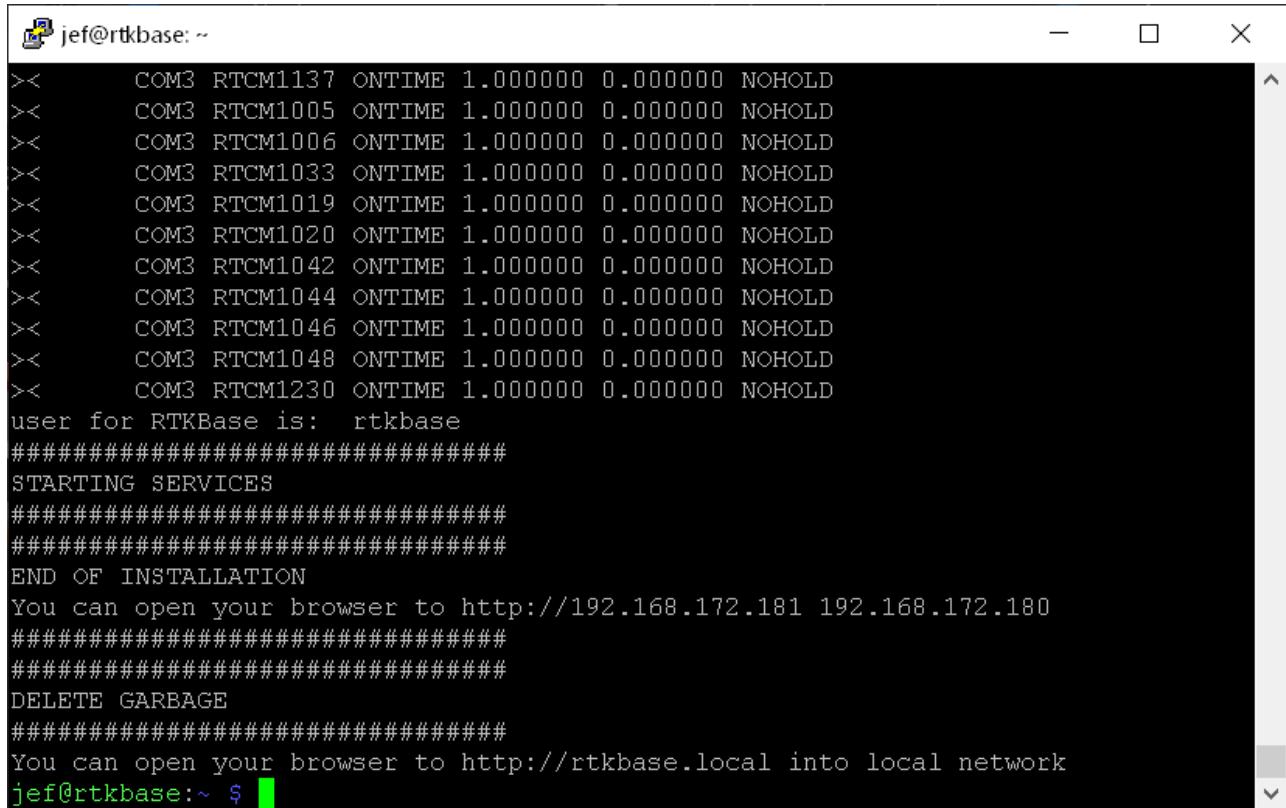


```
jef@rtkbase: ~
Using username "jef".
Authenticating with public key "user@DESKTOP-I3IN1G1"
Linux rtkbase 6.6.31+rpt-rpi-v8 #1 SMP PREEMPT Debian 1:6.6.31-1+rpt1 (2024-05-29) aarch64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Tue Jun 11 00:31:34 2024 from 192.168.172.231
jef@rtkbase:~ $ ./install.sh
#####
UNPACK FILES
#####
NmeaConf
UM980_RTCM3_OUT.txt
UM982_RTCM3_OUT.txt
run_cast.sh
UnicoreSetBasePos.sh
UnicoreSettings.sh
uninstall.sh
rtkbase_install.sh
```

After it completes, you can proceed with the configuration.



```
jef@rtkbase: ~
> COM3 RTCM1137 ONTIME 1.000000 0.000000 NOHOLD
> COM3 RTCM1005 ONTIME 1.000000 0.000000 NOHOLD
> COM3 RTCM1006 ONTIME 1.000000 0.000000 NOHOLD
> COM3 RTCM1033 ONTIME 1.000000 0.000000 NOHOLD
> COM3 RTCM1019 ONTIME 1.000000 0.000000 NOHOLD
> COM3 RTCM1020 ONTIME 1.000000 0.000000 NOHOLD
> COM3 RTCM1042 ONTIME 1.000000 0.000000 NOHOLD
> COM3 RTCM1044 ONTIME 1.000000 0.000000 NOHOLD
> COM3 RTCM1046 ONTIME 1.000000 0.000000 NOHOLD
> COM3 RTCM1048 ONTIME 1.000000 0.000000 NOHOLD
> COM3 RTCM1230 ONTIME 1.000000 0.000000 NOHOLD
user for RTKBase is: rtkbase
#####
STARTING SERVICES
#####
#####
END OF INSTALLATION
You can open your browser to http://192.168.172.181 192.168.172.180
#####
DELETE GARBAGE
#####
You can open your browser to http://rtkbase.local into local network
jef@rtkbase:~ $
```

## Firmware Update

Update the **Raspberry Pi** firmware by inserting the **SD** card into a card reader and copying the **install.sh** file to the root directory of the first (the only one visible, if you have **Windows**) partition of the card. The update occurs at startup and takes 5-10 minutes. Internet **is required** for the update.

To determine the current version number, look at the bottom of any page.

Uptime:	12d 12h 30mn 45s
Storage:	20.53GB available of 30.83GB - (30.5 % used)
Settings:	<button>Backup</button> <button>Restore</button> <button>Reset</button>
Diagnostic:	<button>View</button>
Power:	<button>Reboot</button> <button>Shutdown</button>
ELT_RTKBase v1.5.0 RTKBase v2.5.0 gnss.store gnss.design	

## Configuring Raspberry Pi

Configure the **Raspberry Pi** by inserting the **SD** card into a card reader and creating a **system.txt** file in the root directory of the first (the only one visible, if you have **Windows**) partition of the card. This file sets parameters with simple pairs consisting of the parameter name, equal sign, and value. Each line contains one pair, if there are spaces inside the value, the entire value must be in quotes. Line endings can be any (both **Windows** and **Linux**). The file is applied at **Raspberry Pi** startup and then deleted from the disk.

The simplest way to create such a file is to run the **WinRtkBaseConfigure.exe** application. You can find the application on the **SD** card or download it from [the provided link](#).



The application has three sections described below. Check the boxes for what you want to set up, then enter the values. To load an **SSH** public key, click the “**Load SSH public key**” button, select the key, and click **Open**. The application suggests using your own public key (it is created in the **.ssh** folder in the user directory when you install the **SSH** client on your computer) but allows you to choose any other key. After entering all the values, click **Save**. The application will automatically find where the **SD** card is inserted and write the **system.txt** file to it.

## WiFi Standard

Different countries allow different frequencies for **WiFi** operation, so the standard is set by choosing the country according to the **ISO 3166-1** two-letter code. For example, the string **country=LV** means Latvia. For the USA, you should write **COUNTRY=US**.

## Connecting to WiFi

The **SSID** (name) of the **WiFi** network is set in the **SSID** parameter, and the key (password) for access to the network is set in the **KEY** parameter (which can be omitted). For a network with a hidden **SSID**, add **HIDDEN=Y**. For example:

**SSID="A B C"**  
**KEY=124567890**  
**HIDDEN=Y**

## Adding Users

To add a user, you need to set their login (**LOGIN**), password (**PWD**), and/or SSH public key (**SSH**) for the user who will log in to the **Raspberry Pi**. For example:

**LOGIN=abc**

**PWD="1 23"**

**SSH="ssh-rsa AAAAB3NzaC1yc2E18cu66peHViu0U5CQF abc@comp"**

Quotes for **SSH** are mandatory. The username is specified in lowercase Latin letters and can include numbers, underscores, and hyphens

## Connection

First, you need to mount the antenna on the roof or a high pole. For details on antenna installation, refer to [our blog](#). The key is to give the antenna as much open sky as possible and minimize reflected satellite signals. The antenna itself is sealed, but its connector is not. Therefore, it is recommended to seal the connection point between the antenna and the cable with heat shrink tubing or special self-vulcanizing tape.

First, insert the **SD** card into the slot on the left and connect the antenna to the **SMA** connector on the right. For **WiFi** connection, set the **SSID**, password, and your **WiFi** network's country code as described in the “Connecting to WiFi” section.



For **Ethernet** connection, plug it into the port on the right. Then, connect the power cable to the **USB Type-C** port on the left. Other **USB** and **HDMI** ports are disabled.



Finally, plug the power adapter into the electrical outlet. The power adapter has interchangeable plugs and adapts to most types of sockets.



**Important:** After turning it on, do not turn off the device for at least five minutes as slow installation and setup operations are being performed.

## **Mounting**

The device should be placed in a cool, dust-free, and dry location. Avoid direct sunlight, exposure to rain, snow, hail, and protect it from domestic and wild animals, birds, snakes, fish, and insects.

Besides “tabletop” placement, there are four mounting options:

### **“Bent End Plate Bracket”**



“Clip On Bracket”



“Linc Lugs”



Rail Mount for 19-inch Racks



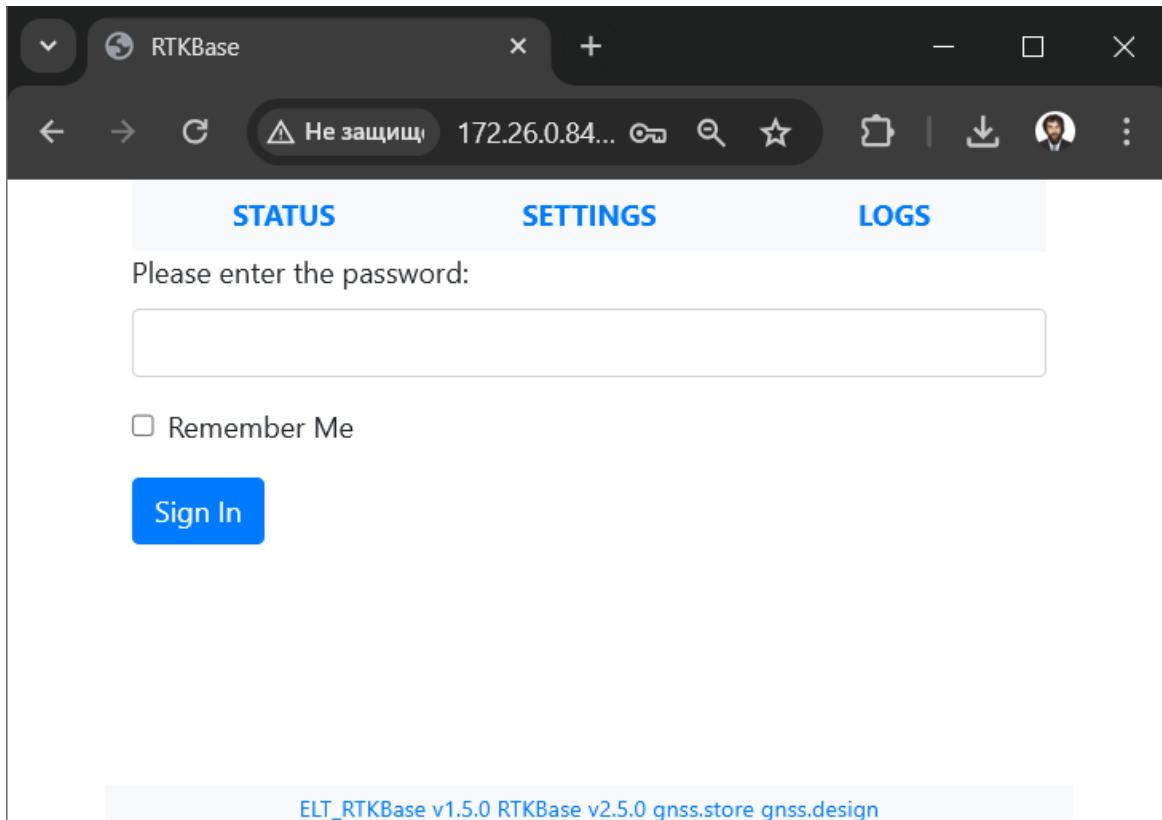
# Configuring RtkBase

## Address of Raspberry pi in the Local Network

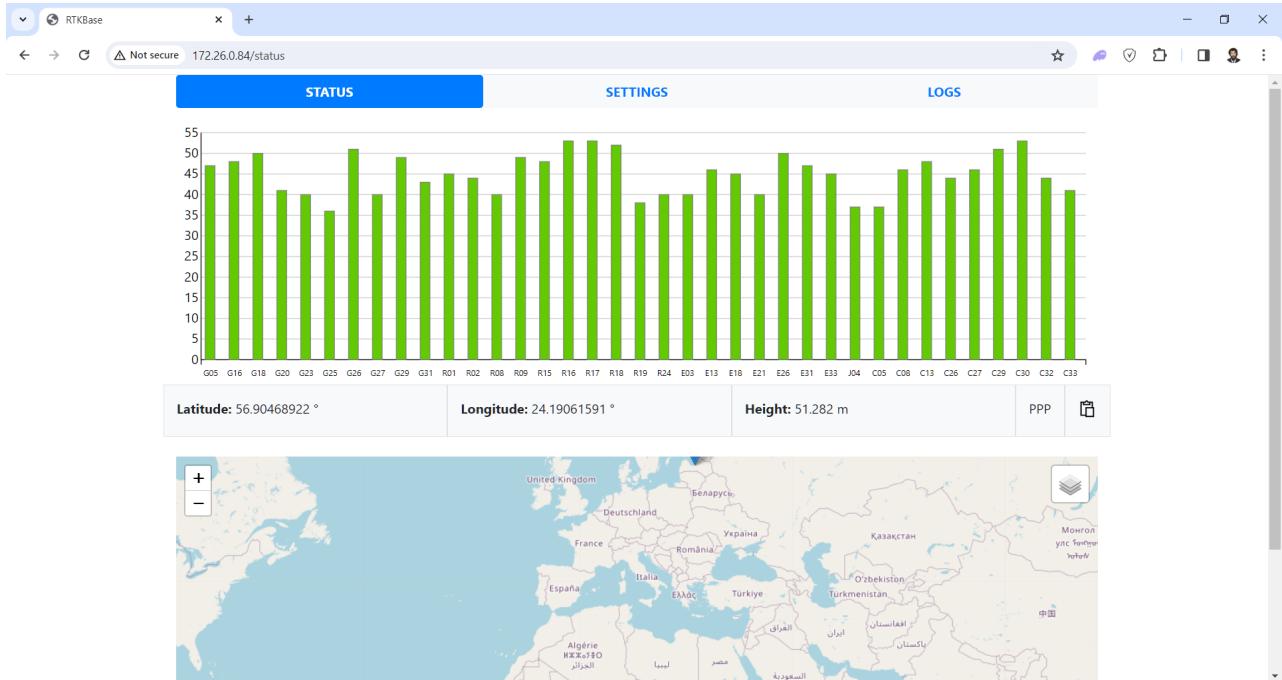
At the end of the installation, **RtkBase** will display the IP addresses of **Raspberry pi** on the screen. However, there is another way for modern operating systems — the address **rtkbase.local**, which means the site can be opened as <http://rtkbase.local>. Unfortunately, this method works only in the local network.

## Changing the Password

Log in to the site for the first time (using <http://rtkbase.local> as the address).



Enter the password “**admin**”.



Click on **Settings** at the top.

The screenshot shows the RTKBase settings page at the URL 172.26.0.84/settings. At the top, there are three tabs: STATUS, SETTINGS (highlighted in blue), and LOGS. The page is divided into two main sections:

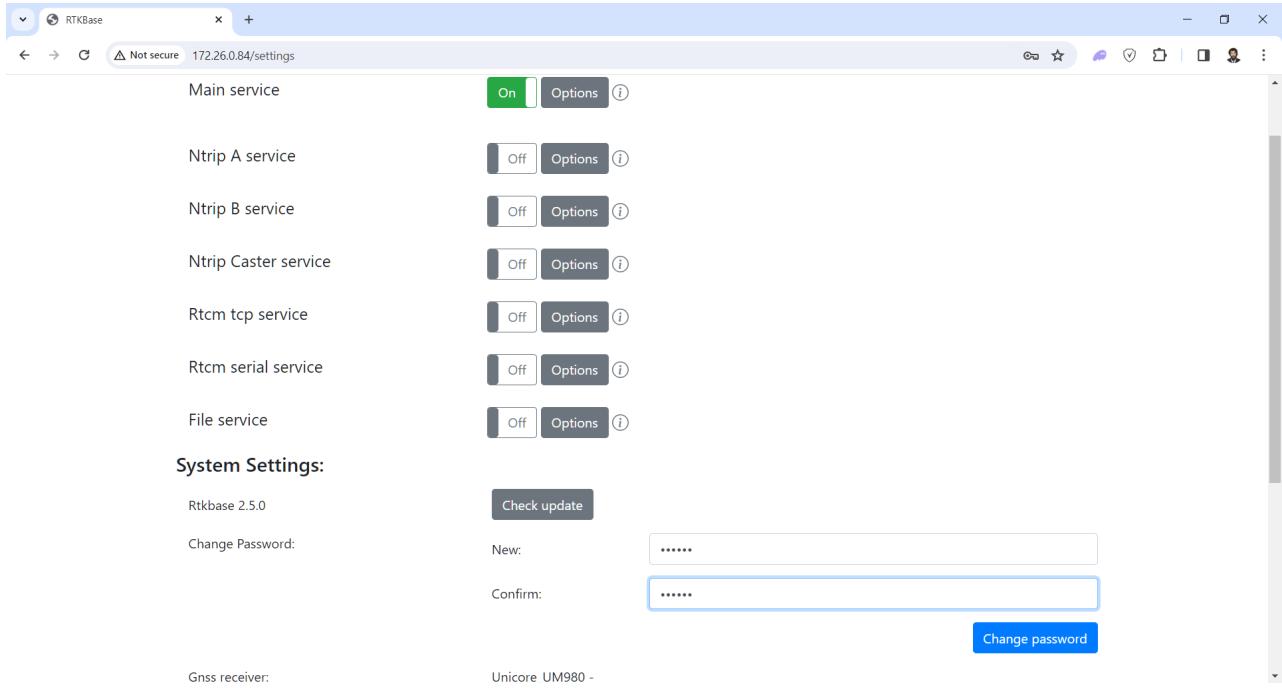
### Services:

- Main service: On (green button), Options (button with info icon)
- Ntrip A service: Off (gray button), Options (button with info icon)
- Ntrip B service: Off (gray button), Options (button with info icon)
- Ntrip Caster service: Off (gray button), Options (button with info icon)
- Rtcm tcp service: Off (gray button), Options (button with info icon)
- Rtcm serial service: Off (gray button), Options (button with info icon)
- File service: Off (gray button), Options (button with info icon)

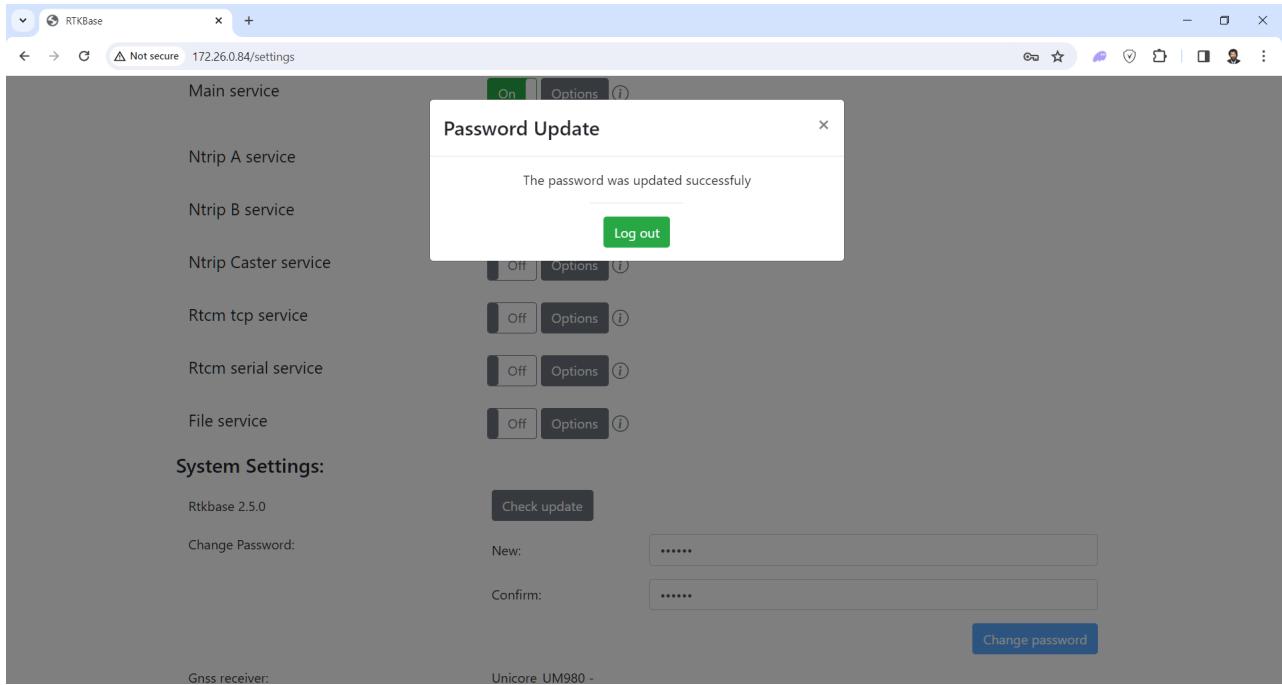
### System Settings:

- Rtkbase 2.5.0: Check update (button)
- Change Password:
  - New:
  - Confirm:

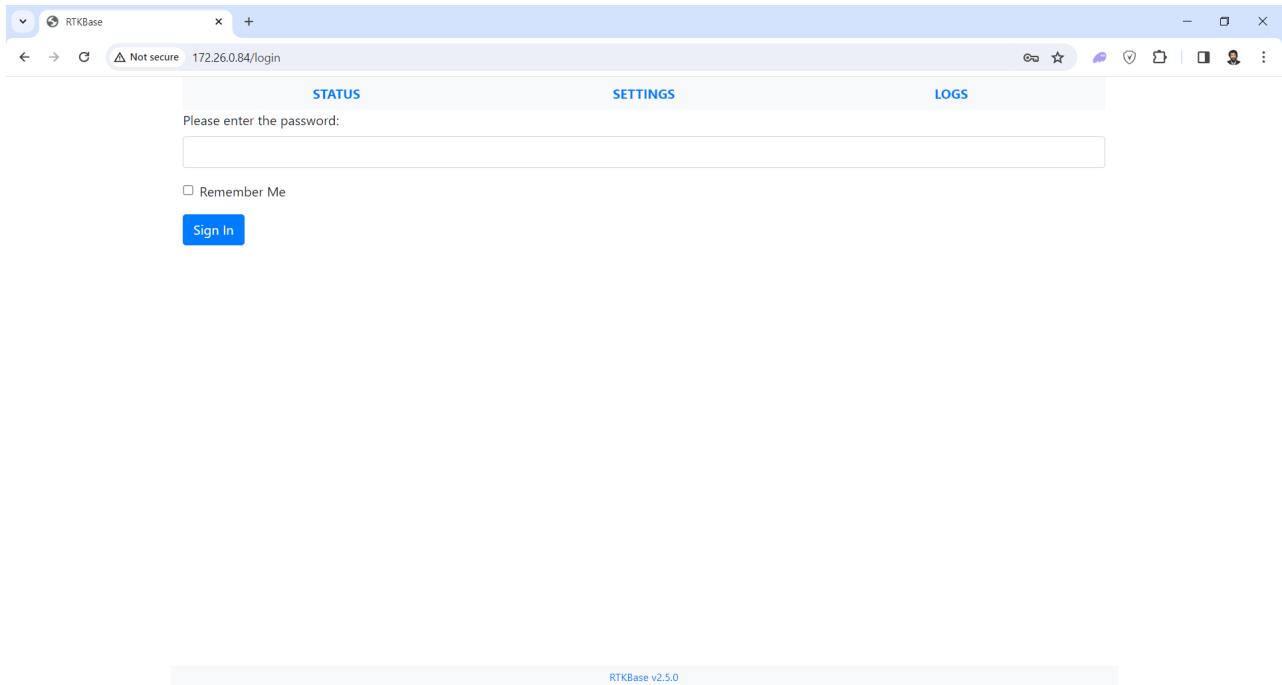
At the bottom, in the “**System Settings**” section, find “**Change Password**” and enter the new password.



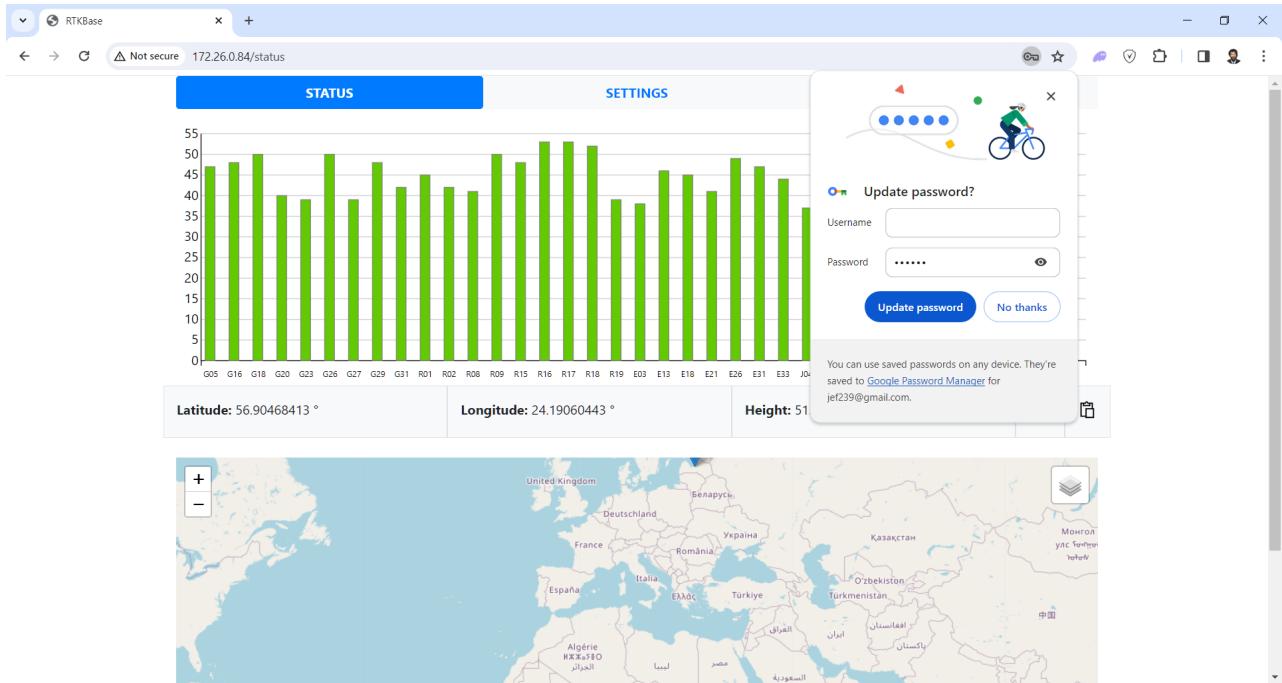
Click on the “**Change Password**” button and see the message on the screen. Now click on the “**Log Out**” button and log out.



You will end up on the login screen again. Enter the new password and check the “remember me” box.



You will be taken to the **Status** page.



## Shutdown

You can turn off the device by disconnecting the power. However, the most gentle method is to press the “**Shutdown**” button in the web interface.

Gnss receiver:	Bynav_M2-0 - V7.82_118A5B_T
Board:	Raspberry Pi 4 Model B Rev 1.5
Os:	Debian 12 (Bookworm)
CPU Temp:	50,1 C° - (highest record: 57,0C°)
Uptime:	15d 12h 51mn 11s
Storage:	20.59GB available of 30.83GB - (30.3 % used)
Settings:	<button>Backup</button> <button>Restore</button> <button>Reset</button>
Diagnostic:	<button>View</button>
Power:	<button>Reboot</button> <button>Shutdown</button>

[ELT\\_RTKBase v1.5.0](#) [RTKBase v2.5.0](#) [gnss.store](#) [gnss.design](#)

## Configuring the Receiver

Receiver configuration is performed automatically during installation. Manual configuration is needed only when replacing the receiver.

## USB Receivers

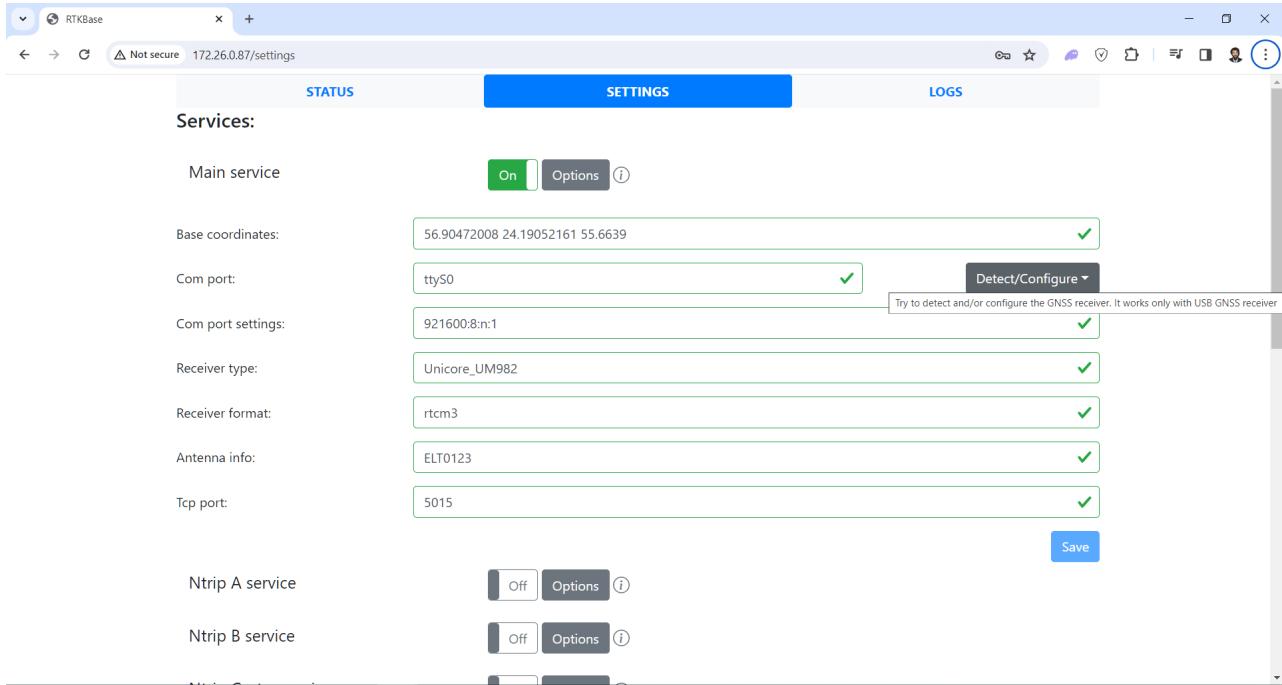
There is a nuance with **USB** receivers. To reduce power consumption, **USB** ports are usually turned off. Therefore, if you want to use a **USB** receiver, set the value **ttyUSB0** (or any other **USB** port) in the “**Com port**” field in the settings, save the settings, and reboot the **Raspberry Pi**. After rebooting, power will be supplied to the **USB** ports, and detection and configuration will be successful.

During the first boot, detection and configuration occur before the ports' power is turned off, so if you just inserted the **SD** card and are doing the first boot, everything will go automatically even for a **USB** receiver.

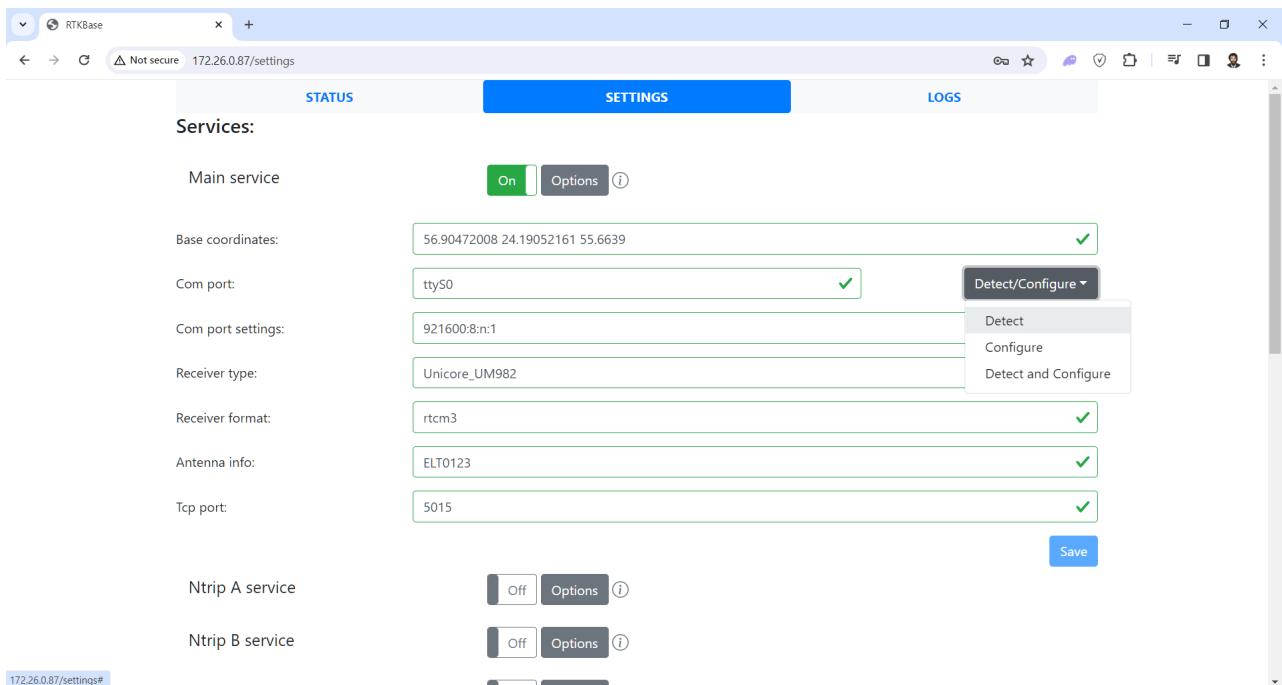
# Detection

To detect a USB receiver, you need to perform the “**Detect**” operation in the settings.

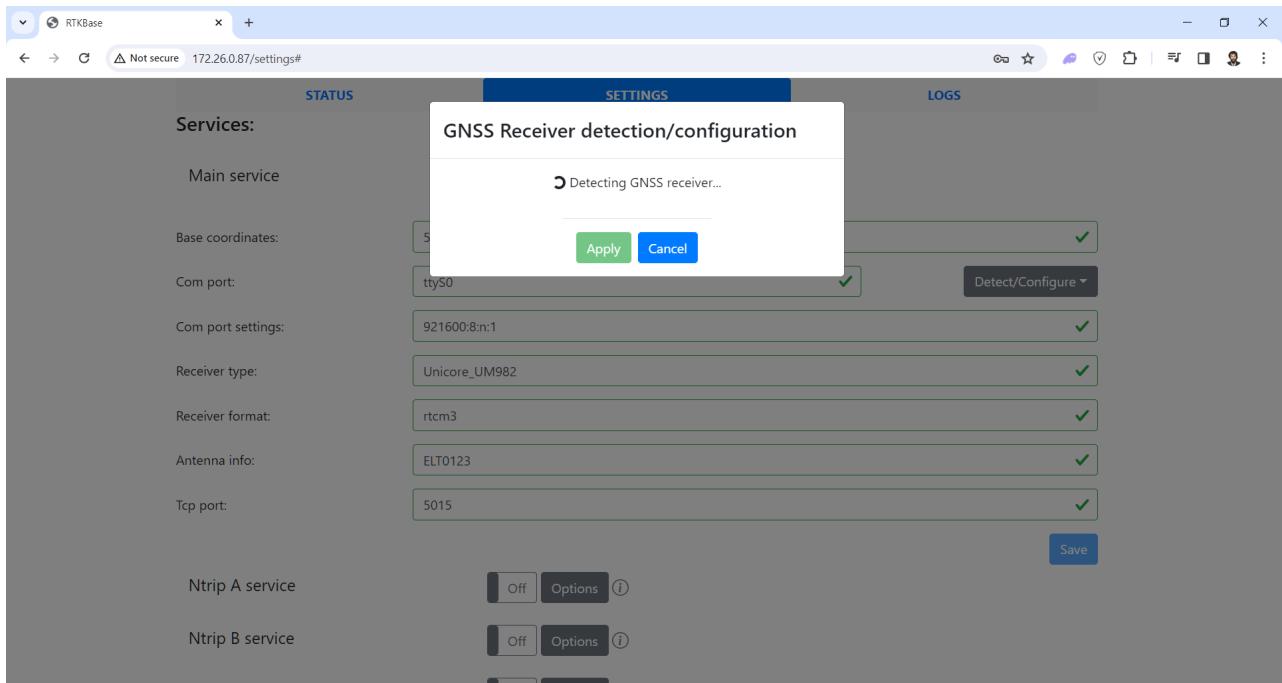
Go to the **Settings** page, and to the right of “**Main service**”, click the **Options** button.



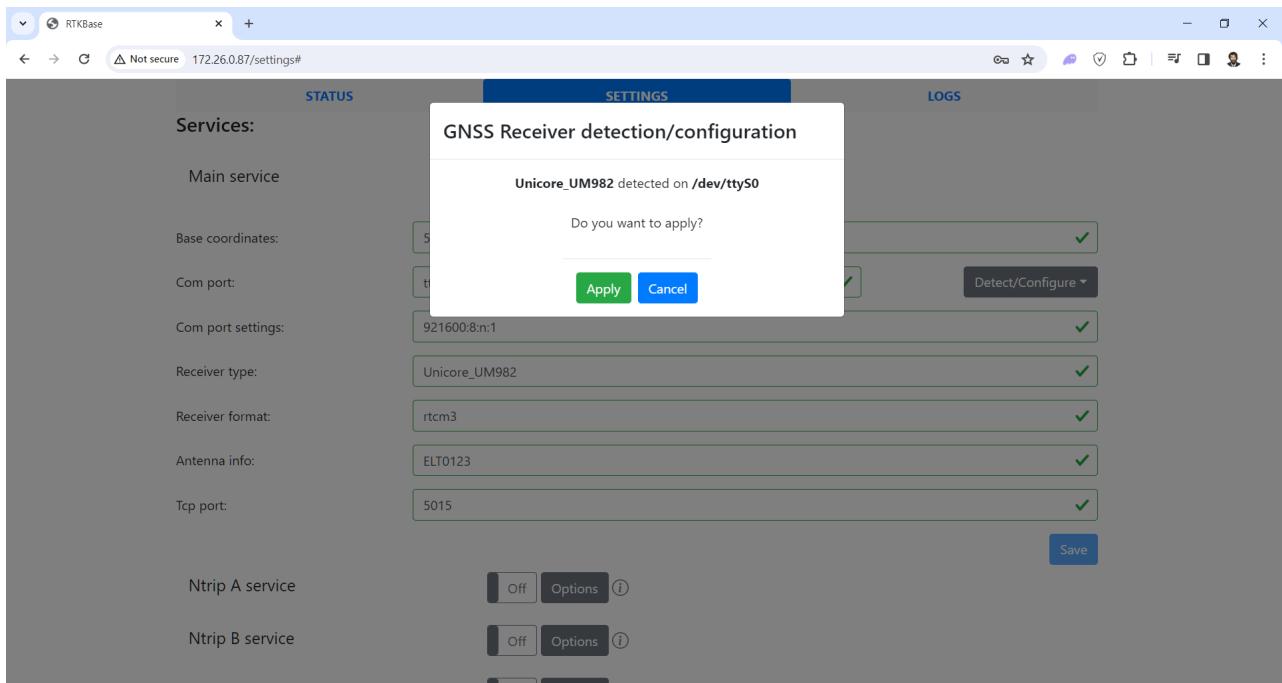
Click the “**Detect/Configure**” button and select “**Detect**” from the drop-down menu.



Detection is in progress.



The receiver is detected.

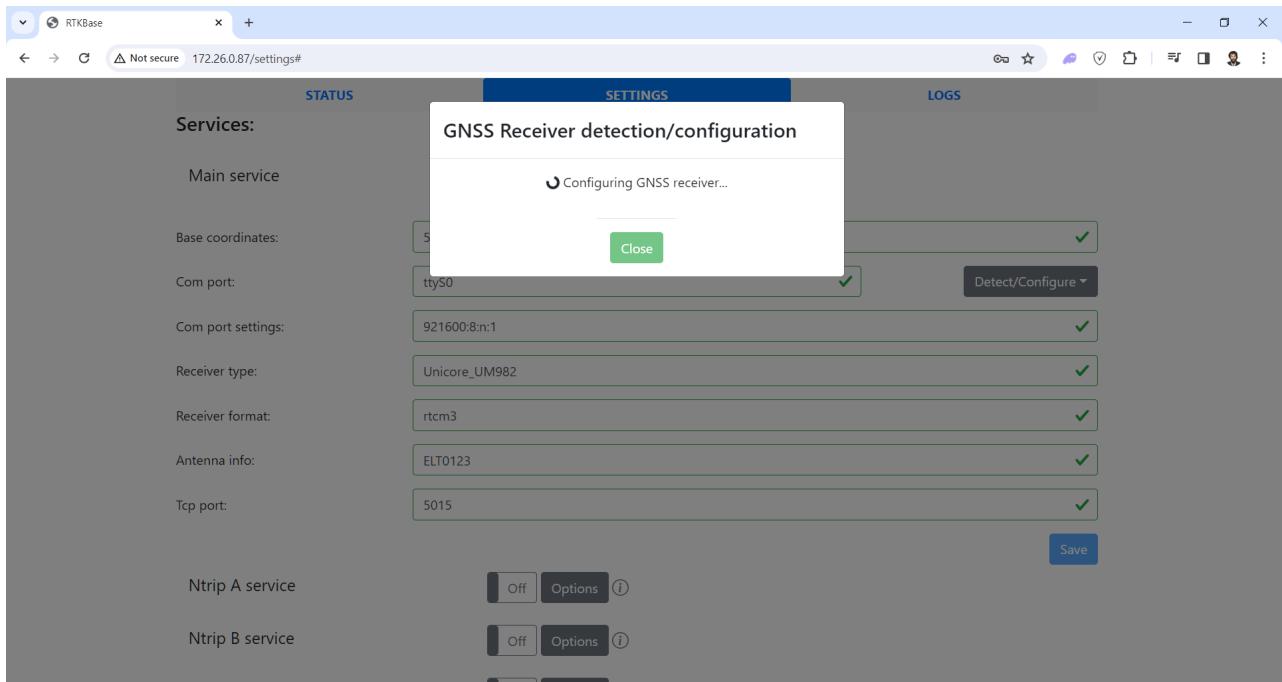


Then you can click the **Apply** button to save the detected receiver's settings (port, speed, receiver name, and protocol type). These four settings will be used later during the receiver configuration.

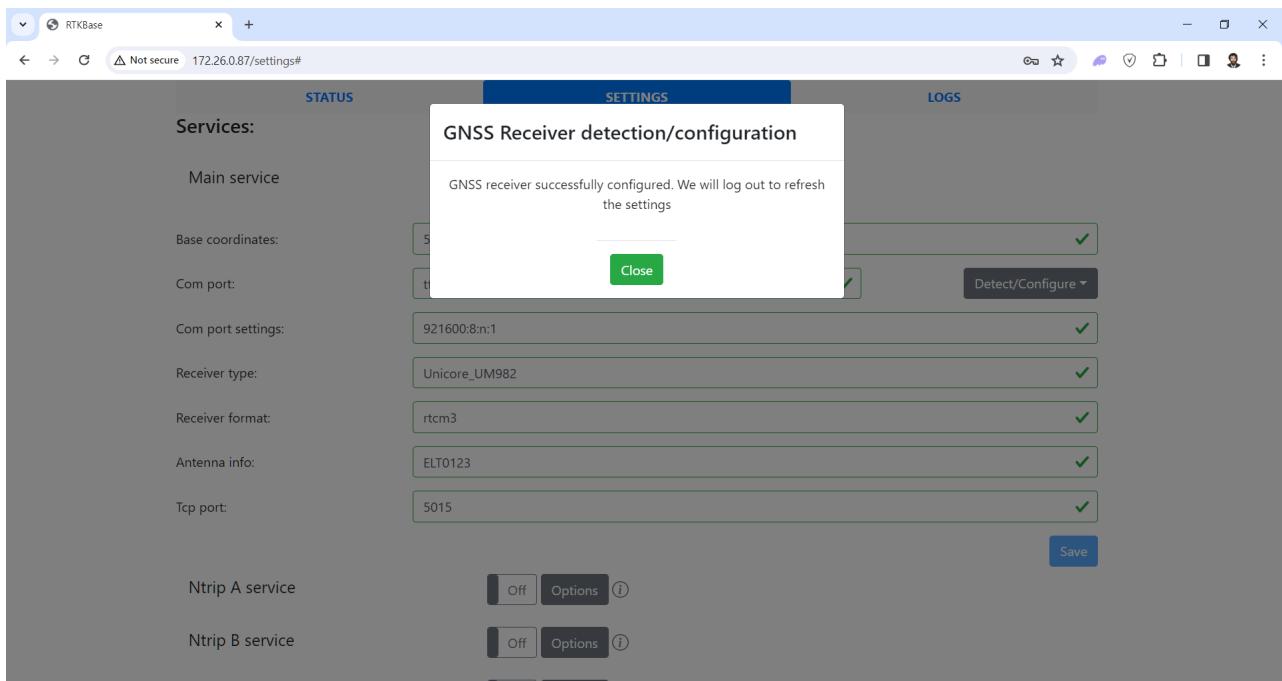
**Septentrio** receivers can operate using either the **rtcm3** protocol (by default) or the **sbf** protocol. To select the **sbf** protocol, change the protocol after detection and then proceed with the configuration.

# Configuration

To configure the receiver, do as described in the Detection section, but click the “Configure” button.



After configuration is complete, click the “Close” button.



During configuration, the receiver speed is reset to **115200**, and all services are disabled.

If the receiver was not at **115200** speed and the configuration ended with an error, the receiver speed will not match the speed specified in the settings. In this situation, you need to perform detection as described in the Detection section. In general, detection is a universal way to fix various issues.

## Checking the Receiver Firmware Version

After configuring the receiver, the firmware version is displayed at the bottom of the “Settings” page. For **Unicore UM980**, the required version is **R4.10Build10231** and above, for **Unicore UM982 – R4.10Build10186** and above, for **Bynav M2-0 — V7.81\_19D751\_T** and above, and for **Septentrio mosaic-X5 – 4.14.4** and above. If the version is older, update the firmware as described in the sections “Updating Unicore Receiver Firmware”, “Updating Bynav Receiver Firmware” and “Updating Septentrio Receiver Firmware”.

Gnss receiver:

Unicore UM980 - R4.10Build10231

Board:

Raspberry Pi 4 Model B Rev 1.5

Os:

Debian 12 (Bookworm)

CPU Temp:

54,5 C° - (highest record: 56,0C°)

Uptime:

39mn 30s

Storage:

26.71GB available of 30.83GB - (8.7 % used)

Settings:

[Backup](#) [Restore](#) [Reset](#)

Diagnostic:

[View](#)

Power:

[Reboot](#) [Shutdown](#)

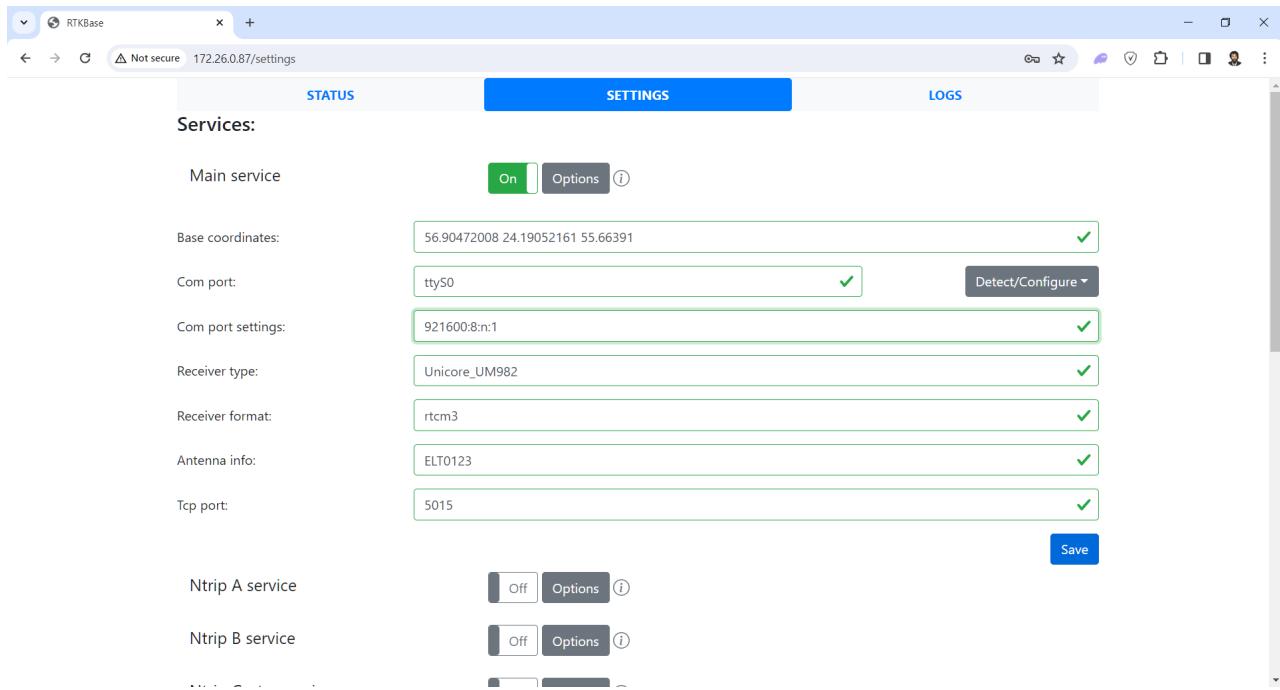
[ELT\\_RTKBase v1.5.0](#) [RTKBase v2.5.0](#) [gnss.store](#) [gnss.design](#)

# Changing the Speed

If you need to change the speed, simply change it in the settings and click the **Save** button. During saving, the receiver is reconfigured to the required speed. However, although you can enter any speed, only the speeds **115200:8:n:1**, **230400:8:n:1**, **460800:8:n:1**, **921600:8:n:1** are allowed. All other speeds are not allowed.

