Flying Neurons

Tracking

User Manual

Flying Neurons - Email (Support): contact@flyingNeurones.com Web: www.flyingNeurones.com

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Amendments

Version	Date	Description
1.0	26/05/2026	First drafted

Contents

This document details the installation, configuration and use of Flying Neurons' systems for tracking purposes.

Table of Contents

1 Tips and tricks

Check out the FAQs in the support section of the Flying Neurons website. Various tips are added regularly to make optimal use of tracking.

2 Presentation

The Neurone and MiniNeurone allow you to track all kinds of vehicles or objects by radio over a long distance. No network is used to convey position information, which allows it to operate anywhere without any constraints.

The **Neurone** can play a double role. It can be placed on the vehicle or object to be tracked or used as a receiving station. It has an internal battery.
Used as a tracker, its emission period is 1 second.
Used as a receiving station, the Neurone receives the position information of all MiniNeurones and Neurones and transmits it via Bluetooth to the smartphone or tablet.

Associated with **NeuroEthernet**, the Neurone can send all these received positions to any server on the Internet.

Pressing one of the two buttons on the Neurone triggers an End of Flight (RDT) or turns flashes on or off on aircraft equipped with MiniNeurones.

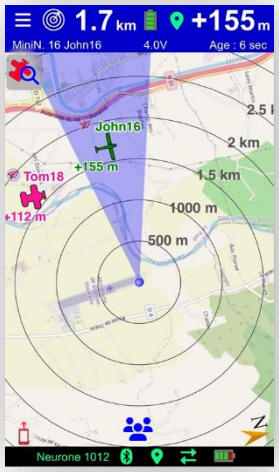
The **MiniNeurone** is ultra-miniaturized and weighs 2.7 grams. It is particularly suitable for model aircraft, drones, etc. Its small size and very low weight allow it to be placed on extremely light aircraft. Unlike the Neurone, it does not have an internal battery and therefore requires an external power supply.

It allows the remote control of the end of the aircraft's flight, either by direct control of a servomotor, or, in the case of Free Flight model aeronautics, by direct control of the electronic timer. Remote flash control is also possible.

The MiniNeurone incorporates an altimeter that allows altitude curves to be recorded as part of the Free Flight model aeronautics. These altimetry curves are dated to the nearest second and are associated with a precise location.

As part of the Free Flight competitions, the MiniNeurone altimeter is EDIC certified by the FAI.

The MiniNeurone periodically radios its position. The periodicity of transmission depends on the movement of the aircraft.

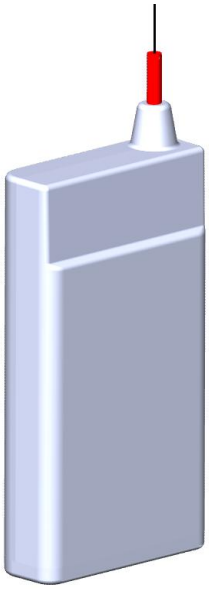


The **NeuroTrack** app has two main functions. It allows you to:

- Configure Neurones and MiniNeurones.
- Display the position of all Neurones or MiniNeurones. It is possible to select a particular one and visually track its heading, distance and altitude. The application also allows you to reread altitude histories.

Note that the Smartphone or tablet does not need to be connected to the mobile network for the NeuroTrack Application to work.

3 Description of the equipment



MiniNeurone

Neurone

Charging cable

Neurone Radio Antenna

NeuroEthernet

Support

4 Hardware Installation

4.1 Neurone

4.1.1 Antenna mounting

The antenna connector is SMA female type. You can mount antennas of all kinds, directly, or remote them via a coaxial cable. The frequency of the antennas must be 868 MHz.

4.1.2 Peripheral connectors

The various peripherals such as NeuroEthernet connect to auxiliary connectors 1 or 2. Prefer connector 1 which offers more speed possibilities.

4.1.3 Positioning

The Neurone can be placed in a pocket, cuff, or any other location. The contact of the antenna with the human body reduces the radio range. The radio range is better with the vertical antenna.

4.1.4 Connecting the NeuroEthernet

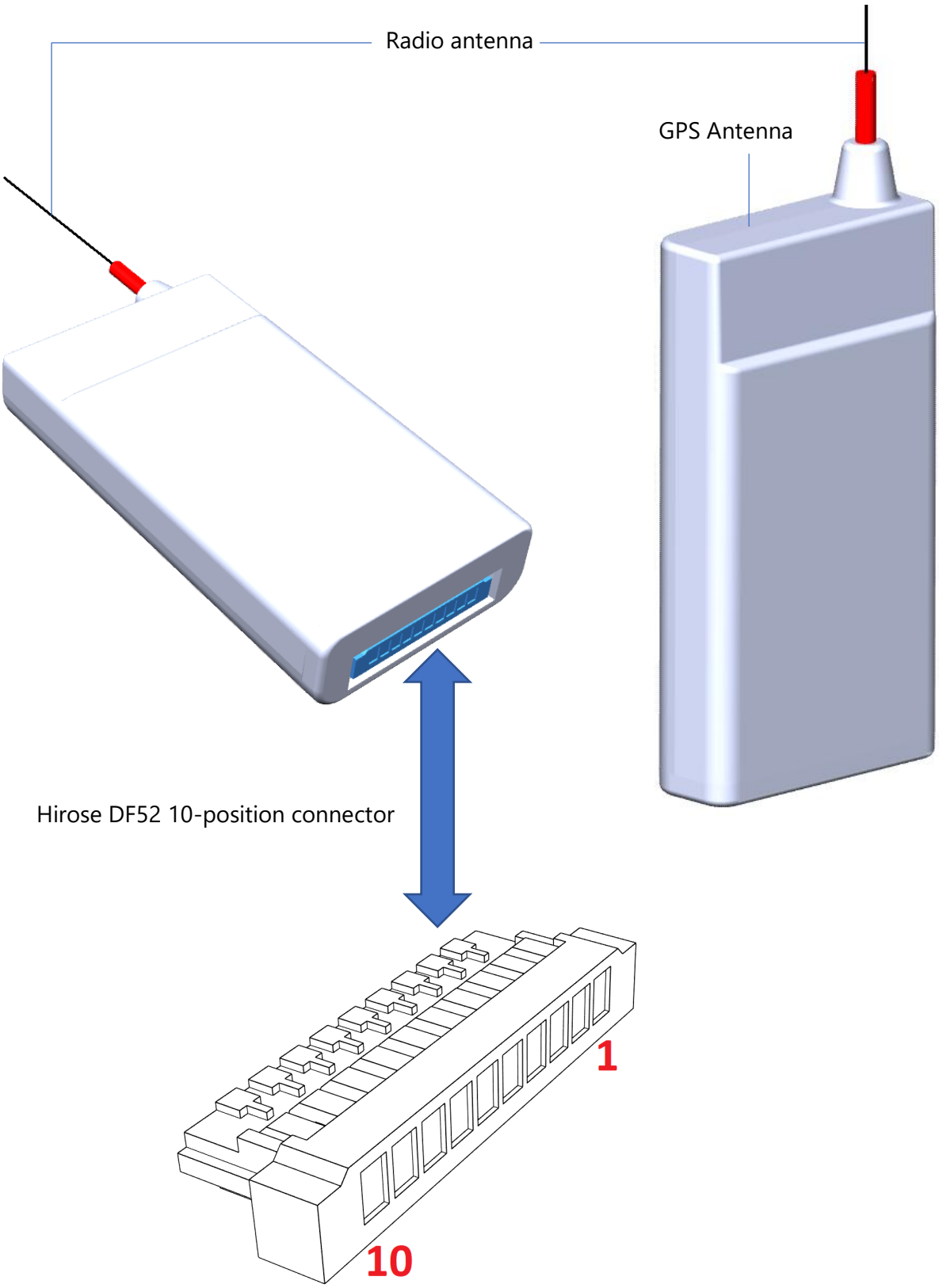
Connect the NeuroEthernet to the Neurone auxiliary connector 1 which offers more throughput possibilities than connector 2.