Manually changing other parameters (except speed and coordinates) is strictly not recommended.

When the **Save** button is clicked, all services are stopped. If the main service was running at the time of clicking **Save**, it will restart, but the other services will remain stopped.

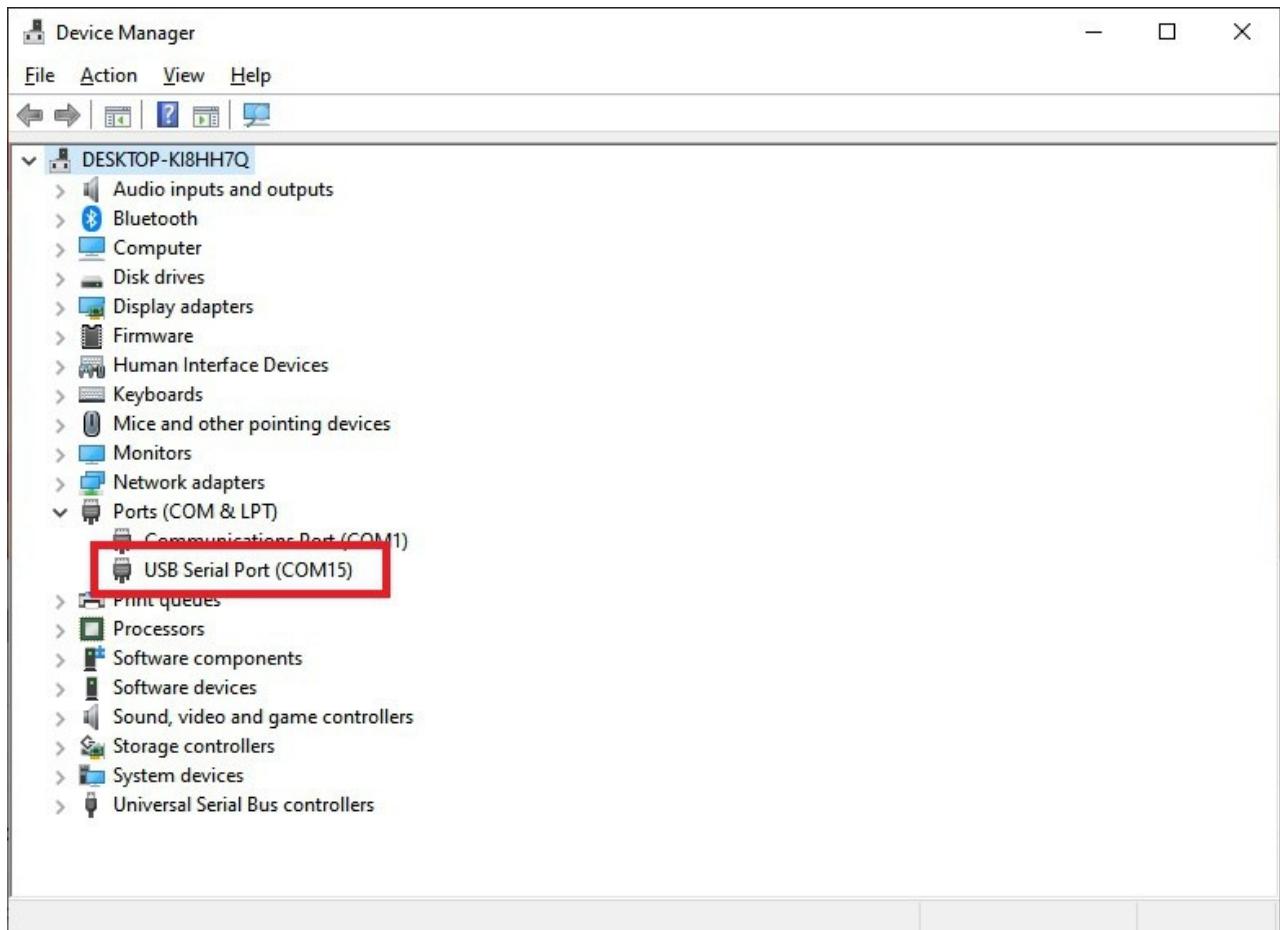


## Configuring through the USB Port

If you need to change the receiver settings in a non-standard way, you can use the **USB Type-C** connector in the corner of the receiver board. Open the case, insert the **USB** cable into the connector on the receiver board, and the other end into a Windows computer. In the photo, it's the white cable.



On the computer, open “**Device Manager**” and check the name of the newly appeared **COM** port.



# Configuring the Septentrio Receiver via the Website

Find the button to open the **mosaic** receiver's website on the **Settings** page and click it.

Gnss receiver: Septentrio\_mosaic-X5 - 4.14.4 **Mosaic Web server** (circled)

Board: Raspberry Pi 4 Model B Rev 1.5

Os: Debian 12 (Bookworm)

CPU Temp: 58,4 C° - (highest record: 60,4C°)

Uptime: 5h 18mn 22s

Storage: 26.5GB available of 30.83GB - (9.4 % used)

Settings: **Backup** **Restore** **Reset**

Diagnostic: **View**

Power: **Reboot** **Shutdown**

ELT\_RTKBase v1.5.5 RTKBase v2.6.0 gnss.store gnss.design

On the website that opens, you can configure the receiver.

**Receiver** **Position** **Status**

mosaic-X5 S/N 3671000	Lat: N56°54'16.7518" 0.000m	Tracked Sats: 60
IP Address:	Lon: E24°11'25.8500" 0.000m	Time: 2024-08-09 22:33:09
Uptime: 0d 01:31:51	Hgt: 47.730m 0.000m	Temp: 58.00 °C

**Quality Indicators**

Overall  10/10	Main RF power  10/10	Main signals  10/10	CPU  10/10
---------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------

**GNSS**

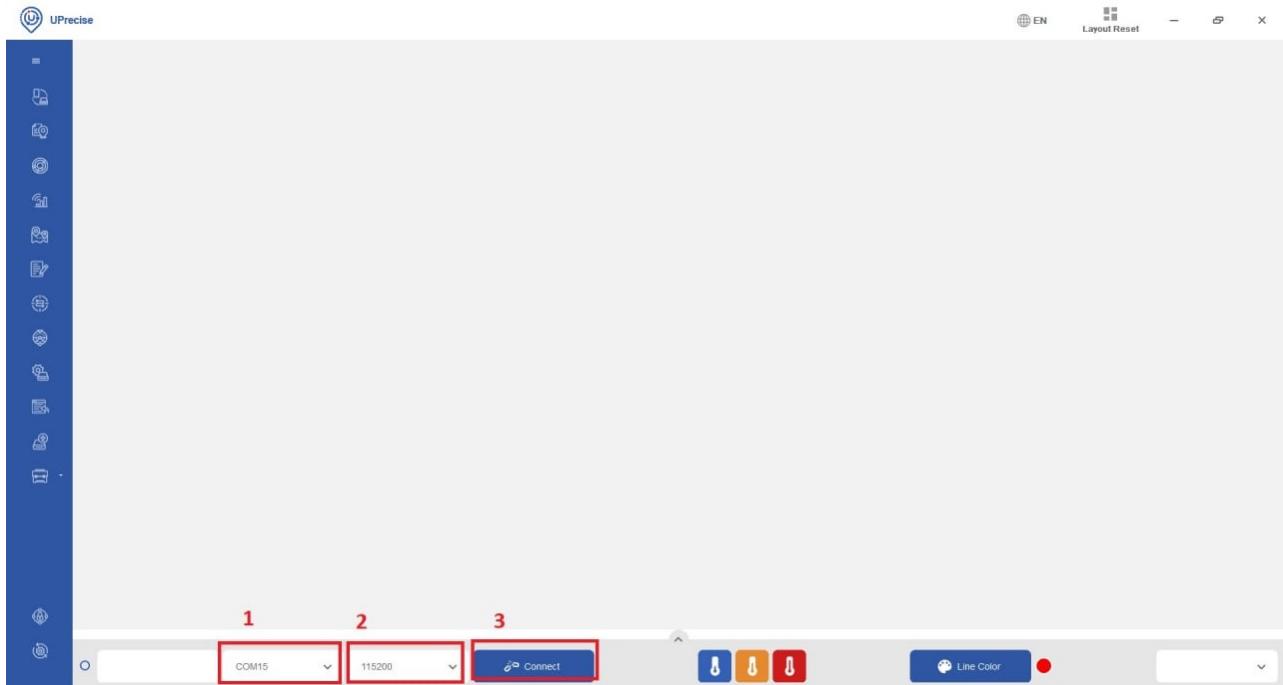
Fixed 	<ul style="list-style-type: none"><li>GPS (Position: 10, Track: 11)</li><li>GLOASS (Position: 8, Track: 11)</li><li>Galileo (Position: 9, Track: 10)</li><li>SBAS (Position: 0, Track: 5)</li><li>BeiDou (Position: 14, Track: 19)</li><li>QZSS (Position: 1, Track: 1)</li><li>NavIC (Position: 0, Track: 3)</li></ul>
-------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Legend:

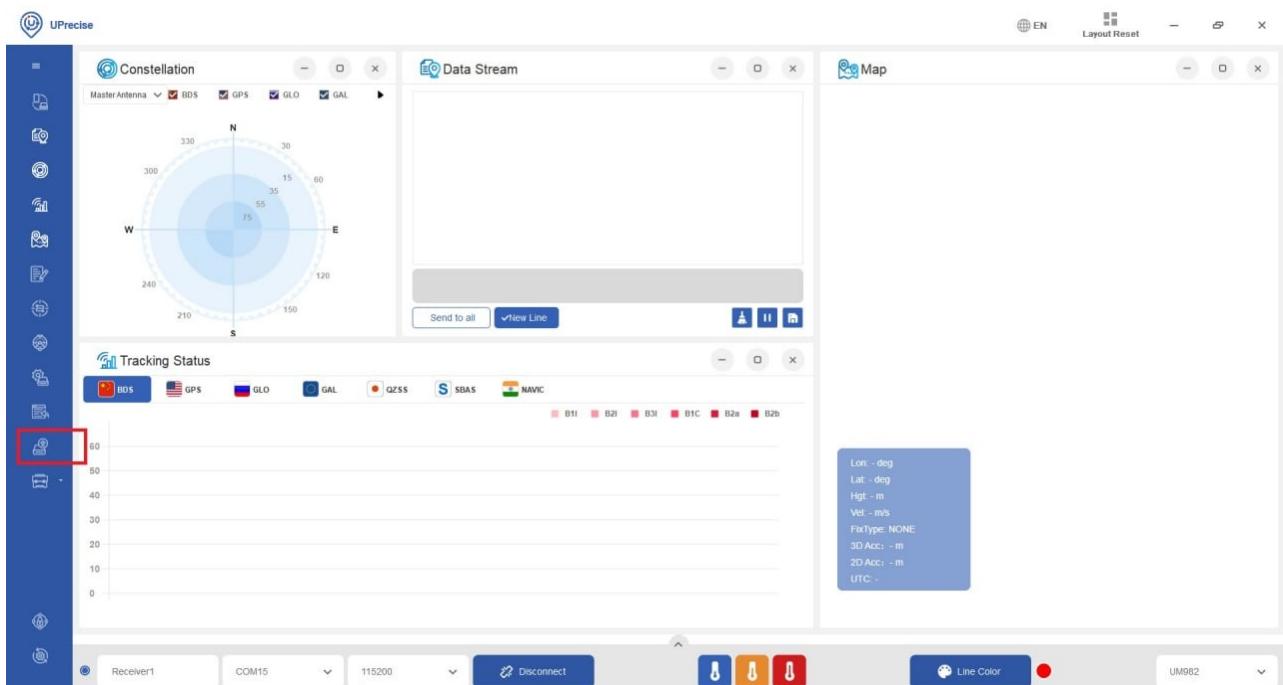
- Fixed
- Overall Quality
- Corrections
- OSNMA
- Internal
- Logging
- Spectrum clean

# Updating Unicore Receiver Firmware

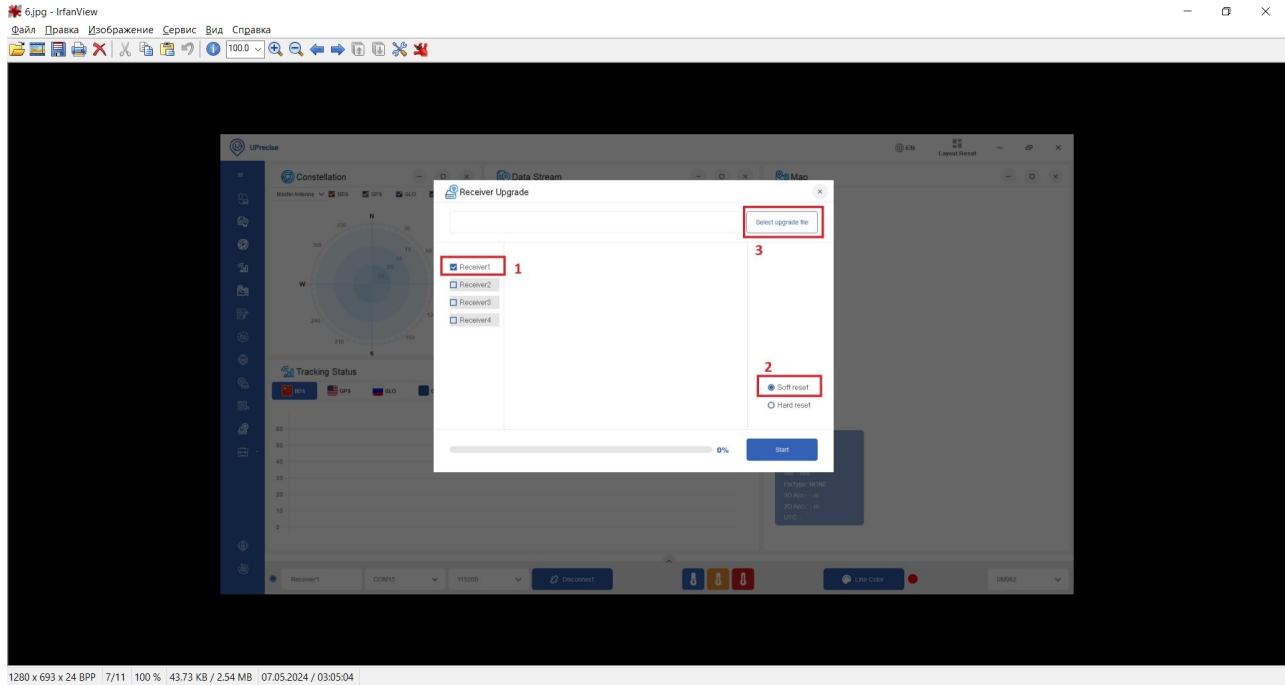
Download and run **UPrecise** from the [website](#). Enter the **COM** port (see above) and speed **115200** in the lower part (since a different receiver port is used on **USB** than on the **Raspberry Pi**, the speed will always be **115200**), then click **Connect**.



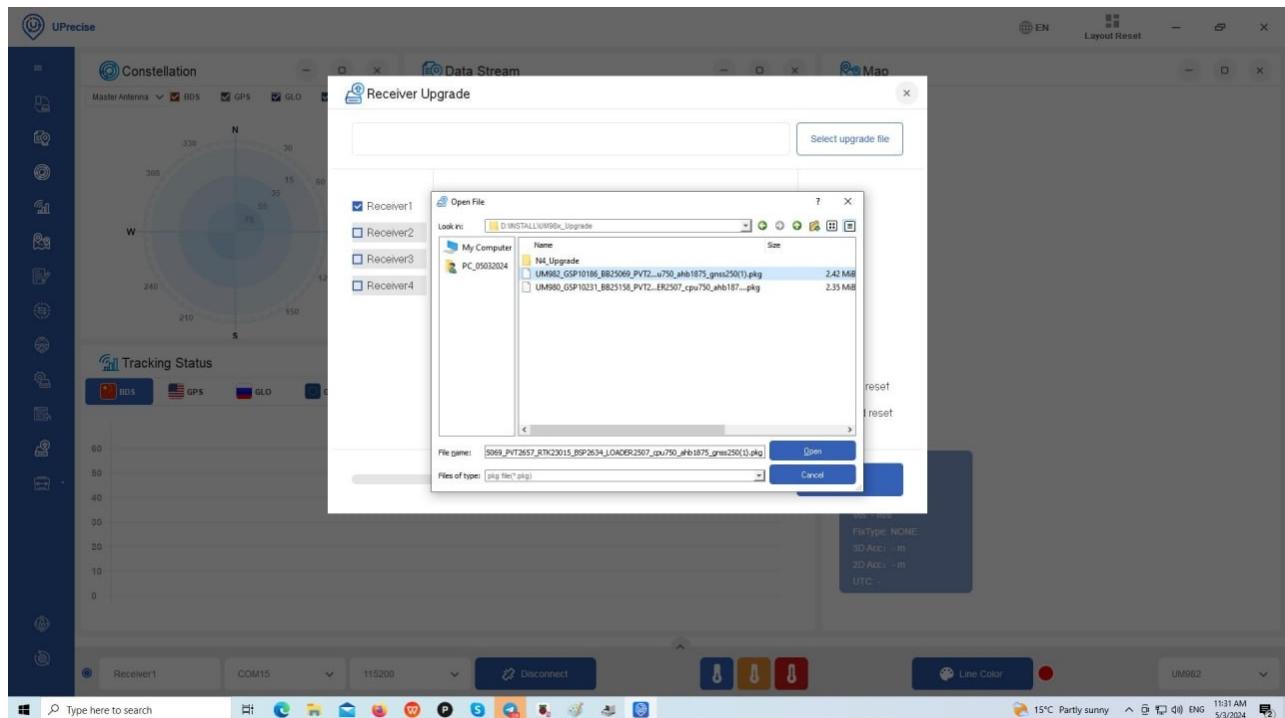
On the left panel, click the “**Receiver Upgrade**” button.



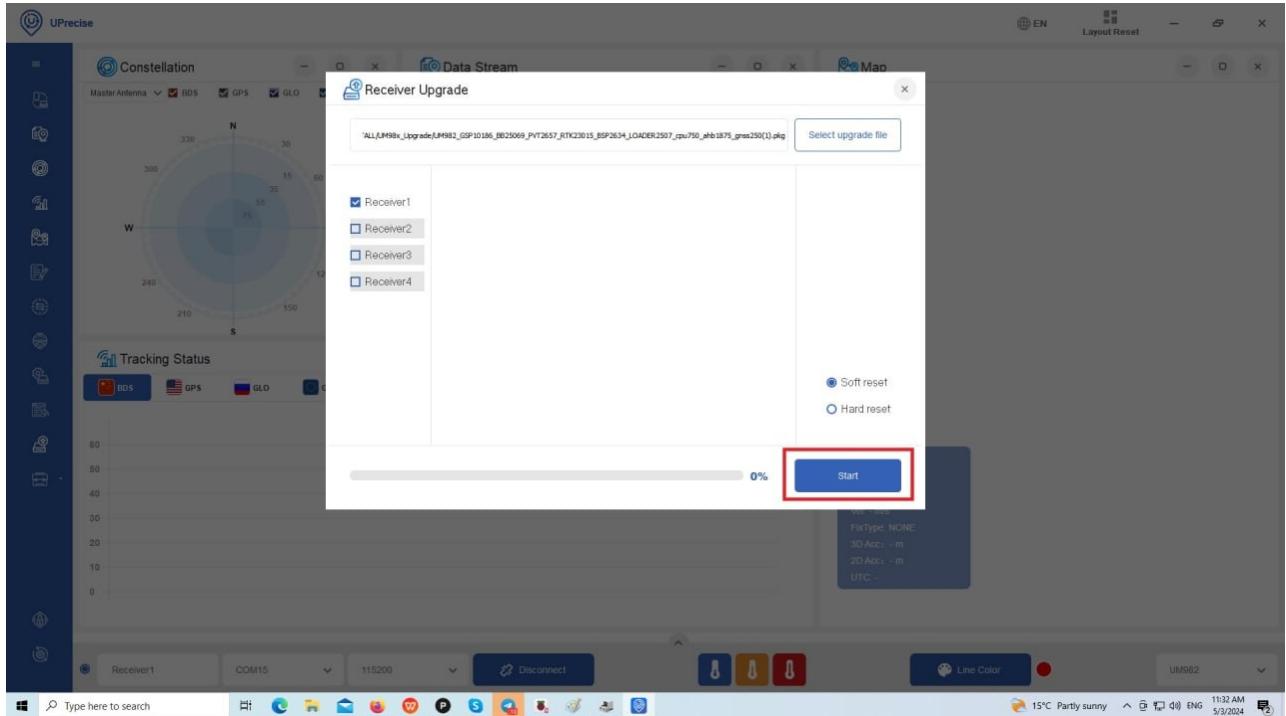
After clicking the button, the firmware update settings window appears. Check the box next to receiver 1 (and do not check the others) — number 1 in the screenshot. Select “**Soft Reset**” — number 2 in the screenshot. Click “**Select upgrade file**” — number 3 in the screenshot.



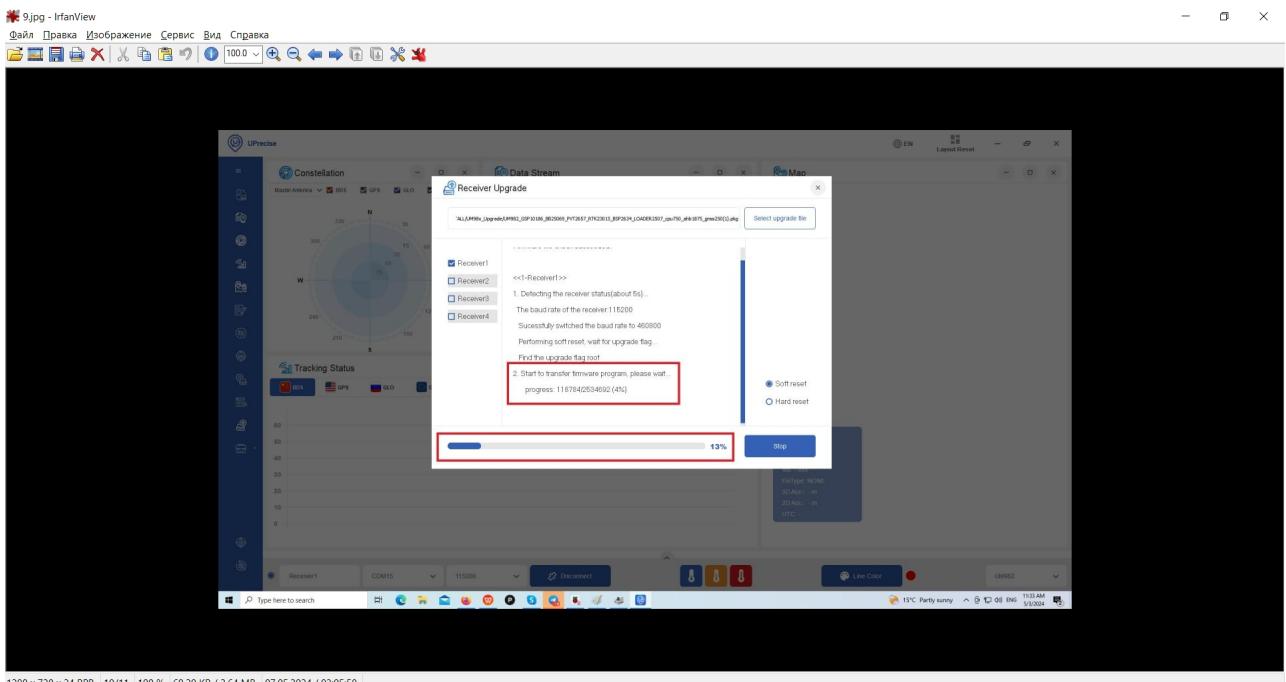
Select the new firmware file.



After selecting the new firmware file, click the **Start** button in the lower right corner of the window.

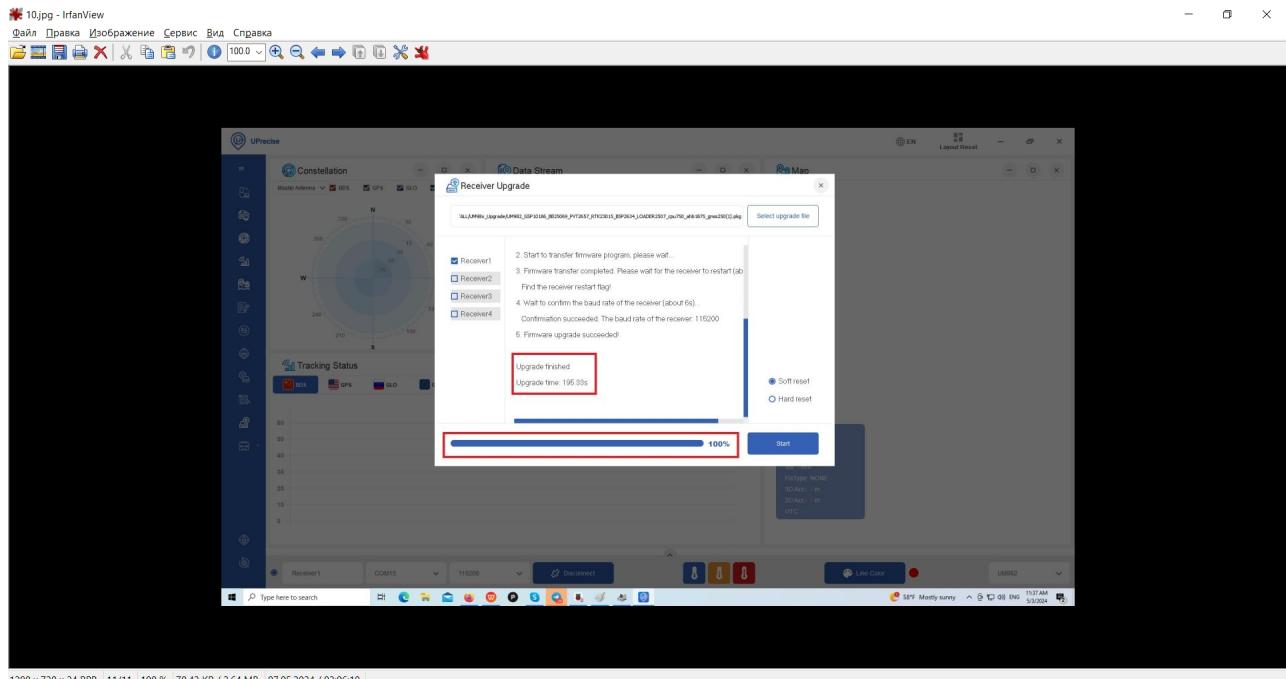


The receiver firmware update process begins.



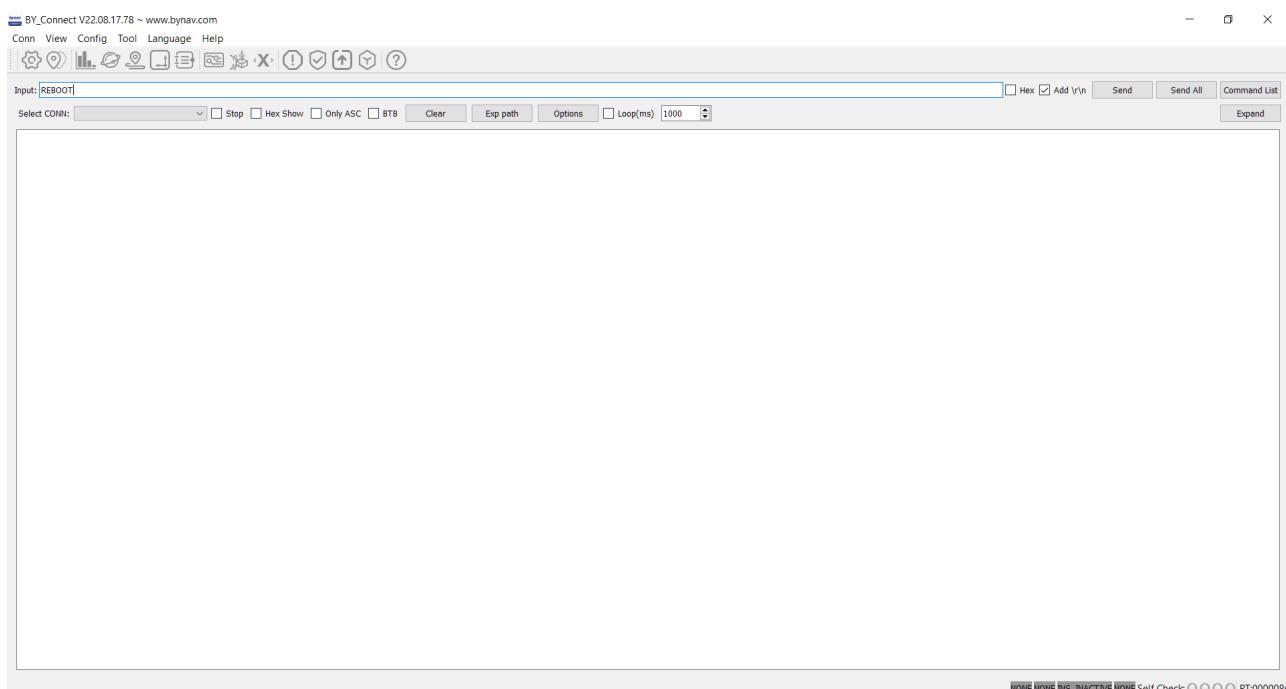
1280 x 720 x 24 BPP | 10/11 | 100 % | 69.20 KB / 2.64 MB | 07.05.2024 / 03:05:58

After the firmware update is complete, a message appears.

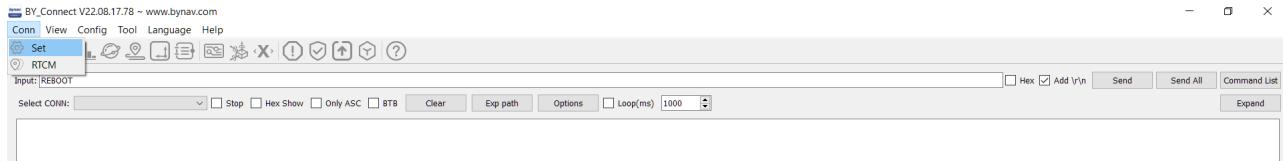


## Updating Bynav Receiver Firmware

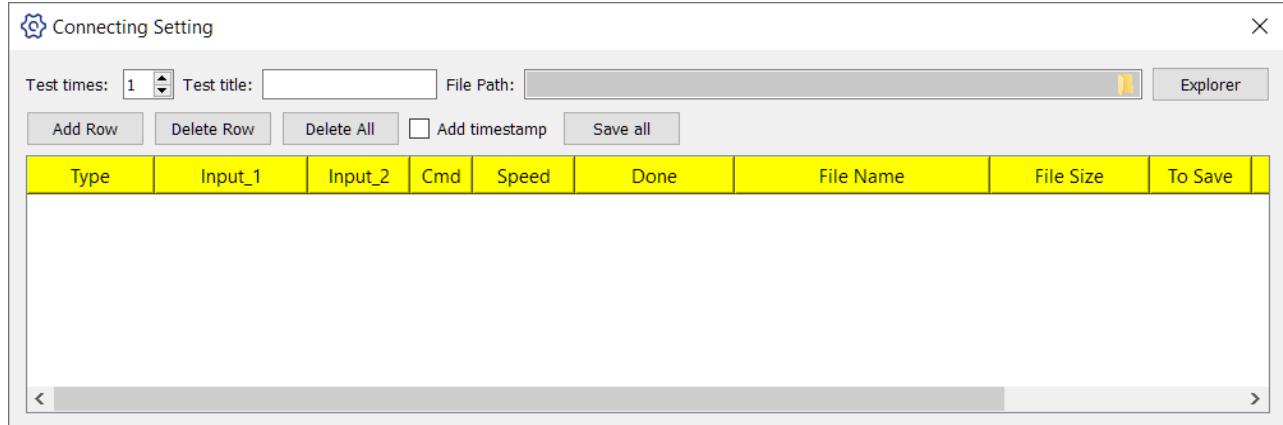
Download, unzip, and run **BY\_connect** from the [website](#).



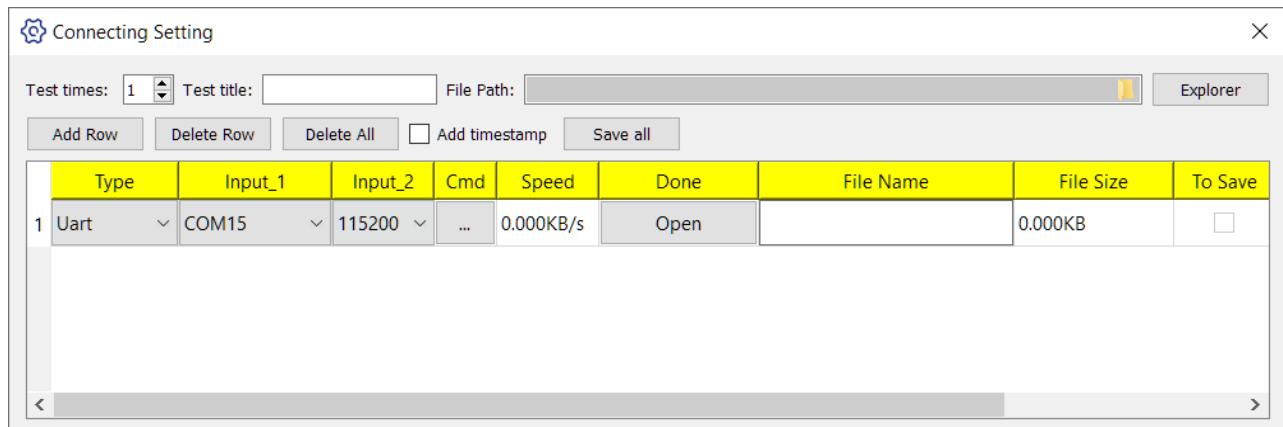
In the **Conn** menu, select **Set**.



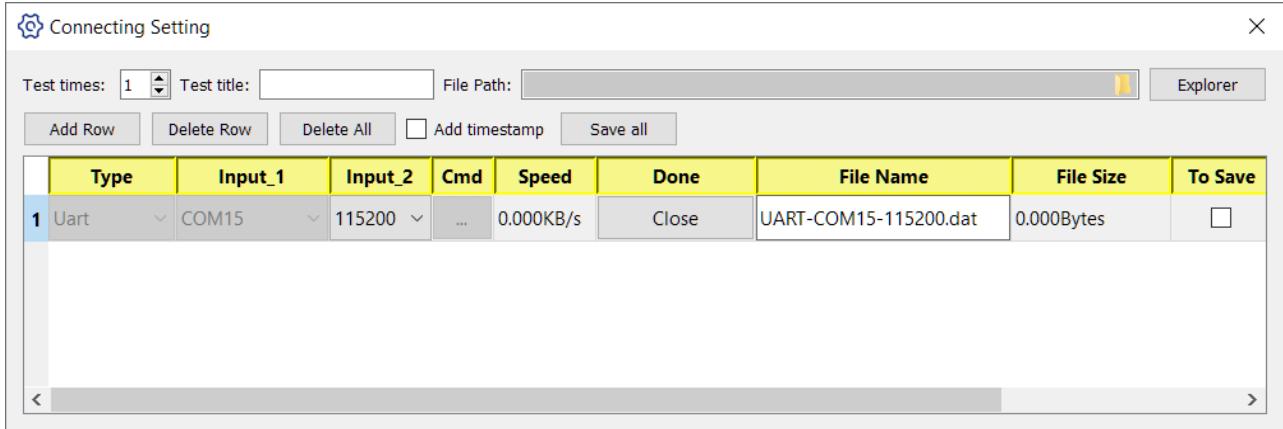
The “Connecting Setting” window opens.



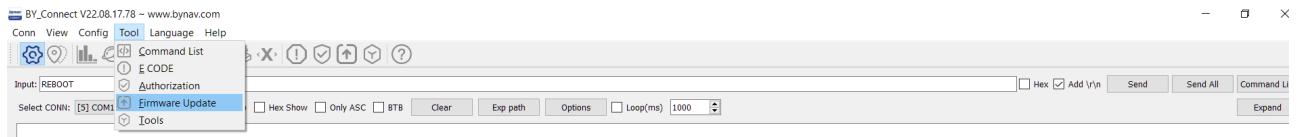
Click “Add Row” and fill in the fields as shown in the screenshot. Use the **COM** port specified in the **Device Manager**.



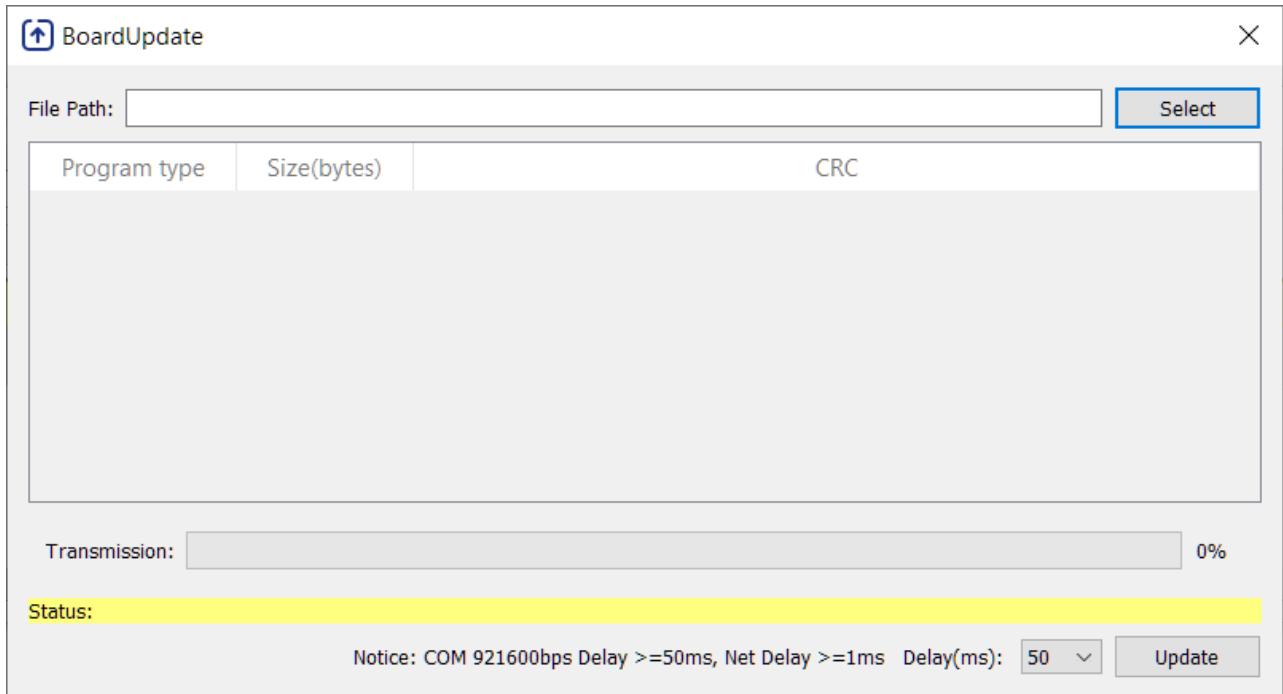
Click Open.



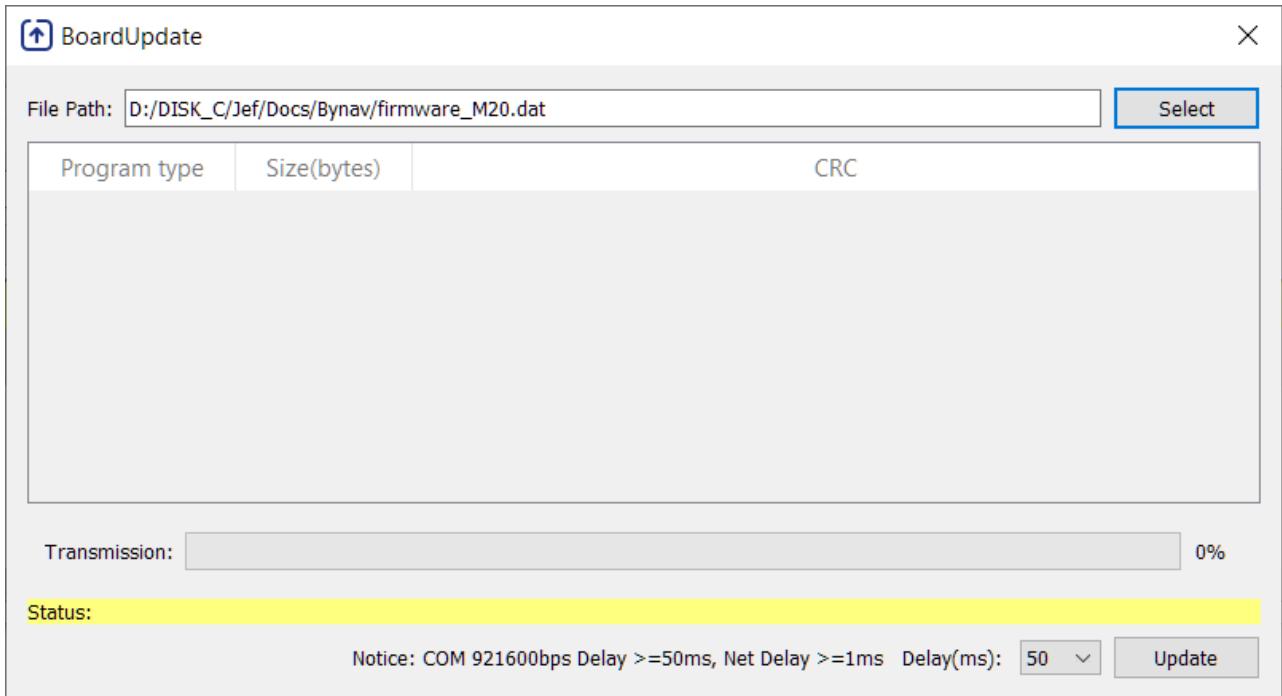
In the Tool menu, select “Firmware update”.



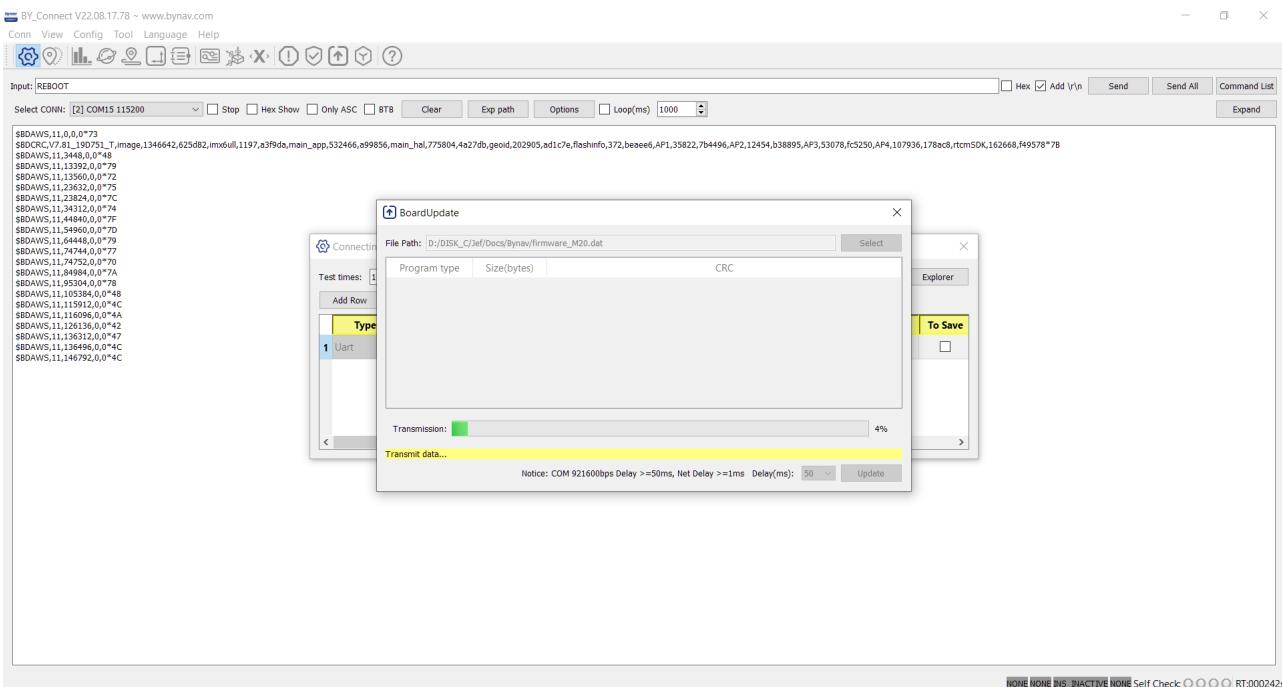
The “BoardUpdate” window opens. Click Select and choose the firmware update file.



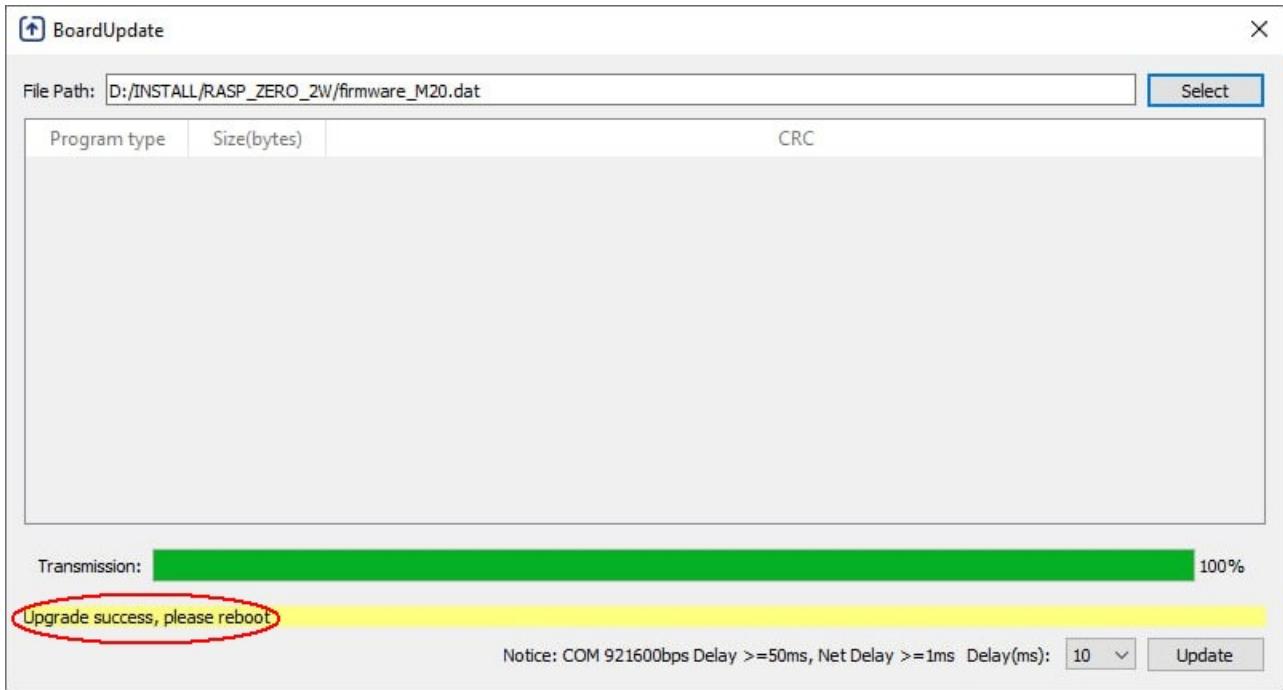
After selecting the new firmware file, click the **Update** button in the lower right corner of the window.



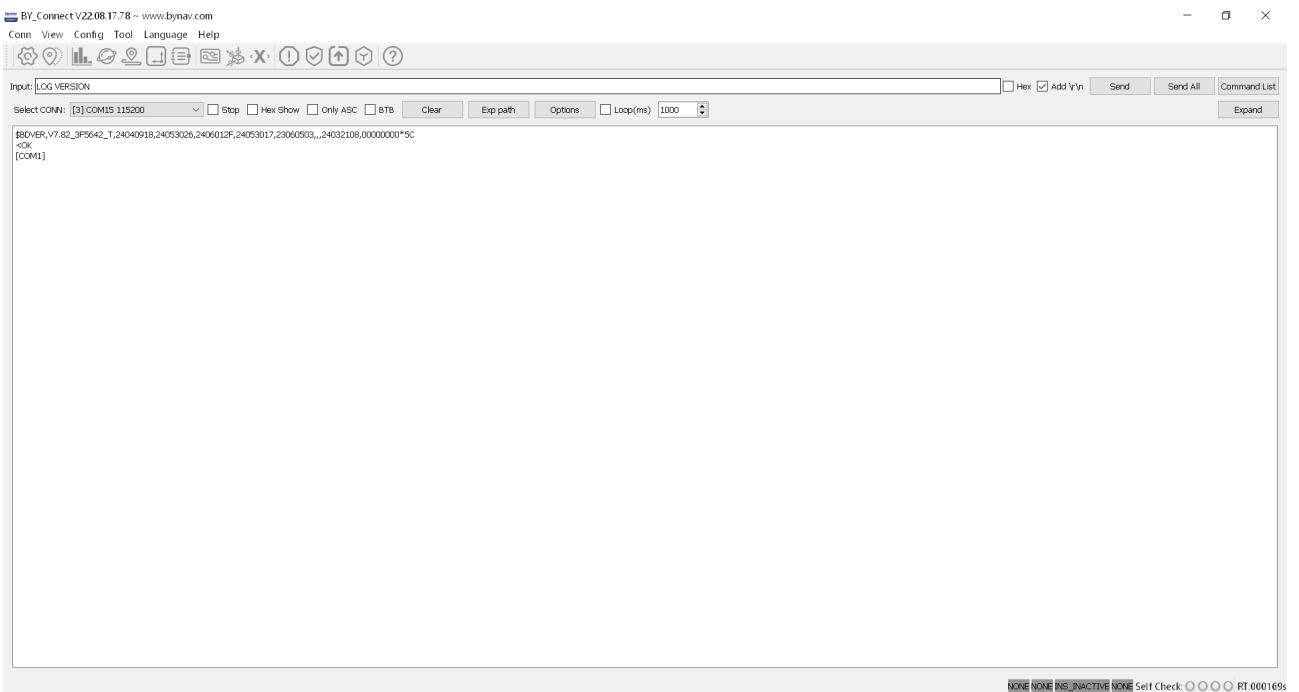
The firmware update process begins.



Wait for the firmware update to complete. On success, the message “**Upgrade success, please reboot**” appears, and on failure, “**Upgrade failure**” appears.



After the firmware update is complete, you need to issue the “**REBOOT**” command, followed by the “**LOG VERSION**” command. If any field (except the last one) in the response to this command shows only zeros, you need to repeat the firmware update.



Then configure the receiver as described in the “Configuration” section and check the receiver firmware version at the bottom of the settings page.

Gnss receiver:	Bynav_M2-0 V7.82_3F5642_T
Board:	Raspberry Pi 4 Model B Rev 1.5
Os:	Debian 12 (Bookworm)
CPU Temp:	51,1 C° - (highest record: 51,6C°)
Uptime:	34mn 23s
Storage:	26.71GB available of 30.83GB - (8.7 % used)
Settings:	<a href="#">Backup</a> <a href="#">Restore</a> <a href="#">Reset</a>
Diagnostic:	<a href="#">View</a>
Power:	<a href="#">Reboot</a> <a href="#">Shutdown</a>

ELT\_RTKBase v1.5.0 RTKBase v2.5.0 gnss.store gnss.design

## Updating Septentrio Receiver Firmware

Find the button to open the **mosaic** receiver's website on the **Settings** page and click it.

Gnss receiver:	Septentrio_mosaic-X5 - 4.14.4 <a href="#">Mosaic Web server</a>
Board:	Raspberry Pi 4 Model B Rev 1.5
Os:	Debian 12 (Bookworm)
CPU Temp:	58,4 C° - (highest record: 60,4C°)
Uptime:	5h 18mn 22s
Storage:	26.5GB available of 30.83GB - (9.4 % used)
Settings:	<a href="#">Backup</a> <a href="#">Restore</a> <a href="#">Reset</a>
Diagnostic:	<a href="#">View</a>
Power:	<a href="#">Reboot</a> <a href="#">Shutdown</a>

ELT\_RTKBase v1.5.5 RTKBase v2.6.0 gnss.store gnss.design

On the receiver's website that opens, go to the **Admin** menu and click the **Upgrade** option.

The screenshot shows the main dashboard with various status indicators and a sidebar menu. The sidebar under the **Admin** tab includes options like Configurations, Reset, Power Mode, **Upgrade** (which is circled in red), User Administration, Expert Control, Receiver Messages, and About.

**Quality Indicators:**

- Overall: 9/10
- Main RF power: 10/10
- Main signals: 9/10
- CPU: 10/10

**GNSS:**

- Fixed: GPS (Position: 12, Track: 13), GLONASS (Position: 7, Track: 10), Galileo (Position: 8, Track: 11), SBAS (Position: 0, Track: 4), BeiDou (Position: 12, Track: 19), QZSS (Position: 0, Track: 0), NavIC (Position: 0, Track: 3)

Click “**Choose file**” and select the firmware update file.

The screenshot shows the "Admin > Upgrade" page. It features a form for selecting a firmware file:

Select upgrade (\*.suf) file:  
 Choose File No file chosen

Current firmware version: 4.14.4

Then click the “Start Upgrade” button.

The screenshot shows the Septentrio GNSS receiver control interface. At the top, there's a header with the Septentrio logo and navigation tabs: Overview, GNSS, Communication, Corrections, NMEA/SBF Out, Logging, Admin. Below the header, it says "Admin > Upgrade". The main area has a title "Upgrade Receiver Firmware". It asks for a ".suf" file, with a "Choose File" button followed by "mosaic-X5-4.14.4.suf". A prominent orange button labeled "Start upgrade" is highlighted with a red oval. Below this, a "Description" section states "Application firmware for mosaic-X5, version 4.14.4.", "Size: 21.7 MB", and "Current firmware version: 4.14.4".

The firmware update process begins.

The screenshot shows the same interface as above, but now with a central orange progress dialog box. The dialog has the title "Upgrading receiver..." and the message "Please wait while the receiver is upgraded." It lists the steps: "• resetting receiver to upgrade mode", "• **uploading SUF file and upgrading**", and "• upgrade complete". An orange circular progress indicator is shown. To the left of the dialog, a log of upgrade steps is visible, starting with "[ 31] 20265577/22771051" and ending with "[ 34] SUF fully processed.". At the bottom of the screen, a message says "Rebooting to normal firmware.".

The firmware is updated. Click the “**identification page**” link to check the version.

Septentrio GNSS Receiver Dashboard

**Receiver**

mosaic-X5 S/N 3671000	Lat: N56°54'16.7518" 0.000m	Tracked Sats: 58
IP Address:	Lon: E24°11'25.8500" 0.000m	Time: 2024-08-09 21:02:44
Uptime: 0d 00:01:26	Hgt: 47.730m 0.000m	Temp: 58.00 °C

**Status**

Fixed	Internal
Overall Quality	Logging
Corrections	Spectrum clean
OSNMA	

**Overview**   **GNSS**   **Communication**   **Corrections**   **NMEA/SBF Out**   **Logging**   **Admin**

Admin > Upgrade > After upgrade

**Upgrade successful**

In order to verify the outcome of the upgrade:

- Please consult the [identification page](#) to review the installed versions.
- Please look at the latest upgrade status info below, to observe error messages if any.

```
[ 17] Processing filterdata payload rootfs
[ 17] Volume ID 0, size 63 LEBs (15998976 bytes, 15.3 MiB), LEB size 253952 bytes
(248.0 KiB), static, name "gupies_rootfs_3", alignment 1
[ 28] Processing filter payload
[ 28] Processing filterdata payload kernel
[ 28] Volume ID 2, size 16 LEBs (4063232 bytes, 3.9 MiB), LEB size 253952 bytes (248.0
KiB), static, name "gupies_kernel_3", alignment 1
[ 31] Processing filter payload
[ 31] Processing filterdata payload fwfs
[ 31] Volume ID 3, size 12 LEBs (3047424 bytes, 2.9 MiB), LEB size 253952 bytes (248.0
KiB), static, name "gupies_fwfs_3", alignment 1
[ 33] Processing exe payload clear-css.sh
[ 33] Processing file payload antinfo.bin
[ 33] Processing file payload fwp
[ 33] Processing exe payload sshdenable.sh
[ 33] Processing filter payload
[ 33] Processing filterdata payload
[ 34] SUF fully processed.
[ 35] Rebooting to normal firmware.
```

Verify that the version number is correct.

Septentrio GNSS Receiver Dashboard

**Receiver**

mosaic-X5 S/N 3671000	Lat: N56°54'16.7518" 0.000m	Tracked Sats: 59
IP Address:	Lon: E24°11'25.8500" 0.000m	Time: 2024-08-09 21:06:52
Uptime: 0d 00:05:34	Hgt: 47.730m 0.000m	Temp: 57.00 °C

**Status**

Fixed	Internal
Overall Quality	Logging
Corrections	Spectrum clean
OSNMA	

**Overview**   **GNSS**   **Communication**   **Corrections**   **NMEA/SBF Out**   **Logging**   **Admin**

**Receiver Identification**

Component	Attribute	Description
hwplatform	product	mosaic-X5
firmware	version	4.14.4
files		
components		No components



Now proceed with the configuration as described in the “Configuration” section.

# Determining Coordinates

Determining coordinates is necessary to find the exact coordinates of the antenna. Start with a rough determination of coordinates using the built-in PPP, then refine the coordinates using one of the more accurate methods.

Before determining coordinates, be sure to read the section on [accuracy and stability](#) on our blog.

It is very important to remember about frames and epochs. **Ublox** has a [good tutorial](#) on this topic, and a [brief explanation](#) can also be found on **Onocoy**. The **PPP** and **HAS** methods give results in the **ITRF** frame associated with the Earth's center, while the **RTK** methods sometimes use the **ETRF** frame associated with continents. The difference between frames in Europe is currently about 80 centimeters, so it is recommended to use a [frame calculator](#) for conversion.

The determination time should be no less than a full day, ideally **23 hours and 56 minutes (86160 seconds)**. For high accuracy, it is better to use several daily **RTK** measurements and perform adjustment. The most accurate way is to hire a surveyor or use a paid service.

The main condition is that the antenna should not move relative to the ground. High bending masts are not suitable.

When specifying coordinates, there are two main options. If coordinates “**0.00 0.00 0.00**” are specified, the receiver determines its coordinates by averaging the autonomous solution within a minute. If other values are specified, the receiver tries to establish them.

If the coordinates are incorrectly specified (more than 50 meters from the value determined by the receiver), the **Unicore** receiver will not work. In this situation, only the **Beidou** and **QZSS** satellites will be visible on the **Status** page. To avoid this, when specifying incorrect coordinates in the settings, the receiver uses the averaged value of the autonomous solution. The indicator next to “**Main service**” will be orange, not green.

As for the indicator, green means “everything is fine”, yellow means “the service is running with errors”, and red means “the service is not running”. There is also a blue color, which indicates that the service is currently in the process of starting up.

The screenshot shows the RTKBase application interface with the 'SETTINGS' tab selected. The main area is titled 'Services:' and contains several configuration sections:

- Main service**: Status is set to 'On'. Buttons for 'Options' and 'Info' are available.
- Base coordinates:** Value: 56.90472008 24.19052161 255.6639. A green checkmark is present.
- Com port:** Value: ttyS0. A green checkmark is present. A 'Detect/Configure' button is next to it.
- Com port settings:** Value: 115200:8:n:1. A green checkmark is present.
- Receiver type:** Value: Unicore UM982. A green checkmark is present.
- Receiver format:** Value: rtcm3. A green checkmark is present.
- Antenna info:** Value: ELT0123. A green checkmark is present.
- Tcp port:** Value: 5015. A green checkmark is present.

A blue 'Save' button is located at the bottom right. Below these sections are four service status indicators:

- Ntrip A service**: Status is 'Off'. Buttons for 'On' (highlighted), 'Options', and 'Info' are available.
- Ntrip B service**: Status is 'Off'. Buttons for 'On', 'Options', and 'Info' are available.
- Ntrip Caster service**: Status is 'Off'. Buttons for 'On', 'Options', and 'Info' are available.
- Rtcm tcp service**: Status is 'Off'. Buttons for 'On', 'Options', and 'Info' are available.

## Rough Coordinates

On the **Status** page, check for the presence of the **PPP** mode and click the copy coordinates button. If the **PPP** mode is not available, the coordinates might be incorrect.

The screenshot shows the RTKBase application interface with the 'STATUS' tab selected. A modal dialog box is displayed in the center, titled 'Coordinates sent to clipboard', containing the text '56.90470999 24.19054032 58.255'. A blue 'Close' button is at the bottom. In the background, there is a bar chart with various green bars and a map of Europe. At the bottom of the screen, coordinate values are displayed: Latitude: 56.90470996 °, Longitude: 24.19054080 °, Height: 58.403 m. To the right of these values are two buttons: a blue 'PPP' button with a pink circle around it, and a white clipboard icon with a blue outline and a pink circle around it.

Click **Close** and go to the **Settings** page.

The screenshot shows the RTKBase Settings page. At the top, there are three tabs: STATUS, SETTINGS (which is selected), and LOGS. Below the tabs, there are two main sections: Services and System Settings.

**Services:**

- Main service: Status is On (green), with Off, Options, and Help (i) buttons.
- Ntrip A service: Status is Off, with On, Options, and Help (i) buttons.
- Ntrip B service: Status is Off, with On, Options, and Help (i) buttons.
- Ntrip Caster service: Status is Off, with On, Options, and Help (i) buttons.
- Rtcm tcp service: Status is Off, with On, Options, and Help (i) buttons.
- Rtcm serial service: Status is Off, with On, Options, and Help (i) buttons.
- File service: Status is Off, with On, Options, and Help (i) buttons.

**System Settings:**

- Rtkbase 2.5.0: Includes a Check update button.
- Change Password: Fields for New password and Confirm password.

At the bottom left, there is a link to 172.26.0.84/settings.

To the right of “Main service”, click the **Options** button.

This screenshot is identical to the one above, showing the RTKBase Settings page. The difference is that the Options button for the Main service has been clicked, causing it to become highlighted with a blue border.

The main service settings open.

The screenshot shows the RTKBase web interface with the URL 172.26.0.84/settings. The top navigation bar has tabs for STATUS, SETTINGS (which is selected), and LOGS. Below the tabs, there's a section titled "Services:" with a list of services and their status controls. The "Main service" is set to "On". Other services listed are "Ntrip A service" and "Ntrip B service", both currently set to "Off". Each service has an "Options" button and an information icon. Below the services, there are configuration fields for "Base coordinates", "Com port", "Com port settings", "Receiver type", "Receiver format", "Antenna info", and "Tcp port". Each field has a value input, a green checkmark icon, and a "Save" button at the bottom right. The "Base coordinates" field contains the value "0.00 0.00 0.00".

In the “**Base coordinates**” field, simply paste the values from the **clipboard** (for example, using **Ctrl-V**).

This screenshot is identical to the one above, but the "Base coordinates" field now contains the values "56.90471329 24.19059987 56.235", indicating that the clipboard value has been pasted into the field.

Click the **Save** button and click **Options** again.

The screenshot shows the RTKBase Settings page. At the top, there are three tabs: STATUS, SETTINGS (which is selected), and LOGS. Below the tabs, under 'Services:', there is a list of services with their current status (On or Off) and an 'Options' button. Under 'System Settings:', there is a 'Check update' button, a 'Change Password:' section with fields for 'New:' and 'Confirm:', and a 'Change password' button.

Go to the **Status** page and see the entered coordinates as a target, and the current coordinates as a blue marker.

The screenshot shows the RTKBase Status page. At the top, there are three tabs: STATUS (selected), SETTINGS, and LOGS. Below the tabs, there is a bar chart with values ranging from 0 to 55. At the bottom of the chart, there are three text boxes: 'Latitude: 56.90471493 °', 'Longitude: 24.19057703 °', and 'Height: 55.472 m'. To the right of these text boxes are buttons for 'PPP' and a file icon. Below the chart is a map view showing a location with a blue marker and a coordinate grid.

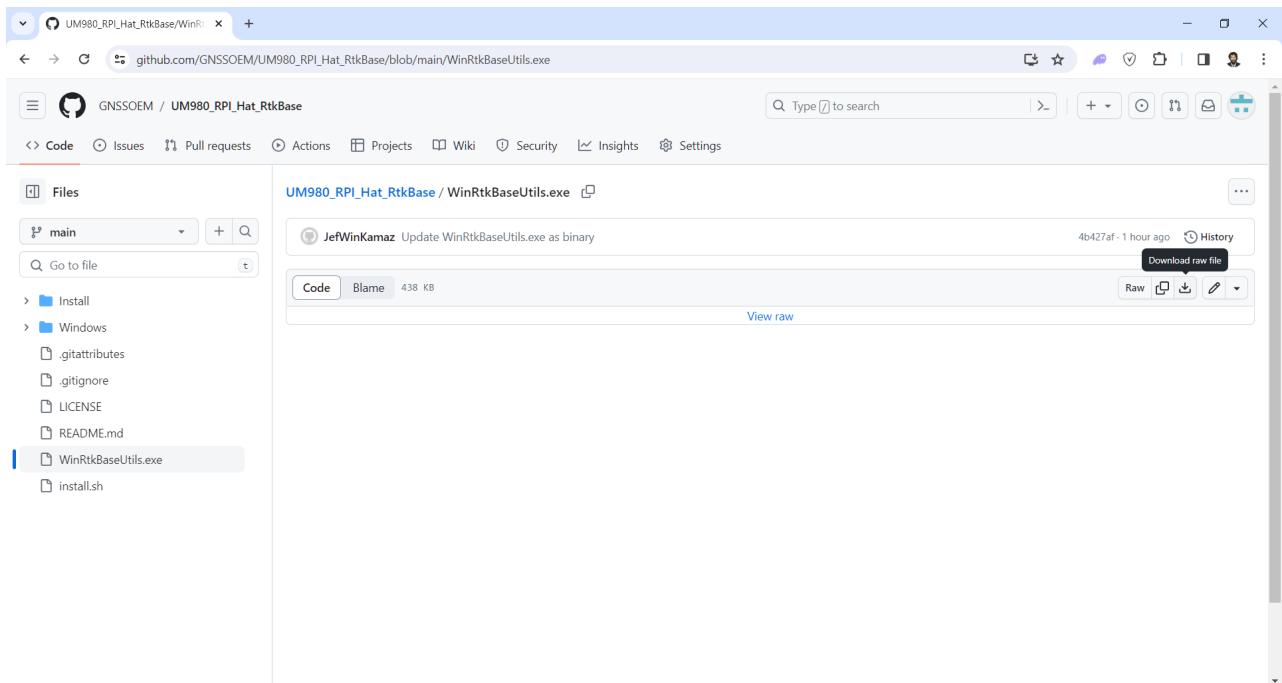
## Determining Coordinates using the PPP Method

To determine coordinates using the built-in **PPP**, go to the **Status** page after a day and copy the coordinates as described above. Note that each time the base coordinates or other main service settings are changed, the **PPP** refinement process starts from scratch.

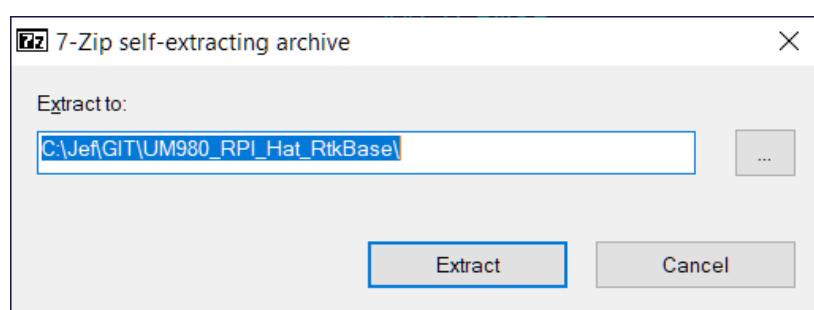
# WinRtkBaseUtils Package

## Download and unpack

Insert the **SD** card sent to you into your computer's card reader and download the self-extracting archive **WinRtkBaseUtils.exe** to your hard drive. You can also download this archive from **GitHub** using the [provided link](#).



Run the file to unpack it. During the run, you can choose the folder for unpacking and click the **Extract** button.



Sometimes the antivirus may give a warning, and you need to explain to it that this file is safe. For example, **Microsoft Defender** may display the following message. In this case, click “**More Info**”.

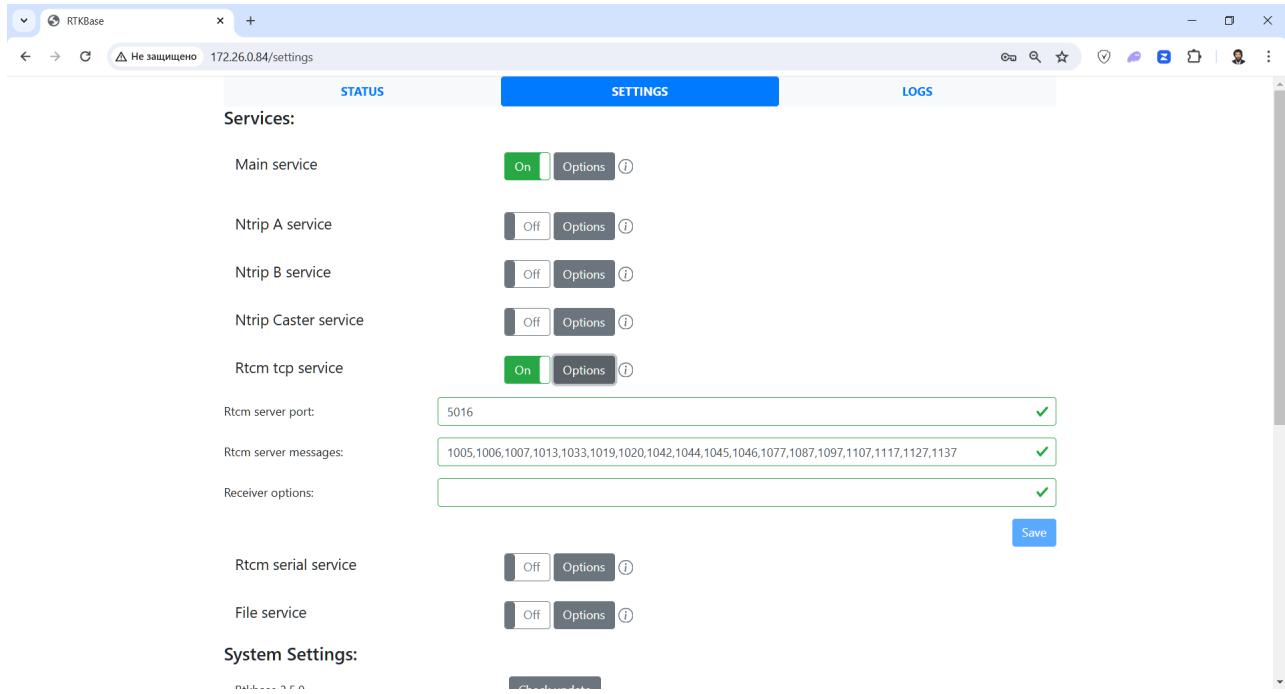


Next, click “Run anyway”.



## Important Requirements

To determine coordinates using the **WinRtkBaseUtils** package, you must enable the “**Rtcm tcp service**” by clicking the “**On/Off**” button to the right of “**Rtcm tcp service**”, and after determining the coordinates, disable it again. Enabling this service allows access to change the receiver settings from outside the **Raspberry PI**, and in the worst case, even outside your local network. The list of messages for this service is obsolete and does not affect anything.



Moreover, if there were failures during the execution of **RTK.bat** or **HAS.bat**, you must reconfigure the receiver as described in the “Configuration” section. The **WinRtkBaseUtils** package reconfigures the receiver, and in case of a failure, it must be reconfigured back.

It is not possible to run multiple **RTK.bat** or multiple **HAS.bat** from the same directory simultaneously, even with different **Raspberry pi** and receivers. This is due to the impossibility of simultaneous use of the same temporary file. Trying to do this will result in a message like the one shown in the picture.

```
RTK for Unicore
Enter parametries...
Receiver IP addr (192.168.172.190):
Receiver port (5017):
RTCM3 server IP (igs-ip.net):
RTCM3 server port (2101):
RTCM3 server mountpoint (RIGA00LVA0):
RTCM3 server user (██████):
RTCM3 server password (██████):
Period in sec (60):
Check Receiver on 192.168.172.190:5017...
Receiver is UM980
Check RTCM3 server on igs-ip.net:2101/RIGA00LVA0@████████:████████...
(c) Elitehs SIA @ http://gnss.design (library by ESTIMO-GNSS UG)
MSG: ChanA TCP CONNECTED with NTRIP: igs-ip.net:2101/RIGA00LVA0
MSG: RIGA00LVA0: GOOD answer from NTRIP server. Ready to received RTCM.
Configure UM980 on 192.168.172.190:5017 as RTK...
Counting base coordinates at 60 seconds...
The process cannot access the file because it is being used by another process.
Base coordinates:
!
Press any key to continue . . .
```

If the receiver firmware version is outdated, there may be messages like the one in the picture. In this case, check the receiver firmware version as indicated in the “Checking the Receiver Firmware Version” section.

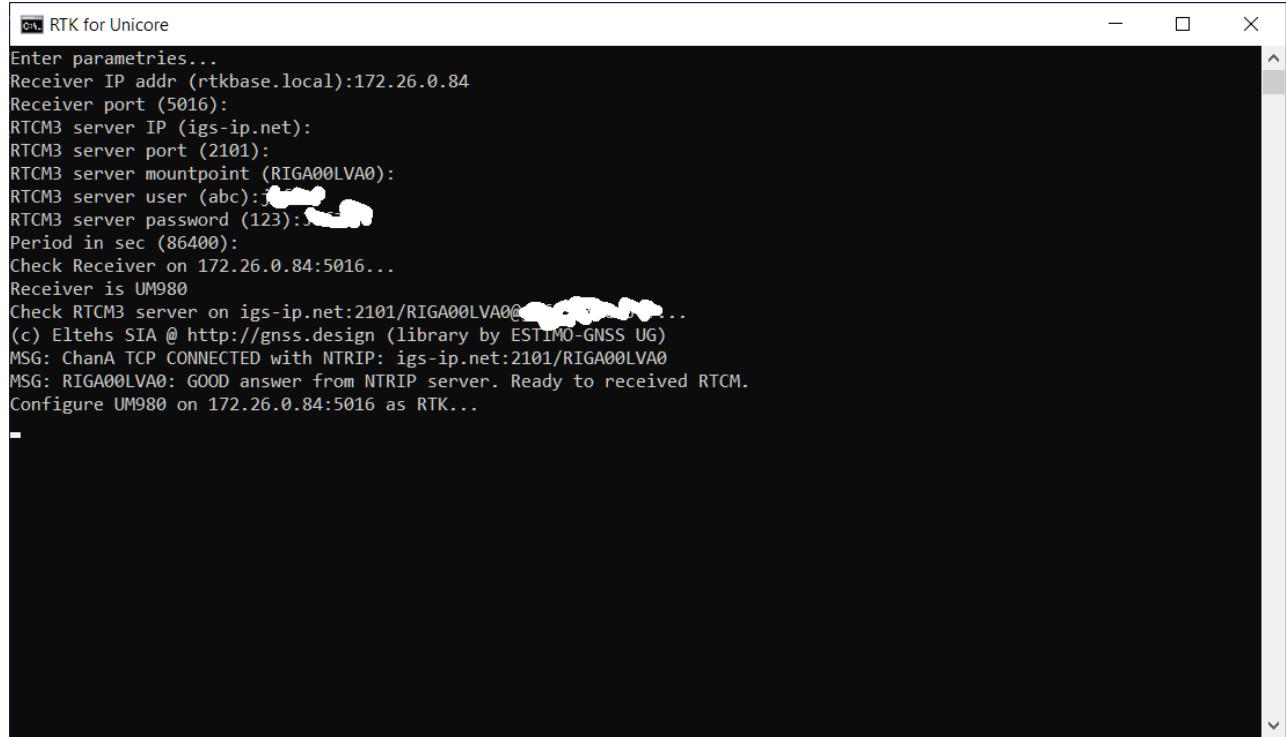
```
RTK for Unicore
Enter parametries...
Receiver IP addr (192.168.172.190):
Receiver port (5017):
RTCM3 server IP (igs-ip.net):
RTCM3 server port (2101):
RTCM3 server mountpoint (RIGA00LVA0):
RTCM3 server user (██████):
RTCM3 server password (██████):
Period in sec (60):
Check Receiver on 192.168.172.190:5017...
Receiver is UM980
Check RTCM3 server on igs-ip.net:2101/RIGA00LVA0@████████:████████...
(c) Elitehs SIA @ http://gnss.design (library by ESTIMO-GNSS UG)
MSG: ChanA TCP CONNECTED with NTRIP: igs-ip.net:2101/RIGA00LVA0
MSG: RIGA00LVA0: GOOD answer from NTRIP server. Ready to received RTCM.
Configure UM980 on 192.168.172.190:5017 as RTK...
<MODE ROVER SURVEY DEFAULT
>$command,MODE ROVER SURVEY DEFAULT,response: PARSE FAIL GRAMMAR ERROR.MODE ROVER SURVEY DEFAULT*5F
Counting base coordinates at 60 seconds...
The process cannot access the file because it is being used by another process.
Base coordinates:
!
Press any key to continue . . .
```

After changing coordinates by clicking the **Save** button, all services are stopped. If the “**Main service**” was running at the time of clicking **Save**, it will restart, but the other services will remain stopped.

## Determining Coordinates via RTK

RTK stability on **Unicore** receivers is about 4 mm **CEP50** horizontally and 8 mm **CEP50** vertically. Accuracy is approximately 1mm per kilometer of distance between the receiver and the base. For increased accuracy, network corrections with virtual bases should be used.

To determine coordinates using **RTK**, run the **RTK.bat** file. In the opened window, enter the receiver address and port. If you use **Raspberry pi** on the local network, do not change them. Then enter the address, port, mount point, login, and password for the **NTRIP** server, as well as the measurement time. The entered parameters are saved in the **Ini.cmd** file.



```
RTK for Unicore
Enter parameters...
Receiver IP addr (rtkbase.local):172.26.0.84
Receiver port (5016):
RTCM3 server IP (igs-ip.net):
RTCM3 server port (2101):
RTCM3 server mountpoint (RIGA00LVA0):
RTCM3 server user (abc):[REDACTED]
RTCM3 server password (123):[REDACTED]
Period in sec (86400):
Check Receiver on 172.26.0.84:5016...
Receiver is UM980
Check RTCM3 server on igs-ip.net:2101/RIGA00LVA0[REDACTED]...
(c) Eltehs SIA @ http://gnss.design (library by ESTIMO-GNSS UG)
MSG: ChanA TCP CONNECTED with NTRIP: igs-ip.net:2101/RIGA00LVA0
MSG: RIGA00LVA0: GOOD answer from NTRIP server. Ready to received RTCM.
Configure UM980 on 172.26.0.84:5016 as RTK...
```

Communication with the receiver and server is checked, then the receiver is configured, and then RTK starts.

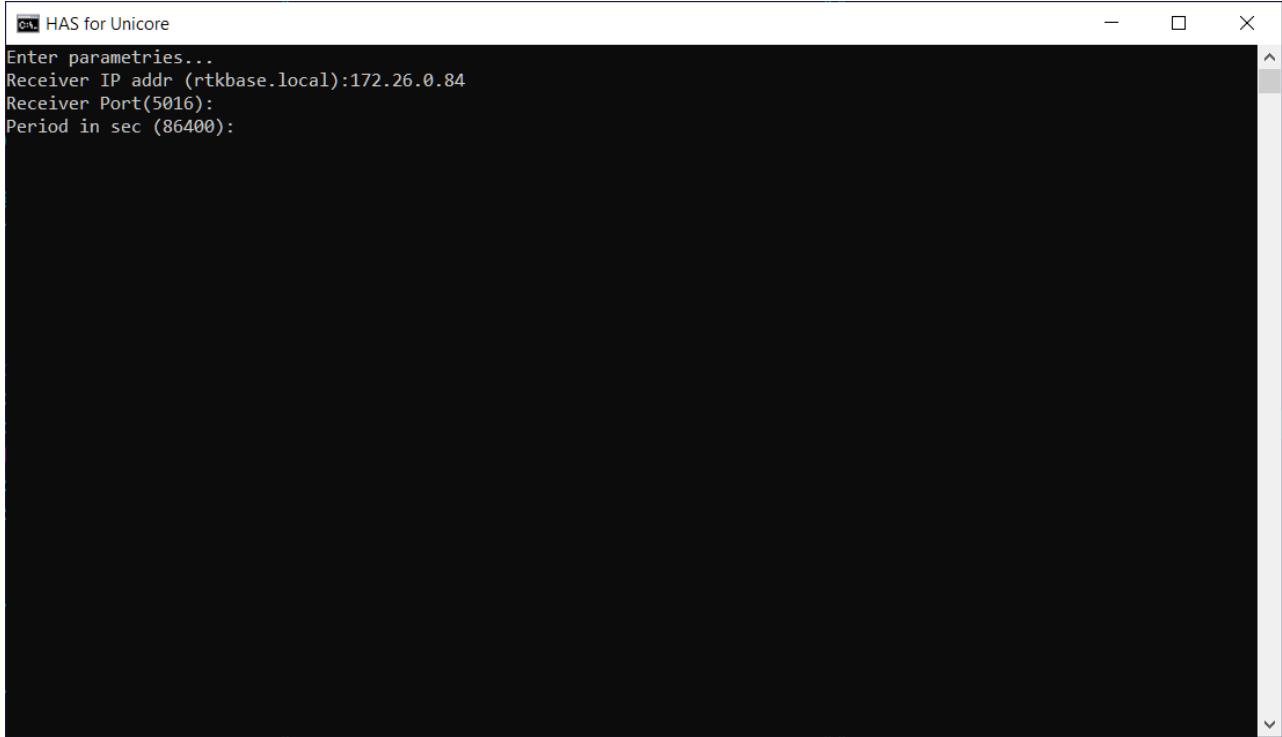
```
RTK for Unicore
Enter parametries...
Receiver IP addr (rtkbase.local):172.26.0.84
Receiver port (5016):
RTCM3 server IP (igs-ip.net):
RTCM3 server port (2101):
RTCM3 server mountpoint (RIGA00LVA0):
RTCM3 server user (abc):[REDACTED]
RTCM3 server password (123):[REDACTED]
Period in sec (86400):
Check Receiver on 172.26.0.84:5016...
Receiver is UM980
Check RTCM3 server on igs-ip.net:2101/RIGA00LVA0@... [REDACTED] ...
(c) Eltehs SIA @ http://gnss.design (library by ESTIMO-GNSS UG)
MSG: ChanA TCP CONNECTED with NTRIP: igs-ip.net:2101/RIGA00LVA0
MSG: RIGA00LVA0: GOOD answer from NTRIP server. Ready to received RTCM.
Configure UM980 on 172.26.0.84:5016 as RTK...
Counting base coordinates at 86400 seconds...
(c) Eltehs SIA @ http://gnss.design (library by ESTIMO-GNSS UG)
MSG: rtcm3save on 172.26.0.84:5016 is STARTED
MSG: ChanA TCP CONNECTED with 172.26.0.84:5016
MSG: ChanOUT0 TCP CONNECTED with NTRIP: igs-ip.net:2101/RIGA00LVA0
MSG: RIGA00LVA0: GOOD answer from NTRIP server. Ready to received RTCM.
new mode None(0) at 02:31:18 (0.5 sec)
new mode Autonome(15) at 02:31:20 (2.4 sec)
new mode Autonome(19) at 02:31:22 (4.4 sec)
new mode Autonome(24) at 02:31:23 (5.4 sec)
new mode Fix(31) at 02:31:29 (11.4 sec)
-
```

In the end, the coordinates are copied to the clipboard and displayed on the screen, and the receiver is configured back to base mode. For early termination, press the **Q** button. After completion, press any key to close the window.

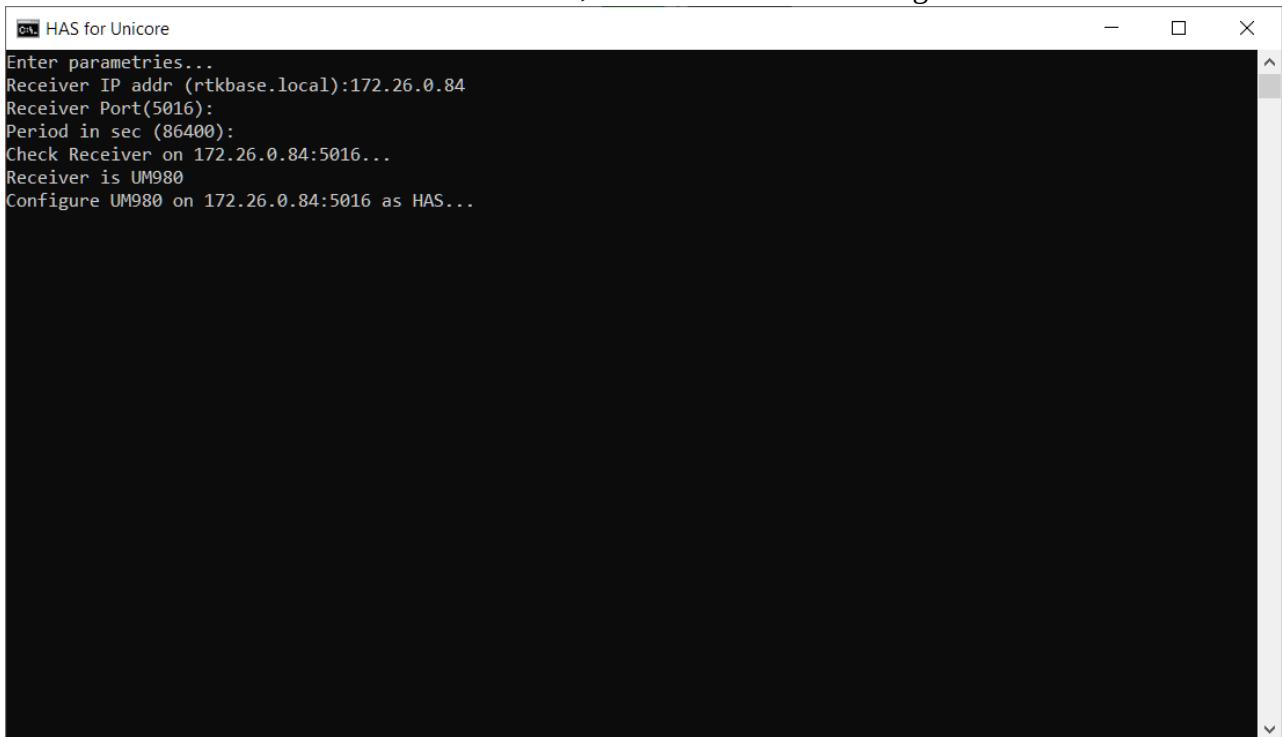
```
RTK for Unicore
(c) Eltehs SIA @ http://gnss.design (library by ESTIMO-GNSS UG)
MSG: ChanA TCP CONNECTED with NTRIP: igs-ip.net:2101/RIGA00LVA0
MSG: RIGA00LVA0: GOOD answer from NTRIP server. Ready to received RTCM.
Configure UM980 on 172.26.0.84:5016 as RTK...
Counting base coordinates at 86400 seconds...
(c) Eltehs SIA @ http://gnss.design (library by ESTIMO-GNSS UG)
MSG: rtcm3save on 172.26.0.84:5016 is STARTED
MSG: ChanA TCP CONNECTED with 172.26.0.84:5016
MSG: ChanOUT0 TCP CONNECTED with NTRIP: igs-ip.net:2101/RIGA00LVA0
MSG: RIGA00LVA0: GOOD answer from NTRIP server. Ready to received RTCM.
new mode None(0) at 17:49:25 (0.6 sec)
new mode None(5) at 17:49:26 (1.4 sec)
new mode Autonome(16) at 17:49:27 (2.4 sec)
new mode DGNSS(17) at 17:49:29 (4.4 sec)
new mode DGNSS(28) at 17:49:30 (5.4 sec)
new mode Fix(34) at 17:49:34 (9.4 sec)
ChanA TCP CLIENT 172.26.0.84:5016 read 2205 in 26 pkt writed 29K in 111 pkt maxRead=91 maxLen=91 maxWrite=0
Fix 36 sats Fi=56.90472012 La=24.19052167 H=55.6629
NMEA: GNNGA=25 GBGGA
ChanOUT0 TCP CLIENT NTRIP: igs-ip.net:2101/RIGA00LVA0 read 29K in 111 pkt maxRead=1176 maxLen=1176 maxWrite=0
RTCM3: 1006=2 1008=2 1033=2 1077=25 1087=26 1097=26 1127=26 1230=2
BASE: cnt=17 Fi=56.90472011 La=24.19052166 H=55.6622
X=3184369.4207 Y=1430479.2264 Z=5320160.5651
2D: RMS=0.0017 CEP50=0.0009 MAX=0.0038
3D: RMS=0.0063 CEP50=0.0042 MAX=0.0165
Working 26.2 sec
Base coordinates:
56.90472011 24.19052166 55.6622!
Restore BASE configuration UM980 on 172.26.0.84:5016
Press any key to continue . . .
```

## Determining Coordinates via HAS (Only Unicore)

Determining coordinates using the **HAS** method is available only for **Unicore** receivers. To do this, run the **HAS.bat** file. In the opened window, enter the receiver address and port. If you use **Raspberry pi** on the local network, do not change them. Then enter the measurement time. The entered parameters are saved in the **Ini.cmd** file.



Communication with the receiver is checked, then the receiver is configured.



**HAS resolution starts in 2-10 minutes.**

```
Enter parametries...
Receiver IP addr (rtkbase.local):172.26.0.84
Receiver Port(5016):
Period in sec (86400):
Check Receiver on 172.26.0.84:5016...
Receiver is UM980
Configure UM980 on 172.26.0.84:5016 as HAS...
Counting base coordinates at 86400 seconds...
(c) Eltehs SIA @ http://gnss.design (library by ESTIMO-GNSS UG)
MSG: rtcm3save on 172.26.0.84:5016 is STARTED
MSG: ChanA TCP CONNECTED with 172.26.0.84:5016
new mode None(0) at 02:44:08 (0.6 sec)
new mode Autonome(15) at 02:44:09 (1.8 sec)
new mode Autonome(21) at 02:44:11 (3.8 sec)
new mode Autonome(28) at 02:44:12 (4.8 sec)
new mode DGNSS(45) at 02:46:40 (152.8 sec)
new mode Float(46) at 02:51:49 (461.8 sec)
```

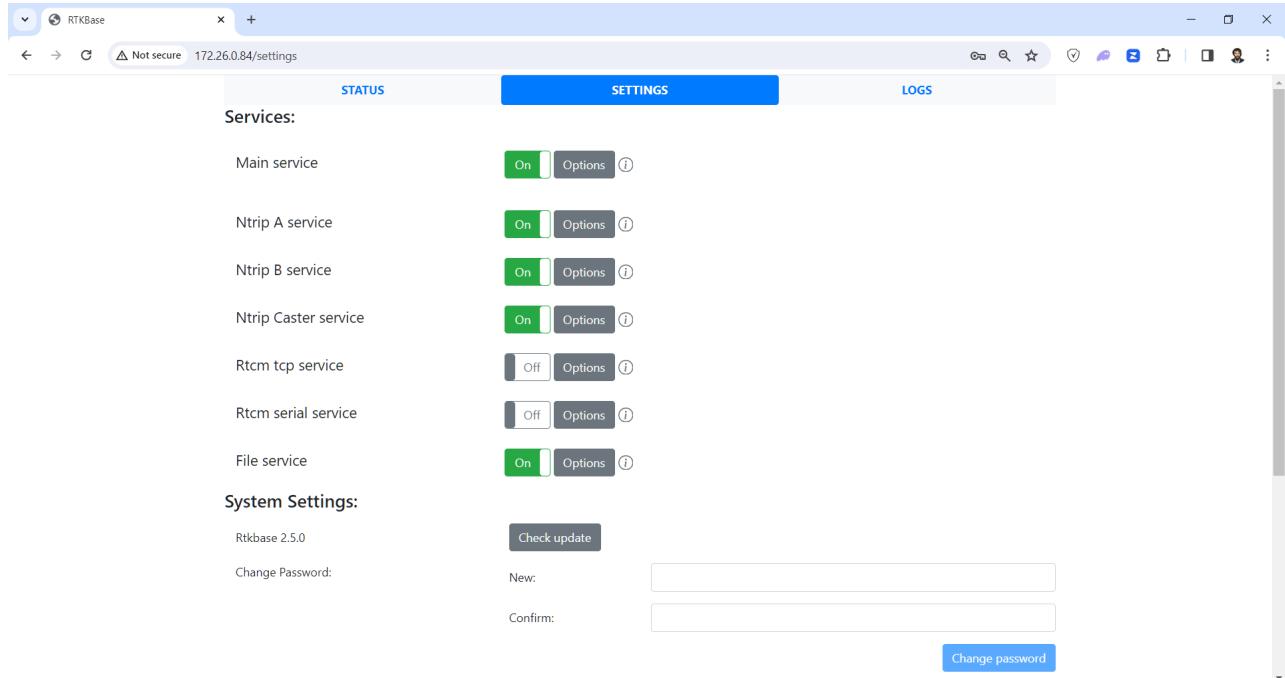
In the end, the coordinates are copied to the clipboard and displayed on the screen, and the receiver is configured back to base mode. For early termination, press the **Q** button. After completion, press any key to close the window.

```
Enter parametries...
Receiver IP addr (rtkbase.local):172.26.0.84
Receiver Port(5016):
Period in sec (86400):
Check Receiver on 172.26.0.84:5016...
Receiver is UM980
Configure UM980 on 172.26.0.84:5016 as HAS...
Counting base coordinates at 86400 seconds...
(c) Eltehs SIA @ http://gnss.design (library by ESTIMO-GNSS UG)
MSG: rtcm3save on 172.26.0.84:5016 is STARTED
MSG: ChanA TCP CONNECTED with 172.26.0.84:5016
new mode None(0) at 17:52:53 (0.8 sec)
new mode Autonome(14) at 17:52:54 (1.9 sec)
new mode Autonome(20) at 17:52:56 (3.9 sec)
new mode Autonome(28) at 17:52:58 (5.9 sec)
new mode DGNSS(45) at 17:55:16 (143.9 sec)
new mode Float(45) at 18:00:15 (442.9 sec)
ChanA TCP CLIENT 172.26.0.84:5016 read 47K in 541 pkt maxRead=92 maxLen=92 maxWrite=0
Float 44 sats Fi=56.90471936 La=24.19053185 H=55.7358
NMEA: GNGGA=541
BASE: cnt=99 Fi=56.90471844 La=24.19053257 H=55.8240
X=3184369.3712 Y=1430479.9327 Z=5320160.5991
2D: RMS=0.0394 CEP50=0.0257 CEP95=0.0917 MAX=0.1076
3D: RMS=0.0692 CEP50=0.0312 CEP95=0.1485 MAX=0.1706
Working 541.0 sec
Base coordinates:
56.90471844 24.19053257 55.8240!
Restore BASE configuration UM980 on 172.26.0.84:5016
Press any key to continue . . .
```

# Determining Coordinates via External Services

Another method is to use an external **RINEX** post-processing service operating in your region. For example, for France, [IGN](#) services (instructions for it [here](#)) and [Orpheon](#) are suitable, and for the rest of the world, [NRCAN](#). Such services are usually paid.

First, enable the “**File Service**” and record the measurements. You need at least one full day according to Greenwich. The fact that recording is in progress is visible on the **Logs** page by the increasing size of the **rtcm3** file. For this, only one file should be recorded per day. Turning off the device or stopping the file or main service will result in the daily archive being unsuitable for conversion to **RINEX**.



The screenshot shows the RTKBase web interface with the URL [172.26.0.84/settings](http://172.26.0.84/settings). The interface has a header with tabs for STATUS, SETTINGS (which is active), and LOGS. Below the tabs is a section titled "Services:" with a list of services and their status (On/Off) and options. The services listed are Main service, Ntrip A service, Ntrip B service, Ntrip Caster service, Rtcml tcp service, Rtcml serial service, and File service. Under "System Settings:", there is a "Check update" button, a "Change Password:" section with fields for "New:" and "Confirm:", and a "Change password" button.

Service	Status	Action
Main service	On	Options
Ntrip A service	On	Options
Ntrip B service	On	Options
Ntrip Caster service	On	Options
Rtcml tcp service	Off	Options
Rtcml serial service	Off	Options
File service	On	Options

**System Settings:**

Rtkbase 2.5.0

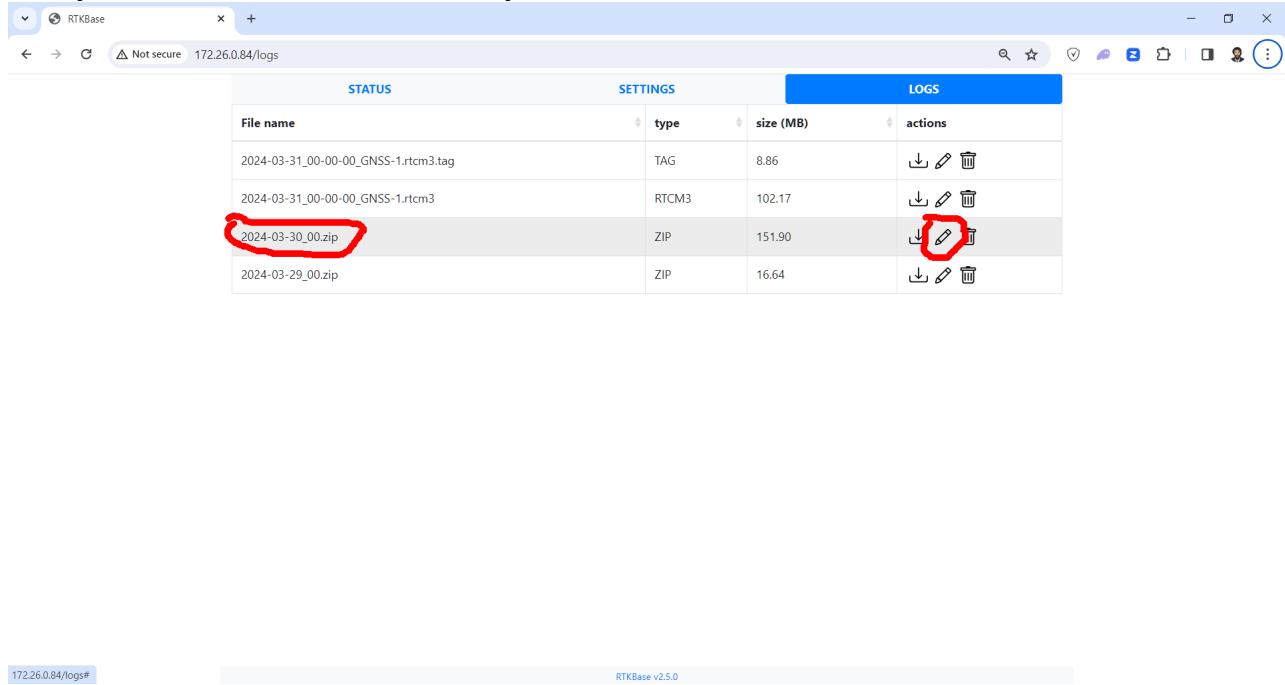
Change Password:

New:

Confirm:

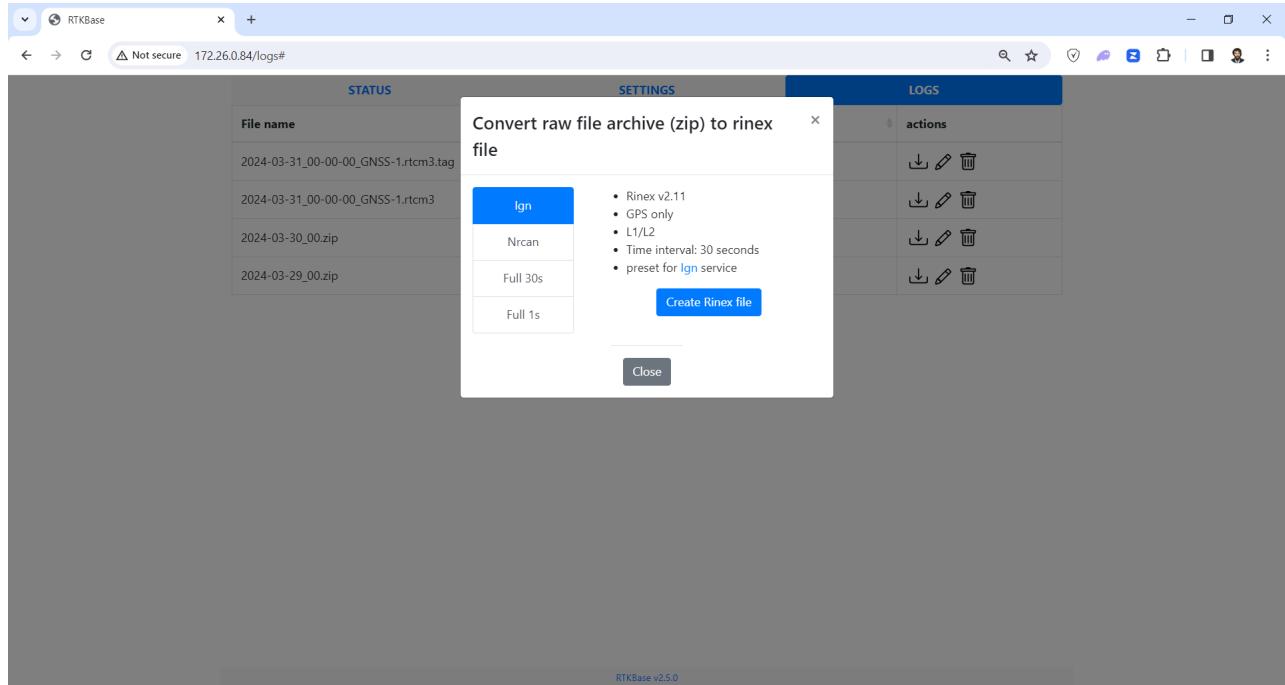
Change password

After recording, go to the **Logs** page. Click on the pencil icon next to the full-day **ZIP** archive file. Ideally, use an archive older than 15 days so that the service can form final satellite orbits.