Connect the RJ45 connector of the NeuroEthernet to a router or computer via an RJ45 cable.

4.1.5 USB connection

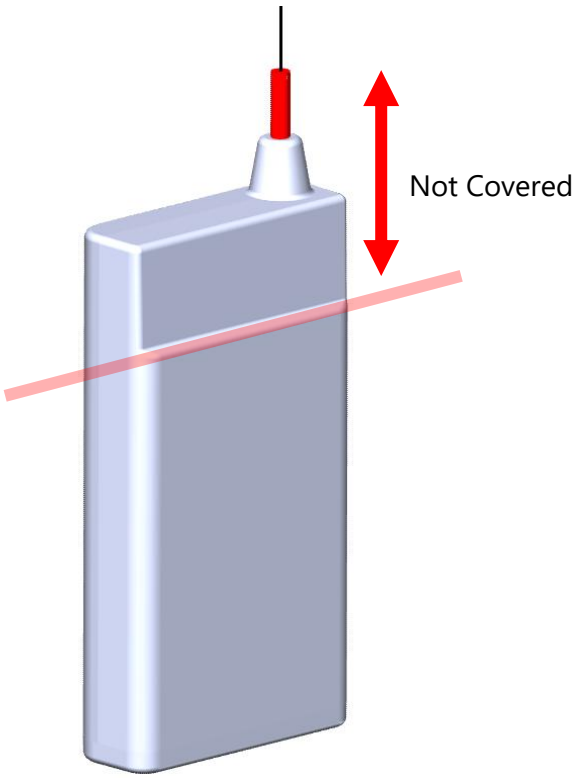
Connect the USB output of the Neurone to the USB connector of a computer. The Neurone's USB output also acts as a battery charging socket.

4.2 MiniNeurone



4.2.1 Installation on the aircraft

The MiniNeurone must be installed vertically to achieve a good radio range.



The upper part of the MiniNeurone**,** located above the stall of the box, contains the GPS antenna and must not be covered by a metal or carbon part.

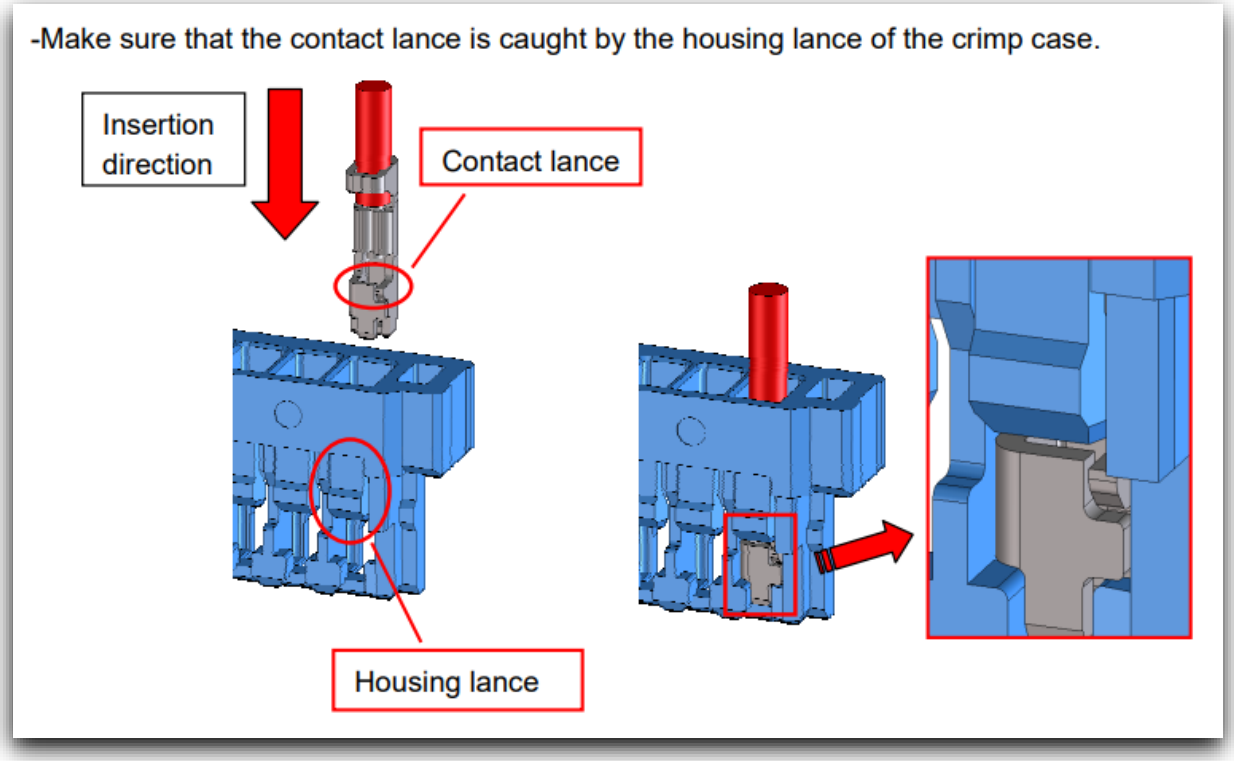
4.2.2 Connector Description

Hirose DF52 10-position connector		
Positions	**Function**	**Description**
1	VBAT (3.3 to 5V)	+Battery or other power supply
2	VBAT (3.3 to 5V)	+Battery or other power supply
3	Mass	- Battery or other power supply
4	Mass	- Battery or other power supply
5	No connection	
6	No connection	
7	SIGNAL	End of Flight Trigger Signal (RDT)
8	No connection	
9	FLASH	The lighting sequence can be configured
10	ALIM_SERVO	Servo Power

References	Connector	Wired wires
Manufacturer www.hirose.com	DF52-10P-0.8C	DF52-2832PF1571-28A9-300
Distributor www.digikey.com	H125089-ND	
Distributor www.mouser.com	798-DF52-10P-0.8C	668-9001-0

4.2.3 Mounting the wires in the connector

Use the wired wires referenced above. They feature a contact at each end. The connector manufacturer offers documentation for inserting these wires into the connector.