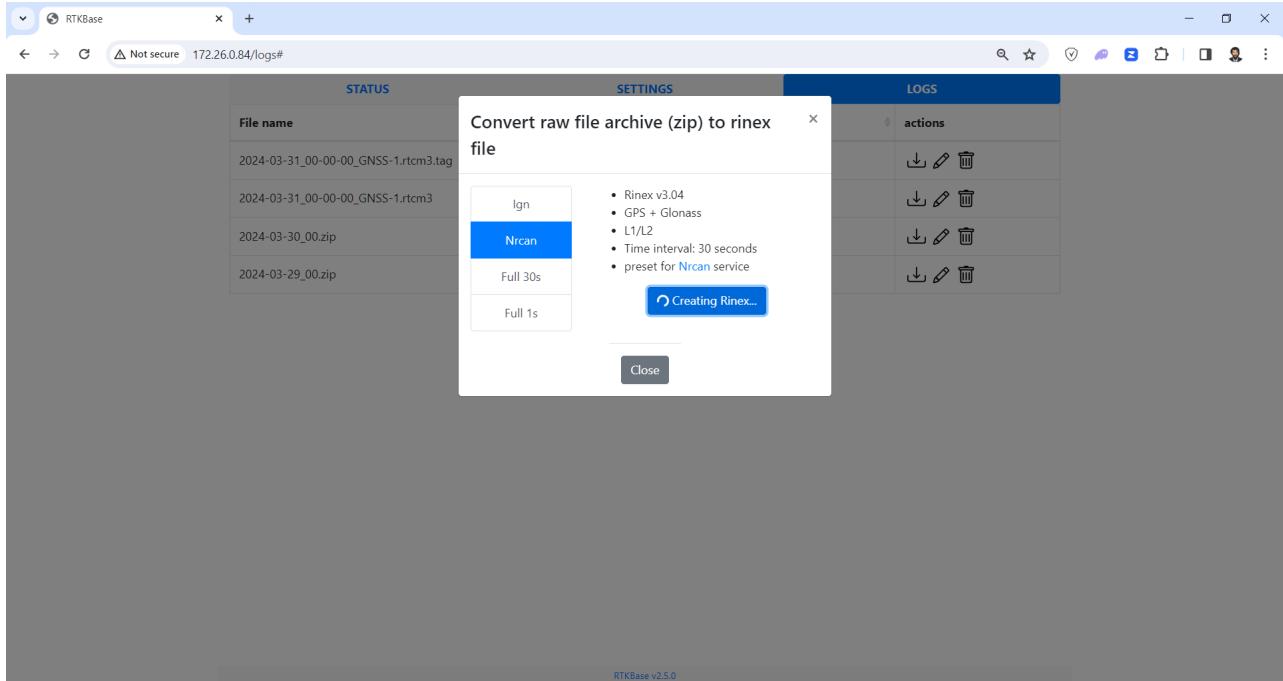
The screenshot shows a web browser window titled "RTKBase" with the URL "172.26.0.84/logs". The page displays a table of recorded files under the "LOGS" tab. The columns are "File name", "type", "size (MB)", and "actions". The "actions" column contains icons for download, edit, and delete. A file named "2024-03-30\_00.zip" is circled in red, and its corresponding edit icon is also circled in red.

A window like this will open. For **NRCAN**, select “**Nrcan**”, for **IGN** - “**Ign**”, and click the “**Create RINEX file**” button.

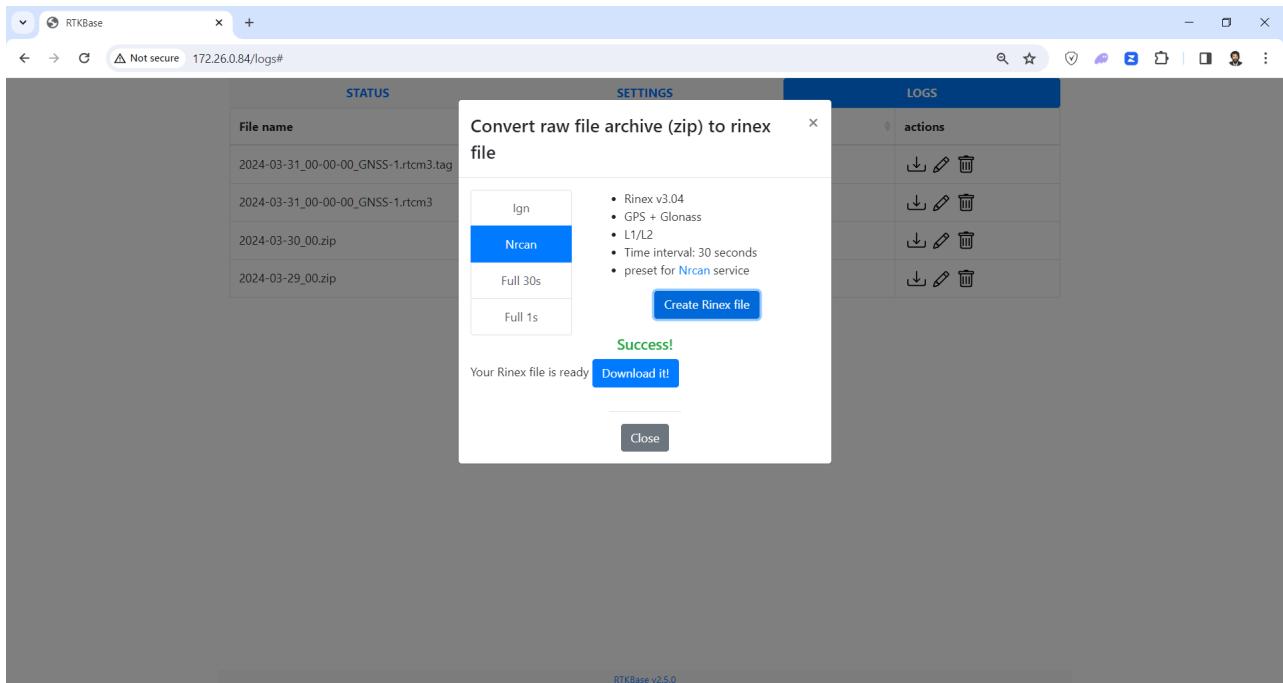


The screenshot shows a modal dialog box titled "Convert raw file archive (zip) to rinex file". The left side of the dialog lists file names: "2024-03-31\_00-00-00\_GNSS-1.rtcm3.tag", "2024-03-31\_00-00-00\_GNSS-1.rtcm3", "2024-03-30\_00.zip", and "2024-03-29\_00.zip". On the right, there is a list of actions with download, edit, and delete icons. In the center, there is a list of options: "Ign" (selected), "Nrcan", "Full 30s", and "Full 1s". Below these options is a list of RINEX settings: "Rinex v2.11", "GPS only", "L1/L2", "Time interval: 30 seconds", and "preset for Ign service". At the bottom of the dialog is a "Create Rinex file" button.

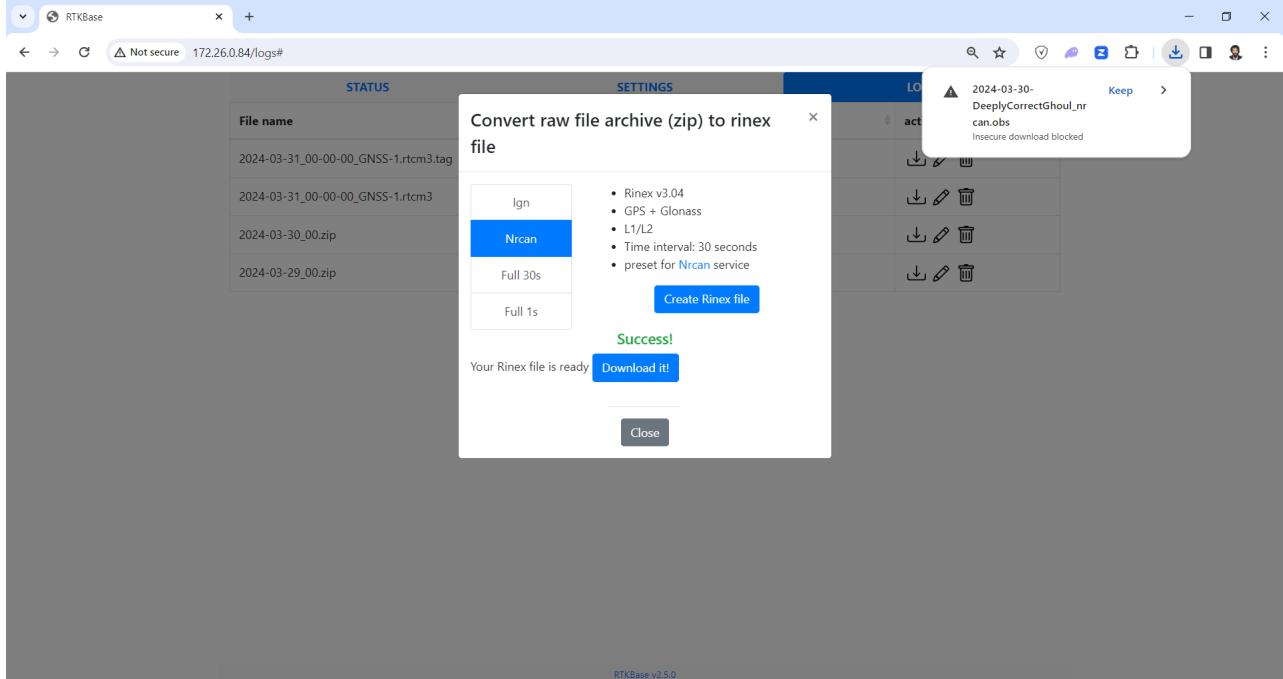
A message indicating the file creation process appears. Wait a few minutes.



The RINEX file is created. Click the "Download it!" button to download it.



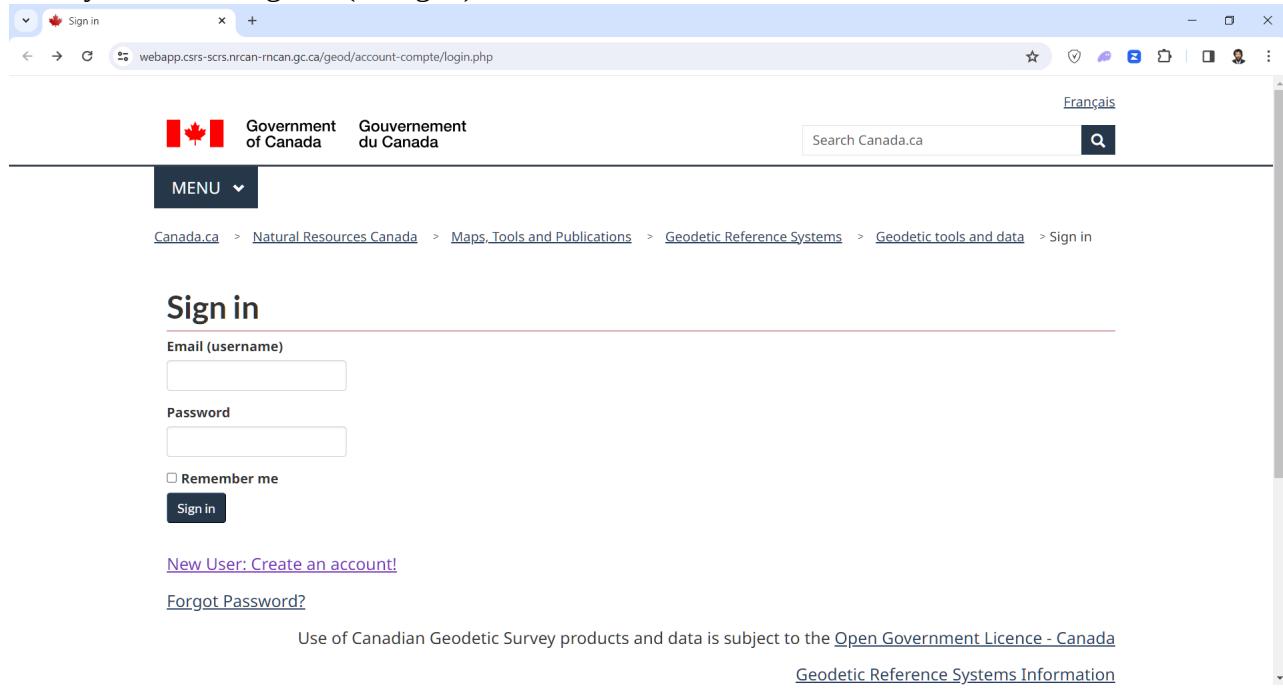
During the download, a message about unsafe downloading may appear. Click “keep”. The downloaded file size is 6-8 megabytes.



After downloading, the created file can be seen in the log list for re-downloading.

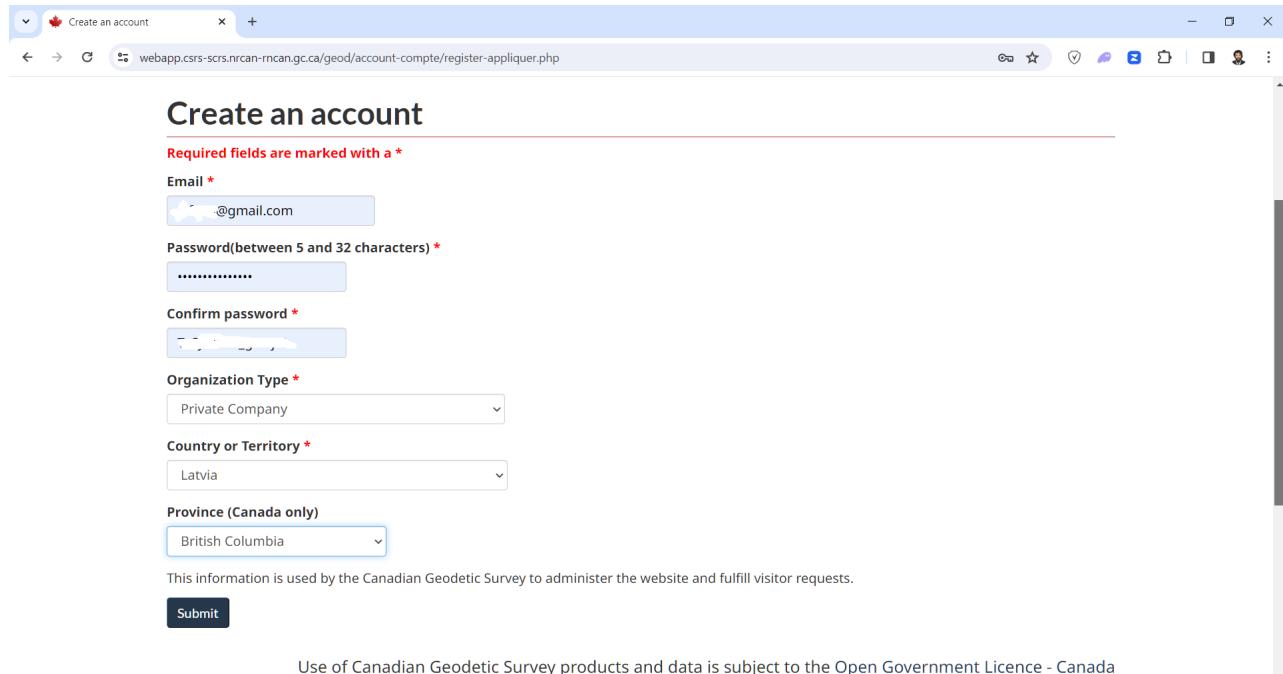
File name	type	size (MB)	actions
2024-03-31_00-00-00_GNSS-1.rtcml.tag	TAG	12.80	
2024-03-31_00-00-00_GNSS-1.rtcml3	RTCM3	148.12	
2024-03-30_00.zip	ZIP	151.90	
2024-03-30-DeeplyCorrectGhoul_nrcan.obs		7.42	
2024-03-29_00.zip	ZIP	16.64	

Next, you need to register (or log in) on **Nrcan**.



The screenshot shows the 'Sign in' page of the Nrcan website. At the top, there is a navigation bar with the Canadian flag, 'Sign in', and links for 'Français' and 'Search Canada.ca'. Below the navigation bar, the 'Government of Canada / Gouvernement du Canada' logo is displayed. A 'MENU' button is visible. The main content area is titled 'Sign in' and contains fields for 'Email (username)' and 'Password', both with placeholder text. There is also a 'Remember me' checkbox and a 'Sign in' button. Below these fields, links for 'New User: Create an account!' and 'Forgot Password?' are provided. At the bottom of the page, a note states: 'Use of Canadian Geodetic Survey products and data is subject to the [Open Government Licence - Canada](#)' and '[Geodetic Reference Systems Information](#)'.

Click “**New User: Create an account!**” and fill in the details. After completing the form, click “**Submit**”.



The screenshot shows the 'Create an account' page. The title 'Create an account' is at the top, followed by a note: 'Required fields are marked with a \*'. The form includes fields for 'Email' (containing '@gmail.com'), 'Password (between 5 and 32 characters)' (containing '.....'), 'Confirm password' (containing '.....'), 'Organization Type' (set to 'Private Company'), 'Country or Territory' (set to 'Latvia'), and 'Province (Canada only)' (set to 'British Columbia'). Below the form, a note states: 'This information is used by the Canadian Geodetic Survey to administer the website and fulfill visitor requests.' A 'Submit' button is located at the bottom. At the very bottom of the page, a note states: 'Use of Canadian Geodetic Survey products and data is subject to the [Open Government Licence - Canada](#)' and '[Geodetic Reference Systems Information](#)'.

You will receive a message that an email has been sent to you.

The screenshot shows a web browser window for the Canadian Government's 'Create an account' page. The URL is [webapp.crsr-scrs.nrcan-rncan.gc.ca/geod/account-compte/register-appliquer.php](https://webapp.crsr-scrs.nrcan-rncan.gc.ca/geod/account-compte/register-appliquer.php). The page features the Canadian Government logo and navigation links for Canada.ca, Natural Resources Canada, Maps, Tools and Publications, Geodetic Reference Systems, and Geodetic tools and data. A 'Create an account' link is also present. The main content area is titled 'Create an account' and includes a confirmation message: 'Thank you, a confirmation has been sent to the following email address: [jef239@gmail.com](mailto:jef239@gmail.com)'. It also instructs the user to follow the instructions in the email. A note about Canadian Geodetic Survey products and data subject to the Open Government Licence - Canada and Geodetic Reference Systems Information is provided. At the bottom, there is a 'Report a problem or mistake on this page' button and a date modified indicator: 'Date modified: 2022-04-29'.

Open the email and activate your account by clicking on the link.

The screenshot shows a Gmail inbox with 668 messages. The inbox list includes categories like Starred, Snoozed, Important, Sent, Drafts, Categories (Social, Updates, Forums, Promotions), and More. An email from 'Do Not Reply / Ne Pas Répondre <DoNotReply-NePasRepondre@nrcan-rncan.gc.ca>' is selected. The subject is 'Welcome to the Canadian Spatial Reference System'. The email body contains a welcome message, a link to activate the account (<https://webapp.crsr-scrs.nrcan-rncan.gc.ca/geod/account-compte/valid.php?locale=en&gs1=96919&gs2=bPW9RdOcweNHbx2>), and a note that if forgotten, a new password will be generated. The email was received at 20:47 (1 minute ago). Below the inbox, there are standard Gmail controls for Reply, Forward, and Delete.

You will receive a message confirming successful registration and a prompt to log in.

The screenshot shows a web browser window with the following details:

- Title Bar:** Welcome to the Canadian Spatial Reference System - Confirmation Email
- URL:** webapp.crsr-scrs.nrcan-rncan.gc.ca/geod/account-compte/valid.php?locale=en&qs1=96919&qs2=bPW9RdOcweNhtbx2
- Header:** Government of Canada / Gouvernement du Canada, Search Canada.ca, Français
- Page Content:**
  - Section: Canada.ca > Natural Resources Canada > Maps, Tools and Publications > Geodetic Reference Systems > Geodetic tools and data > Confirmation Email
  - Section Title: Confirmation Email
  - Text: Your account has been confirmed. You can now [sign in](#).
  - Links:
    - [Use of Canadian Geodetic Survey products and data is subject to the Open Government Licence - Canada](#)
    - [Geodetic Reference Systems Information](#)
  - Buttons:
    - Report a problem or mistake on this page
    - Date modified: 2022-04-29
- Footer:** Contact us, News, Prime Minister, Departments and agencies, Treaties, laws and regulations, About government, Public service and military, Government-wide reporting, Open government, and a background image of the Canadian Parliament buildings.

Click “Sign in” and log in.

The screenshot shows a web browser window with the following details:

- Title Bar:** Welcome to the Canadian Spatial Reference System - Sign in
- URL:** webapp.crsr-scrs.nrcan-rncan.gc.ca/geod/account-compte/login.php
- Header:** Government of Canada / Gouvernement du Canada, Search Canada.ca, Français
- Page Content:**
  - Section: Canada.ca > Natural Resources Canada > Maps, Tools and Publications > Geodetic Reference Systems > Geodetic tools and data > Sign in
  - Section Title: Sign in
  - Form:
    - Email (username):
    - Password:
    - Remember me
    -
  - Links:
    - [New User: Create an account!](#)
    - [Forgot Password?](#)
  - Links at the bottom:
    - [Use of Canadian Geodetic Survey products and data is subject to the Open Government Licence - Canada](#)
    - [Geodetic Reference Systems Information](#)

You will be greeted with a message congratulating you on successfully logging in. Click on “**Geodetic tools and data**”.

The screenshot shows a web browser window with the following details:

- Title Bar:** Welcome to the Canadian Spatial Reference System - Confirmation Email
- URL:** webapp.crsrscs.nrcan.gc.ca/geod/account-compte/valid.php?locale=en&qs1=96919&qs2=bPW9RdOcweNhtbx2
- Header:** Government of Canada / Gouvernement du Canada, Search Canada.ca, Français
- Breadcrumbs:** Canada.ca > Natural Resources Canada > Maps, Tools and Publications > Geodetic Reference Systems > Confirmation Email
- Section:** Geodetic tools and data (circled in red)
- Content:** Confirmation Email. It says "Hello jef239@gmail.com, you are signed in." and provides links to the Open Government Licence - Canada and Geodetic Reference Systems Information.
- Footer:** Report a problem or mistake on this page, Date modified: 2022-04-29, Contact us, News, Prime Minister, Departments and agencies, Treaties, laws and regulations, About government, Public service and military, Government-wide reporting, Open government.

You will land on the “**Geodetic tools and data**” page. Click on “**Canadian Spatial Reference System Precise Point Positioning (CSRS-PPP)**”.

The screenshot shows a web browser window with the following details:

- Title Bar:** Geodetic tools and data
- URL:** natural-resources.canada.ca/maps-tools-and-publications/geodetic-reference-systems/data/10923
- Header:** Government of Canada / Gouvernement du Canada, Search the website, Français
- Breadcrumbs:** Canada.ca > Natural Resources Canada > Maps, Tools and Publications > Geodetic Reference Systems
- Section:** Geodetic tools and data
- Content:** A paragraph about the Canadian Geodetic Survey (CGS) tools and desktop applications, followed by a section titled “Access the tools”.
- “Access the tools” Section:** A link “Canadian Spatial Reference System Precise Point Positioning (CSRS-PPP)” is circled in red. The text next to it describes CSRS-PPP as an online application for global navigation satellite systems (GNSS) data post-processing.

You will be taken to the [PPP calculation page](#). Select **ITRF** (not **NAD83**) and **Static** (not **Kinematic**).

The screenshot shows the PPP calculation page with the following configuration:

- Processing mode:** Static (radio button selected), ITRF (radio button unselected). The NAD83 button is highlighted with a red circle.
- Vertical datum:** CGVD28(HT2\_0)
- Contribute to passive control maintenance?** (What is this?)
- Official Canadian federal or provincial geodetic marker number:** [Input field]

Scroll down the page. Click “**Choose File**” to select the **RINEX** file, and then click “**Submit to PPP**”.

The screenshot shows the PPP calculation page with the following configuration:

- Processing mode:** Static (radio button selected), ITRF (radio button unselected). The NAD83 button is highlighted with a red circle.
- Vertical datum:** CGVD2013
- Contribute to passive control maintenance?** (What is this?)
- Official Canadian federal or provincial geodetic marker number:** [Input field]
- RINEX observation file(s), 300 MB max (.zip, .gz, .Z, .tar, .?O)**  
Note: You may submit multiple RINEX files in a single .zip or .tar archive  
[Choose File] 2024-03-30...oul\_nrcan.obs
- Remove plots from CSRS-PPP solution PDF report (Why?)**
- Submit to PPP**

After processing, you will receive a message that the result has been sent to your email.

The file 2024-03-30-DeeplyCorrectGhoul\_nrcan.obs was successfully submitted for processing.  
The results will be emailed to jef239@gmail.com.

Email for results (required)  
jef239@gmail.com

Processing mode  
Static (selected) Kinematic  
NAD83 ITRF  
• The epoch will be the same as the GPS data.  
• A UTM zone will be calculated from the longitude.

Vertical datum  
CGVD2013

Contribute to passive control maintenance? (What is this?)  
 Authorize the Canadian Geodetic Survey to archive and publish CSRS PPP submission and solution

Official Canadian federal or provincial geodetic marker number  
[ ]

► More options

Open the email and click on the “summary” link.

CSRS-PPP SPARK Results for 2024-03-30-DeeplyCorrectGhoul\_nrcan

Do Not Reply / Ne Pas Répondre <DoNotReply-NePasRepondre@nrcan-rncan.gc.ca>  
to me 23:24 (8 minutes ago)

CSRS-PPP SPARK Latest update: 2023-01-09  
CSRS-PPP SPARK [Latest news](#)  
Software Version: 3.54.2

CSRS-PPP SPARK Results for 2024-03-30-DeeplyCorrectGhoul\_nrcan.obs [full\\_output.zip](#)

2024-03-30-DeeplyCorrectGhoul\_nrcan.obs [summary](#) [ephemeris](#) [residuals](#) GPS & GLONASS NRCan Ultra-rapid

Warning: Although an antenna record was located in the RINEX file, no phase centre information could be found in the IGS/NGS file for your antenna. Estimated height should be used with caution. Ensure that both the antenna type and the RINEX header record "ANT # / TYPE" are valid.

Natural Resources Canada does not assume any liability deemed to have been caused directly or indirectly by any content of its CSRS-PPP online precise positioning service.

To contact us  
[geodeticinformation-informationgeodesique@nrcan-rncan.gc.ca](mailto:geodeticinformation-informationgeodesique@nrcan-rncan.gc.ca)

Follow the link to view the coordinates in the **ITRF2020** frame.

The estimated coordinates **ITRF20 2024-03-30** for the **2024-03-30-DeeplyCorrectGhoul\_rncan.obs** RINEX file are as follows:

Latitude	56° 54' 17.0041" ± 0.003 m (95%)
Longitude	24° 11' 25.9110" ± 0.002 m (95%)
Ellipsoidal Height	55.829 m ± 0.008 m (95%) [56.90472336, 24.19053083, 55.829]

UTM Zone 35 (North)

Northing	6310295.252 m
Easting	328922.468 m
Scale factor (point)	0.99995892
Scale factor (combined)	0.99995017
[6310295.252, 328922.468, 55.829]	

Cartesian coordinates

X	3184368.998 ± 0.005 m (95%)
Y	1430479.649 ± 0.003 m (95%)
Z	5320160.902 ± 0.007 m (95%) [3184368.998, 1430479.649, 5320160.902]

Orbits and Clocks Used: **NRCAN Ultra-rapid**  
GNSS Data: **GPS & GLONASS**  
GRS80 ellipsoid used for (x,y,z) to (lat,lon,h) transformation

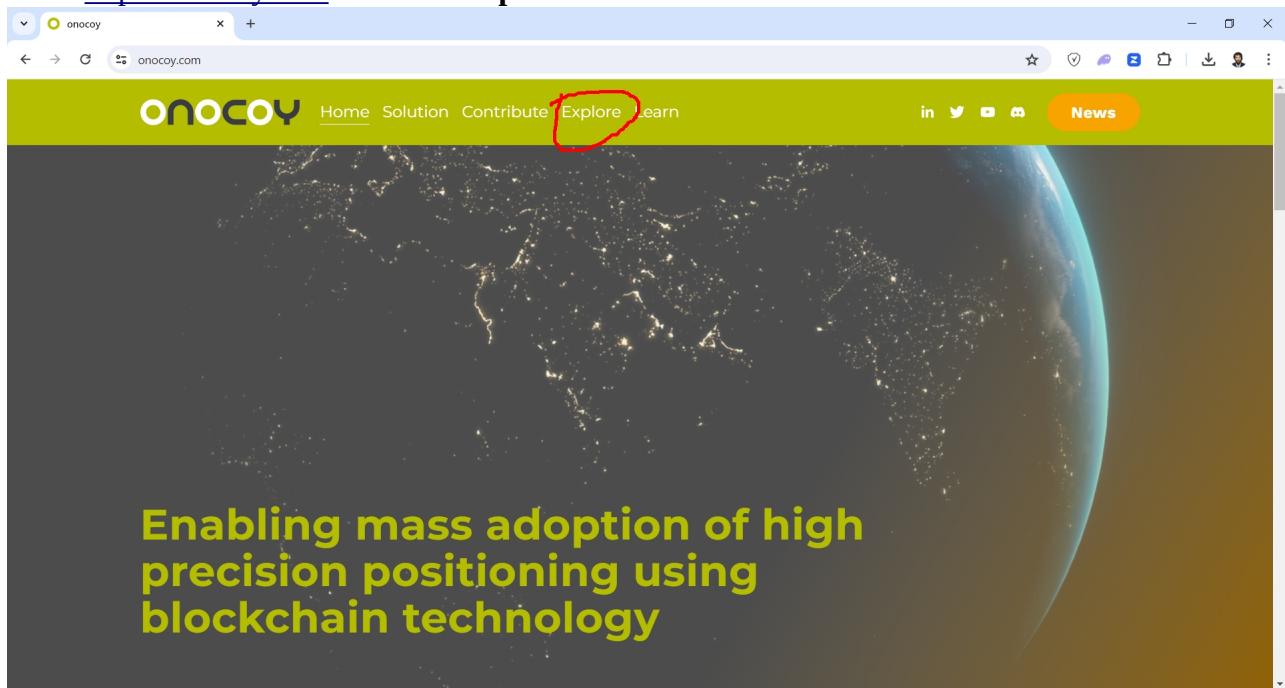
Another interesting section in the report is “**Orbits and Clocks Used**”. In our example, it shows “**Ultra-rapid**”, but if we had waited 15 days, we would have received the much more accurate “**Final**”.

## NTRIP Configuration for Onocoy

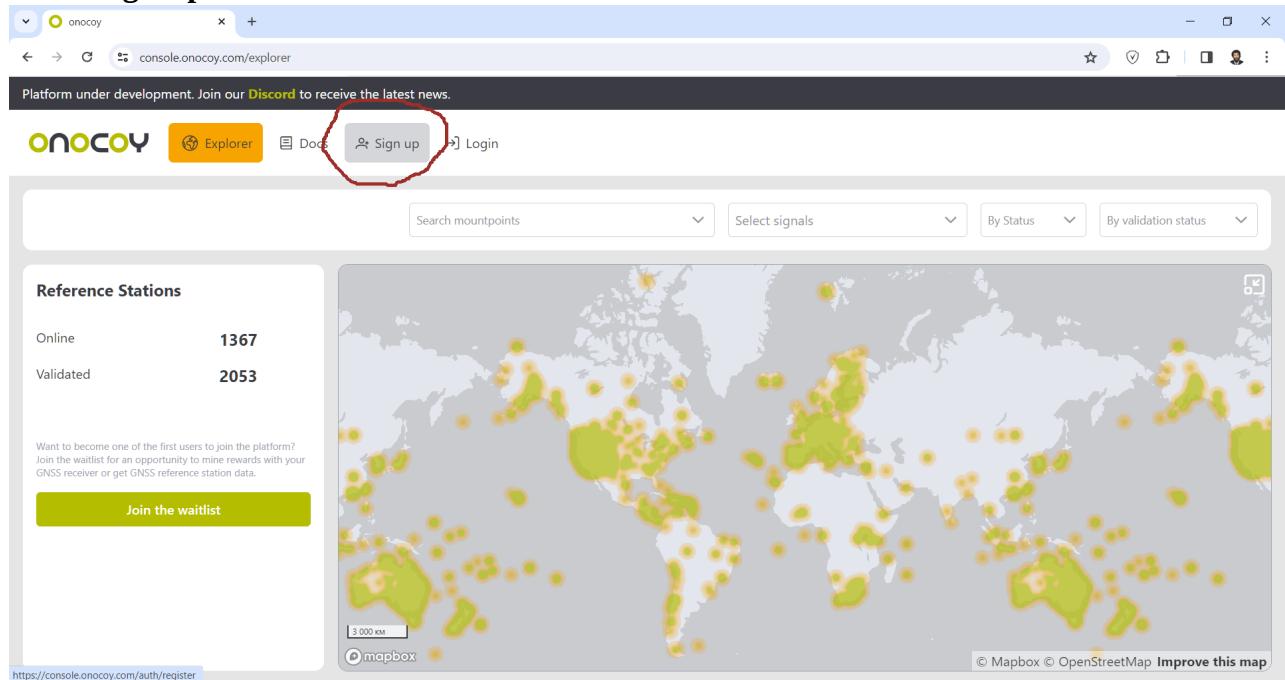
<https://www.onocoy.com> is a service that allows you to earn money using base stations. Documentation can be read at <https://docs.onocoy.com>, and we will provide a brief description for **RtkBase**. Additionally, the Onocoy project's “White paper can be read at the [link](#). Technical support and project news can be obtained on [Discord](#).

# Registration

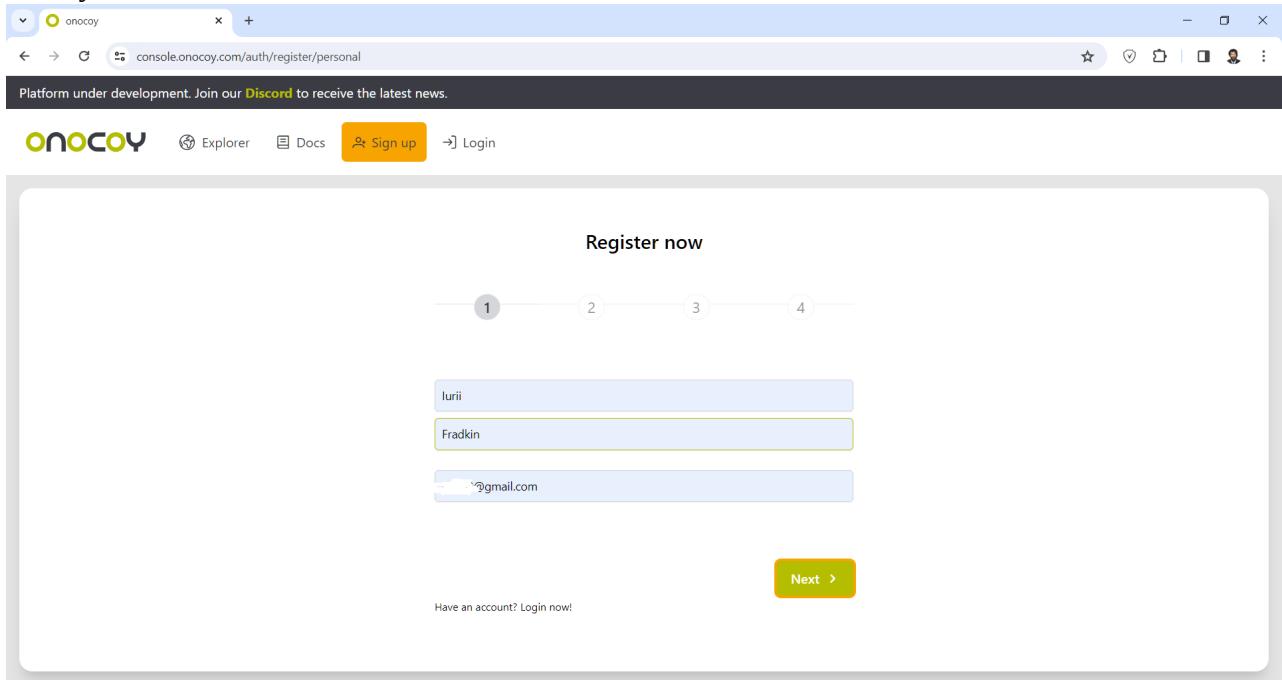
Go to <https://onocoy.com> and click **Explore**.



Click "Sign Up".

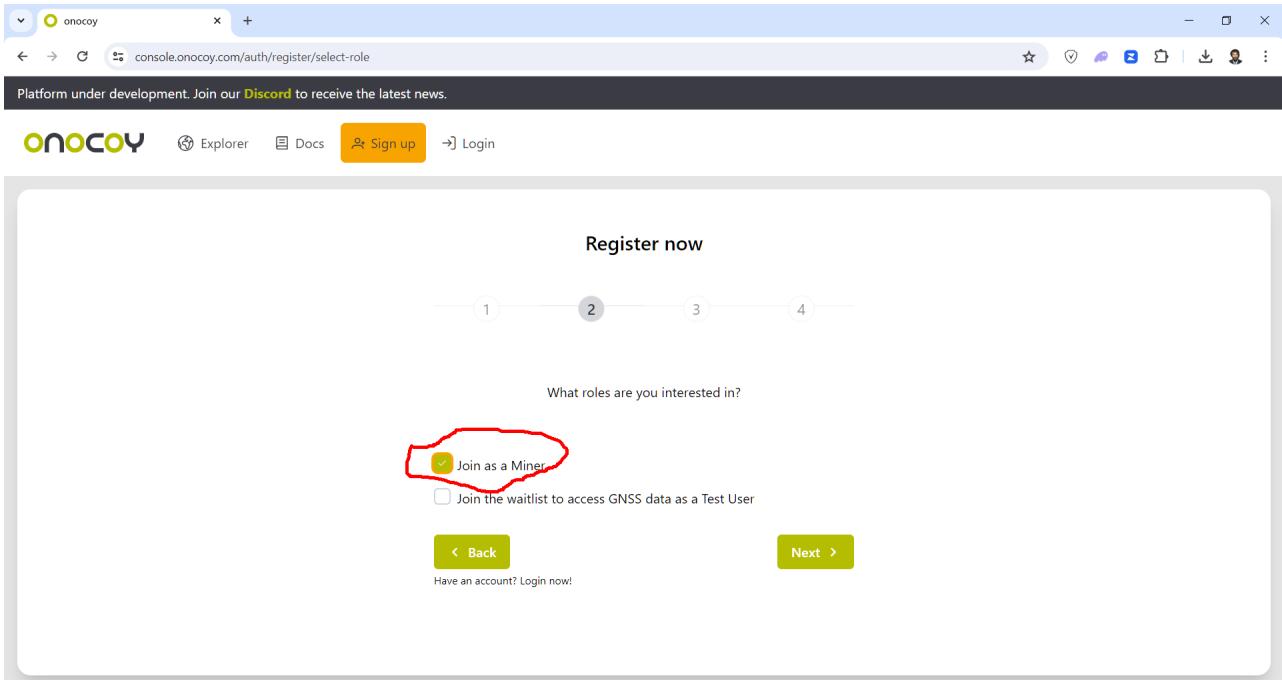


Enter your first name, last name, and email and click **Next**.



Screenshot of the Onocoy registration process. The browser title bar shows "onocoy" and the URL "console.onocoy.com/auth/register/personal". The page header includes the Onocoy logo, "Explorer", "Docs", "Sign up" (which is highlighted in orange), and "Login". A progress bar at the top indicates step 1 of 4. The form fields for "First Name" (lurii) and "Last Name" (Fradkin) are filled. The email field ("@gmail.com") is partially visible. A yellow "Next >" button is at the bottom right, and a link "Have an account? Login now!" is below it.

Check “Join as a Miner”. Do not check the rover access box.



Screenshot of the Onocoy registration process. The browser title bar shows "onocoy" and the URL "console.onocoy.com/auth/register/select-role". The page header includes the Onocoy logo, "Explorer", "Docs", "Sign up" (highlighted in orange), and "Login". A progress bar at the top indicates step 2 of 4. The question "What roles are you interested in?" is displayed. Two checkboxes are shown: "Join as a Miner" (with a checked checkbox and a red oval highlight) and "Join the waitlist to access GNSS data as a Test User" (with an unchecked checkbox). Below the checkboxes are "Back" and "Next >" buttons, and a link "Have an account? Login now!".

Set your **GNSS** knowledge level to “**Novice**”, mark that you have a **GNSS** station, and set the station type to “**Eltehs RtkBase**”. All these answers are only for collecting statistics, so they do not affect anything.

The screenshot shows a web browser window for Onocoy's registration process. The title bar says "onocoy" and the URL is "console.onocoy.com/auth/register/questions?step=3". The main content area is titled "Register now" and shows a progress bar with four steps, step 3 being highlighted. Below the progress bar, it says "1 of 2". There are two dropdown menus: one for "Novice" which is selected, and another for "Other" which is also available. A checkbox labeled "I have a GNSS reference station" is checked. A text input field asks "Please enter your stations name" with "Eltehs RtkBase" typed in. At the bottom are "Back" and "Next" buttons, and a link to "Have an account? Login now!".

Set your knowledge level about cryptocurrencies to “**Novice**”. Again, this does not affect anything.

The screenshot shows a web browser window for Onocoy's registration process. The title bar says "onocoy" and the URL is "console.onocoy.com/auth/register/questions?step=3". The main content area is titled "Register now" and shows a progress bar with four steps, step 3 being highlighted. Below the progress bar, it says "2 of 2". There is a dropdown menu for "Novice" which is selected. A checkbox labeled "I had a blockchain wallet before I became aware of onocoy" is unchecked. At the bottom are "Back" and "Next" buttons, and a link to "Have an account? Login now!".

The last question is about your motivation, i.e., money, fame, love for humanity... Just make sure to check “**I accept the privacy policy**”. Then click “**Register now**”.

Testing  
505 characters left

Others

I accept the [privacy policy](#)  
 I want to receive the newsletter ⓘ

[Back](#) [Register now >](#)

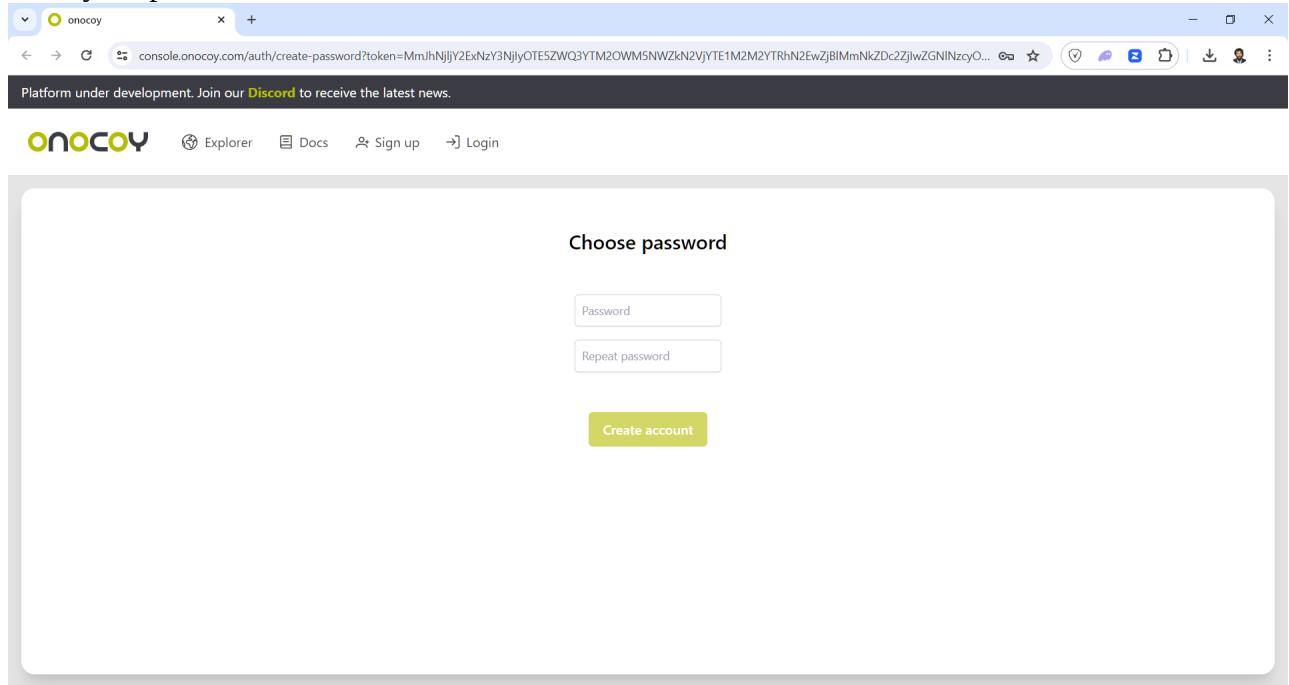
You will be asked to wait for an email.

Platform under development. Join our [Discord](#) to receive the latest news.

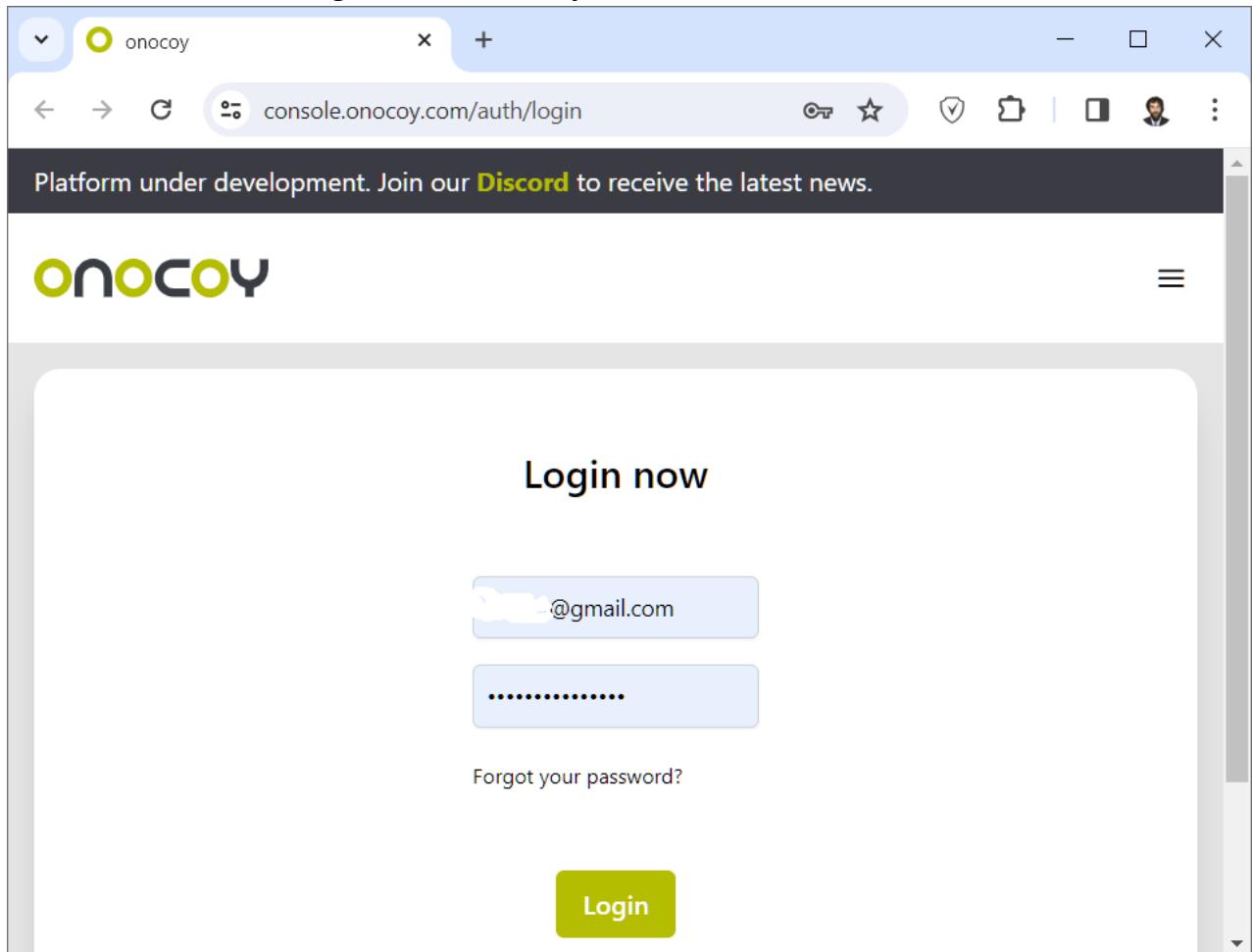
ONOCOY [Explorer](#) [Docs](#) [Sign up](#) [Login](#)

Thank you for joining onocoy!  
To be able to use your account, please check your email and follow the link to activate your account

Wait for the email with a big blue **JOIN** button. Click it and go to the password setting page. Sometimes you may receive another email indicating you are on the waiting list before this one. Enter your password and create an account.



You will be taken to the login window where you need to click “**LOGIN**”.



# Getting Credentials

Log in with your username and password.

The screenshot shows a web browser window for the Onocoy console at [console.onocoy.com/explorer](https://console.onocoy.com/explorer). The title bar says "onocoy". The main content area has a header with tabs: "Reference Stations" (highlighted in orange), "NTRIP Clients" (disabled, "Coming soon..."), and "Docs". Below the header are search and filter fields: "Search mountpoints", "Select signals", "By Status", and "By validation status". To the left, a sidebar titled "Reference Stations" shows counts for "Online" (1375) and "Validated" (2057). To the right is a world map with a legend indicating a 3,000 km scale. The bottom right of the map area says "© Mapbox © OpenStreetMap Improve this map". The top right corner shows a user profile with the name "9aBg...6icf" and an email "9aBg...6icf@gmail.com", with a note "BONO Balance: 0 Beta".

Click “Reference Station” at the top.

The screenshot shows the same browser window after clicking the "Reference Stations" tab. The title bar now says "Reference Stations". The main content area has a header with tabs: "Reference Stations" (highlighted in orange), "NTRIP Credentials" (disabled, "Coming soon..."), and "Docs". Below the header are search and filter fields: "Show Columns", "Search...", "By Status", and "By Credential". A table below shows a single row: "No NTRIP server devices". At the bottom of the table are navigation arrows and a page size selector "Total: 0 10".

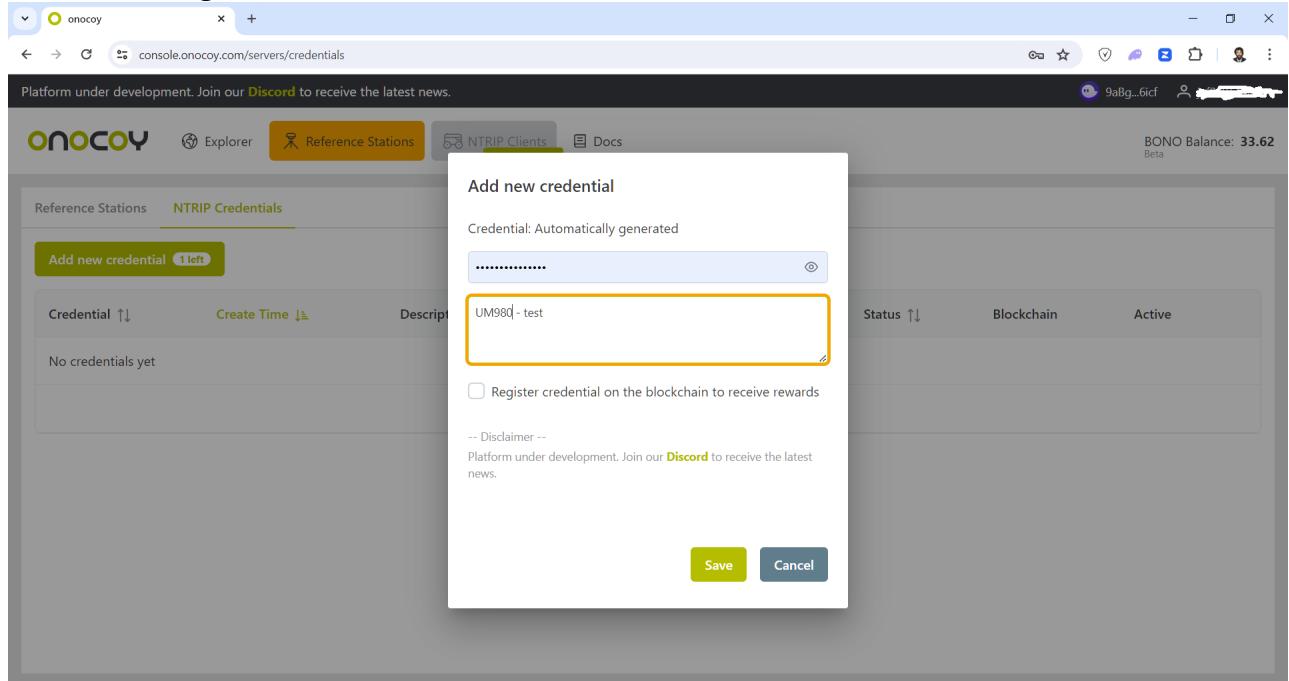
## Click “NTRIP Credential”.

A screenshot of a web browser showing the Onocoy platform. The URL is console.onocoy.com/servers. The page title is "onocoy". The top navigation bar includes links for "Explorer", "Reference Stations" (highlighted in yellow), "NTRIP Clients" (disabled), and "Docs". A message at the top says "Platform under development. Join our [Discord](#) to receive the latest news." On the right, it shows "BONO Balance: 0 Beta" and a user profile. The main content area is titled "NTRIP Credentials" and contains a table header with columns: Credential ↑↓, Create Time ↓↑, Description ↑↓, Password, Usage ↑↓, Status ↑↓, Blockchain, and Active. Below the header, a message says "No credentials yet". At the bottom of the table area, there are navigation buttons (back, forward, search) and a "Total: 0" indicator with a dropdown menu set to "10".

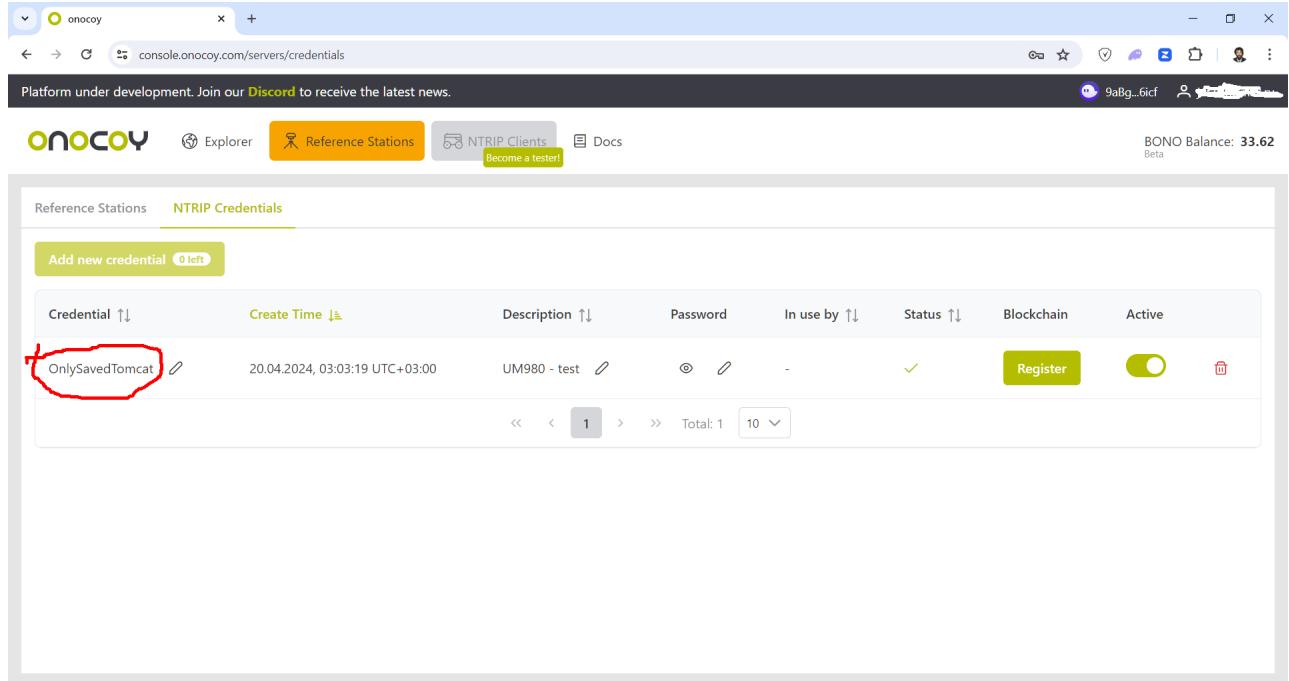
## Click “Add New Credential”.

A screenshot of the same Onocoy platform showing the "Add new credential" dialog box. The background shows the "NTRIP Credentials" page with the table header and "No credentials yet" message. The dialog box has a title "Add new credential" and a sub-instruction "Credential: Automatically generated". It contains two input fields: "Password" and "Description (Optional)". Below these is a checkbox labeled "Register credential on the blockchain to receive rewards". A note below the checkbox says "At least 8 characters required. At least one letter and one number". At the bottom of the dialog are "Save" and "Cancel" buttons. The background table columns are visible: Status ↑↓, Blockchain, and Active.

Enter a password, description, and click **Save**. Remember the password as it will be needed for the **RtkBase** settings.



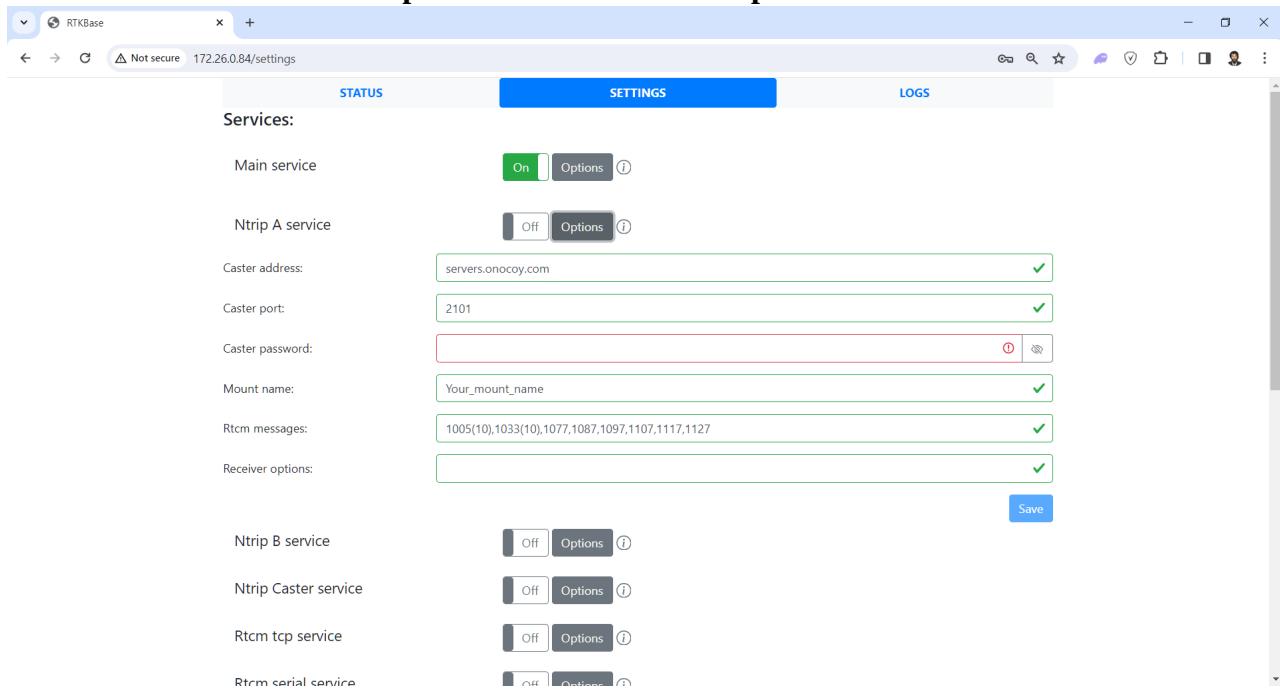
After successfully creating it, you will receive a mount point name, referred to as **Credential**. Remember this name as well.



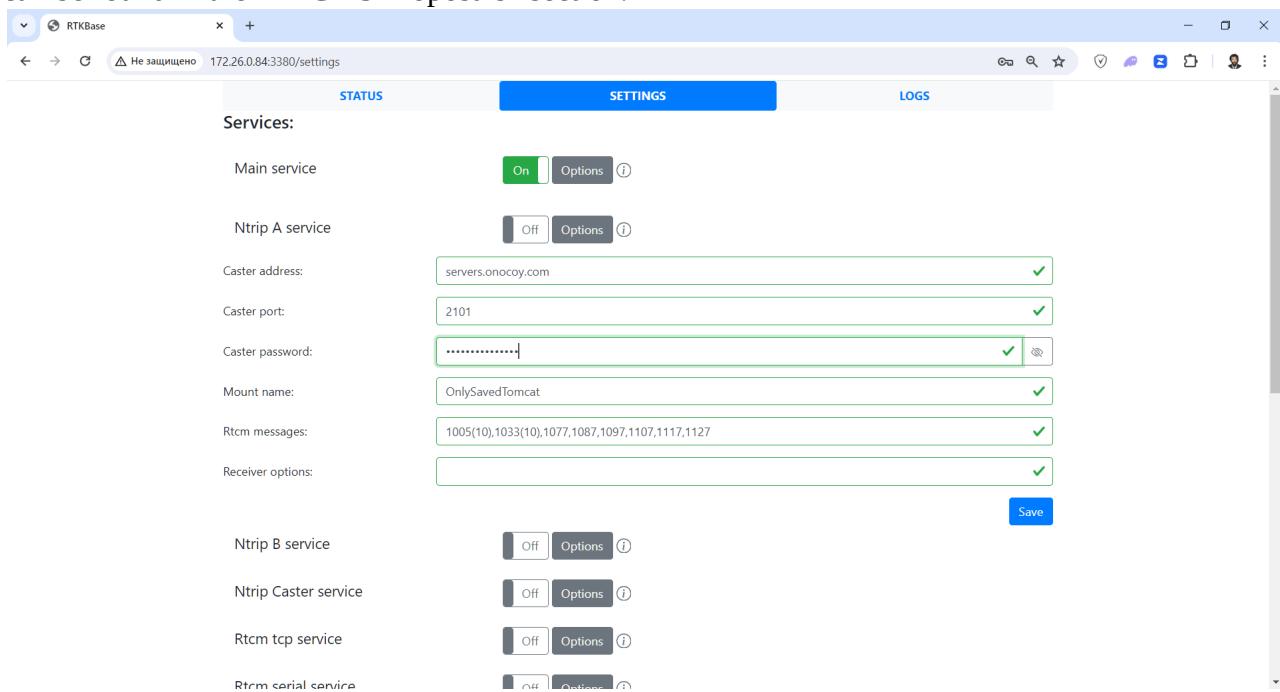
# NTRIP Source Setup

**NTRIP Source** is a mechanism for transmitting data from the base station receiver to a large **NTRIP Caster**, which then distributes (and sells) these data to clients.

Go to **RtkBase** and click the **Options** button next to “**Ntrip A service**”.



Enter the **Onocoy** data. In the “**Caster password**” field, enter the password you set for the **Credential**. In the “**Mount name**” field, enter the name from the **Credential**. The “**Receiver Options**” field is intended for **Ublox** receivers, and information about the “**Rtcm messages**” field can be found in the “**RTCM3 Proposals**” section.



Click **Save**, then **Options**, then **Off** to turn on the service.

The screenshot shows the 'SETTINGS' tab of the RTKBase interface. Under 'Services:', there is a list of services with their current status (On or Off) and an 'Options' button. The services listed are: Main service (On), Ntrip A service (On), Ntrip B service (Off), Ntrip Caster service (Off), Rtcn tcp service (Off), Rtcn serial service (Off), and File service (Off). Below this is a section for 'System Settings' with a 'Check update' button and fields for changing the password. The 'Change Password:' field has 'New:' and 'Confirm:' input boxes, and a 'Change password' button.

## Connection Check

Return to **Onocoy**, click “**Reference Stations**”, and after a couple of minutes, see that your server is running, and the light on the left is green. Click anywhere on the gray stripe (e.g., the server name).

The screenshot shows the 'Reference Stations' page of the Onocoy platform. At the top, there are tabs for 'Explorer', 'Reference Stations' (which is active and highlighted in yellow), 'NTRIP Clients', 'Docs', and 'Become a tester!'. The 'BONO Balance: 33.62 Beta' is also visible. The main area displays a table of reference stations. One row is highlighted with a red circle around the 'Up since 2m 56s' status message. The table includes columns for 'Credential', 'Mountpoint', and 'Validation'. Below the table is a map showing the location of the server. The status message 'Up since 2m 56s' is circled in red.

You will be taken to a window with server data. The “Enable live feed” button is on the top right, which will be discussed later.

The screenshot shows the Onocoy server interface. At the top, there's a header with the URL "console.onocoy.com/servers/4374". Below the header, a banner says "Platform under development. Join our [Discord](#) to receive the latest news." The main area has tabs for "Reference Stations" (which is active), "NTRIP Clients", and "Docs". A "Become a tester!" button is also visible. The main content area displays the following information:

- Mountpoint:** fast-bird-18593
- Credential:** OnlySavedTomcat
- UM980 - test**
- Reference ID:** 4095
- Messages:** 1077(1),1087(1),1097(1),1117(1),1127(1)
- Signals:** 116
- Satellites:** 40
- Latency:** 0.296 s
- Rewards earned:** Not registered
- Status:** Up since 5m 9s
- Validation:** Unvalidated

To the right, there's a "Connection History" section with a table showing a single entry: Start UTC+03:00 (20.04.2024, 03:44:29) and End UTC+03:00 (185.81.48.117:53934). Below this is a map of Riga, Latvia, with a green dot indicating the receiver's location. A legend indicates "Satellites" (orange) and "Shallow" (yellow).

Scroll down and see the received and unreceived signals.

This screenshot shows the same Onocoy interface but with more detailed signal information. The left panel shows the following details:

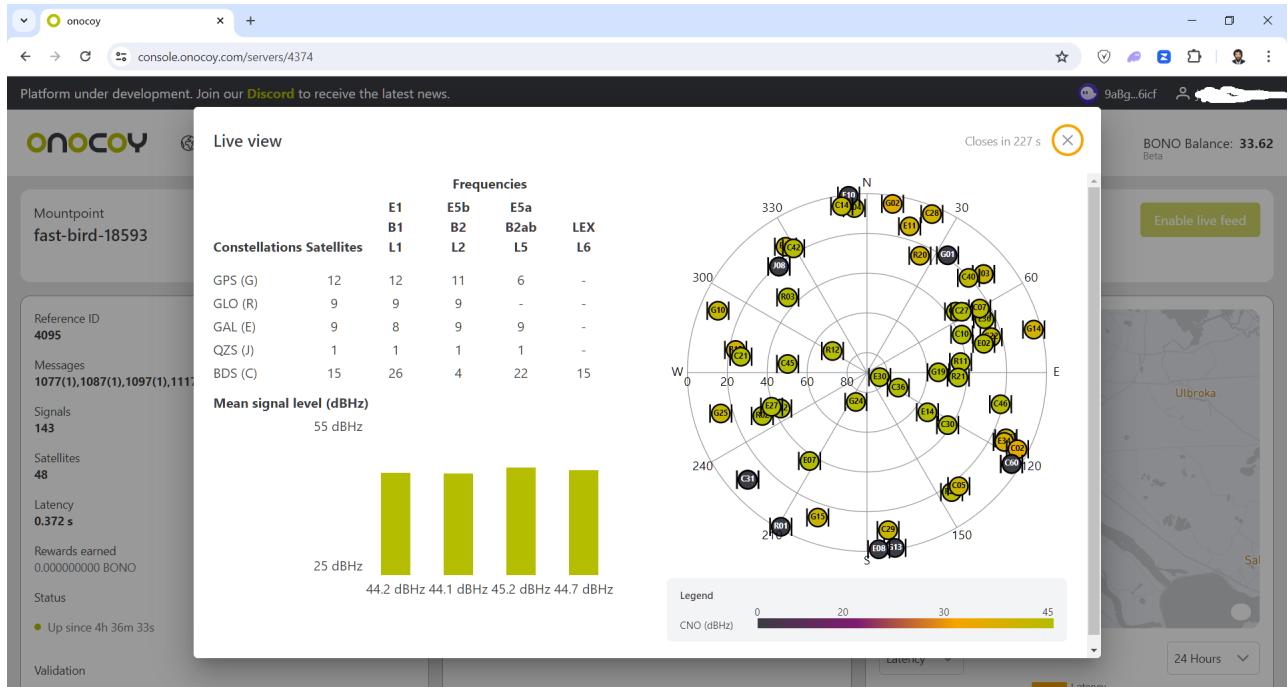
- Satellites:** 40
- Latency:** 0.296 s
- Rewards earned:** Not registered
- Status:** Up since 6m 18s
- Validation:** Unvalidated
- Bands:** GPS, GAL, GLO, QZS, BDS, NIC

Below the bands, there's a grid of green circles representing received signals (L1, L2, L5, E1, E5b, E5a, E6, E5ab, B1, B2, B2ab, B3, LEX) and white circles representing unreceived signals. The right panel contains two graphs: one showing the number of satellites over a 24-hour period (with a peak around 10 AM) and another showing the number of signals over the same period.

The green signals are received, and the white signals are not. On the right, there is a graph of the number of satellites and signals. If you see signals like in the screenshot or better, everything is fine. If you see only **Beidou** signals with a **Unicore** receiver, it means the base station coordinates are entered incorrectly. How to enter them correctly is described in the “Determining Coordinates” section.

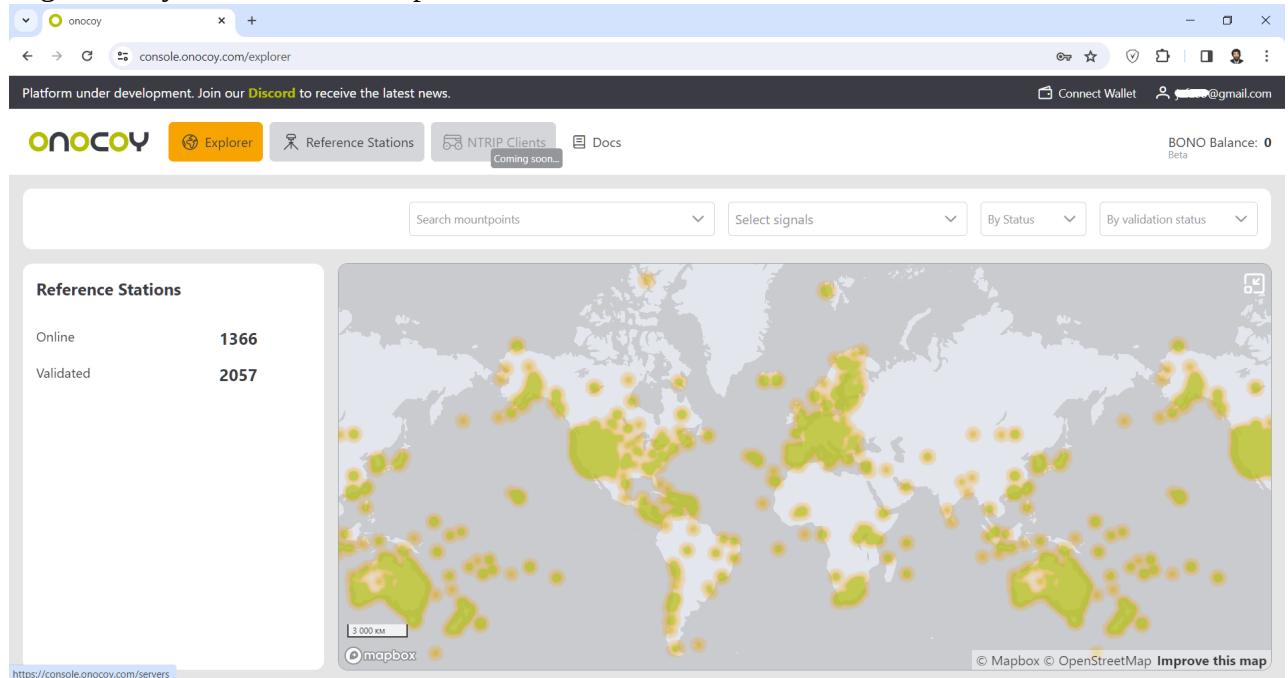
If you have two receivers connected to one antenna, you will not be able to double the benefits on **Onocoy**; in this case, only one receiver will connect.

If you click the “**Enable live feed**” button in the top right corner, you will get a display like this showing the satellite positions in the sky and the signal levels by frequency.

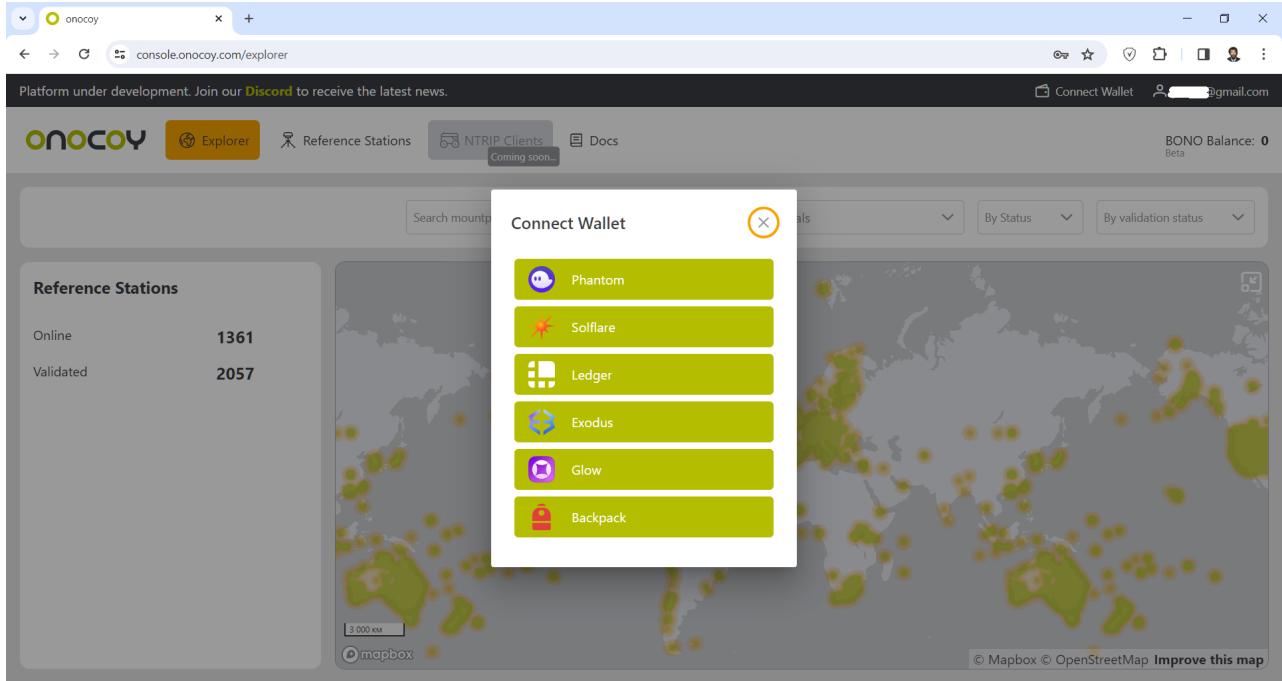


## Creating a Wallet

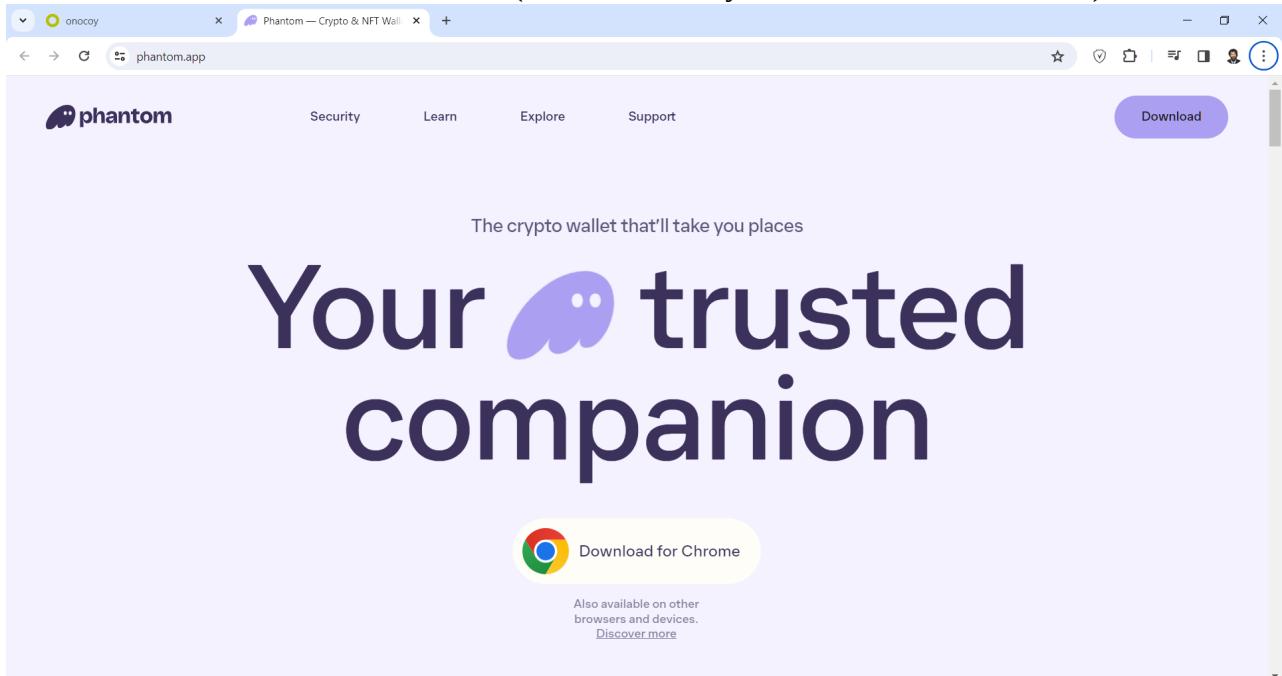
Log in with your username and password.



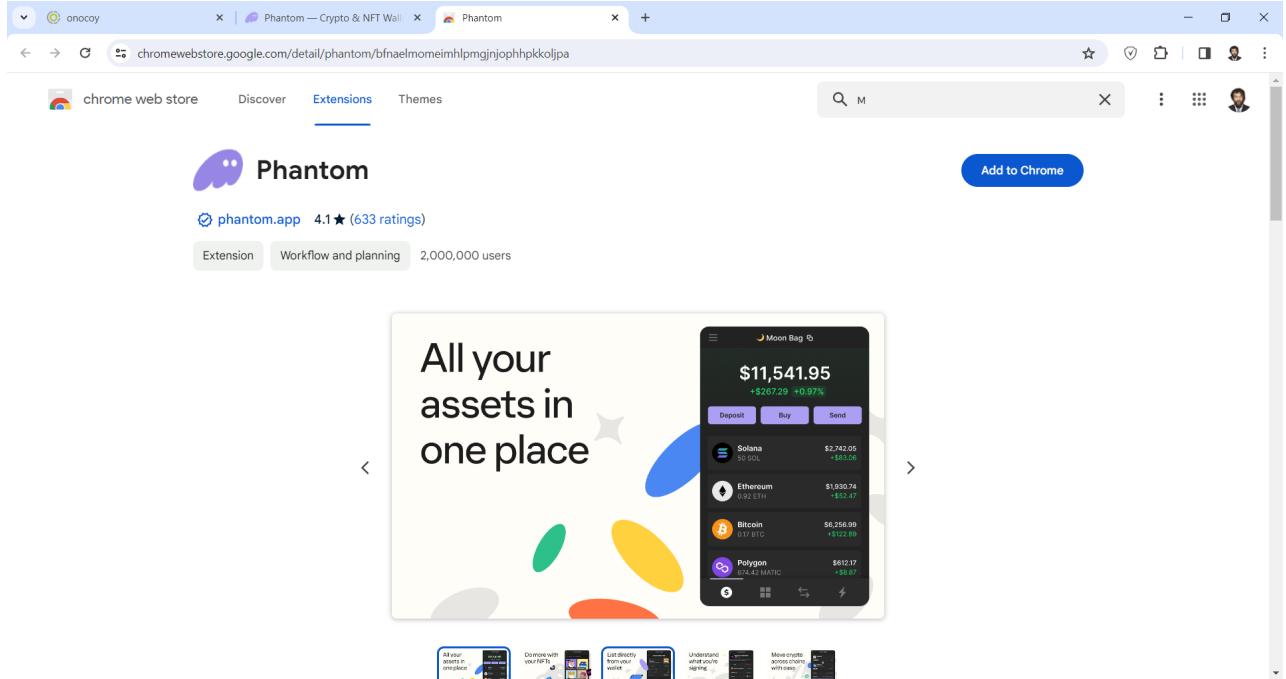
Click “**Connect Wallet**” at the top right, then select the top wallet — **Phantom**.



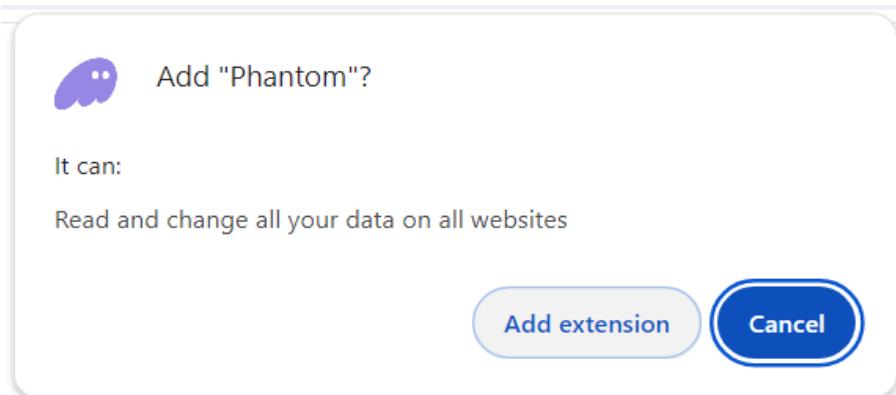
There is a [video](#) on setting up and configuring **Phantom** for **Onocoy**. It is slightly outdated. On this screen, click “**Download for Chrome**” (or otherwise, if you have a different browser).



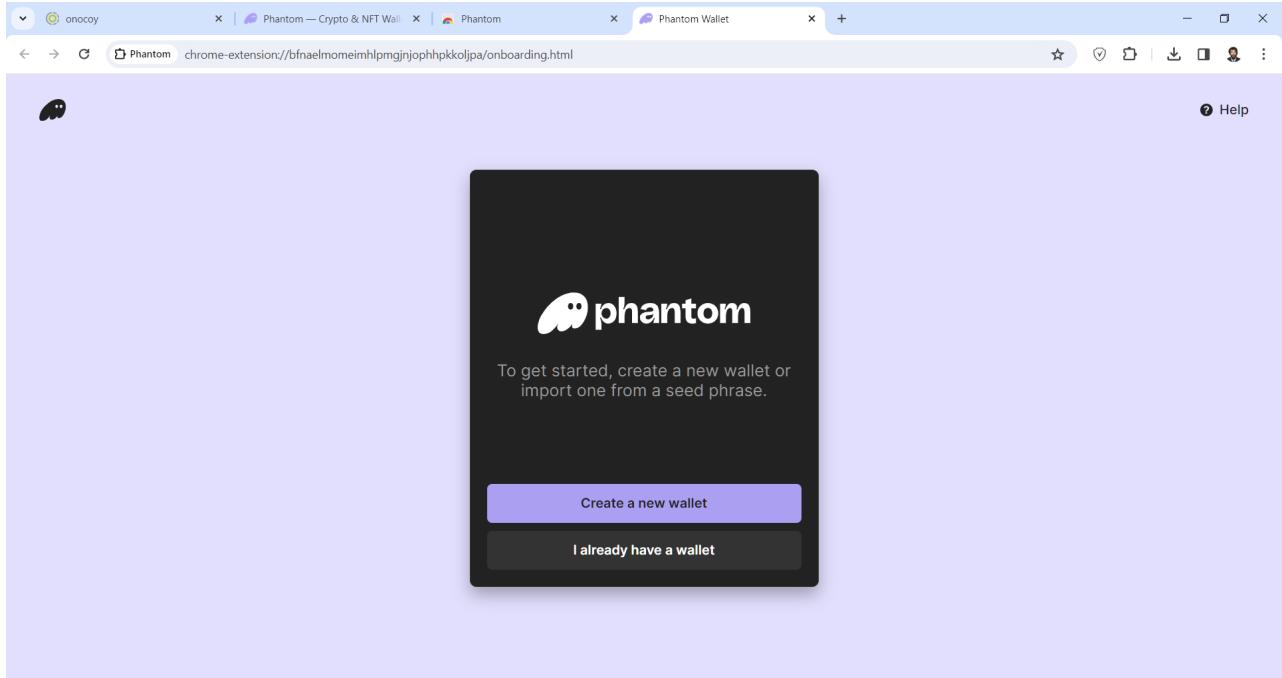
After clicking the button, go to the **Chrome web store** and click “**Add to Chrome**” to install the extension.



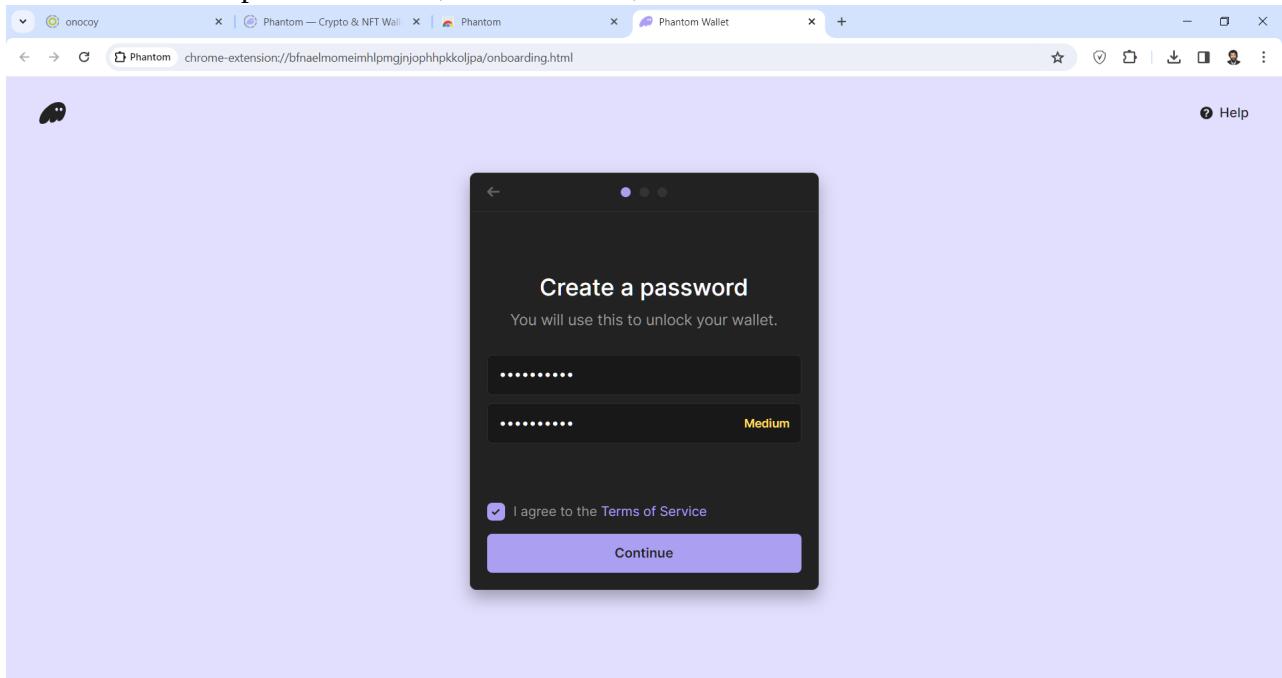
Click “**Add Extension**”.



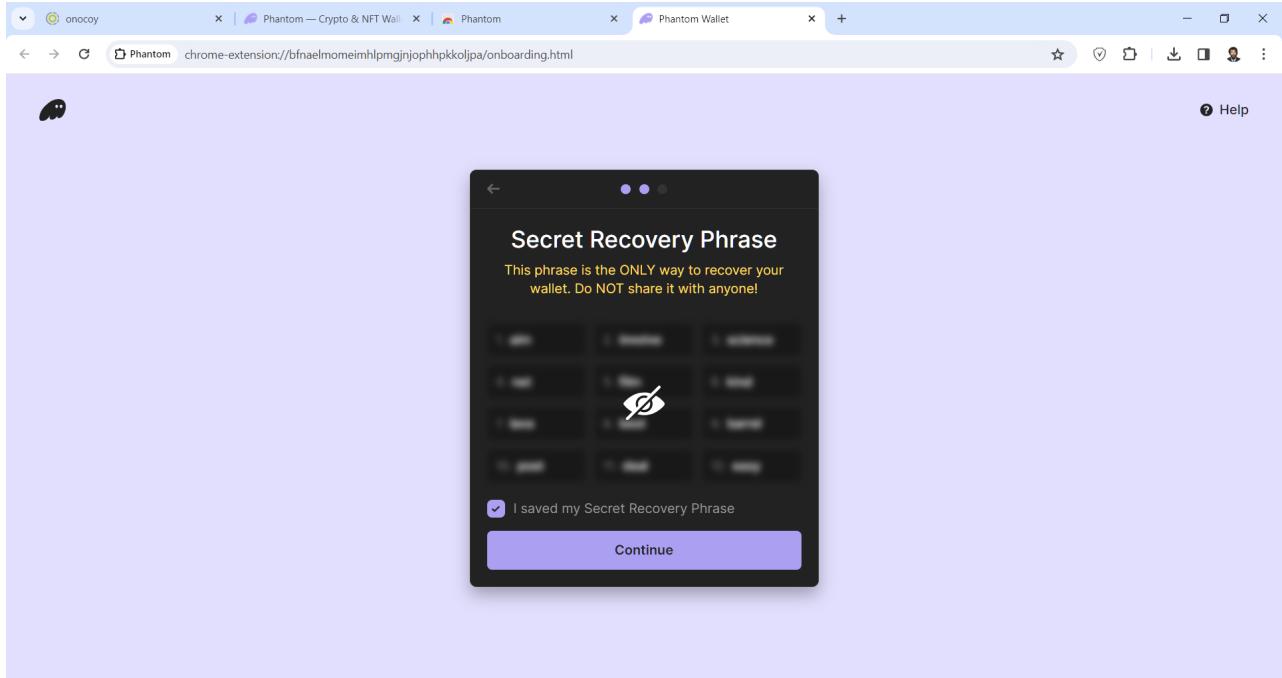
The wallet window opens, where you click “Create a new wallet”.



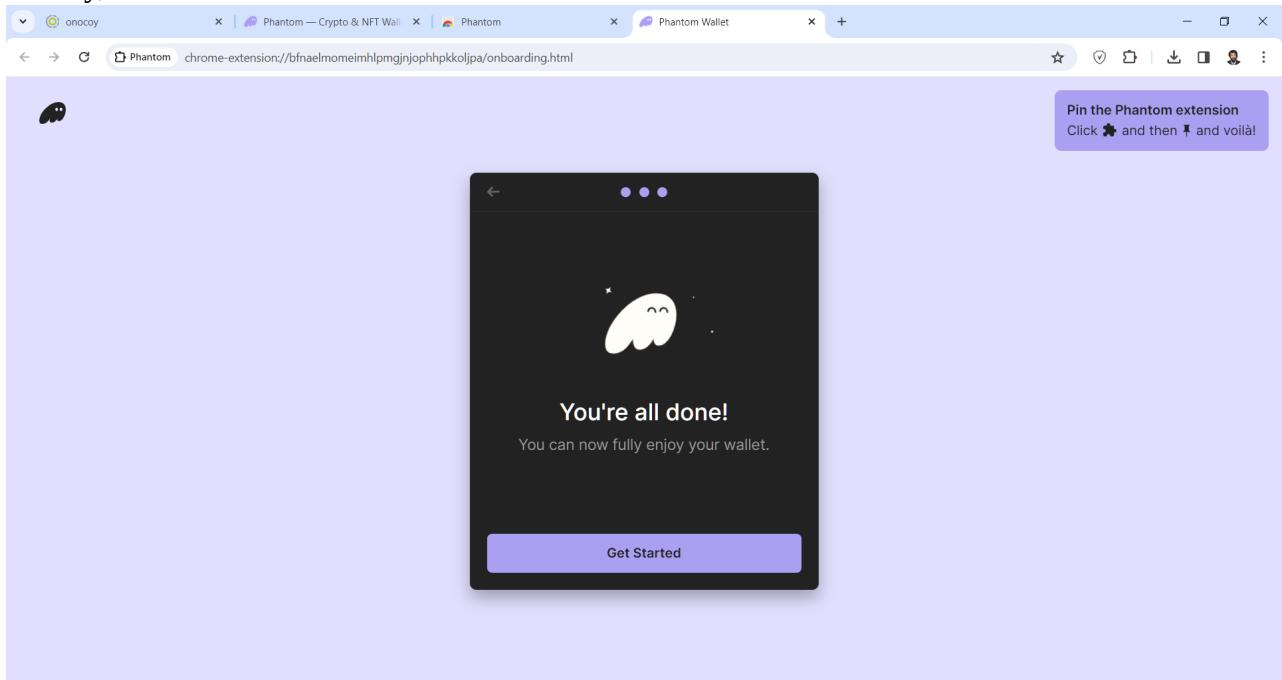
Create and enter a password twice, check the box, and click **Continue**.



Write down the 12 secret words (or take a screenshot). Again, check the box and click **Continue**.

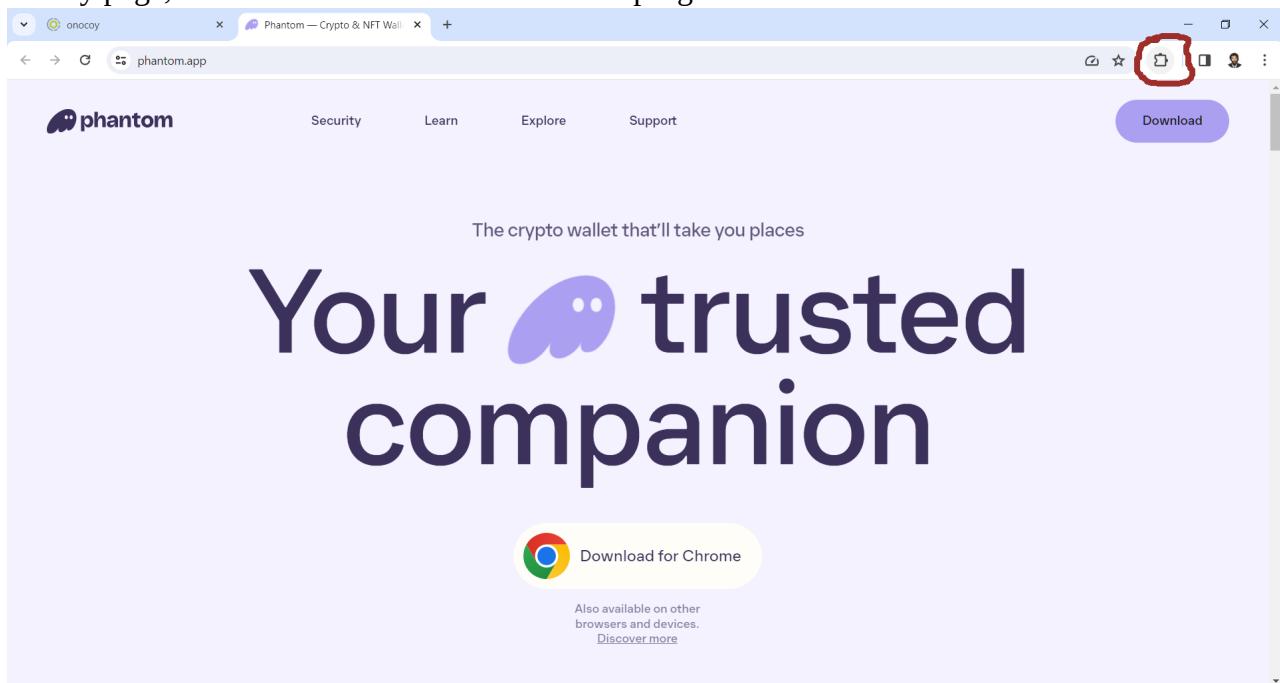


Finally, click “Get Started”.

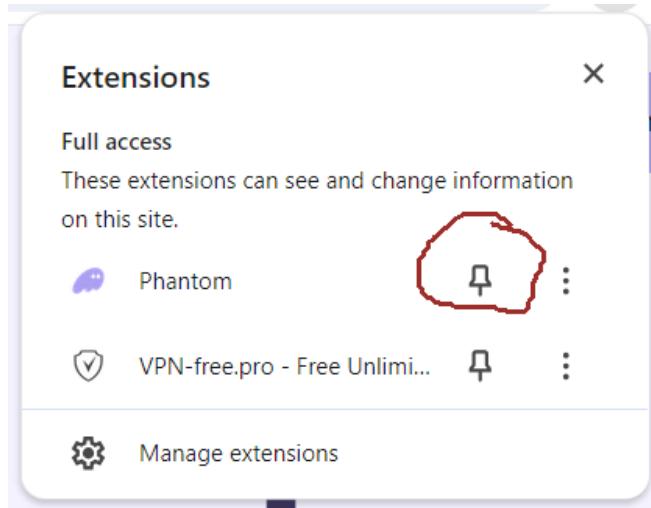


## Enabling the Plugin

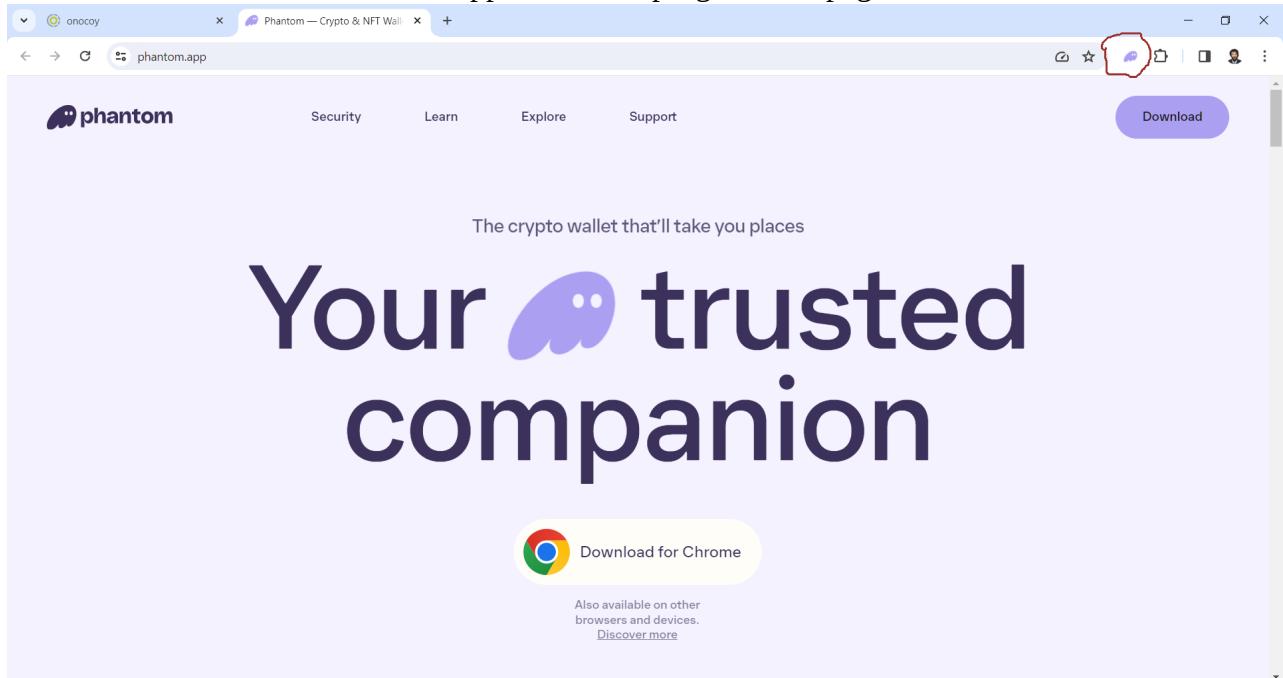
On any page, click the **Extension** button at the top right.