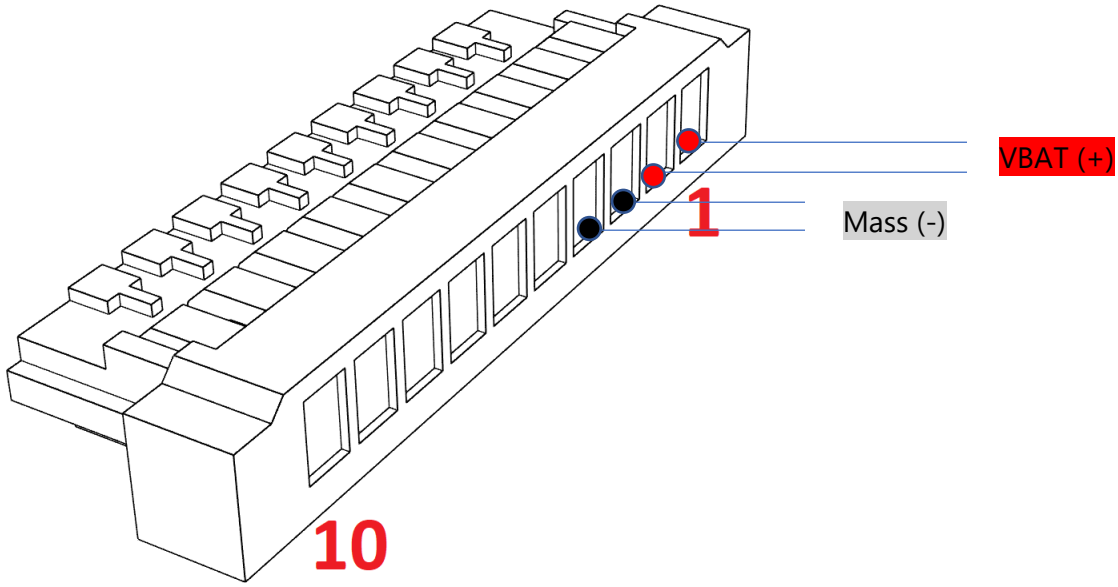


4.2.4 Powering the MiniNeurone

The MiniNeurone can be powered by any source between 3.3V and 5V. Ideally, it should be powered by a 1S lithium battery.

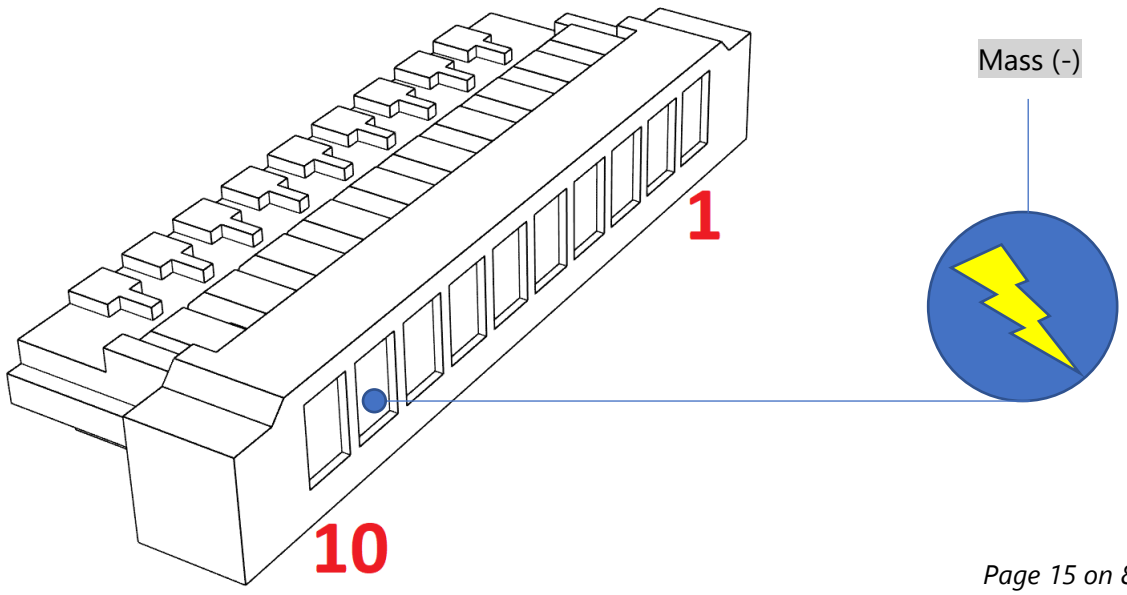
Be careful, the MiniNeurone has consumption peaks of around 500 mA for a short time. The power supply must be able to deliver these peaks without excessive voltage drop. It is therefore advisable to connect the MiniNeurone directly to the power battery.

The power connector is doubled to ensure safety in the event of a cut wire or a bad connection.



4.2.5 Connecting the flashes

Flashes can be controlled by the MiniNeurone. They will be directly powered by VBAT voltage. Check that they are compatible with this voltage. The flashing sequence can be configured by the NeuroTrack application. The flashes connect between the pin9 of the MiniNeurone and the ground.



4.2.6 End of Flight Connection (RDT)

The MiniNeurone can drive 3 End of Flight Systems (RDT).

4.2.6.1 Servo Piloting

The MiniNeurone is able to directly manage the movement of a servo by simply pressing the SOS button on the Neurone.

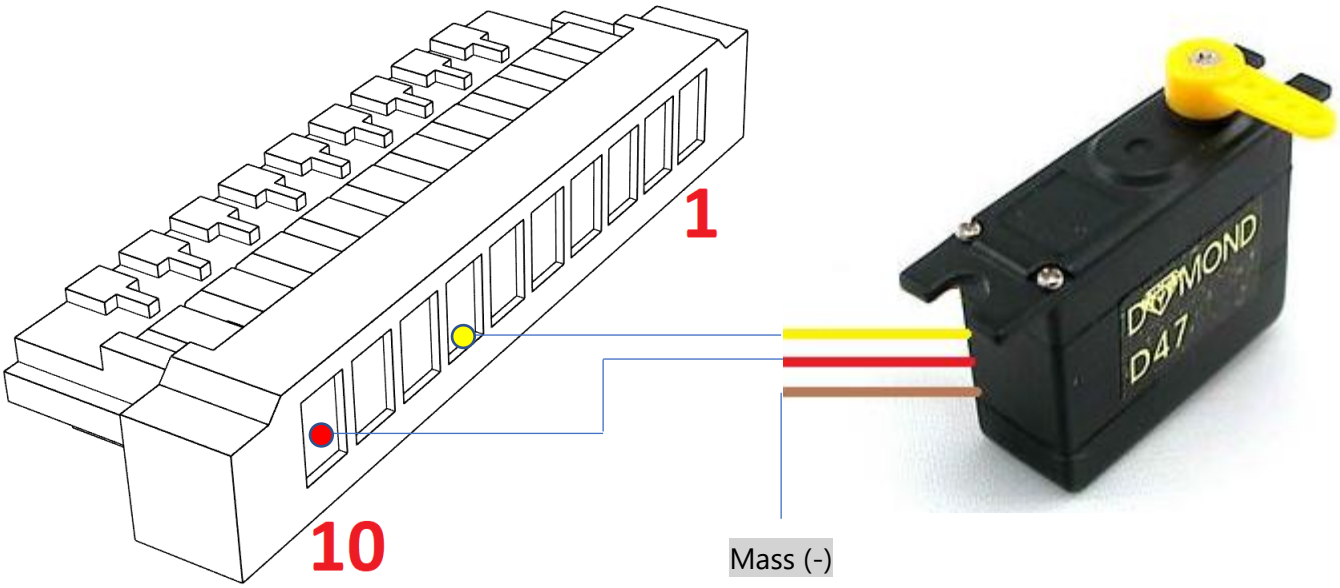
We can thus:

- Trigger the RDT in model aircraft with a simple servo, without any other electronic device.
- Triggering the opening of a parachute for a drone.
- Any other action...

The servo power supply must be connected to pin 10 of the MiniNeurone.