In the dropdown menu, click the button next to **Phantom**.

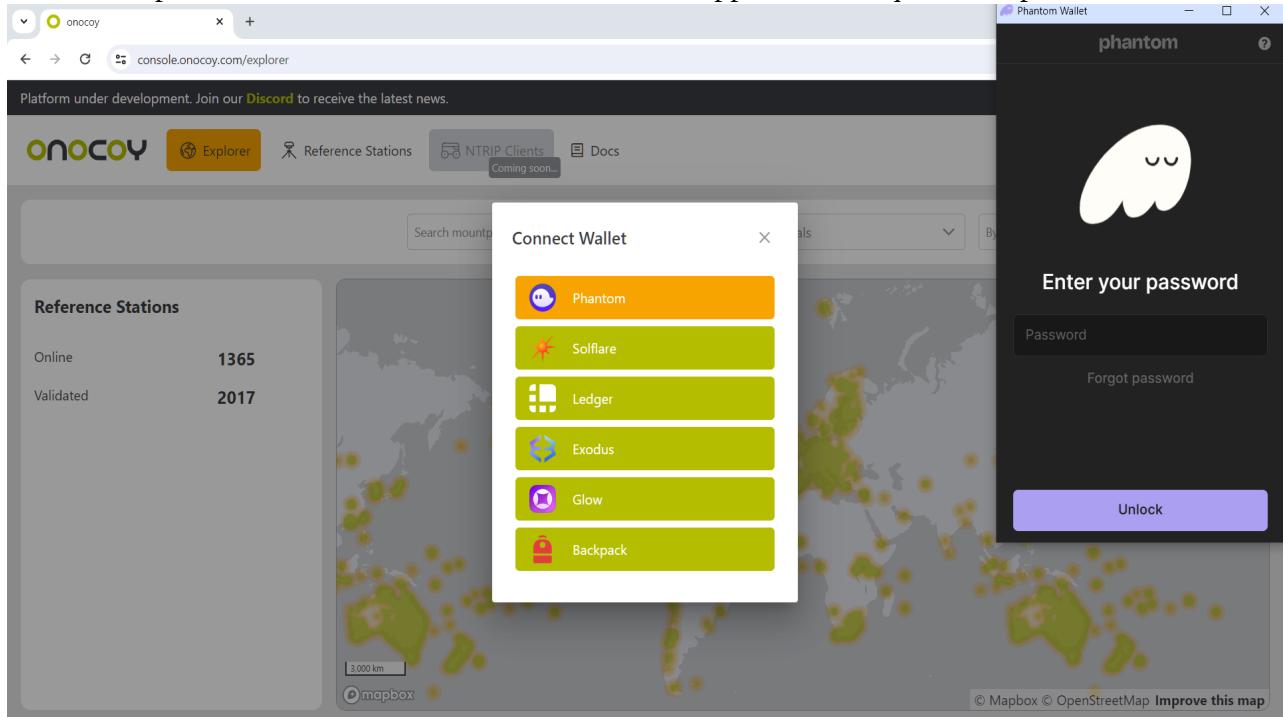


As a result, the **Phantom** icon will appear at the top right of the page.

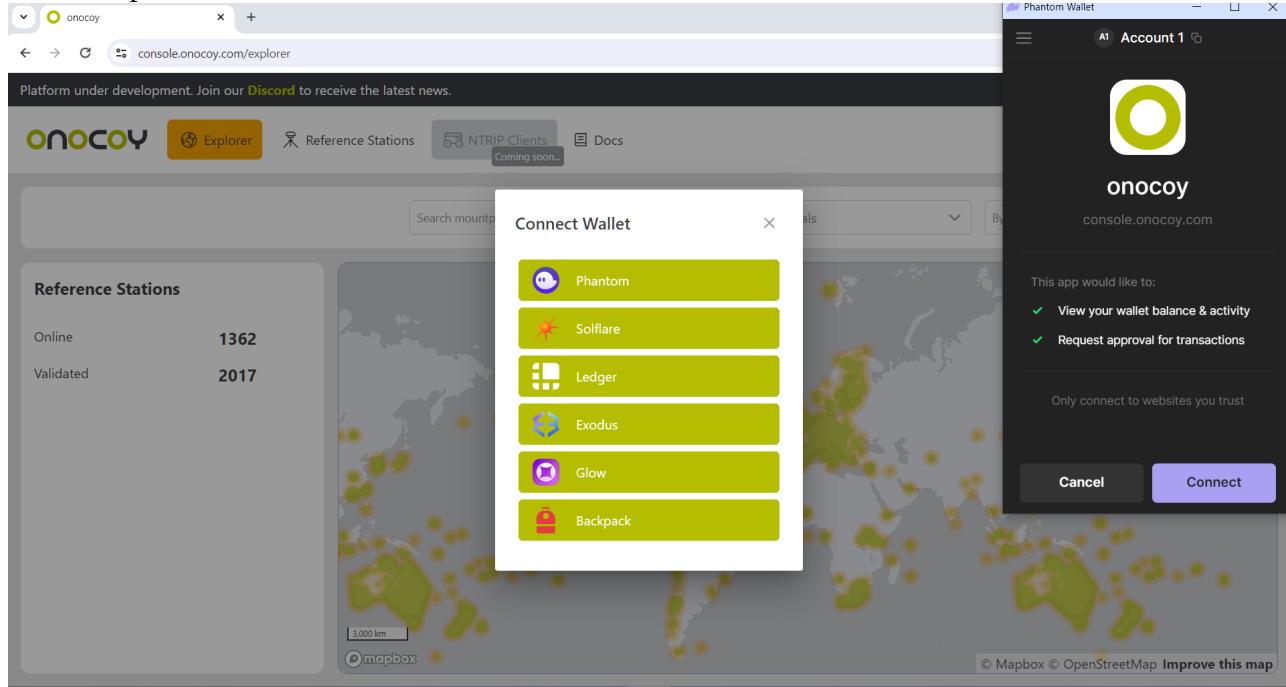


## Connecting the Wallet

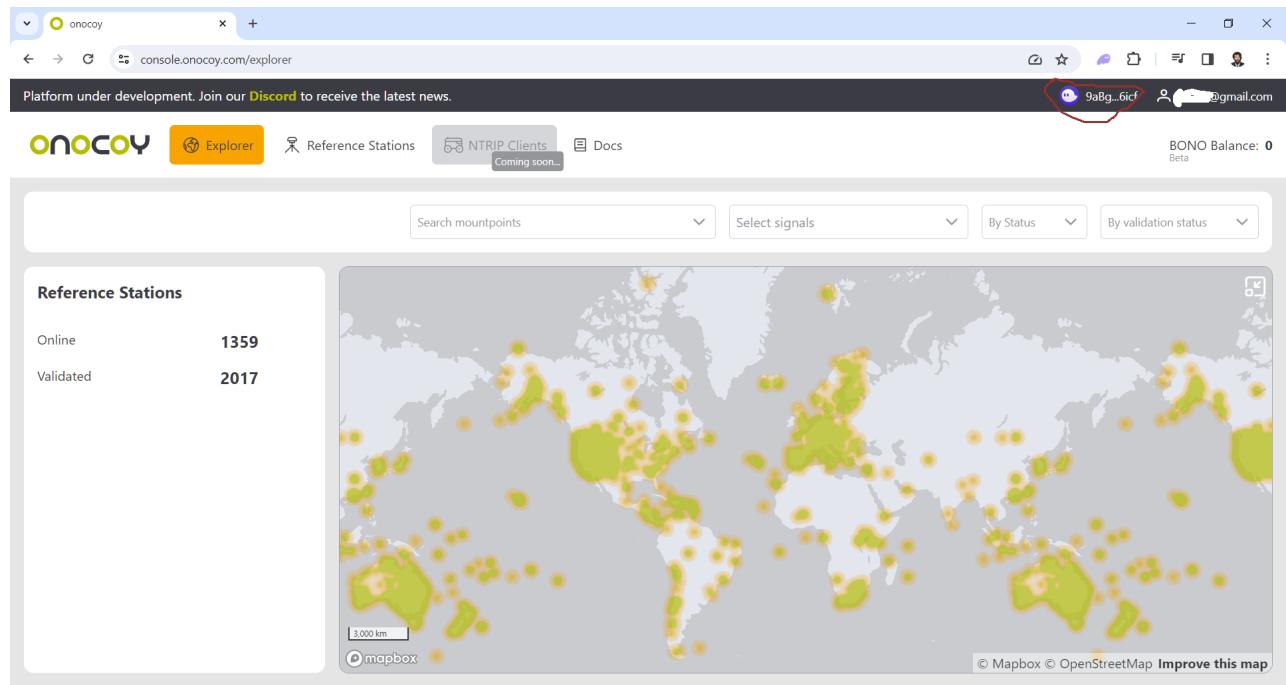
Return to the **Onocoy** page. As described earlier, click “**Connect Wallet**” at the top right, then select the top wallet — **Phantom**. The wallet window appears and requests the password.



Enter the password.

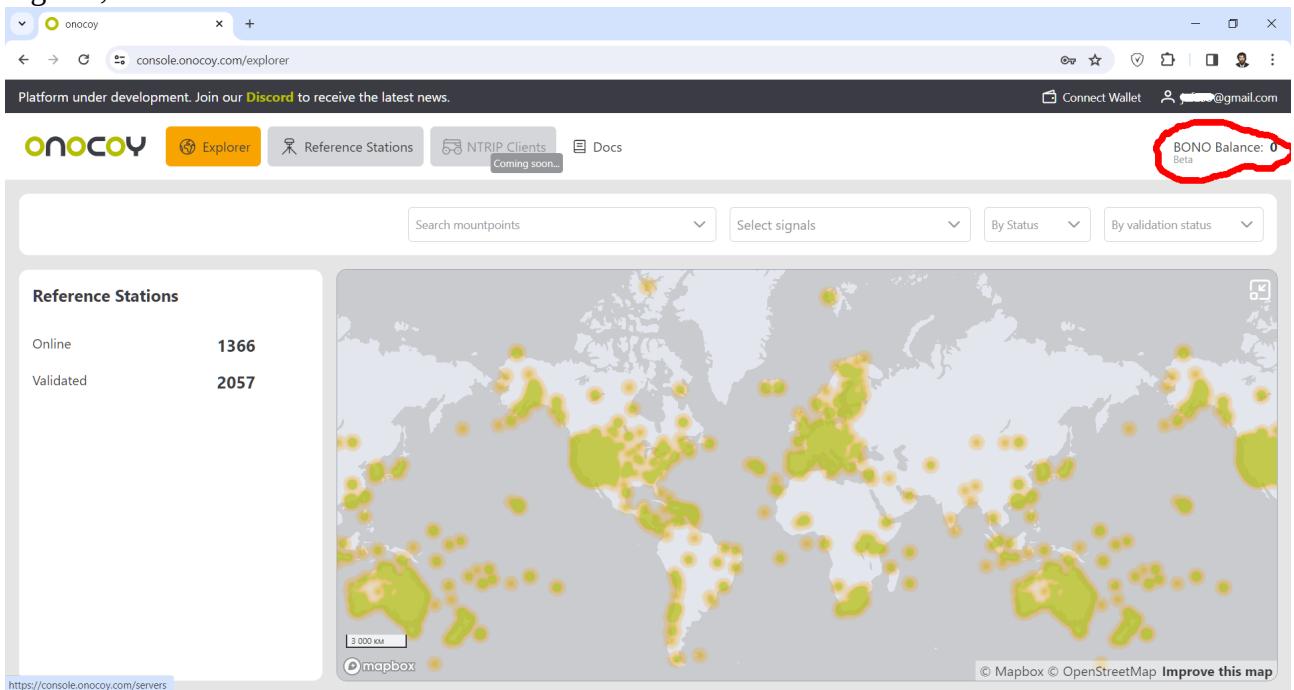


Click **Connect**. The wallet is connected.



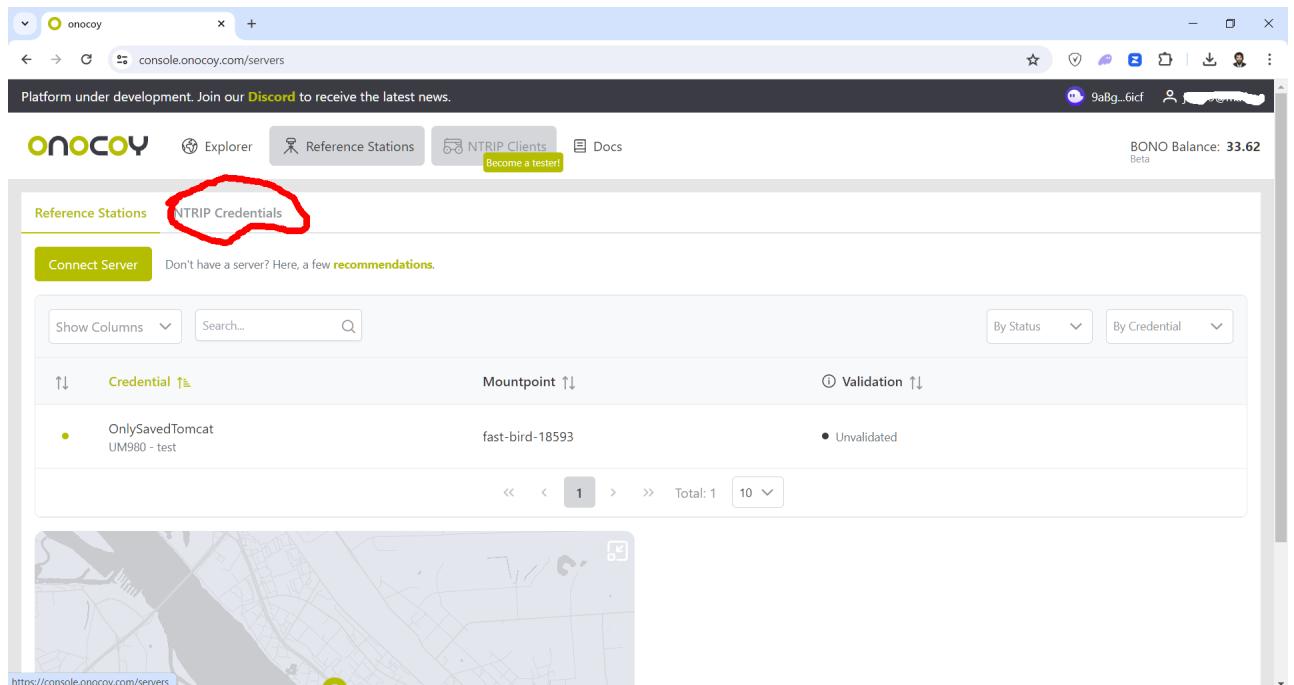
# Registering the Wallet

Log in with your username and password. Registering the wallet makes sense only with a positive balance, i.e., after validating your station and starting to earn cryptocurrency. If you decide to register, click “**Reference Station**”.



The screenshot shows the Onocoy console interface. At the top, there's a navigation bar with tabs for 'Explorer', 'Reference Stations', 'NTRIP Clients' (Coming soon...), and 'Docs'. Below the navigation bar, there are four dropdown filters: 'Search mountpoints', 'Select signals', 'By Status', and 'By validation status'. The main area is titled 'Reference Stations' and displays two statistics: 'Online' (1366) and 'Validated' (2057). To the right is a world map showing numerous green and yellow dots representing reference stations across the globe. A legend indicates a scale of 3,000 km. At the bottom left, the URL is https://console.onocoy.com/servers. At the top right, there's a status bar with 'BONO Balance: 0 Beta'.

Click “**NTRIP Credential**”.



The screenshot shows the Onocoy console interface. The 'NTRIP Credentials' tab is highlighted with a red circle. The main area displays a table with three columns: 'Credential ↑↓', 'Mountpoint ↑↓', and 'Validation ↑↓'. There is one entry: 'OnlySavedTomcat UM980 - test' under 'Credential', 'fast-bird-18593' under 'Mountpoint', and 'Unvalidated' under 'Validation'. Below the table are search and filter options ('Show Columns', 'Search...', 'By Status', 'By Credential'). At the bottom left, there's a small map. The URL https://console.onocoy.com/servers is visible at the bottom left, and the top right shows a user profile with 'BONO Balance: 33.62 Beta'.

## Click Register.

The screenshot shows a web browser window for the Onocoy platform at [console.onocoy.com/servers/credentials](https://console.onocoy.com/servers/credentials). The title bar says "onocoy". The header includes a "Discord" link for news, a user icon, and "BONO Balance: 33.62 Beta". The main navigation tabs are "Explorer", "Reference Stations" (which is active), "NTRIP Clients", and "Docs". A "Become a tester!" button is also present.

The "Reference Stations" section has a sub-tab "NTRIP Credentials" highlighted with an orange border. Below it is a green button labeled "Add new credential" with "0 left".

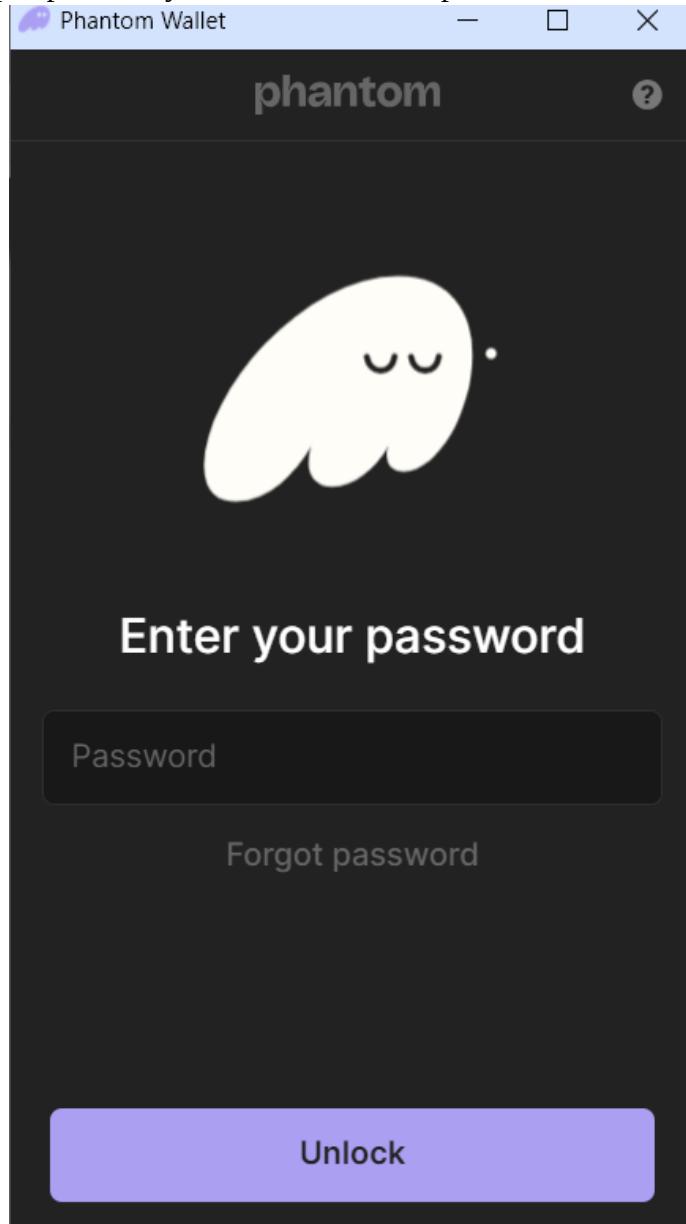
A table lists one credential entry:

Credential ↑↓	Create Time ↓↑	Description ↑↓	Password	In use by ↑↓	Status ↑↓	Blockchain	Active
OnlySavedTomcat	20.04.2024, 03:03:19 UTC+03:00	UM980 - test	∅	∅	fast-bird-18593 ✓		

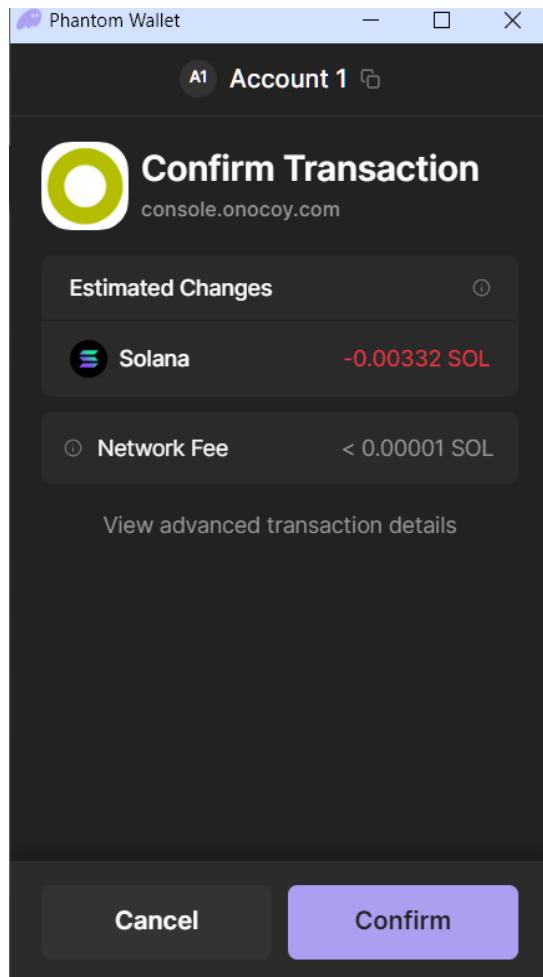
Below the table is a pagination control with "Total: 1" and a dropdown for "10".

A red circle highlights the "Register" button in the table row, which is located to the right of the "Status" column.

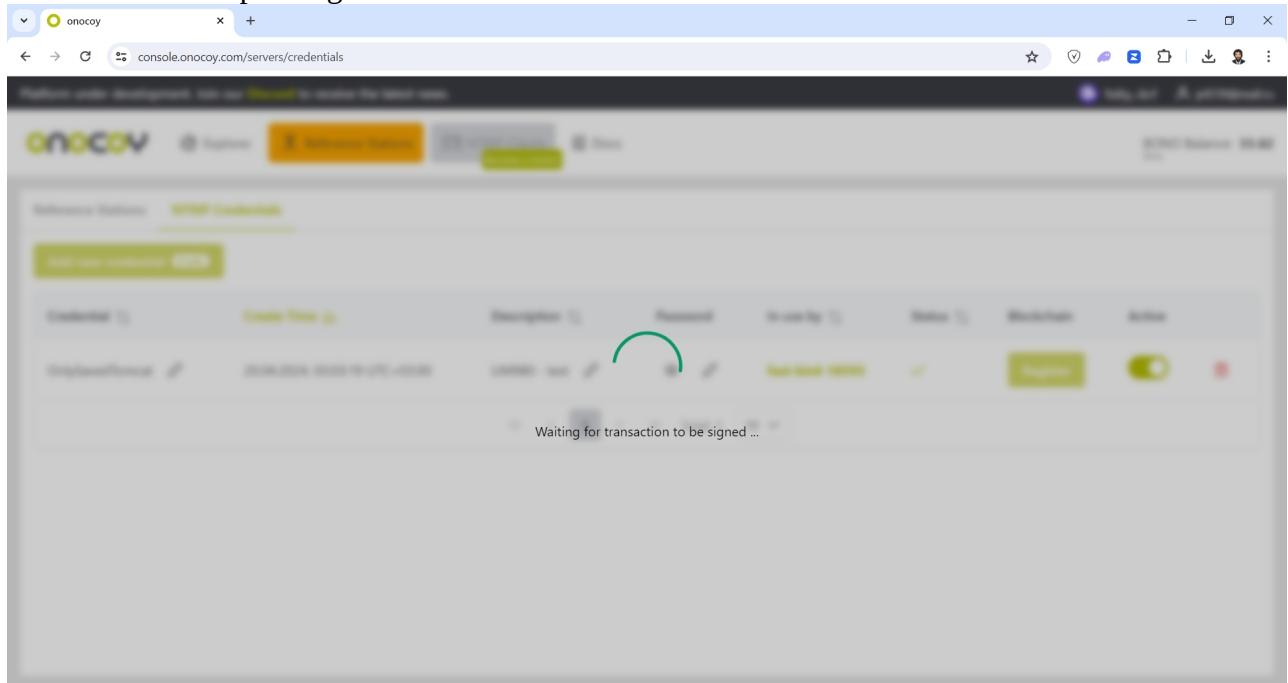
The wallet window pops up, where you need to enter the password and click **Unlock**.



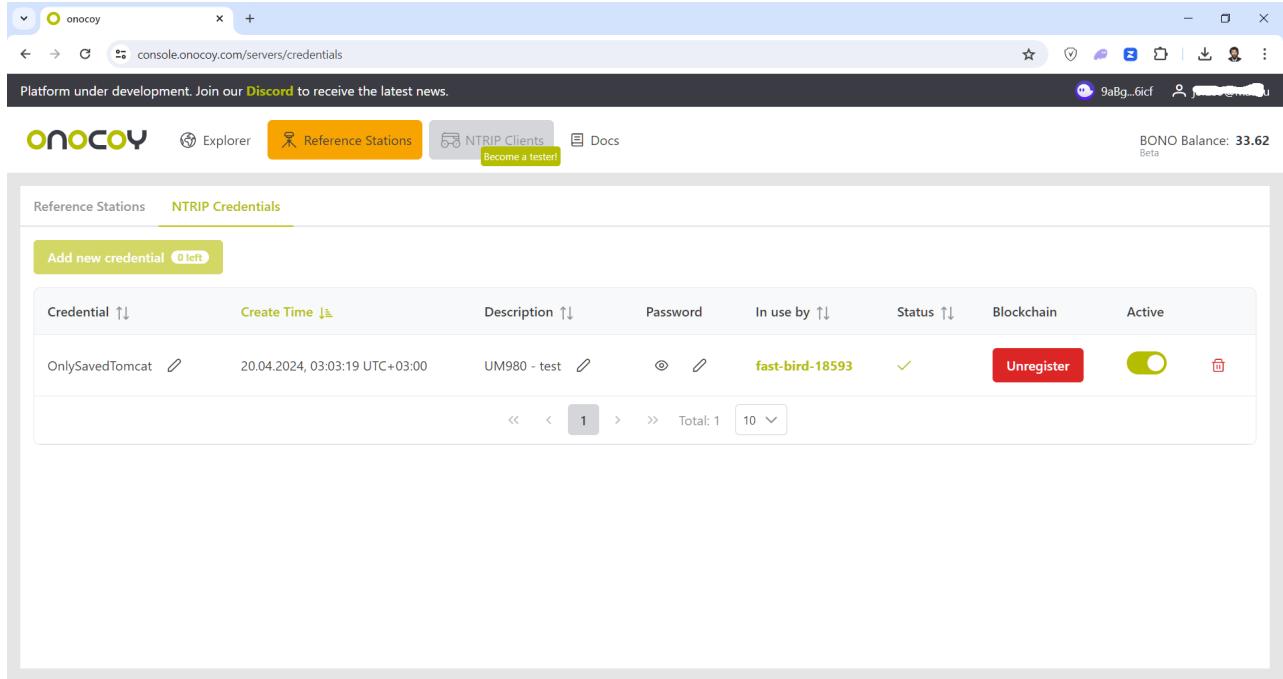
Click **Confirm**.



The transaction is pending.



After successful registration, the screen looks like this. If the registration was unsuccessful, wait a day or two. This means that the blockchain refuses to make a free transaction, and you have not yet accumulated enough cryptocurrency for a paid one.



The screenshot shows a web browser window for the Onocoy platform at [console.onocoy.com/servers/credentials](https://console.onocoy.com/servers/credentials). The title bar says "onocoy". The header includes links for "Explorer", "Reference Stations", "NTRIP Clients" (which is the active tab), and "Docs". A "Become a tester!" button is also present. The top right shows "BONO Balance: 33.62 Beta" and a user profile. A banner at the top says "Platform under development. Join our **Discord** to receive the latest news." Below the header is a navigation bar with "Reference Stations" and "NTRIP Credentials" (the active tab). A green button labeled "Add new credential (0 left)" is visible. The main content area displays a table of NTRIP credentials:

Credential ↑↓	Create Time ↓↑	Description ↑↓	Password	In use by ↑↓	Status ↑↓	Blockchain	Active
OnlySavedTomcat	20.04.2024, 03:03:19 UTC+03:00	UM980 - test	∅	∅	fast-bird-18593 ✓	Unregister	<input checked="" type="checkbox"/> <span>Remove</span>

Pagination controls show "Total: 1" and a dropdown for "10".

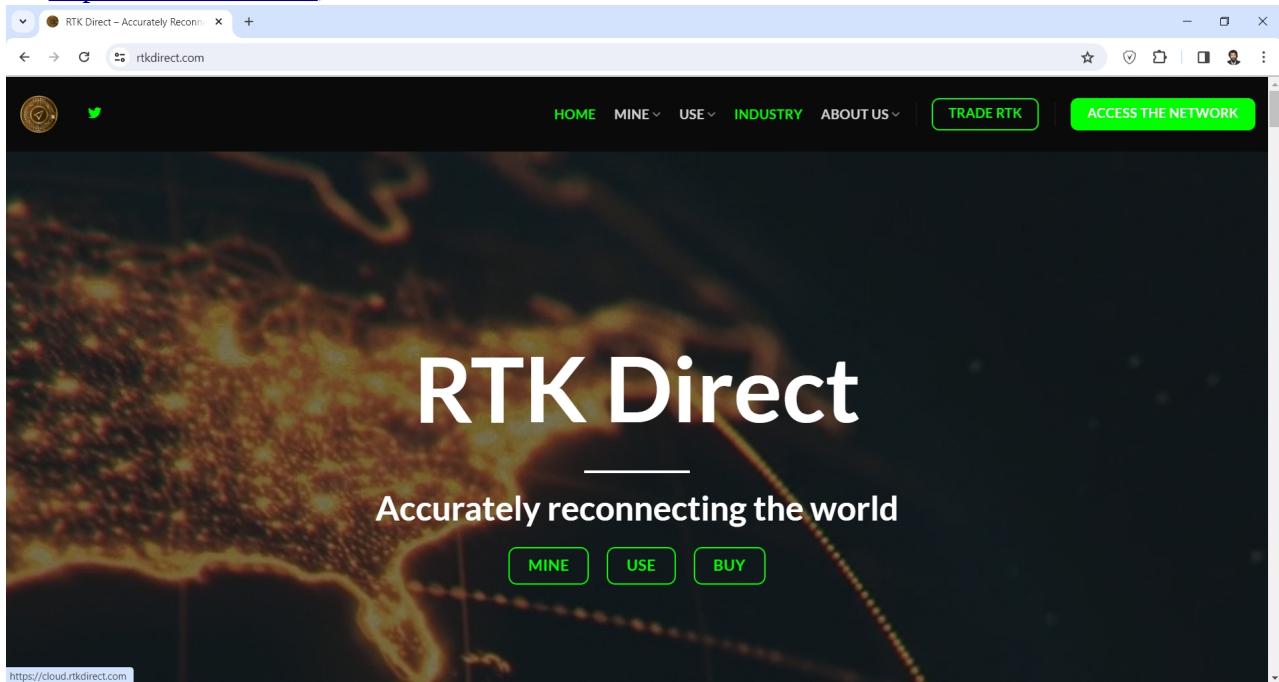
## NTRIP Configuration for RtkDirect

<https://rtkdirct.com/> is another service that allows you to earn money using base stations. A brief connection guide is available at <https://rtkdirct.com/buy-a-hotspot/>, and we will provide a brief description for **RtkBase**.

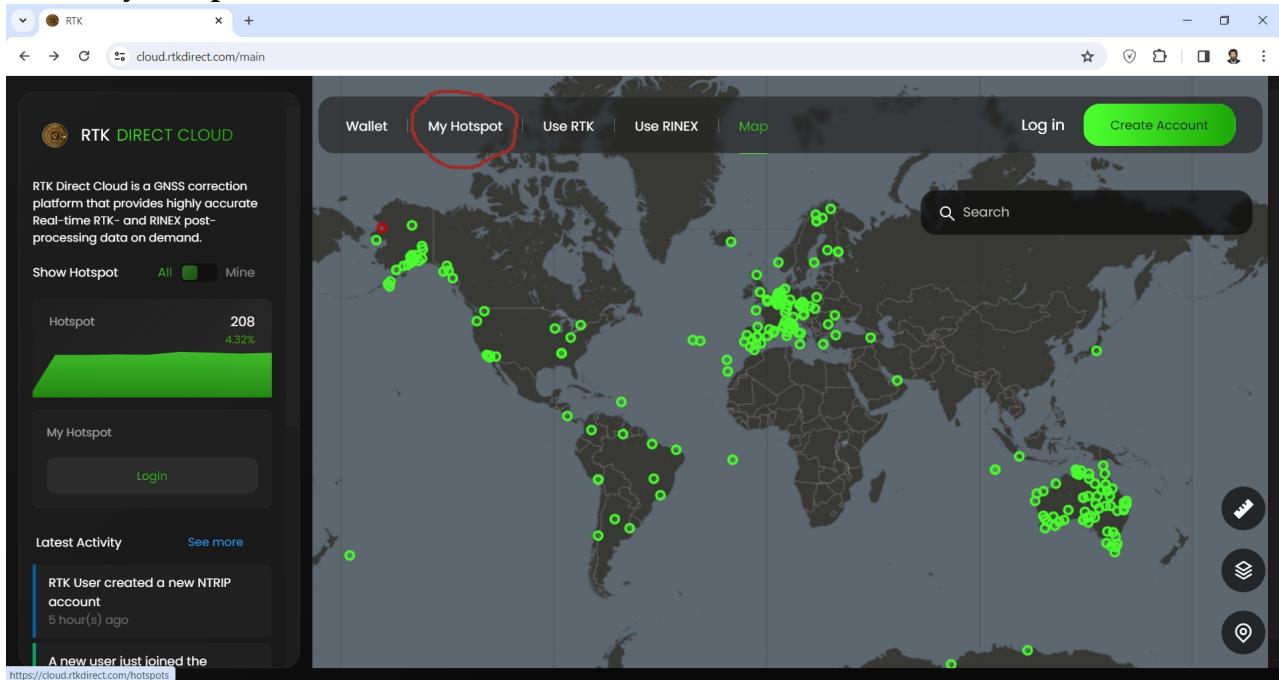
Before connecting to **RtkDirect**, set the precise coordinates of your base as described in “Determining Coordinates”.

# Registration

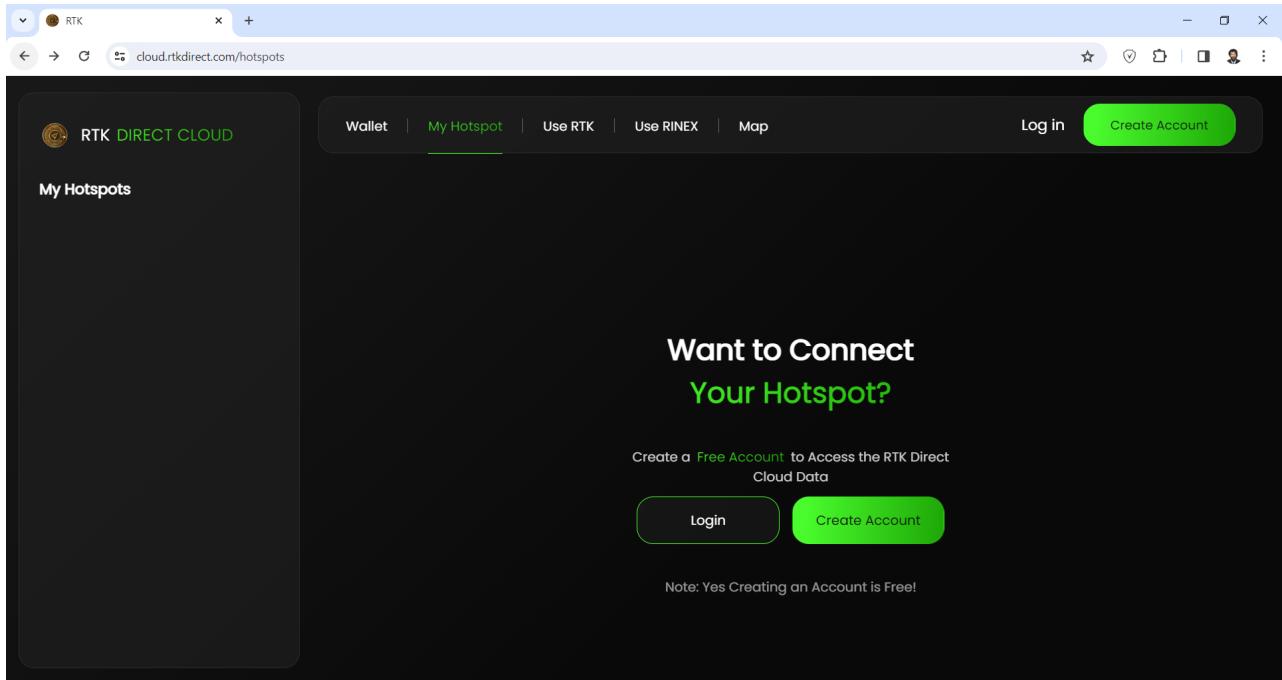
On <https://rtkdirct.com/>, click the “Access The Network” button.



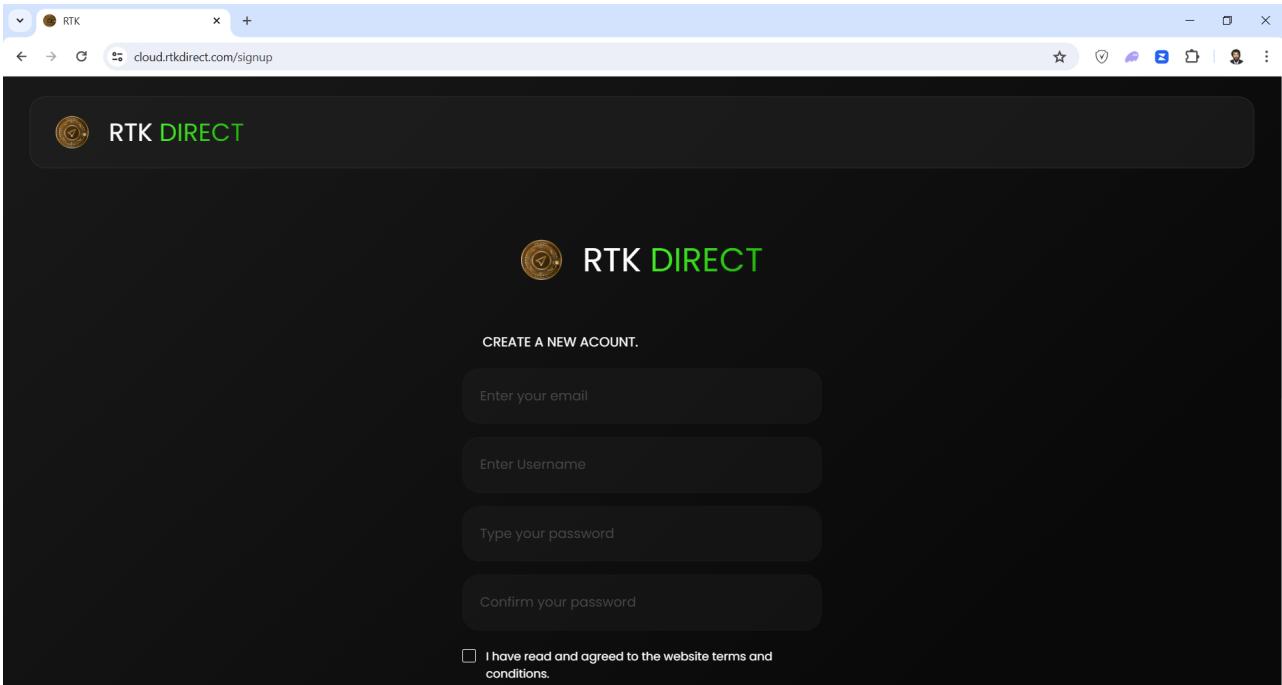
Click “My Hotspot”.



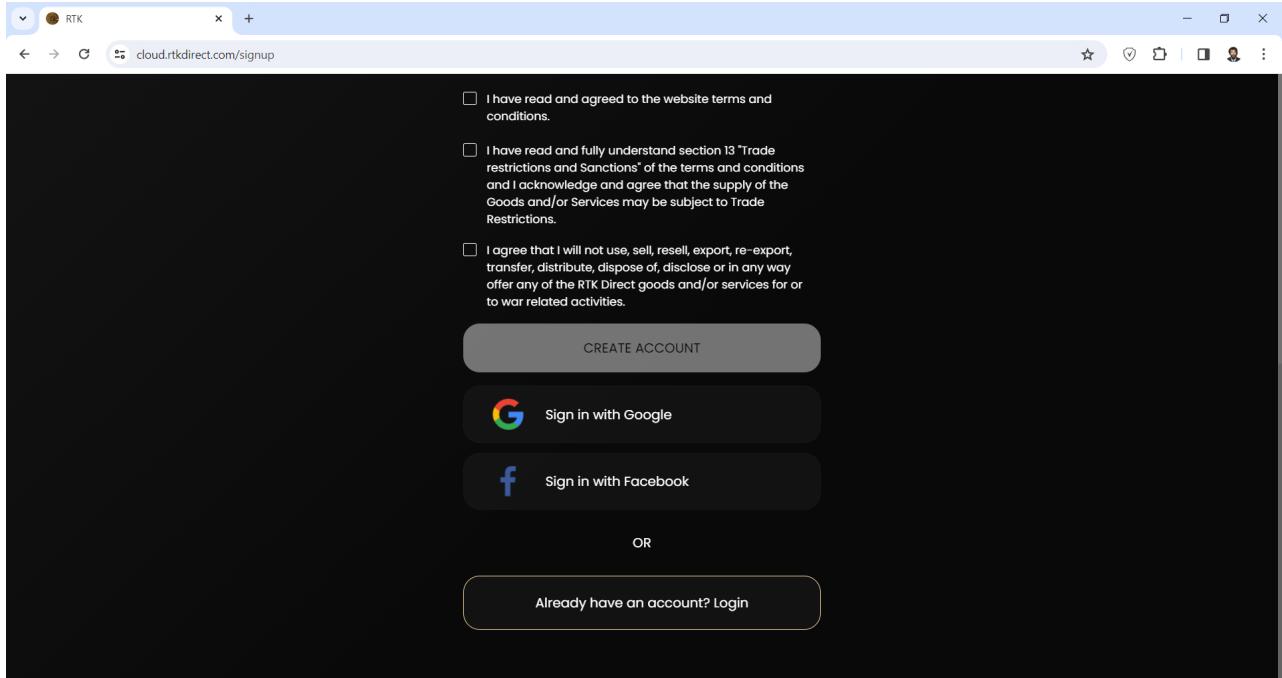
Click “Create Account”.



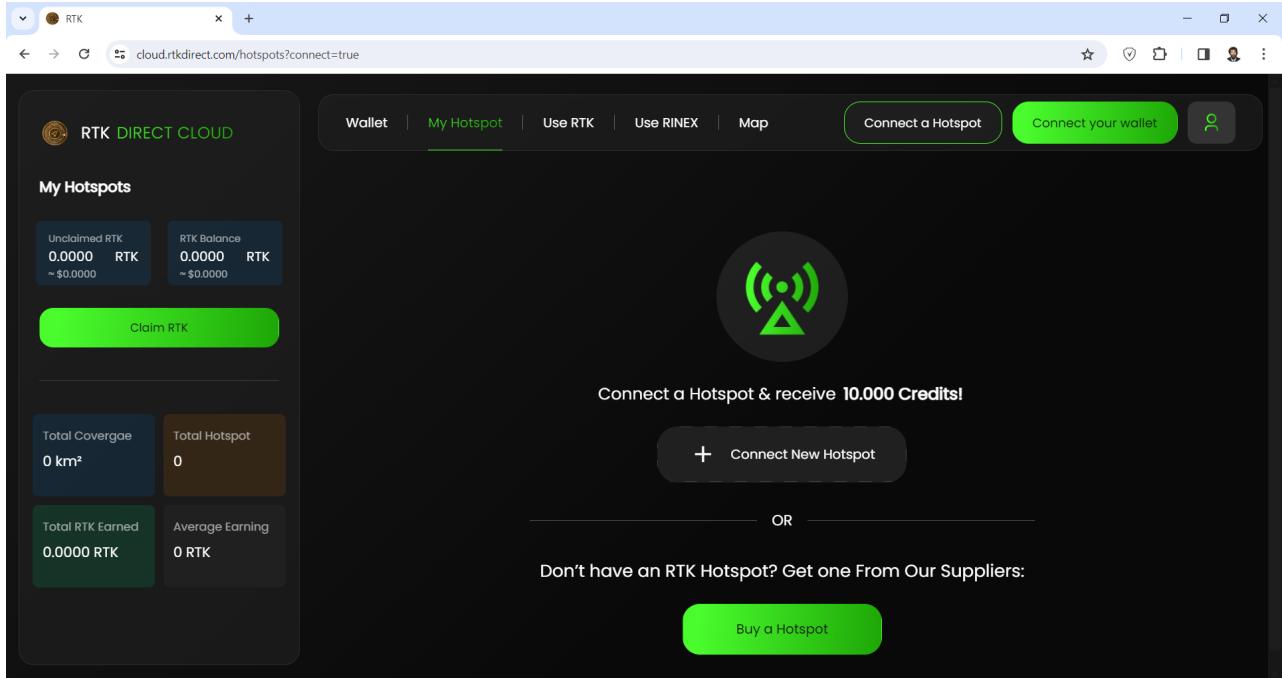
Scroll down.



The simplest way is to register through **Google**.

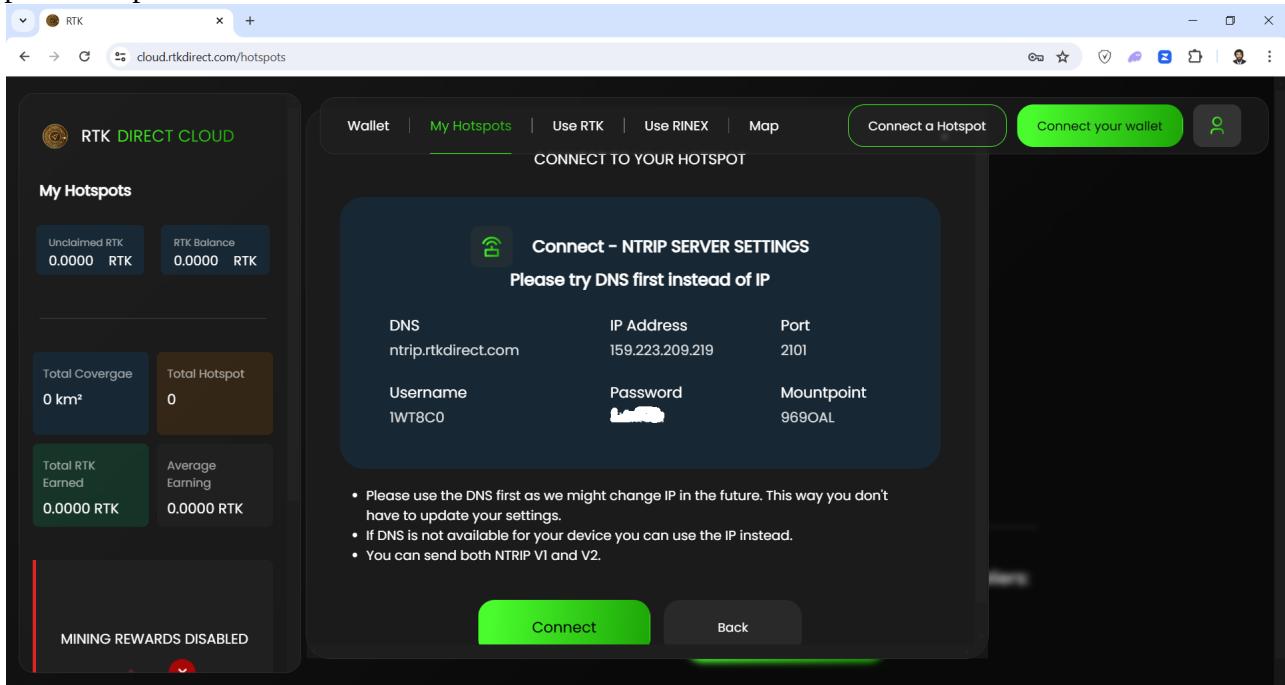


After registration, you can proceed to connect the station. To do this, click “**Connect New Hotspot**”.