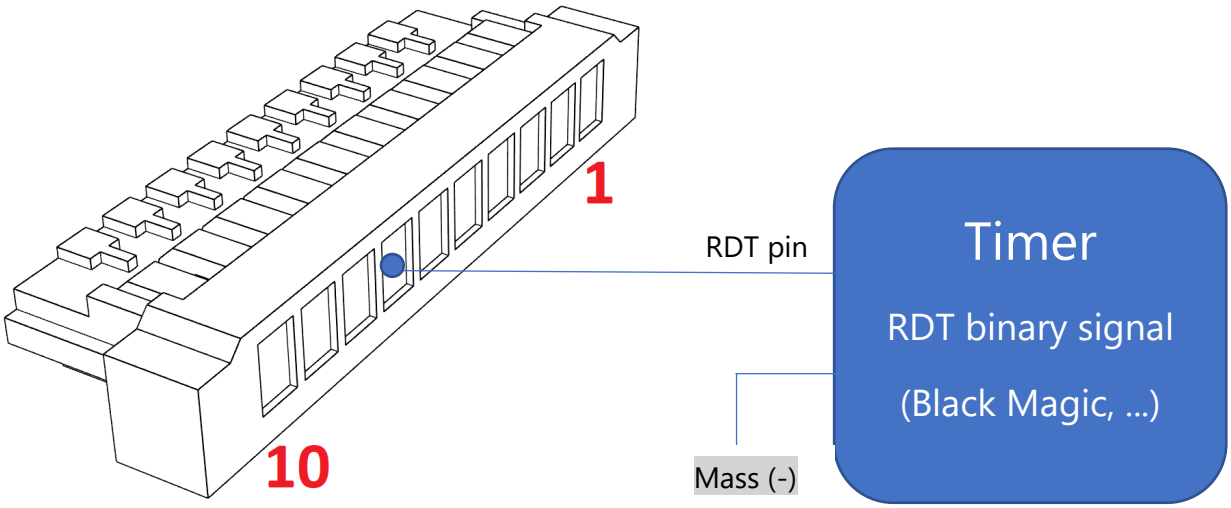
When the servo is powered, the supply voltage is VBAT. Check that your servo is compatible with this voltage.

The servo signal must be connected to pin 7 of the MiniNeurone.
The servo movement is fully customizable by NeuroTrack.



4.2.6.2 Connection to a Free Flight model timer via binary signal

Most free flight timers activate RDT by receiving a binary logic level up or down on a pin. This is particularly the case with the "Black Magic Timers".
The MiniNeurone allows this signal to be generated by pressing the SOS button on the Neurone.
The signal is generated on pin 7 of the MiniNeurone. The polarity and duration of the signal can be configured by the NeuroTrack application.

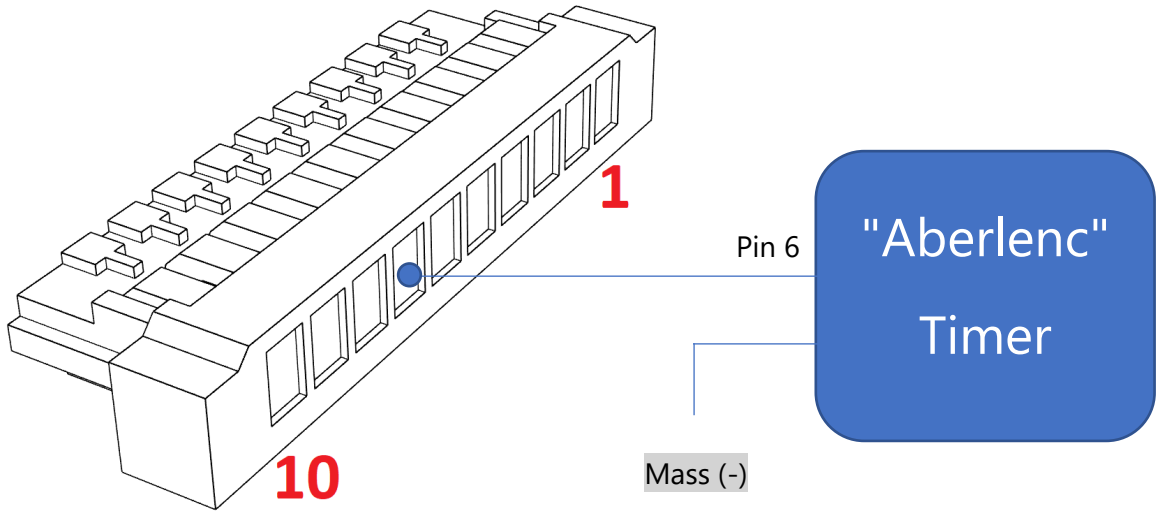


4.2.6.3 Connecting to an "Aberlenc" timer

The MiniNeurone can be interfaced with these timers. The code required to control the timer can be configured in the NeuroTrack app.

Pin 7 of the MiniNeurone should be connected to pin 6 of the timer.

Be careful, the mass of the MiniNeurone must be Pin 16 of the Timer (Battery Mass 1).



5 Neurone Operation

5.1 Manual start

Press the Power button for 3 seconds. The red LED flashes fast and then slower. The flashing remains red until the Neurone determines its position. The flashes then turn green. The Neurone needs a good view of the sky to determine its position.

5.2 Manual shutdown

Press the Power button for 3 seconds.

5.3 The 2 buttons

You can reconfigure the role of the 2 buttons on the front panel.

The **SOS** button can have the following functions:

- Sending an SOS (default).
- Controlling the end of flight of a drone or model aircraft (**RDT**).

For short presses, the **On/Off button** can have the following functions:

- Remote flash on or off.

Regardless of the configuration of the buttons, the 3-second long press controls the Neurone's on/off.

5.4 LEDs

They allow you to control the state of the Neurone

- **Yellow LED**: signals the reception of a radio message from another Neurone or a MiniNeurone.
- **Blue LED**: flashes when the Neurone is connected via Bluetooth to a Smartphone or tablet.
- **Orange LED**: Flashes while charging the battery.
- **Red/green LED** : flashes green if the position of the Neurone is determined, red otherwise.

5.5 Battery charging

It is done via the micro USB connector close to the battery pictogram. The charge can be done Neurone on or off:

- Neurone on the move
  - Flashes **orange** every 5 seconds.
- Neurone at a standstill
  - Slow orange flashing while charging.
  - Fast orange**/green flashing** at the end of charge.

5.6 Sound

The Neurone emits sounds:

- At each radio reception
- During the various configurations
- When pressing the buttons
- When connecting or disconnecting Bluetooth
- …

The sound can be muted during setup.

5.7 Neurone Reset

If the Neurone is not working, you can reset it by pressing with a fine tip such as a paper clip tip, into the reset hole. The Neurone flashes all colors for a few seconds and then reboots.

6 MiniNeurone Operation

6.1 Starting and stopping

The MiniNeurone starts as soon as it is powered and can only be stopped by disconnecting it from its power supply.

The MiniNeurone stops working if its supply voltage is less than 3.0V.

6.2 LEDs

They allow you to control the state of the MiniNeurone**:**

- **Yellow LED**: Not in use.
- **Blue LED**: Not in use.
- **Red/green LED** : flashes green if the position of the MiniNeurone is determined, red otherwise. The green LED flashes slowly after a continuous altitude recording is started (see the chapter "Using the Altimeter").

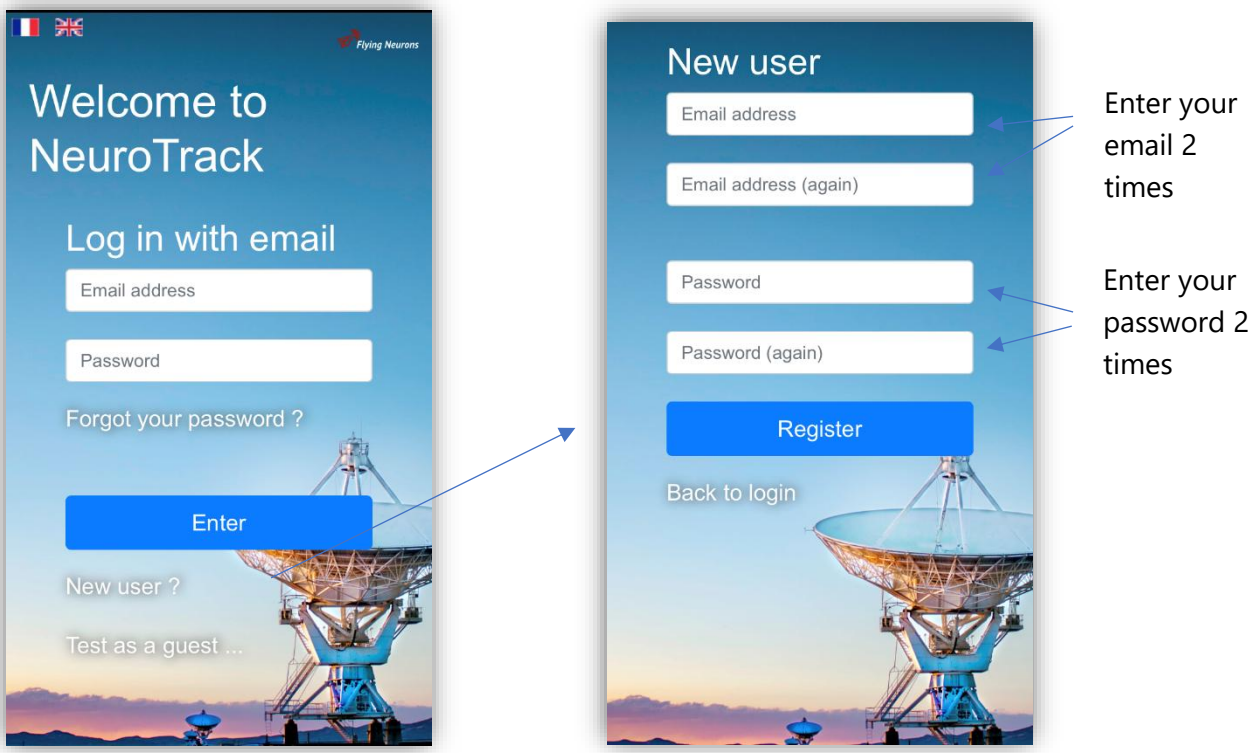
7 Installing the NeuroTrack App

NeuroTrack is available for iOS (Ipad and iPhone) via the AppStore and for Android (Version > 9.0) on the Play Store.

Launch the NeuroTrack application by accepting the requested activations (depending on the smartphone system):

- **Location** must be enabled in order to scan Neurones via Bluetooth or display the position before connecting to the Neurone.
  - This location must be "accurate" on iOS.
- **Background operation** must be accepted so that the application continues to transmit your position or tracking any target in the event of a phone call or use of another application (navigation, etc.).
- **Bluetooth access** must be allowed to scan and connect to a Neurone. It is requested during the first attempt to connect to a Neurone.

8 Create your login and log in



Create your login via the "**New user?"** link or log in with your account if you already have one. Note that this is the same account for NeuroTrack, NeuroFly, and the NeuroSky web platform.

- An account is identified by an email address. After creating your account, a welcome email is sent to the email address.

The internet connection is essential to create your account and log in the first time you launch the application.

Once you have entered NeuroTrack, the app will use your account automatically and no internet connection will be required for future NeuroTrack launches.

9 Setting up the NeuroTrack app

In the NeuroTrack app**,** access the menu with the button in the  top left:

- Click on "**App Configuration**".
- Choose a monitoring area that is sufficient in altitude and distance. Aircraft outside of this area will not be displayed.
- Whether or not you can turn on "**Auto Zoom**". If active, the zoom continuously adapts to the position of the aircraft being tracked.
- Choose the basemap you prefer.
- Choose the units you prefer.
- Choose your language.

For more details, refer to the chapter detailing the configuration of NeuroTrack.

10 Neurone Configuration

- Start the Neurone and launch NeuroTrack.
- For your first connection:
  - Click "**Sign in".**
  - Click the Detected Neurone number in the list.
  - Press the Neurone On/Off button when prompted.
  - Wait for connection.
- Click on "**My Neurone**" and then "**Configure**".
- Choose the Neurone usage type : "**Neurone as:**"
  - **Station** or **Mobile Station** if the Neurone serves as a receiving station.
  - Any device, if the Neurone is installed on board to be tracked.
- Choose the action of the buttons:
  - SOS Button: **End of Flight (RDT)**
  - ON/OFF button: **Flash**
- Radio commands: choose a **password** (maximum 6 characters). Only MiniNeurones with this password will respond to commands from this Neurone.
- Do not change other settings.
- Validate the configuration with the button at the  top right.

When the Neurone is used as a **Station**, it can be connected to a NeuroEthernet. Then configure the connection settings in the **NeuroEthernet** and **Server Connection** sections of the configuration menu. For more details, refer to the chapter detailing the configuration of the Neurone in NeuroTrack.

Similarly, when used as a **Station**, the Neurone can be connected to a computer's USB connector. Then configure the connection settings in the **USB Output** part of the setup menu. For more details, refer to the chapter detailing the configuration of the Neurone in NeuroTrack.

The output formats are detailed in the Appendix.

11 MiniNeurone Configuration

For security reasons, the radio control password can only be changed within 2 minutes of reconnecting the power supply.

- Start the Neurone and MiniNeurone.
- In NeuroTrack, connect to the Neurone.
- Click on "**My MiniNeurone**".
- Optionally, add your MiniNeurone to the "**My MiniNeurones" list**.
    - Click on "**+ Add**".
    - Specify the serial number of the MiniNeurone.
    - Choose a name for the MiniNeurone. Your MiniNeurone will appear everywhere with this name. A good practice is to combine your first or last name with the MiniNeurone serial number (e.g. "John 36").
- Check the MiniNeurone you want to configure.
- Click "**Configure**".
- Select the "**Aircraft Type**".
- To activate or not the altimeter.
- If the altimeter is activated, choose **the starting altitude**:
    - 60 meters for F1A or similar.
    - 10 meters for F1B, F1C or similar.
- Receiving commands: Enter the **radio command password for** your Neurone.
- Flash: Set your flash sequence. Spacing is the length of time between two consecutive sequences.
- End of flight: Choose your End of Flight System (RTS) and its settings.

For more details, refer to the chapter detailing the MiniNeurone configuration in NeuroTrack.

12 Usage

12.1 General remarks

12.1.1 MiniNeurone Battery Life

It is advisable to power the MiniNeurone with a 1-cell Lithium polymer battery (1S).

Battery life depends on the movements of the MiniNeurone, which consumes 2 times less when it is not moving.

With a 350 mAh Lithium Polymer battery, the autonomy obtained is as follows:

- 10 trips of 6 minutes during the day and the rest in stationary mode: 11 hours of autonomy.
- Constant movement: 7 hours of battery life.

With such a battery, the autonomy is therefore between 7 and 11 hours.

It should be noted that, during the winching of a glider, the MiniNeurone consumes as much energy as in flight since it is in motion.