# Getting Credentials

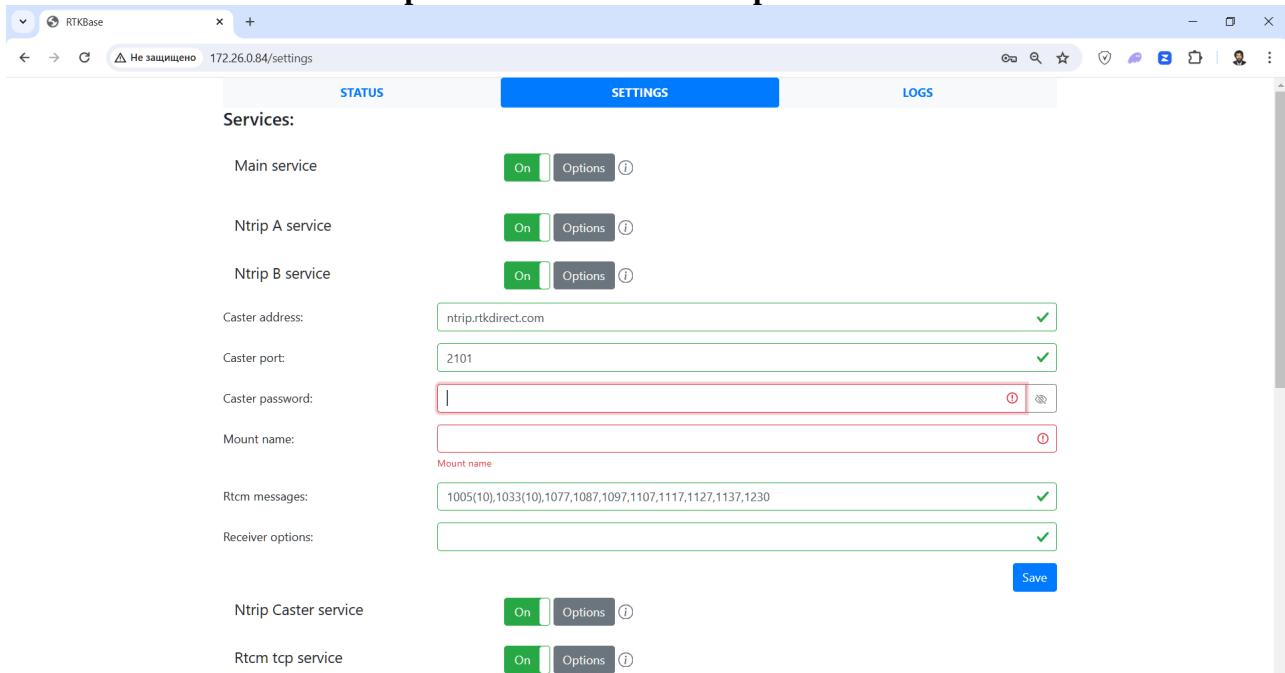
After clicking “**Connect New Hotspot**”, you will receive a login, password, and mount point for entry. The login is used only in the **NTRIP v2** protocol, so we do not need it. Record the mount point and password.



# NTRIP Source Setup

**NTRIP Source** is a mechanism for transmitting data from the base station receiver to a large **NTRIP Caster**, which then distributes (and sells) these data to clients.

Go to **RtkBase** and click the **Options** button next to “**Ntrip B service**”.



- Enter the “**Caster password**” and “**Mount name**” as written on the **RtkDirect** website

The screenshot shows the RTKBase settings page with the following configuration:

- Services:**
  - Main service: On
  - Ntrip A service: On
  - Ntrip B service: On
- Caster address:** ntrip.rtkdirect.com
- Caster port:** 2101
- Caster password:** ..... (redacted)
- Mount name:** 969OAL
- RtcM messages:** 1005(10),1033(10),1077,1087,1097,1107,1117,1127,1137,1230
- Receiver options:** (empty)

**Save** button is visible at the bottom right.

Click **Save**, then **Options**, then **Off** to turn on the service.

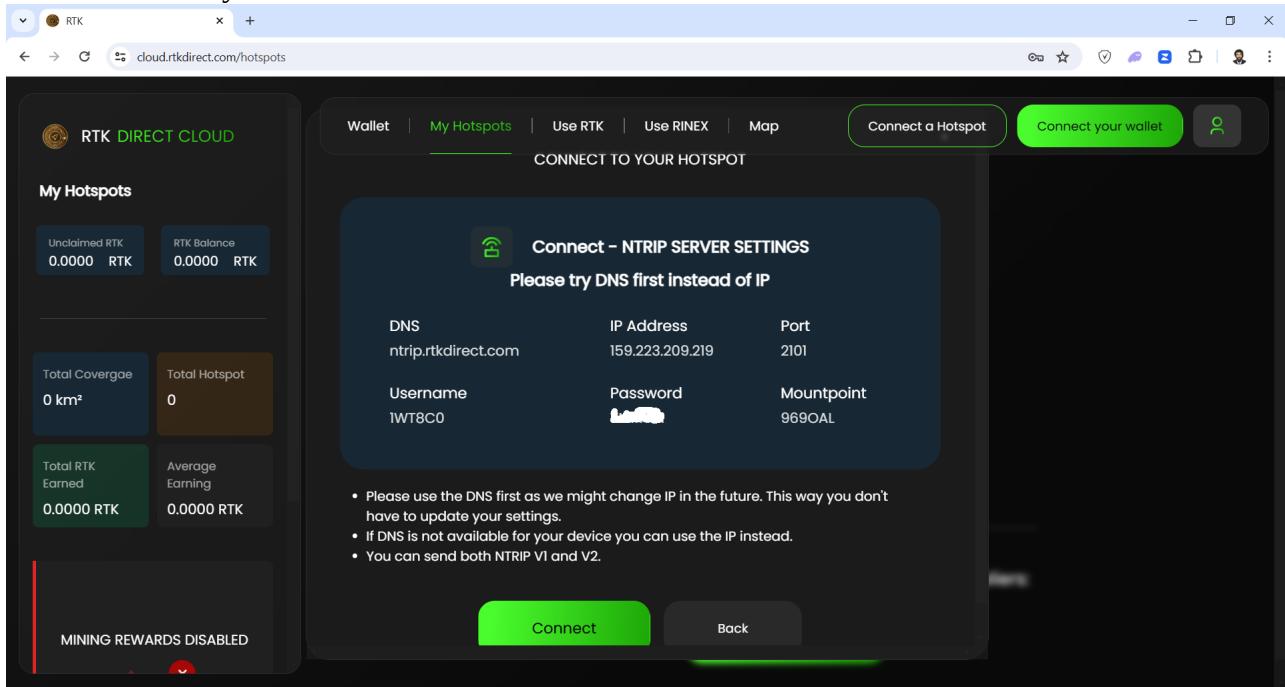
The screenshot shows the RTKBase settings page after saving changes, with all services turned off:

- Services:**
  - Main service: Off
  - Ntrip A service: Off
  - Ntrip B service: Off
  - Ntrip Caster service: Off
  - RtcM tcp service: Off
  - RtcM serial service: Off
  - File service: Off
- System Settings:**
  - Rtkbase 2.5.0: Check update
  - Change Password:
    - New: (empty)
    - Confirm: (empty)

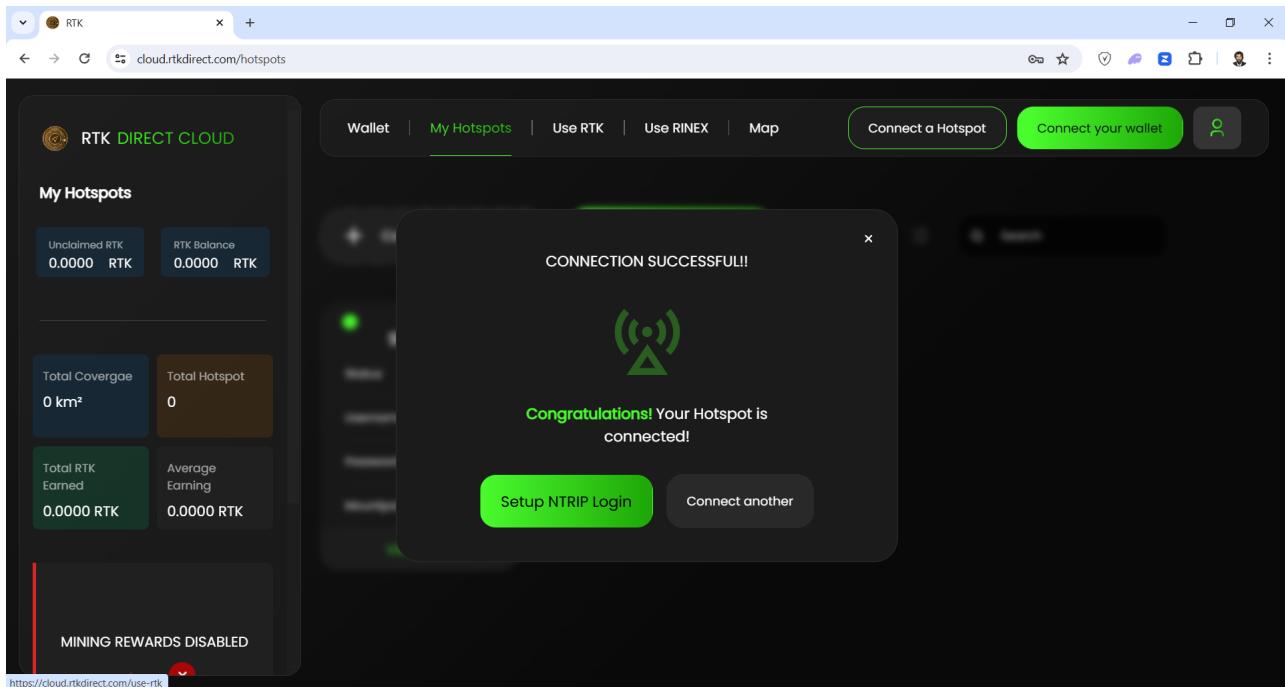
**Change password** button is visible at the bottom right.

# Connection

Now we are ready. Click **Connect** and wait for the connection.

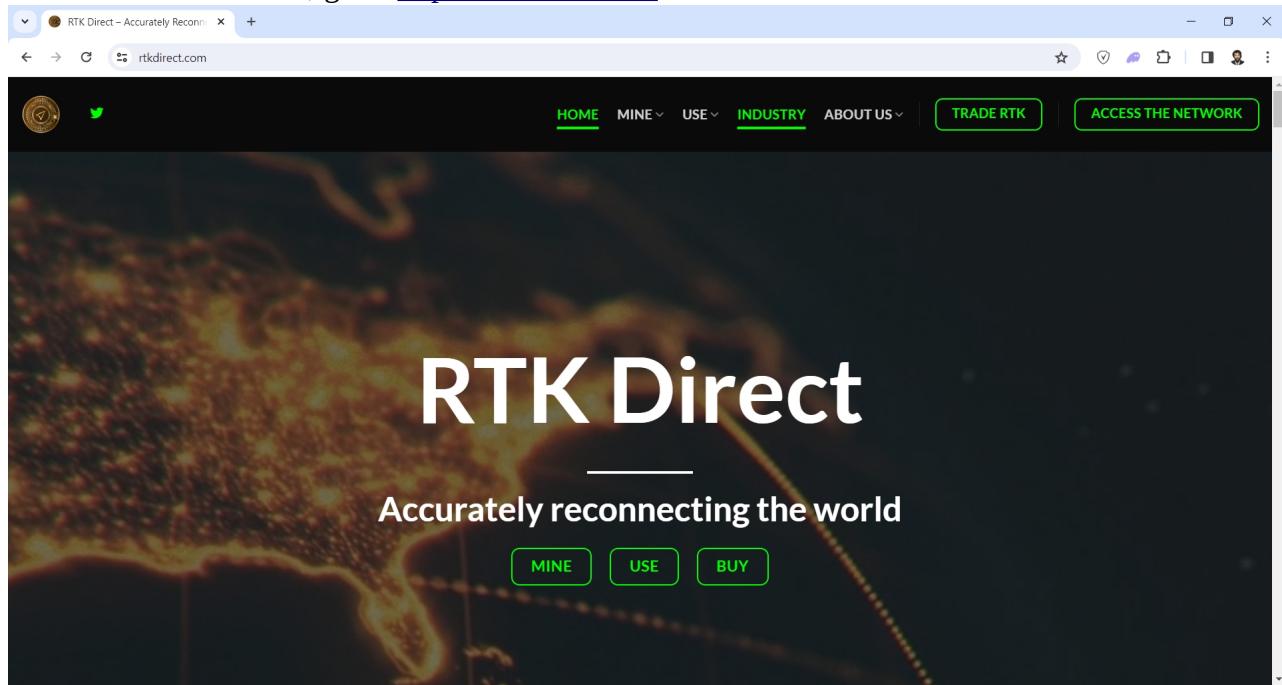


The connection was successful. Click “**Connect another**”.

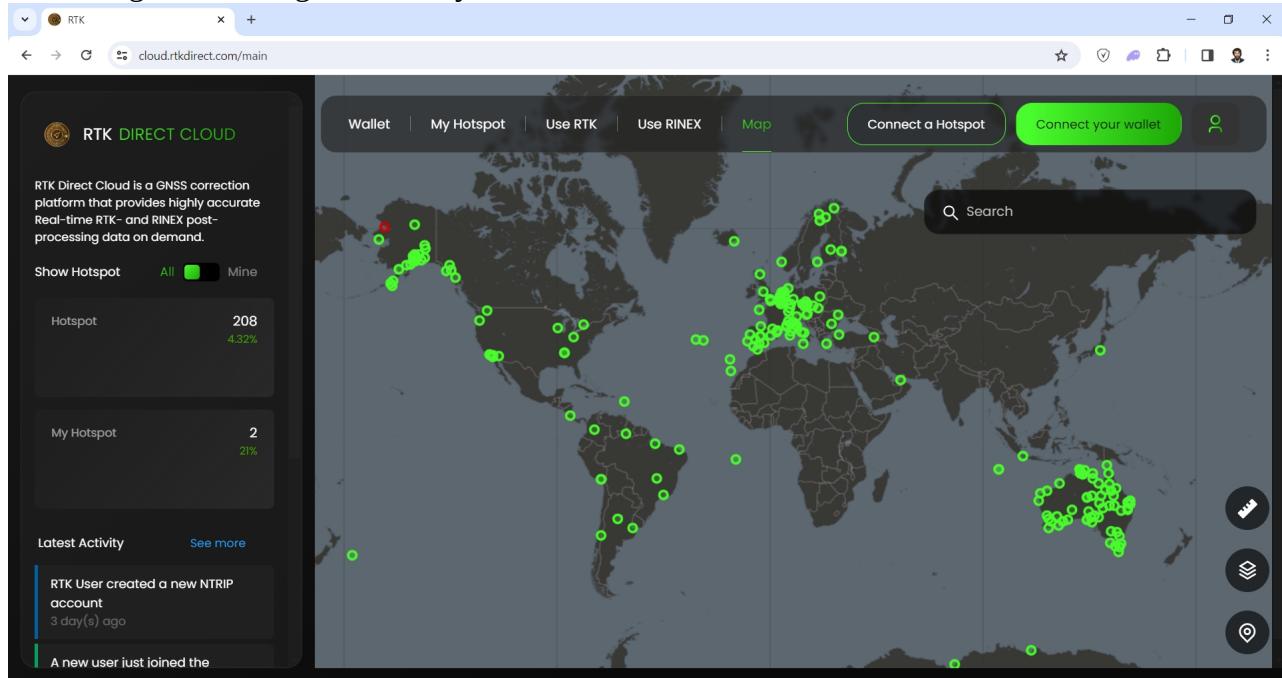


# Choosing a Wallet

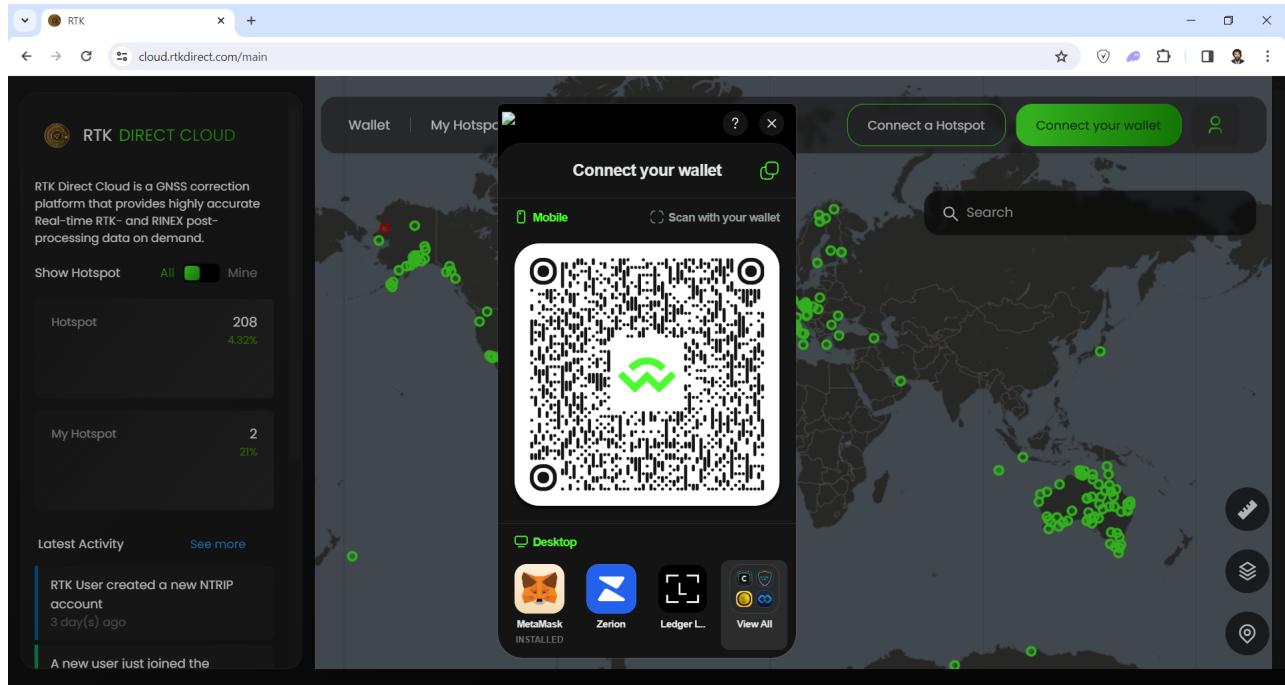
Start from scratch. First, go to <https://rtkdirct.com> and click the “Access The Network” button.



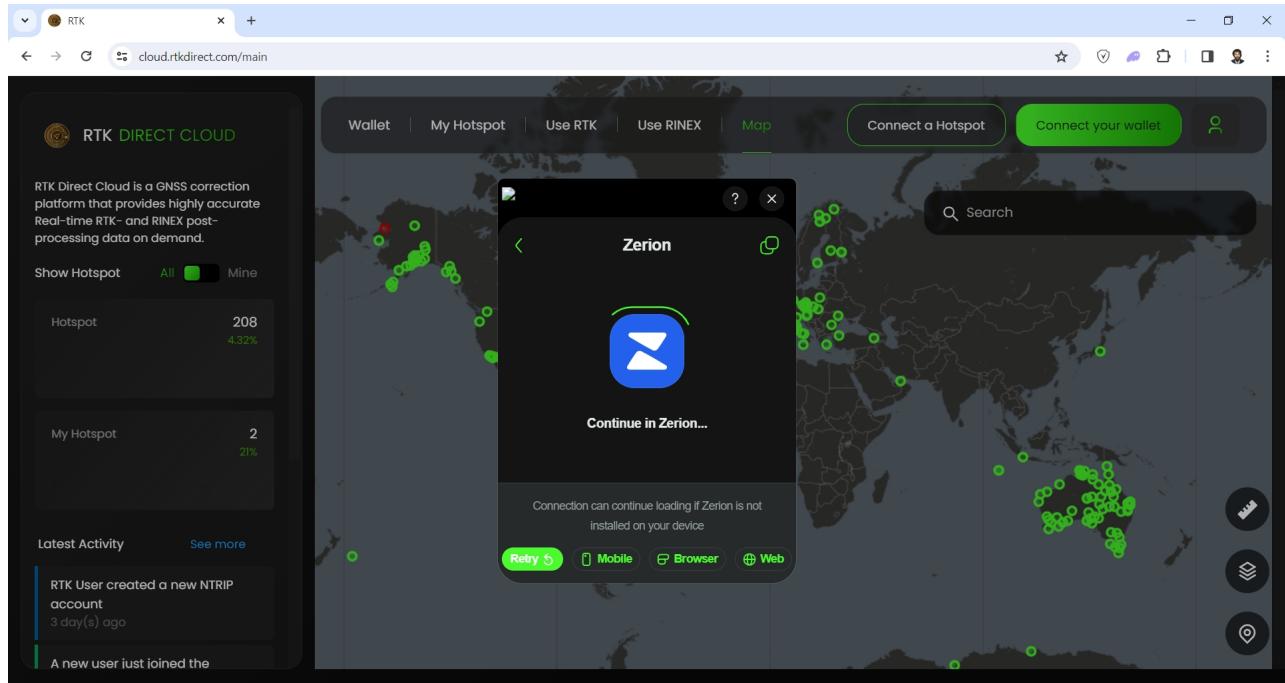
Click the green enticing “Connect your wallet” button.



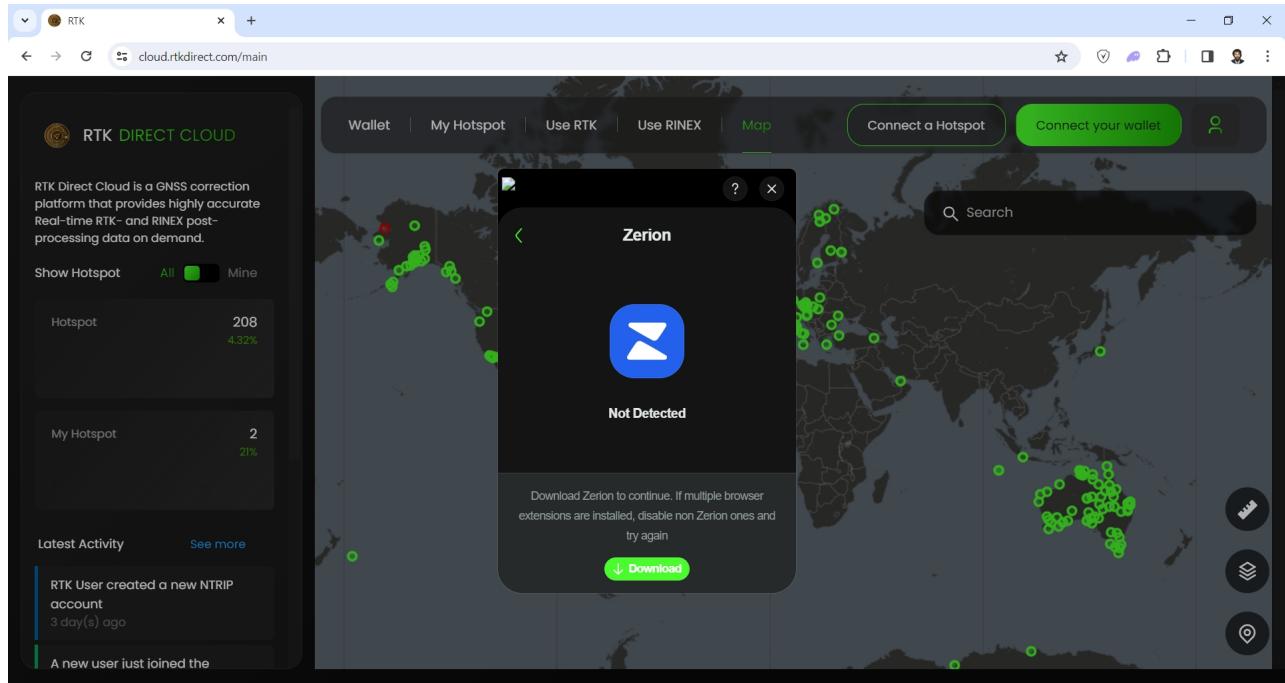
Select the **Zerion** wallet and click on it.



It tries to connect, but we do not have a wallet. Therefore, click the **Browser** button.

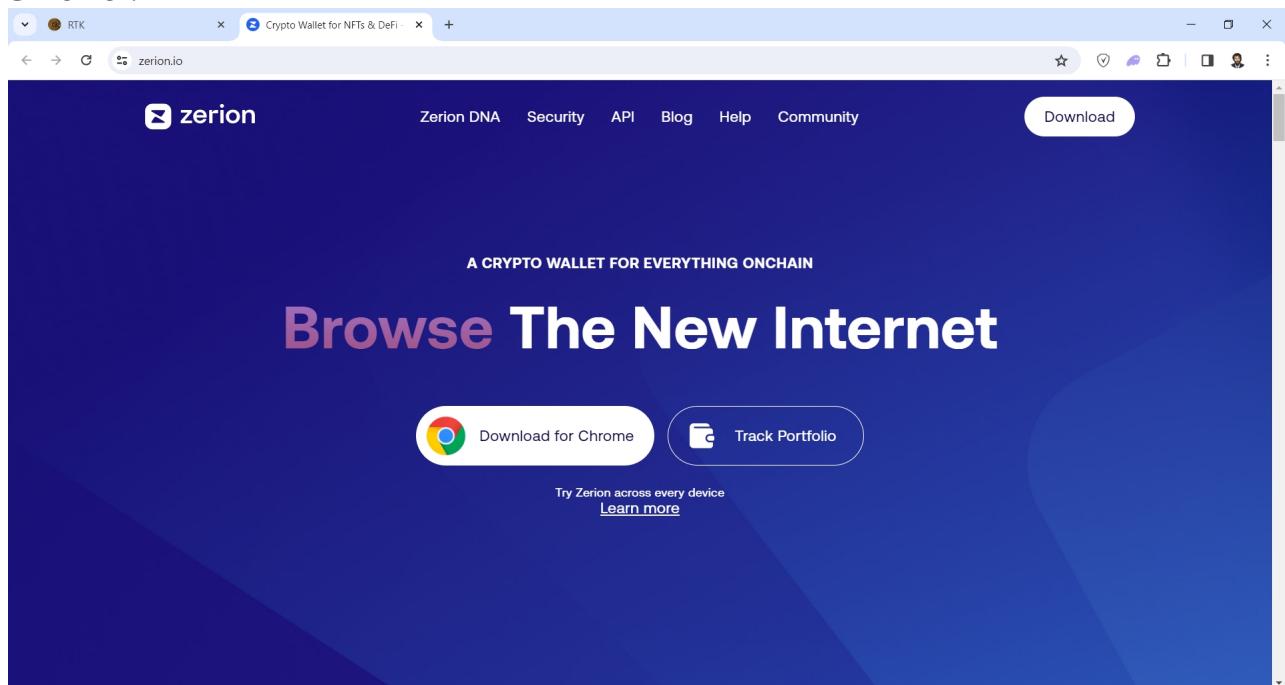


## Click Download.

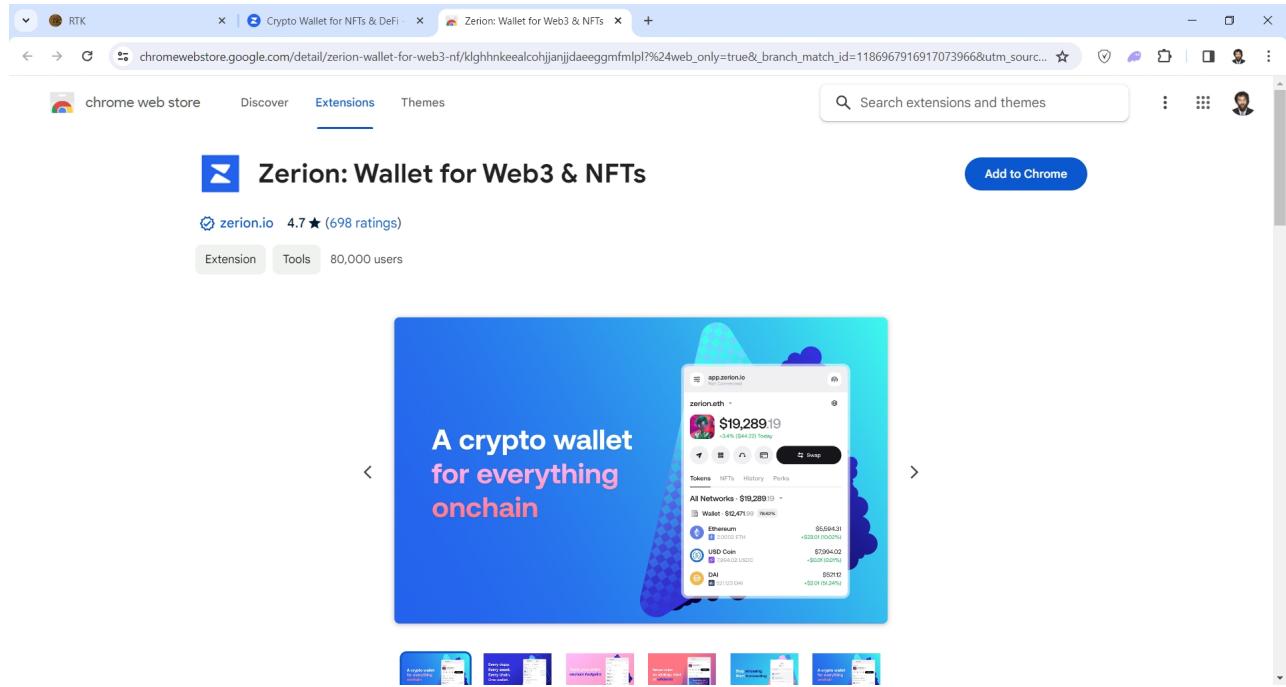


## Installing the Wallet

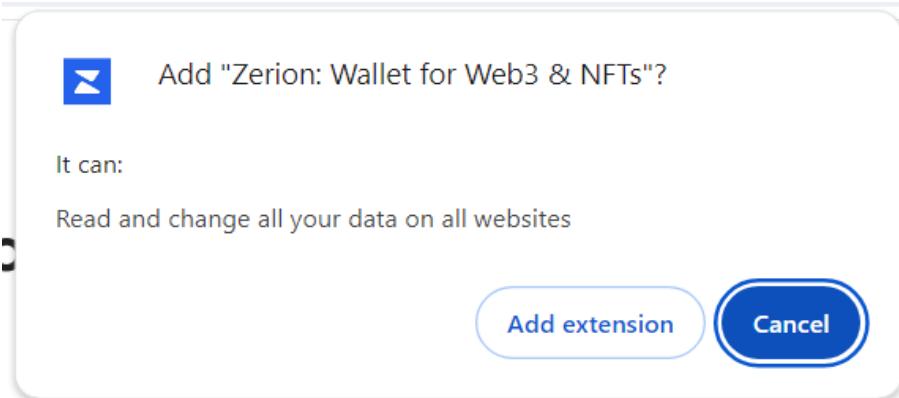
After performing the previous section, go to the **Zerion** wallet installation and click “**Download for Chrome**”.



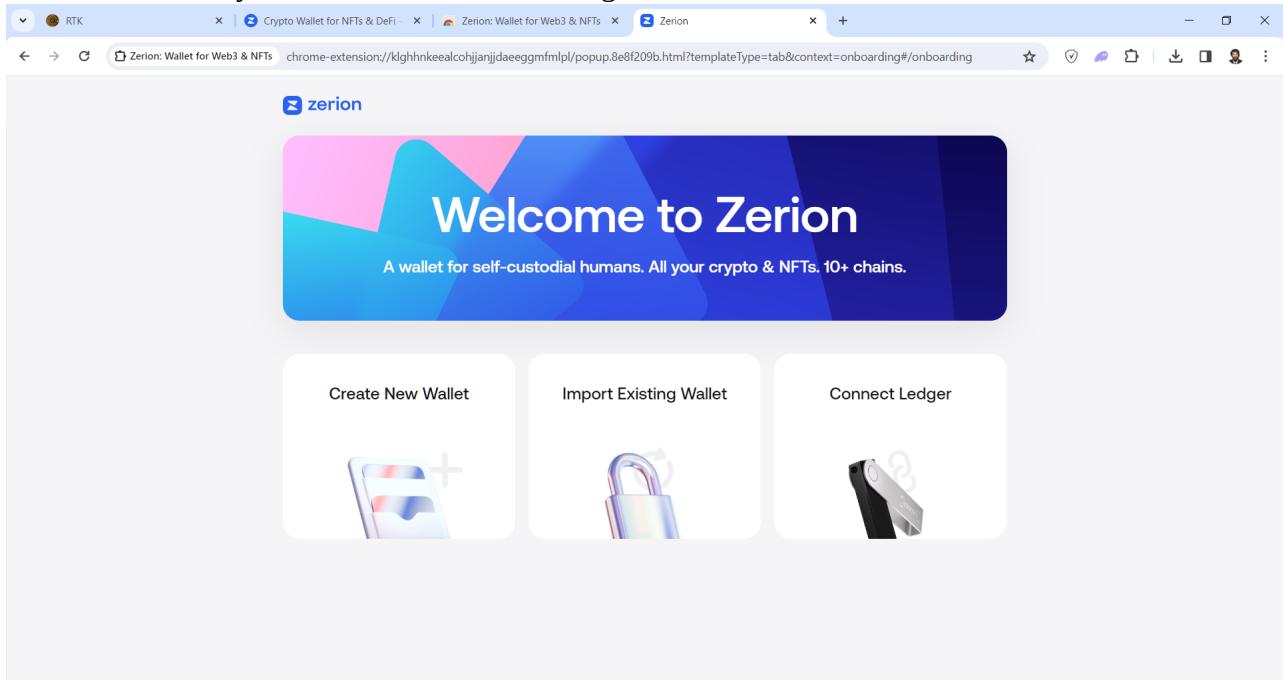
Click “Add to Chrome”.



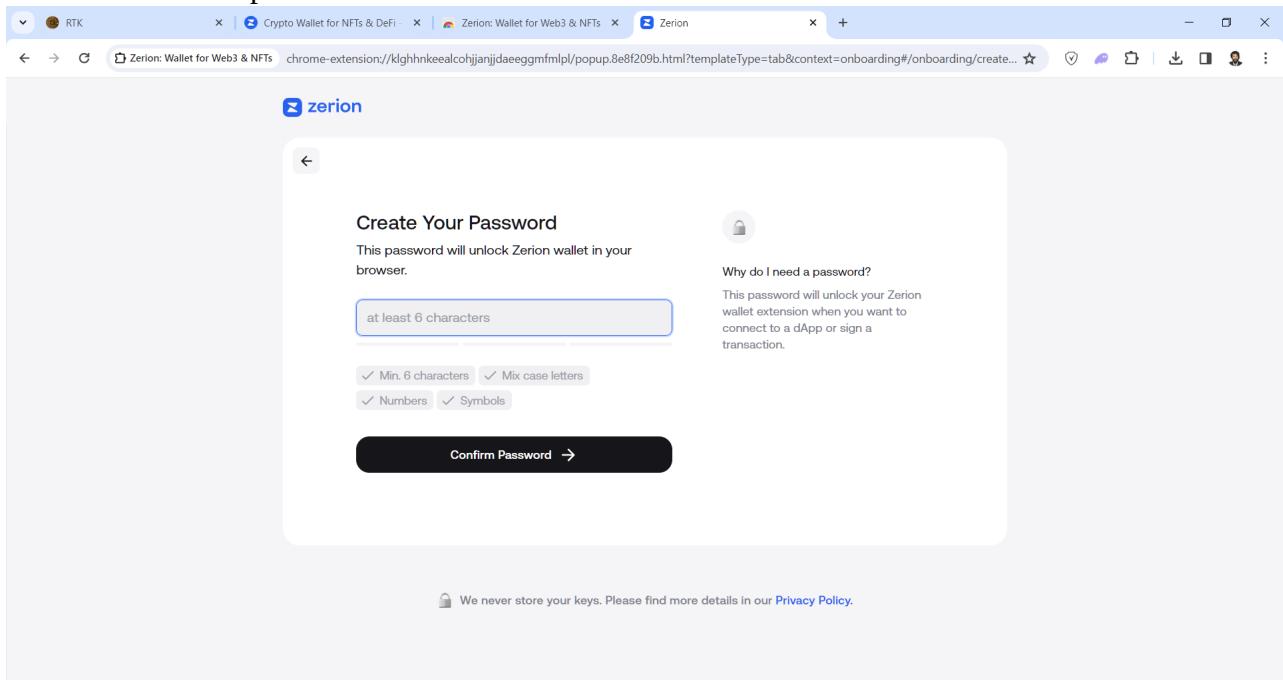
Allow the installation of the extension by clicking “Add Extension”.



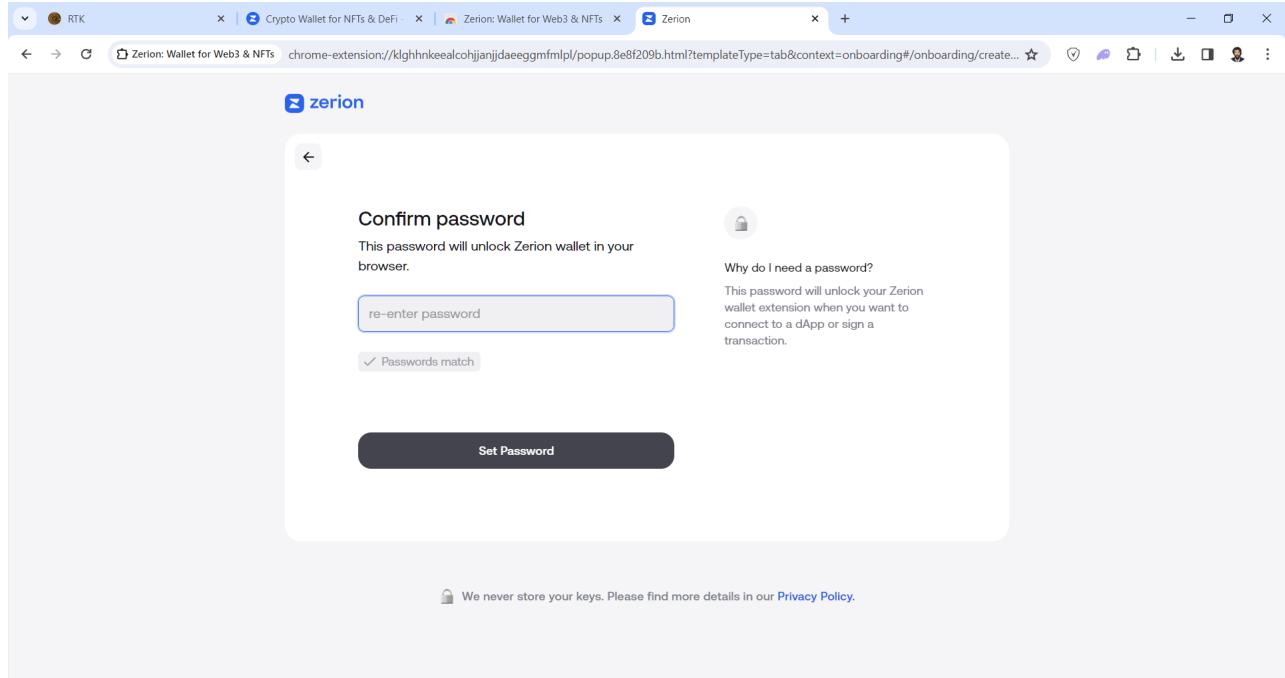
After installation, you will see the wallet management screen. Click “Create New Wallet”.



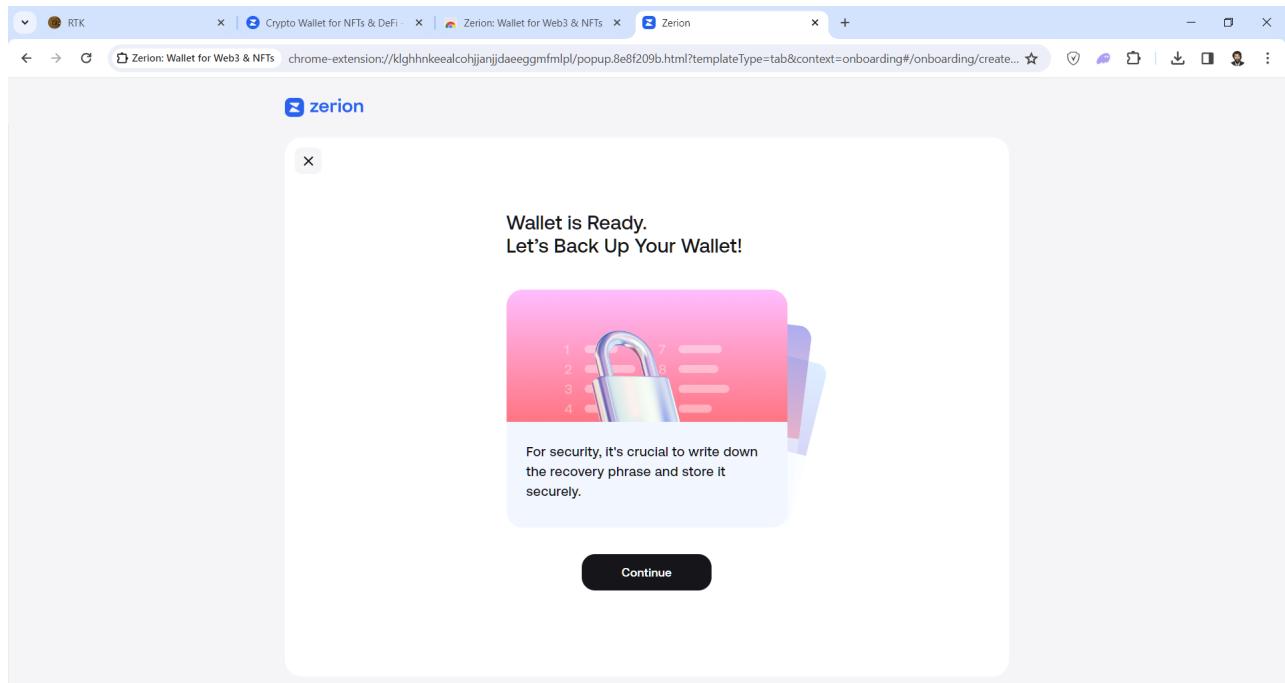
Create and enter a password.



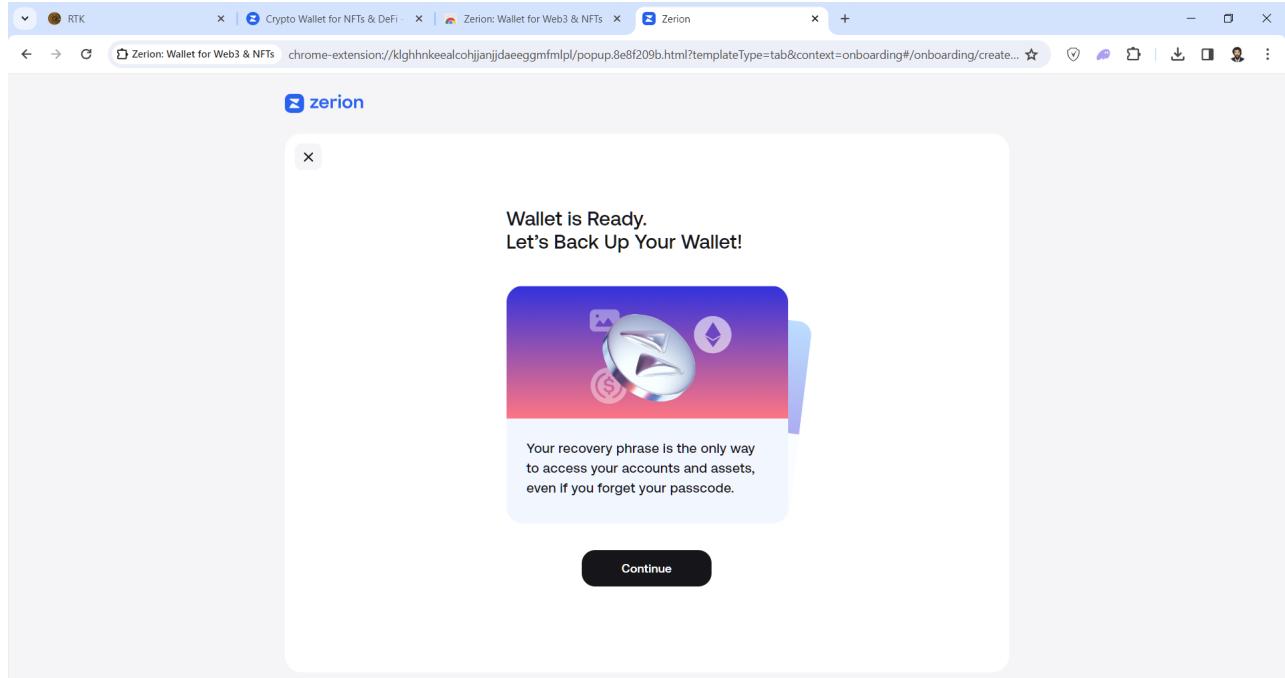
## Repeat the password.



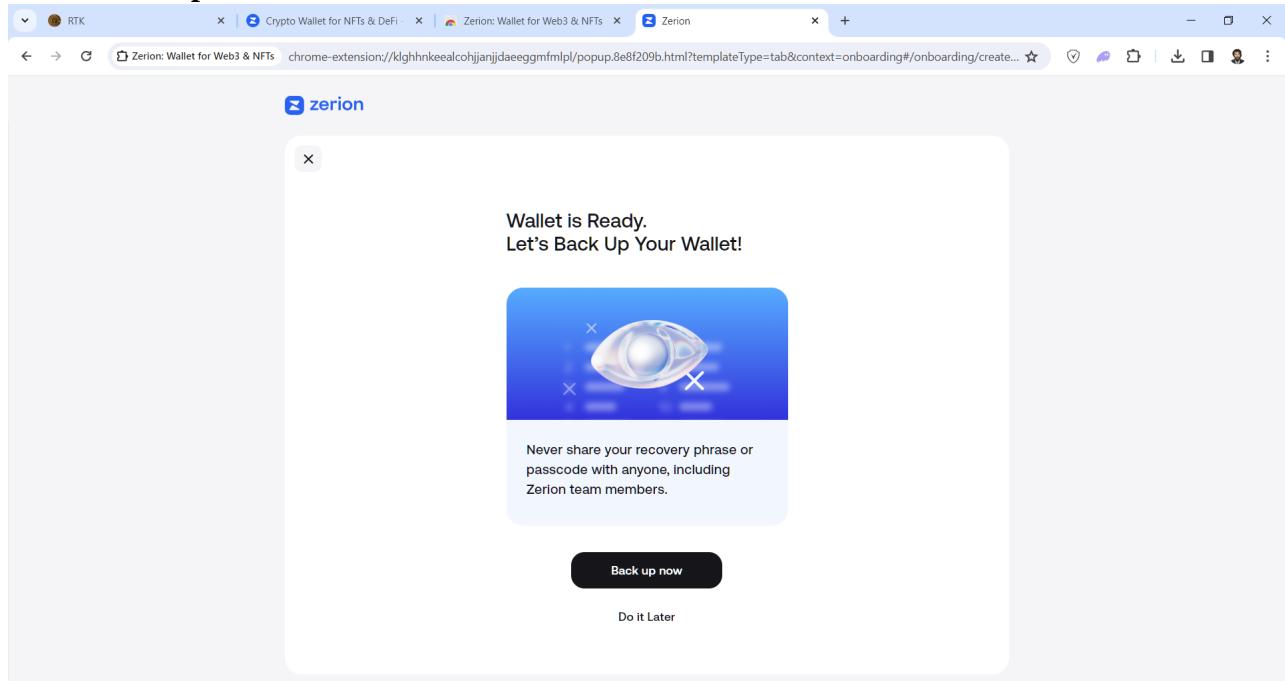
The wallet is created. Click **Continue**.



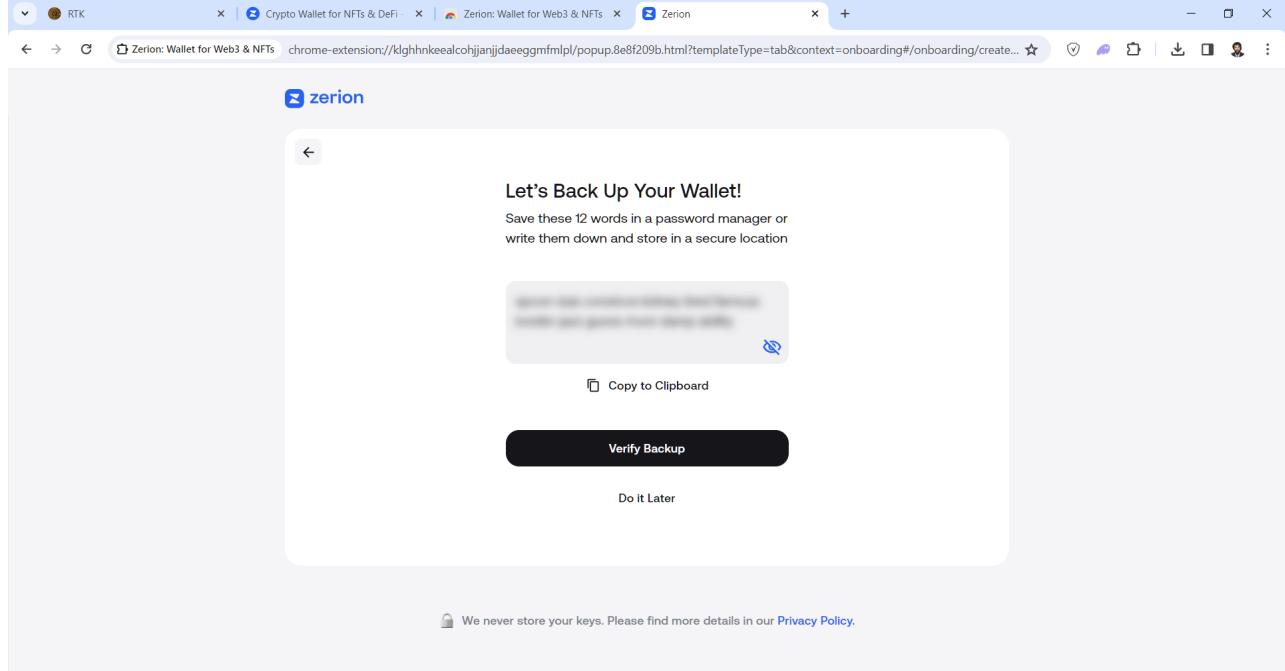
**Click Continue again.**



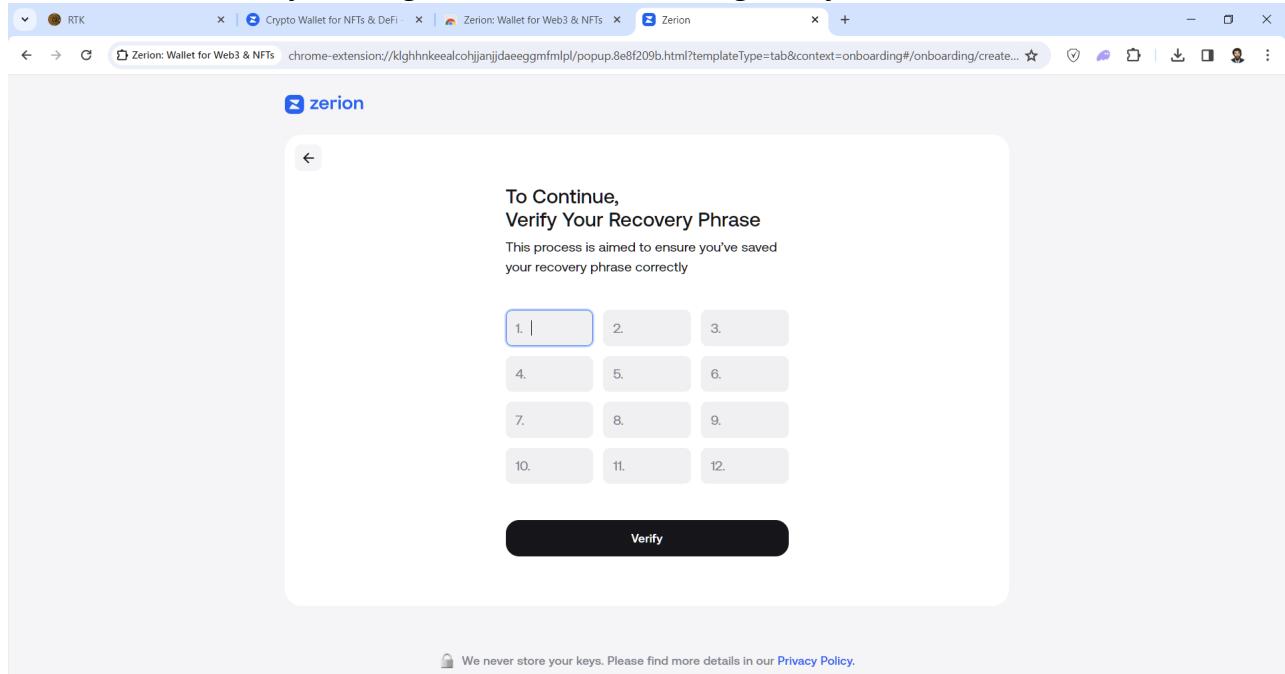
**Click “Back up now”.**



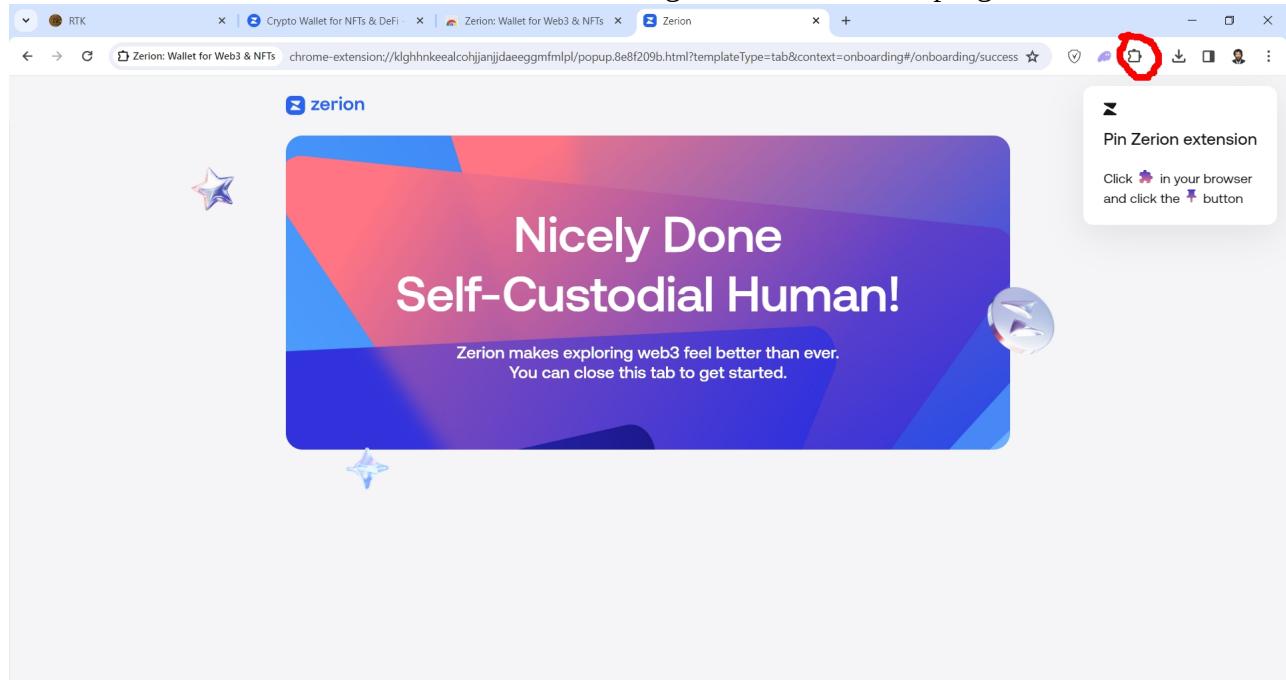
Get a list of 12 words that must be saved. Click “**Copy to clipboard**” and save it to **Notepad**. Click “**Verify Backup**”.



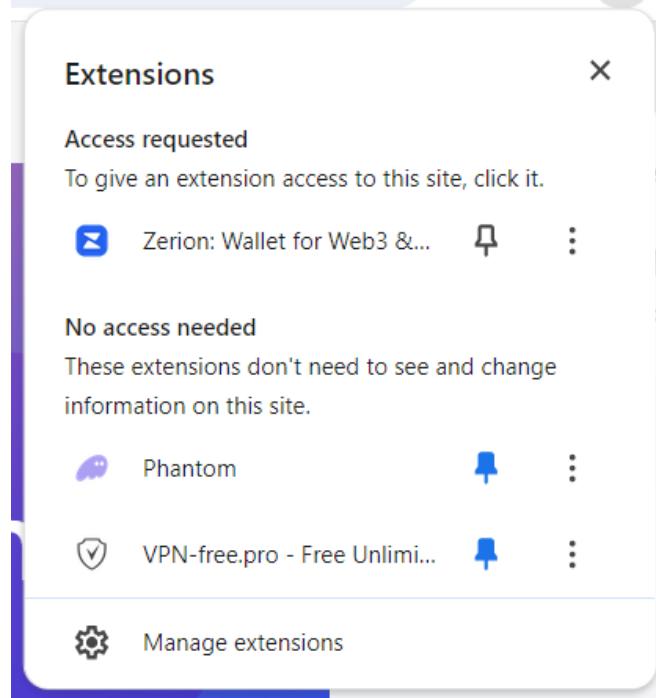
Perform verification by entering all 12 words and clicking **Verify**.



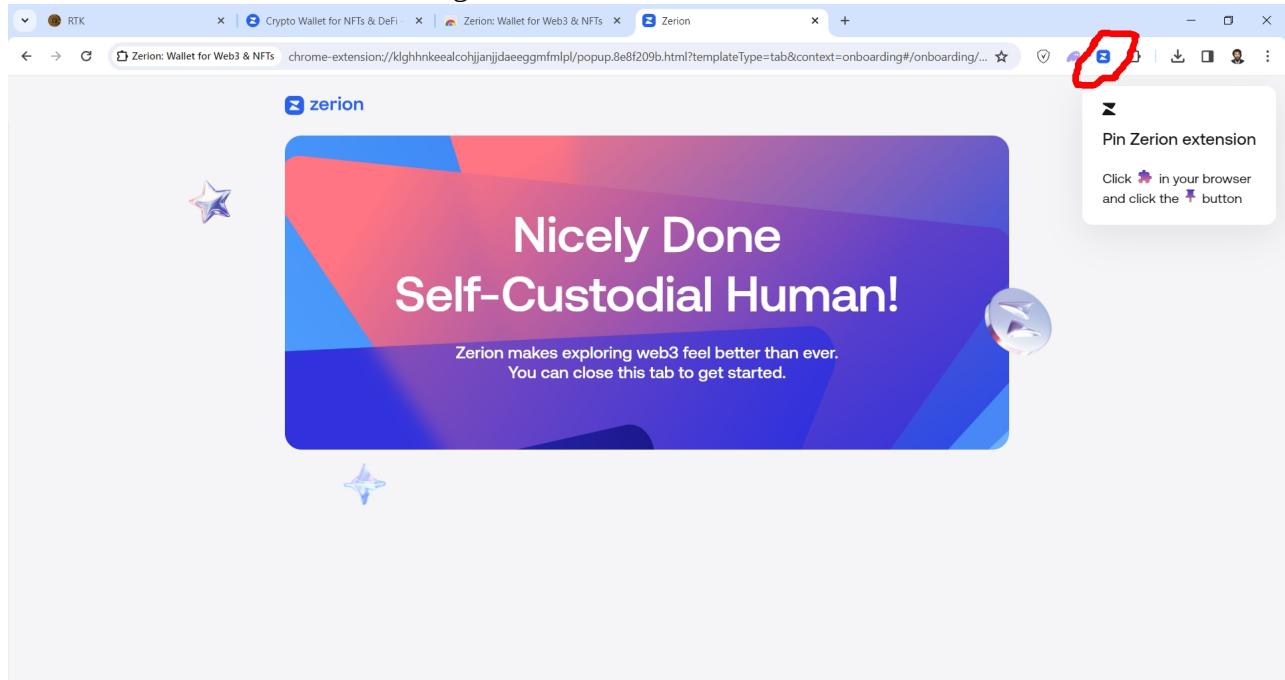
Verification is successful. Click the extension management icon at the top right.



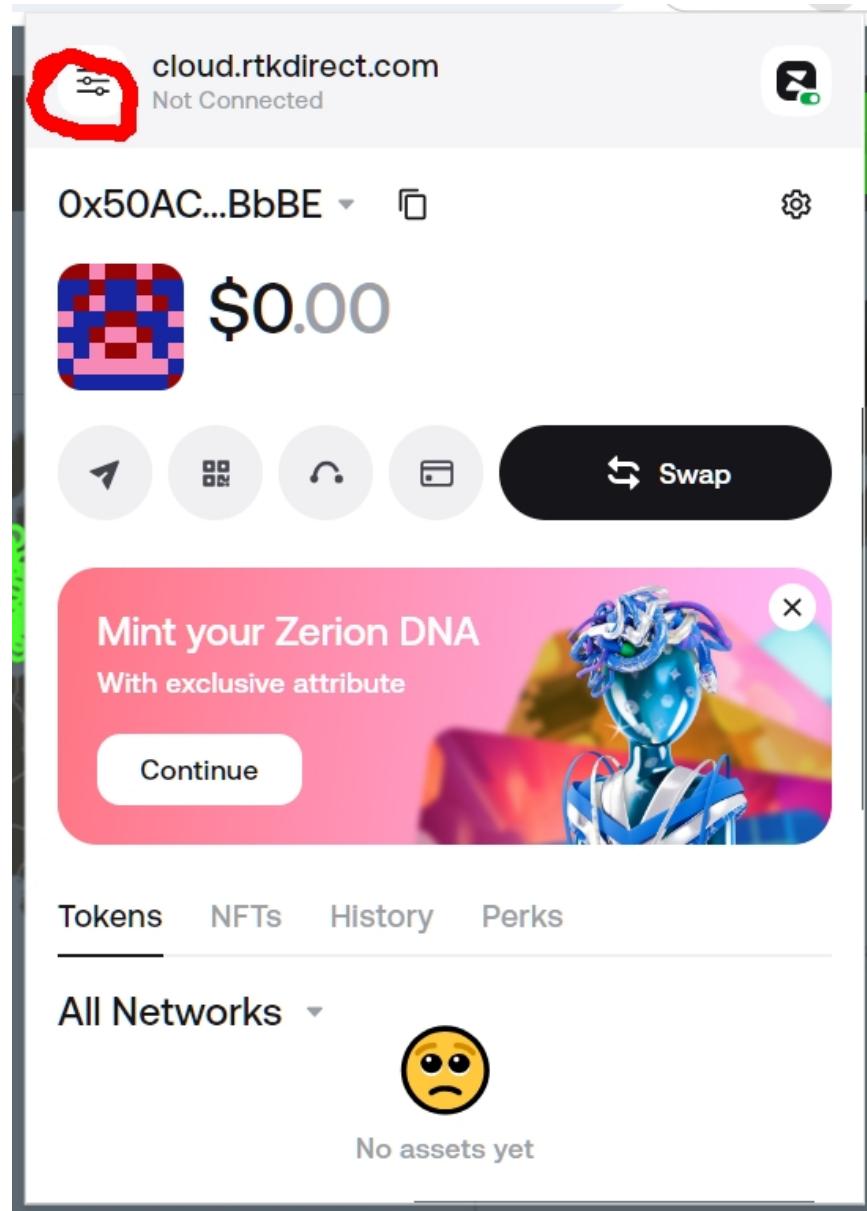
In the extension management window, click the button next to **Zerion**.



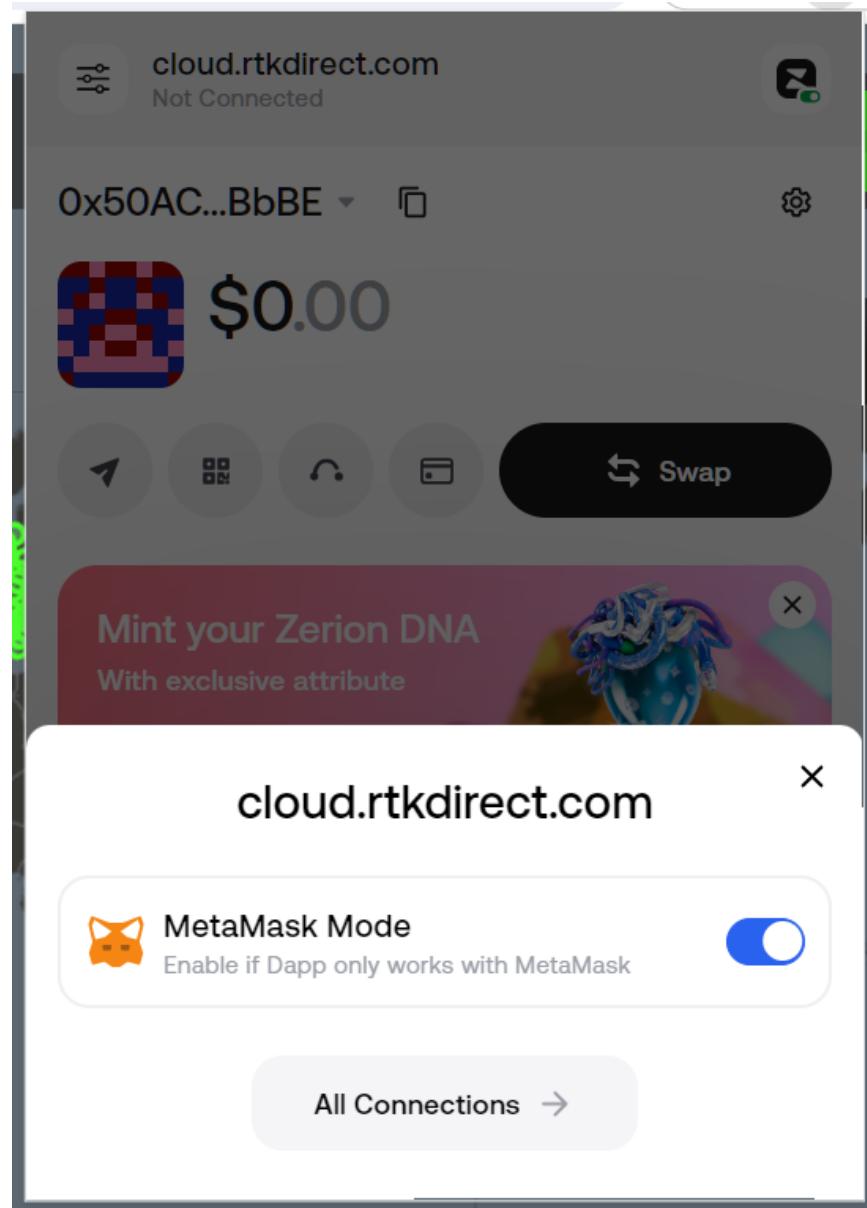
You will see the **Zerion** icon among the extensions.



Click on it to see the settings button in the top left corner.

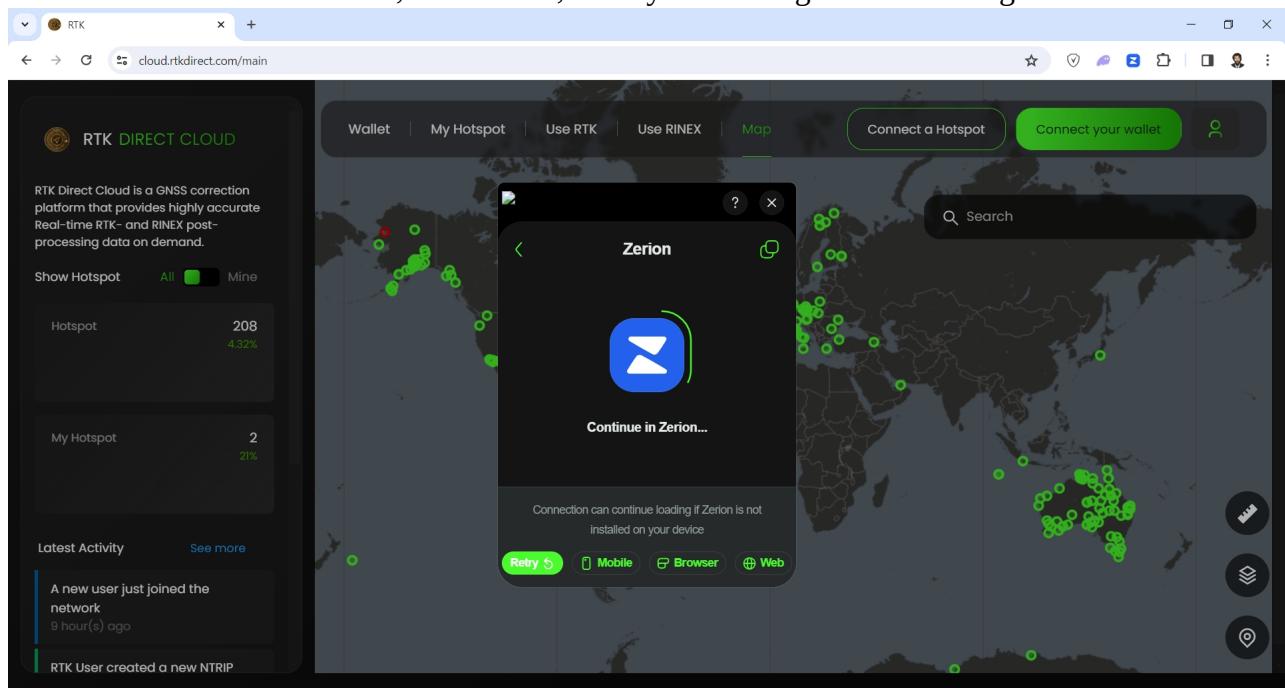


Click the settings button and disable the **MetalMask** mode.

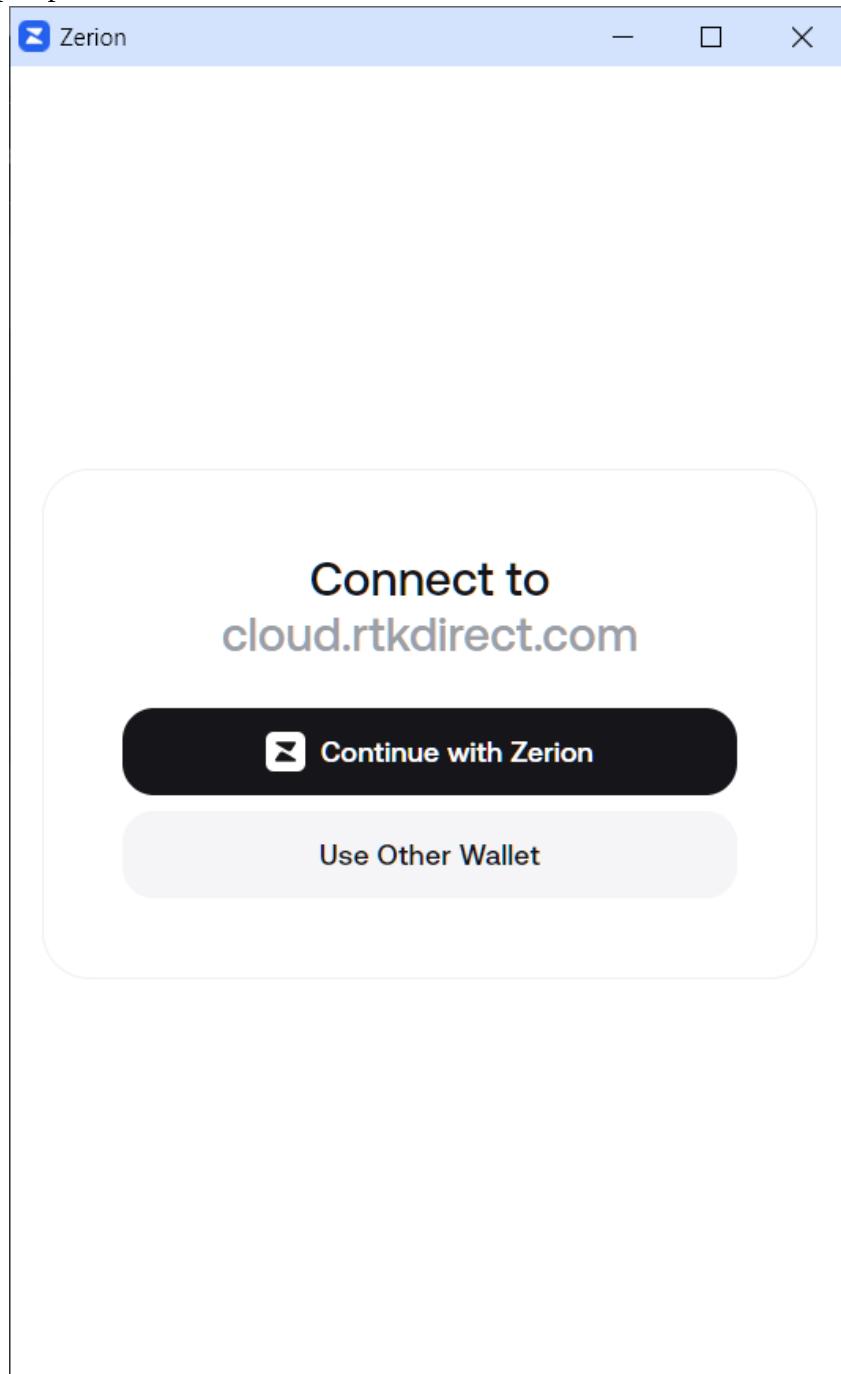


# Connecting the Wallet

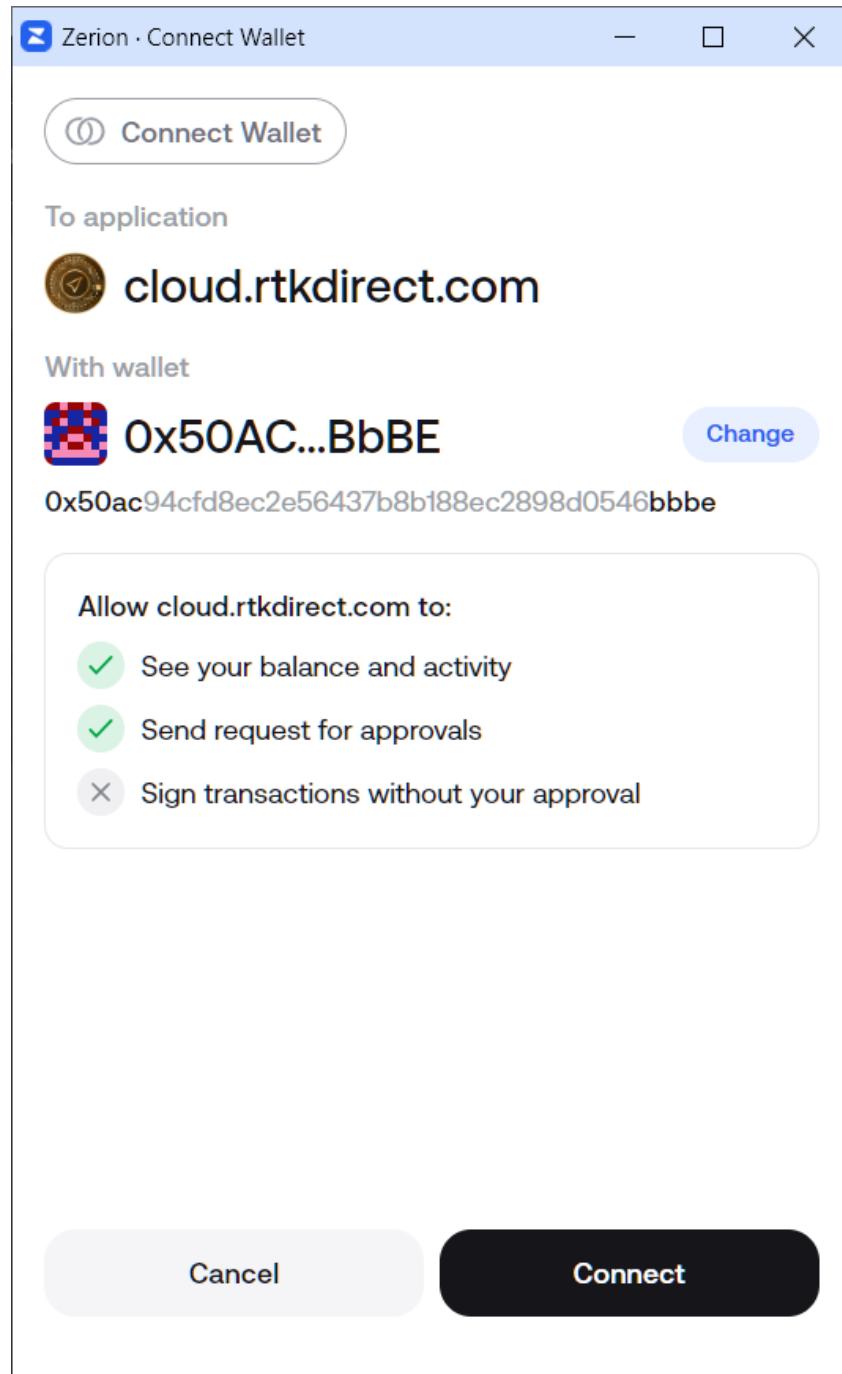
Close the wallet and extra tabs, return back, and try connecting with **Zerion** again.



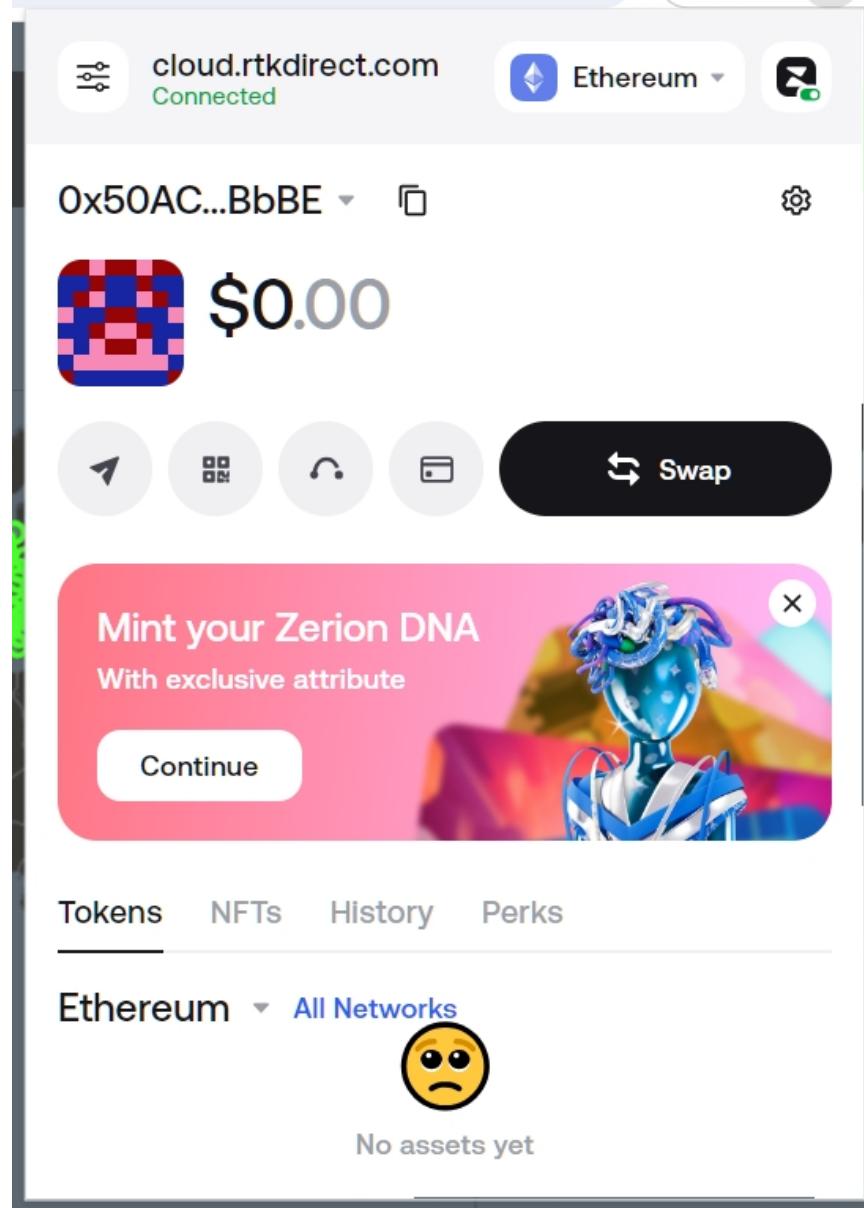
The window pops up, click “**Continue with Zerion**”.



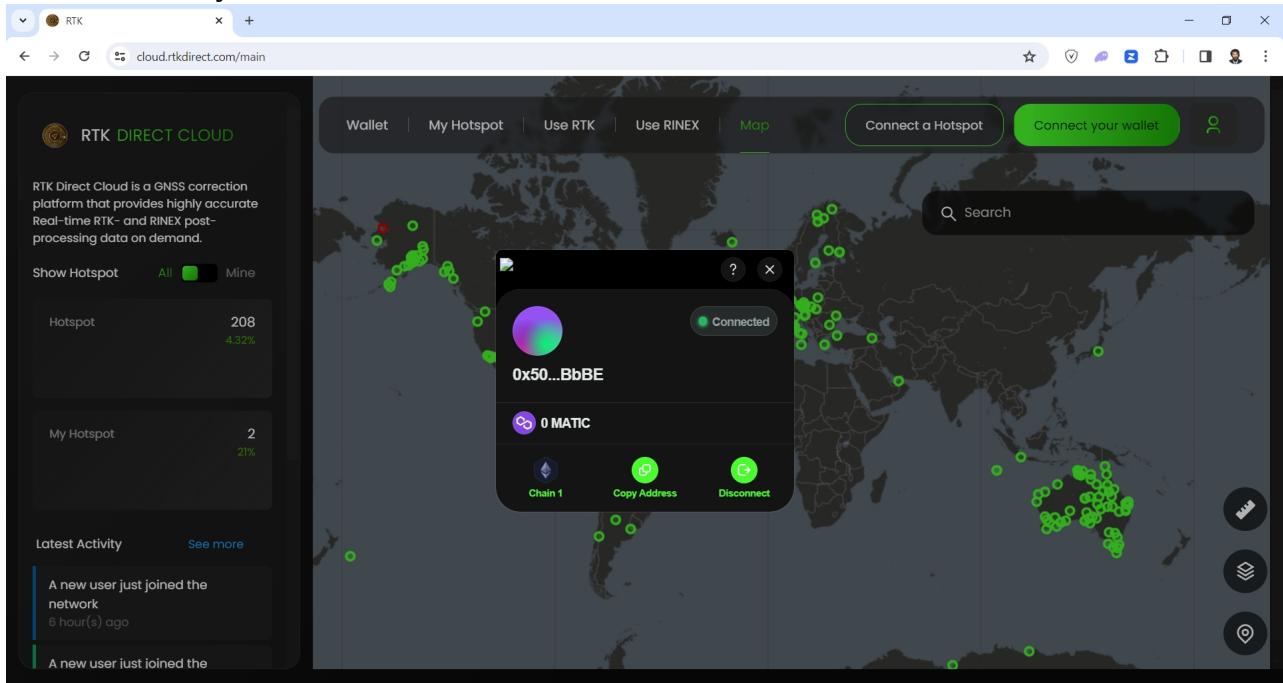
In the next window, click **Connect**.



Check the drop-down wallet window by clicking the extension icon at the top right — the connection is visible.



Click “Connect your wallet” — the connection is visible.

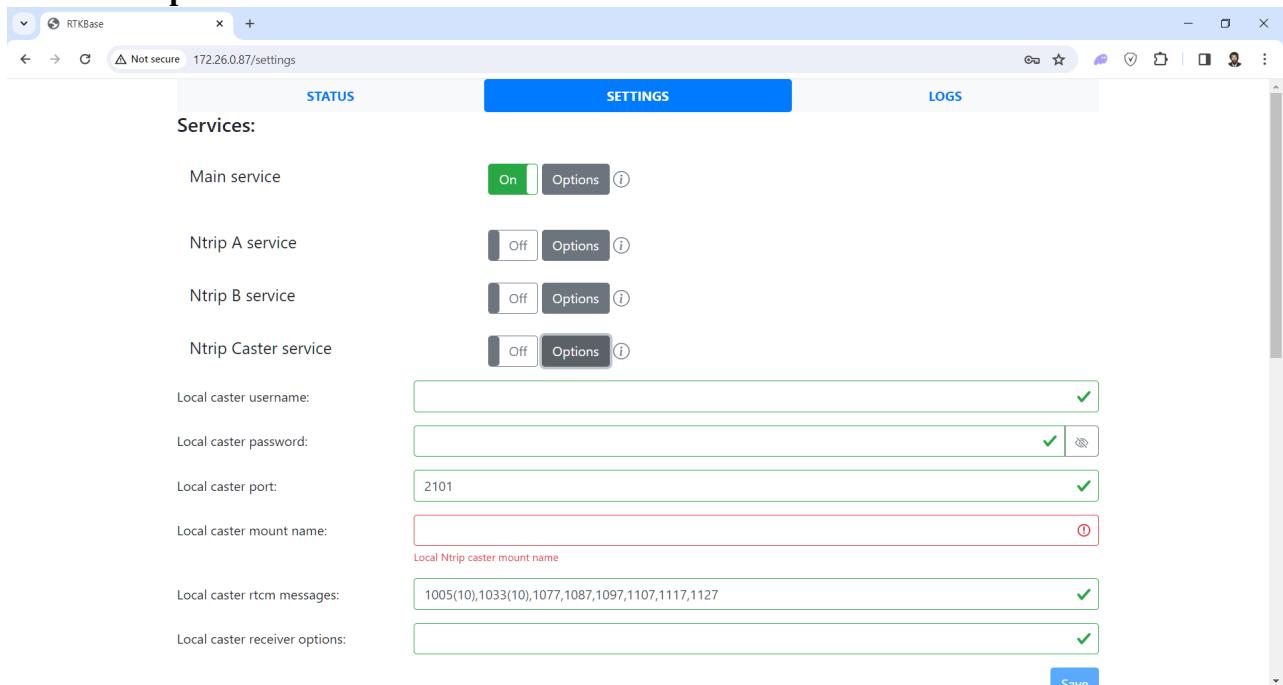


## Other

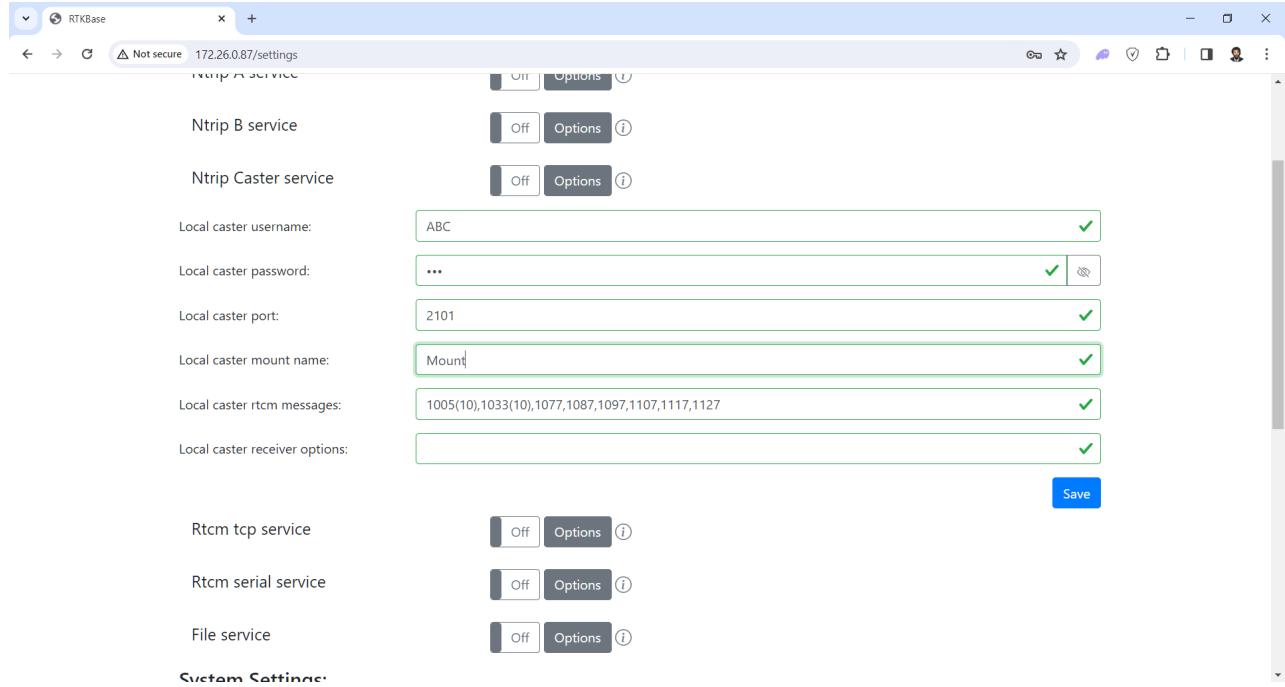
### NTRIP Caster Setup

**NTRIP Caster** is a mechanism for distributing data from the base receiver. Typically, **NTRIP Source** transmits data from the receiver to the **NTRIP Caster**, and the **NTRIP Caster** distributes data from various receivers to several rovers. **RtkBase** has a simple **NTRIP Caster** that allows you to avoid additional (external) **NTRIP Caster**.

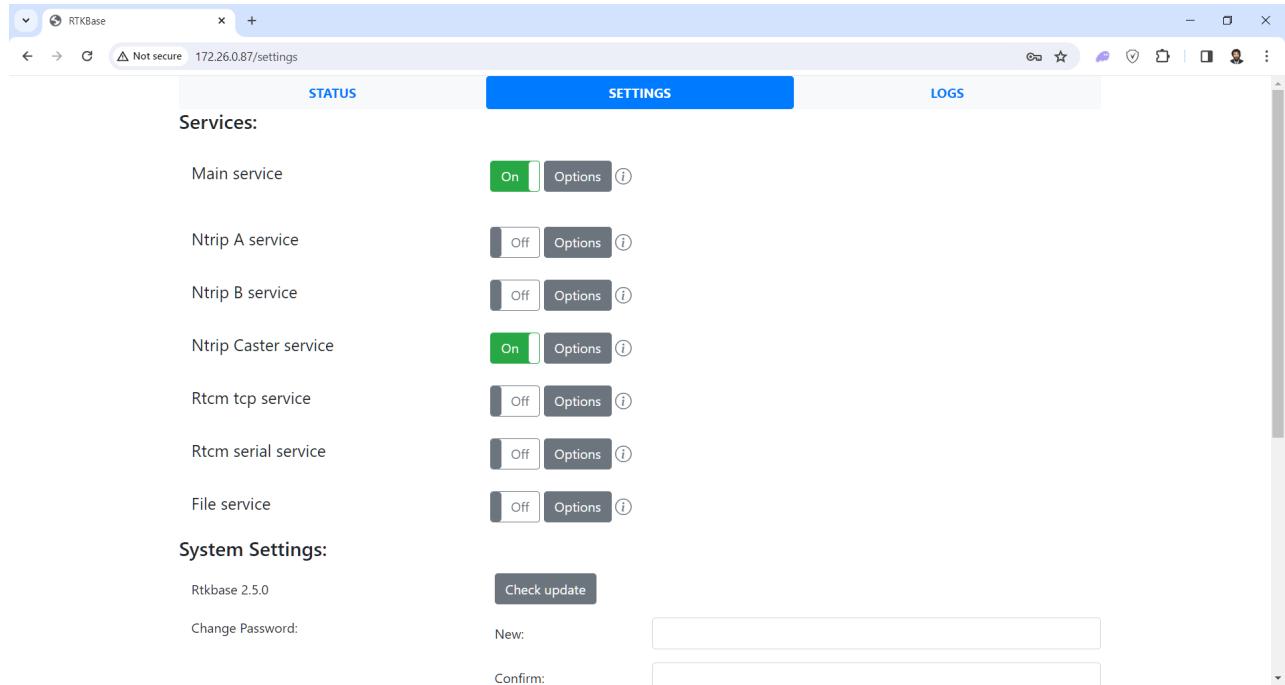
To make **RtkBase** work as an **NTRIP Caster**, go to the **Settings** page and click the **Options** button next to “**Ntrip Caster Service**”.



Enter the username, password, and mount point name, then click **Save**.



After that, close the settings with the **Options** button and turn on the **NTRIP caster** by clicking the **Off** button.



## RTCM3 Proposals

In the settings of all services, except for **Main** and **File**, there is a list of transmitted **RTCM3** proposals. After the proposal number, you can specify the period (time in seconds between proposal transmissions) in parentheses. This is especially relevant for the caster.

The **Unicore** receiver transmits the following proposals:

1. Base coordinates: 1005 and 1006
2. Antenna name: 1007 and 1033
3. Ephemerides: 1019 (GPS), 1020 (Glonass), 1042 (Beidou), 1044 (QZSS), 1045 (Galileo FNAV), 1046 (Galileo INAV)
4. Measurements **MSM7**: 1077 (GPS), 1087 (Glonass), 1097 (Galileo), 1107 (SBAS), 1117 (QZSS), 1127 (Beidou), 1137 (IRNSS)

The **Bynav** receiver transmits the following proposals:

1. Base coordinates: 1005 and 1006
2. Antenna name: 1033
3. Ephemerides: 1019 (GPS), 1020 (Glonass), 1042 (Beidou), 1044 (QZSS), 1046 (Galileo INAV), 1048 (IRNSS)
4. Measurements **MSM7**: 1077 (GPS), 1087 (Glonass), 1097 (Galileo), 1107 (SBAS), 1117 (QZSS), 1127 (Beidou), 1137 (IRNSS)
5. Measurement offset information: 1230 (Glonass)

The **Septentrio** receiver transmits the following proposals:

1. Base coordinates: 1005 and 1006
6. Antenna name: 1007 and 1033
7. System Parameters: 1013
8. Ephemerides: 1019 (GPS), 1020 (Glonass), 1042 (Beidou), 1044 (QZSS), 1045 (Galileo FNAV), 1046 (Galileo INAV)
9. Measurements **MSM7**: 1077 (GPS), 1087 (Glonass), 1097 (Galileo), 1107 (SBAS), 1117 (QZSS), 1127 (Beidou), 1137 (IRNSS)
10. Measurement offset information: 1230 (Glonass)

## TCP Client Setup

If you write **TCP** in the mount point and password fields in the **NTRIP** service settings (either **A** or **B**), it will connect as a **TCP** client instead of an **NTRIP** client.

Thus, our equipment can act as both a **TCP** Server (see “Important Requirements”) and a **TCP** client.

## Troubleshooting

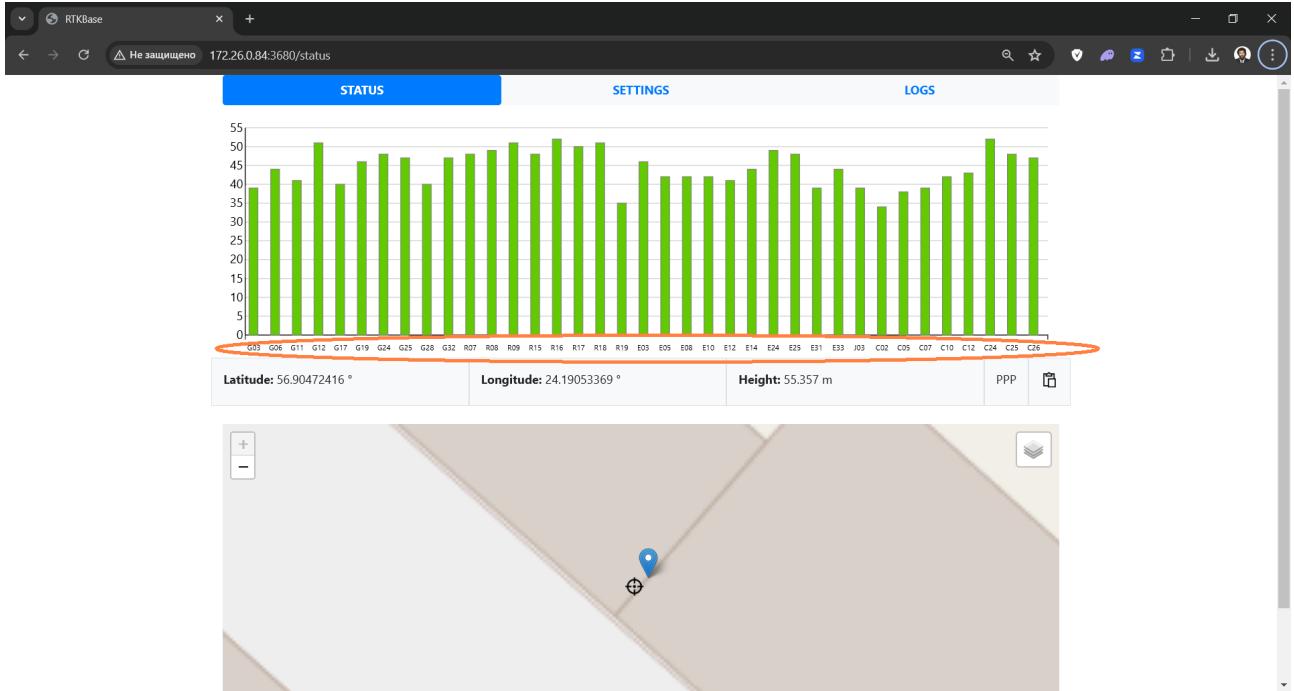
### Detecting Issues on the Status Page

To check for issues, go to the **Status** page.

First, look at the names of the received satellites. You should see satellites labeled **G (GPS)**, **R (Glonass)**, **E (Galileo)**, **C (Beidou)**. Additionally, you may see satellites labeled **J (QZSS)**, **I (IRNSS)**, **S (SBAS)**. If you have a **Unicore** receiver and see only **C (Beidou)** satellites, the problem lies in incorrect coordinates (more than 50 meters off from the true coordinates) in the main service settings. In other cases, it is likely due to incorrect receiver settings.

Next, check the number of received satellites. Typically, 40-50 satellites are received, which is more than the 36 visible on the screen. If there are fewer satellites, consider the length and quality of the antenna cable and the correctness of the antenna installation.

Then, look at the signal strength of the received satellites. If most are above 35, and some are above 50, it indicates good reception quality. If not, there may be issues with the length and quality of the antenna cable and its proper connection to the connectors.



Now, let's look at the middle section. If, despite having a good satellite signal, the coordinates remain zero for more than 15 seconds, the issue lies in the receiver settings. In this case, configure the receiver as described in the “Configuration” section.

Finally, the bottom section with the map. The blue marker represents the current **PPP** solution, while the target represents the coordinates set in the base settings. About an hour after the solution begins, the blue marker should almost stop moving. If the blue marker continues to move significantly after an hour, it indicates multipath reception. This means the antenna is receiving not only direct signals from the satellites but also reflected ones. To correct this, it is recommended to use a **groundplane**, as described in [our blog](#).

## Receiver Problem Resolution

To check the connection with the receiver, perform detection as described in the “Detection” section. If the receiver is not detected the first time, it makes sense to repeat the operation. If the receiver is not detected twice in a row, it means the program has no connection with the **GNSS** receiver, the receiver is not operational, or it is not powered.

The only method to resolve receiver issues is configuration, as described in the “Configuration” section. If the configuration fails, perform detection (since configuration resets the receiver speed) and repeat the configuration.

## Service Statuses

The service status can be blue, green, yellow, or red. Blue means “the service is in the process of starting up”, green means “everything is fine”, yellow means “the service is running with errors”, and red means “the service is not running”.

The screenshot shows the RTKBase web interface with the URL 172.26.0.84:3680/settings. The interface has three tabs: STATUS, SETTINGS (which is selected), and LOGS. Under the STATUS tab, there is a section for Services and another for System Settings.

**Services:**

- Main service: On (yellow)
- Ntrip A service: On (green)
- Ntrip B service: On (green)
- Ntrip Caster service: Off (grey)
- Rtcm tcp service: On (green)
- Rtcm serial service: Off (grey)
- File service: Off (grey)

**System Settings:**

- Rtkbase 2.5.0: Check update button
- Change Password:
  - New: [empty input field]
  - Confirm: [empty input field]
  - Change password button (blue)

The main reason for a yellow status is parameter errors. For “**main service**”, there are several common reasons for a yellow status:

- A speed other than the allowed **115200:8:n:1, 230400:8:n:1, 460800:8:n:1, 921600:8:n:1**.
- Coordinates more than 50 meters off from the true coordinates (only for **Unicore** receivers).
- Very rarely: receiver errors when changing speed or setting coordinates.

If you find an error in the settings, correct it and save the settings. The status should correct itself within a minute. If it is due to rare receiver errors, wait 5 minutes; they usually resolve on their own.

## Bug reports

Send bug reports to [support@gNSS.store](mailto:support@gNSS.store). Try to describe both the error manifestation and the history leading up to it as detailed as possible.