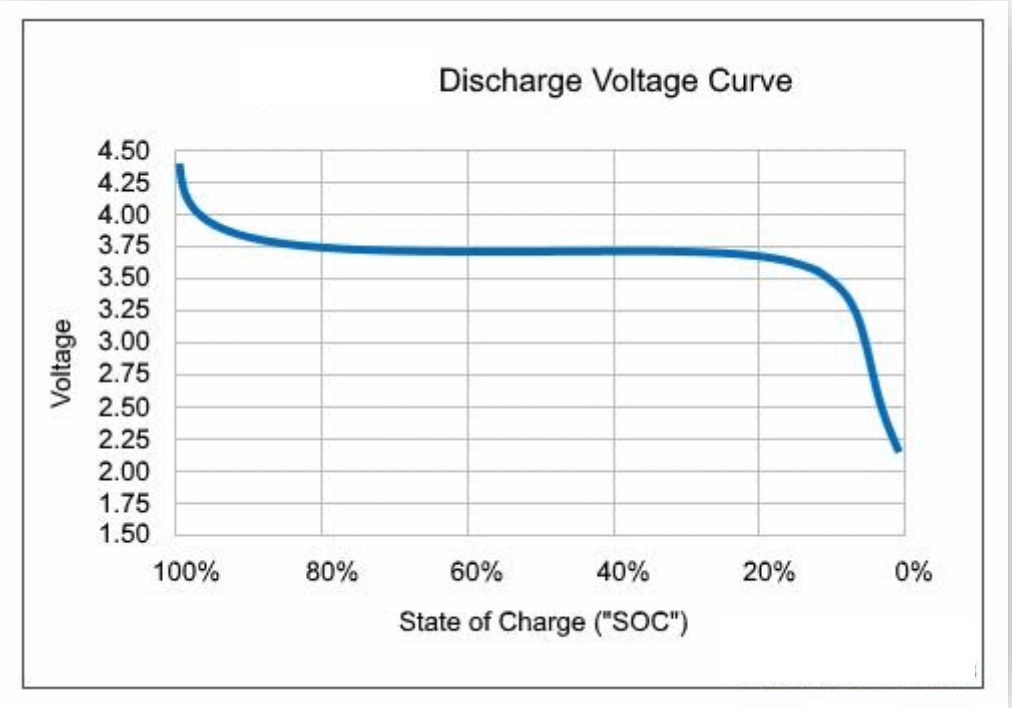
The MiniNeurone has 4 modes of operation:

- Motion Mode:
  - The MiniNeurone moves: the consumption is about 50 mA.
- Stationary Mode:
  - The MiniNeurone does not move: the consumption is about 25 mA.
- Battery End Mode:
  - The battery voltage of the MiniNeurone is between 3.0V and 3.3V.
  - The consumption is about 12 mA.
  - The MiniNeurone cuts off its GPS but continues to send the last calculated position before the GPS is cut off. This mode significantly increases the time it takes to search for a device.
- Off Mode:
  - The battery voltage is less than 3.0V: the MiniNeurone is shut down and consumes less than 1 mA.

It is important to have time to find an aircraft that has flown too long or landed in a remote or hard-to-reach location.

To do this, **it is advisable to change the battery when it reaches 3.7V**. This still leaves 50% autonomy for the MiniNeurone.

Here is a typical discharge curve of a Lithium Polymer battery. It can be seen that, as soon as the voltage drops below 3.6 volts, the battery drains very quickly.



12.1.2 Transmission period

When stationary, the MiniNeurone emits its position every 30 seconds.

When it is in motion, it emits:

- For each 50-metre move.
- For each loss of altitude of 10 meters.
- At least every 30 seconds.

This methodology ensures accurate aircraft location, especially during the rapid descent or crash phase.

12.1.3 Antenna Positioning

To temporarily increase the radio range of the system, hold the Neurone high and vertical.

12.1.4 Precautions

The MiniNeurone's antenna is made of Nitinol, a shape memory alloy. It returns to its original form after any solicitation. Take care and avoid twisting it in all directions.

12.1.5 Find a lost Neurone

The Neurone emits a position regularly. It is therefore possible, with the help of another Neurone**,** to geolocate a lost Neurone.

12.2 Search for an aircraft

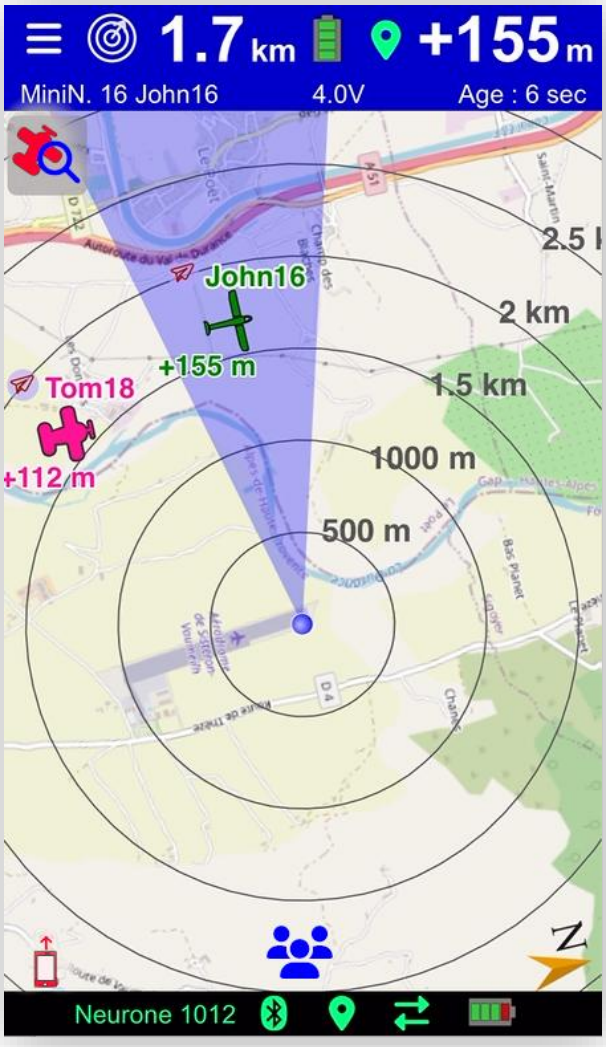
Once your Neurone is connected to the app, you can view all the MiniNeurones and Neurones around you.

To follow one in particular, you have 2 possibilities:

- Click on the magnifying glass icon and enter the number of the MiniNeurone or Neurone to track.
- If the Neurone or MiniNeurone appears on the map, click on it and then click "**Follow**".

In case a lot of Neurones or MiniNeurones are displayed on the map, you can filter the display by pressing the button to make only your own MiniNeurones (listed in **My MiniNeurones**) appear (and vice versa by pressing the button again). This makes it easier to view and click on one of your MiniNeurones in the event of a high number of visitors.

A blue cone shows you the direction of the aircraft. The top banner shows you the distance, altitude difference or barometric height of the aircraft, the battery status of the MiniNeurone and the age of the last reception.
An audio message takes up the information from the banner.



As soon as one of the parameters in the banner is abnormal, it is displayed in red. Please pay attention to them:

- The MiniNeurone is not able to determine its position: the position symbol is red.
- The MiniNeurone's battery has a low voltage, it is displayed in red.
- The MiniNeurone is out of radio range or not working. (The age of the last received is displayed in red).

If the MiniNeurone altimeter is activated, the altitude is replaced by the barometric height, provided that it is between 0 and 250 meters.
This height, determined by the measurement of ambient pressure, is accurate to within one metre, unlike GPS altitude, which is accurate to around 20 metres.
The MiniNeurone estimates that it is at 0 meters when the ambient pressure is constant for 60 seconds.
Subsequently, the barometric height displayed is relative to this ground height.

12.3 Research in very dense vegetation

The accuracy of the GPS is around 10 meters. In very dense vegetation, this precision may be insufficient to locate a MiniNeurone.

Click on the icon representing your MiniNeurone. The "**signal strength**", between 0 and 100%, makes it possible to know the distance between the Neurone and the MiniNeurone. This value is updated each time the MiniNeurone is emitted, i.e. every 30 seconds.

Move gradually to increase this strength. At 90% you are less than 2 meters from the MiniNeurone.

You can also use your body to obstruct the signal and find directionality. Press the Neurone against your belly. Each time you update the signal strength, rotate around you a little. When the force is minimal, the MiniNeurone is behind you.

12.4 How do you hold the Neurone during research?

The Neurone can be placed in any place, pocket, cuff, ...

However, in the vicinity of the MiniNeurone to be searched, it is advisable to take the Neurone out of the pocket in order to obtain an accuracy of a few meters. This allows the Neurone to have a better view of the sky.

12.5 Trigger End of Flight (RDT)

To trigger an end of flight (RDT), you must have previously configured:

- A single command password for your Neurone and MiniNeurones.
- The "**SOS**" button of the Neurone in "**End of Flight (RDT)**".
- An end-of-flight system for your MiniNeurones.

All you have to do is press the "**SOS**" button on the Neurone to start an end of flight. All MiniNeurones with the same password as the Neurone will perform an end of flight.

12.6 Control Flashes

To control the flashes remotely, you must have previously configured:

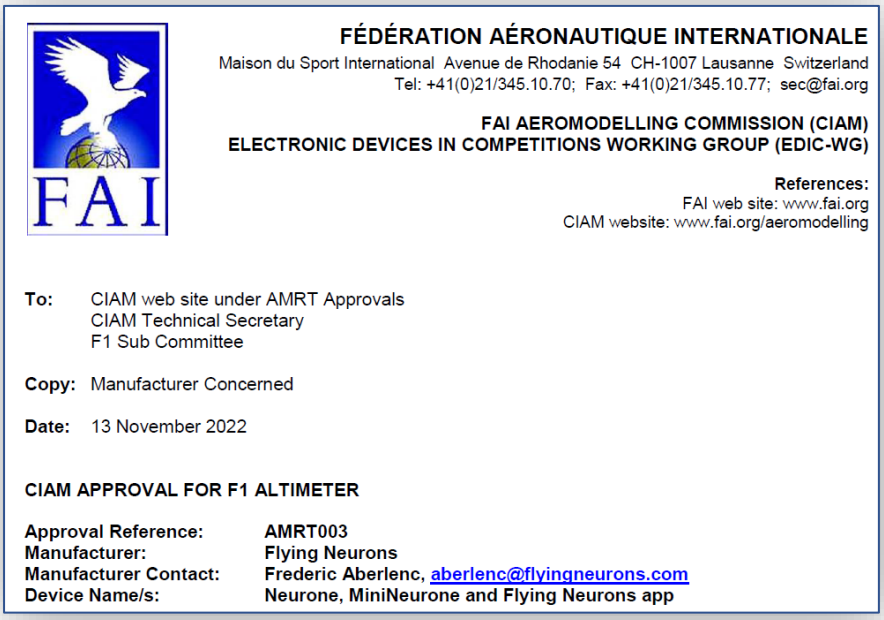
- A single command password for your Neurone and MiniNeurones.
- The "**On/Off**" button of the Neurone in "**Flash**".
- A flash sequence for the MiniNeurone.

All you have to do is press the **"On/Off"** button on the Neurone to start or stop the flashes. All MiniNeurones with the same password as the Neurone will perform the command.

Note that 10 minutes after a request to turn on, the flashes turn off.

12.7 Using the Altimeter

The MiniNeurone altimeter is EDIC certified by the FAI.



FÉDÉRATION AÉRONAUTIQUE INTERNATIONALE
Maison du Sport International Avenue de Rhodanie 54 CH-1007 Lausanne Switzerland
Tel: +41(0)21/345.10.70; Fax: +41(0)21/345.10.77; sec@fai.org

FAI AEROMODELLING COMMISSION (CIAM)
ELECTRONIC DEVICES IN COMPETITIONS WORKING GROUP (EDIC-WG)

References:
FAI web site: www.fai.org
CIAM website: www.fai.org/aeromodelling

To: CIAM web site under AMRT Approvals
CIAM Technical Secretary
F1 Sub Committee

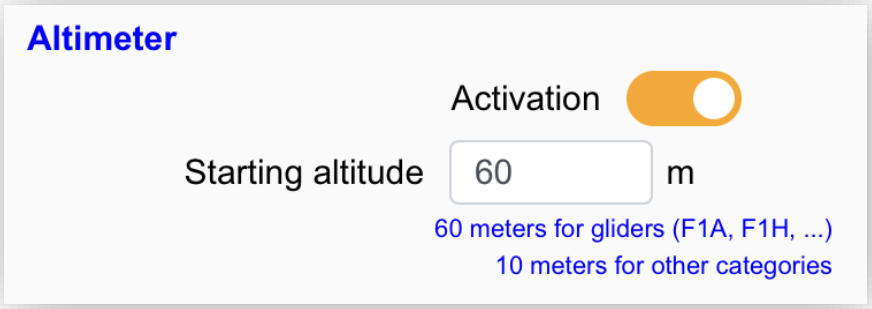
Copy: Manufacturer Concerned

Date: 13 November 2022

CIAM APPROVAL FOR F1 ALTIMETER

Approval Reference:	**AMRT003**
Manufacturer:	**Flying Neurons**
Manufacturer Contact:	**Frederic Aberlenc, aberlenc@flyingneurons.com**
Device Name/s:	**Neurone, MiniNeurone and Flying Neurons app**

In order for elevation histories to be recorded, you must enable the MiniNeurone altimeter (see MiniNeurone Setup).



There are 2 types of registration:

- Automatic check-in.
- The recording continues.

12.7.1 Automatic recording

Set a "**Starting Altitude**" in the MiniNeurone configuration. It is an altitude in relation to the ground.

As soon as your model exceeds this altitude, the automatic recording of altitudes begins, including the previous 10 seconds.

It is advisable to define:

- 10 meters for models such as F1G, F1B, F1C, F1H, F1S, drones, ...
- 60 meters for winched gliders with 50 meters of cable.

Do not take a value that is too low because the altimeter may start before the start of the flight, due to fluctuations in the altimeter measurements.

The end of flight is automatically detected when the altitude remains constant.

Ten flights can be registered. Any new theft automatically erases the oldest one.

To view the latest flights, there are 2 possibilities:

- Click on your model icon and then on "**Altimeter**".
    - The last flight is then displayed.

- Go to the "**My MiniNeurone**" menu.
    - In the "**Flights Log**" section, click on "**Display**".
    - Choose the number of flights to display (between 1 and 10).
    - Flights are displayed.

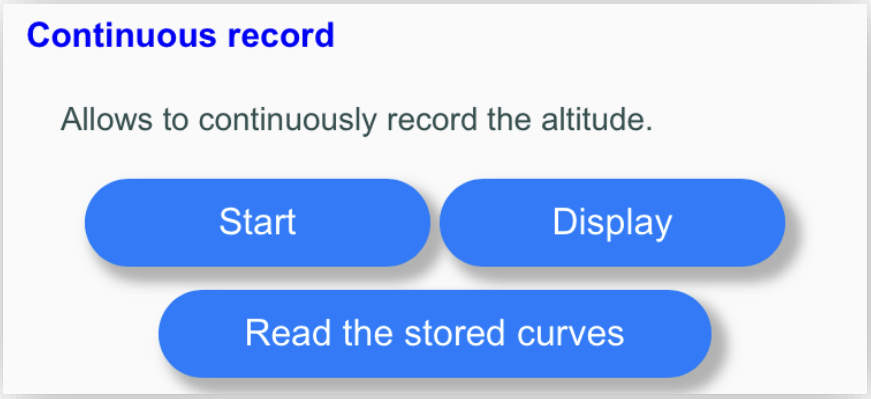
12.7.2 Continuous recording

Continuous recording allows altitude to be recorded at all times, whether the model is in flight or not.

The advantage of continuous recording compared to automatic recording is that in the event of non-detection of the departure (glider dropped at less than 60 meters for example), the recording will be effective.

The disadvantage is that it must be started manually and requires a manual curve analysis in order to extract the flight you are interested in.

To enable continuous recording:

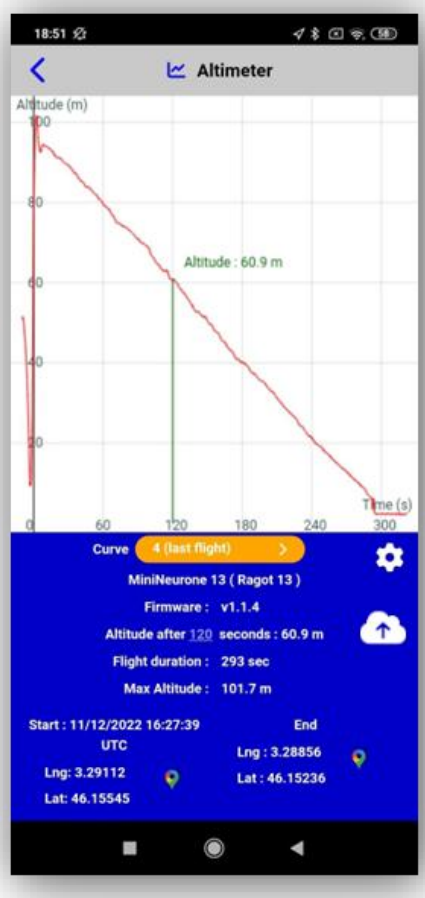


- Go to the "**My MiniNeurone**" menu.
- In the "**Continuous record**" section, click "**Start**".
- An audio message confirms the startup.
- The MiniNeurone flashes green at a 1-second interval.

The MiniNeurone can store more than 2 hours of altimetry information.

To view the recording, click "**Display**." The recording is displayed but it continues. It is stored in the memory of the smartphone or tablet so that it can be consulted later without requiring the use of the MiniNeurone.

12.7.3 Viewing elevation records



Many tools are then available:

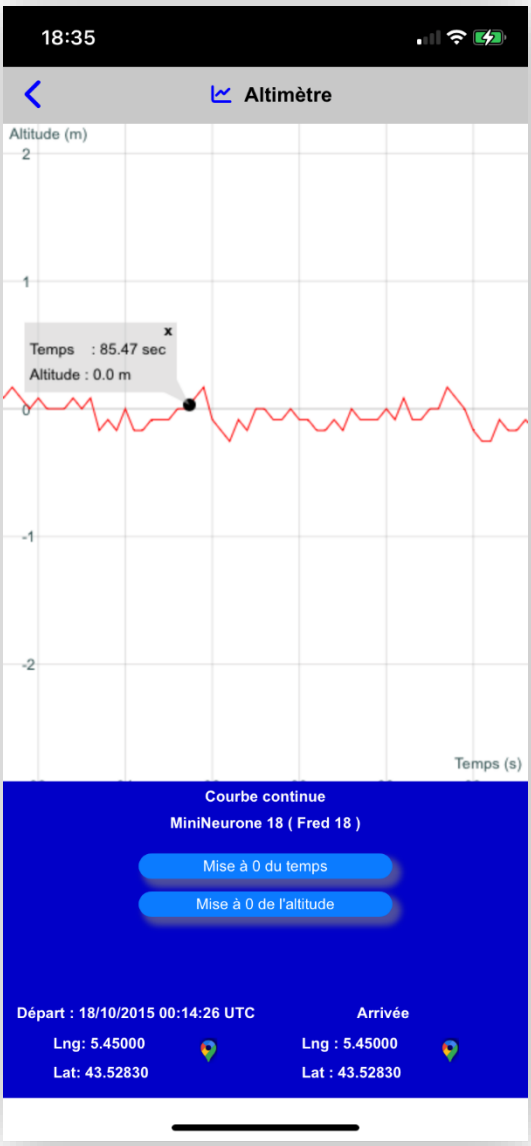
- Flight selection if multiple flights are displayed. The curve of the selected flight appears in red. Click on the orange tab to choose another flight.
- Choice of flight time defined by the organizer for tiebreaker flights based on altitude. Click on the time value in blue to change it.
- Locate the start and end of the flight by clicking on the Google Map icon.
- Study of Vz and the estimation of flight time without DT by clicking on a point of the curve. The duration used for the estimate can be changed by clicking on the setup icon (cog).

It is possible to zoom in or move around the graph with your fingers.

The flights are time-stamped and geolocated to avoid any dispute if they are used in competition.

For continuous recordings, it is necessary to define the ground altitude as well as the start time:

- Walk along the curve until you find a point that corresponds to the elevation of the ground.
- Click on this point.
- Click on "**Set the altitude to 0**".
- Walk the curve again to find the beginning of the flight.
- Click on this point.
- Click on "**Set time to 0**".



13 MiniNeurone Upgrade

During the MiniNeurone update, it is advisable not to call or use other applications on the smartphone or tablet performing the update. Similarly, do not move the smartphone or tablet away from the Neurone.

When you select a MiniNeurone to track, the app will look for whether the MiniNeurone needs to be updated. If this is the case, the update is offered to you. It is advisable to accept in order to take advantage of regular improvements.

You can also request an update at any time:

- Start the Neurone as well as the MiniNeurone to update.
- Connect to the Neurone.
- Go to the "**My MiniNeurone**" menu.
- Select the MiniNeurone.
- Click on "**Advanced**" and then on "**Update**"
- The update starts and takes about 2mn30.

13.1 MiniNeurone Stuck Following Update

If the update has not been completed (stopping the application, logging out, etc.), it is possible to restart it. The procedure is identical to that described above.

14 Neurone Upgrade

During the Neurone update, it is advisable not to call or use other applications on the Smartphone or tablet performing the update. Similarly, do not move the smartphone or tablet away from the Neurone.

The update operation takes about 1 minute and 30 seconds.

14.1 Automatic update

Neurone updates are automatically offered to you when you log in to the app. We advise you to accept them as they bring new features and fixes.

14.2 Manual update

You can cause an update of the Neurone.

- Go to the "**My Neurone**" menu.
- Go to the **"Advanced" section.**
- Click " **Update".**

14.3 Neurone Stuck Following Update

If the update has not been completed (stopping the application, logging out, etc.), it is possible to restart it. The procedure is identical but answer **"No"** to the question **"Can you connect?",** enter the Neurone number and click on **"OK"**

If the update doesn't work, contact **Flying Neurons**.

15 The NeuroTrack app in detail

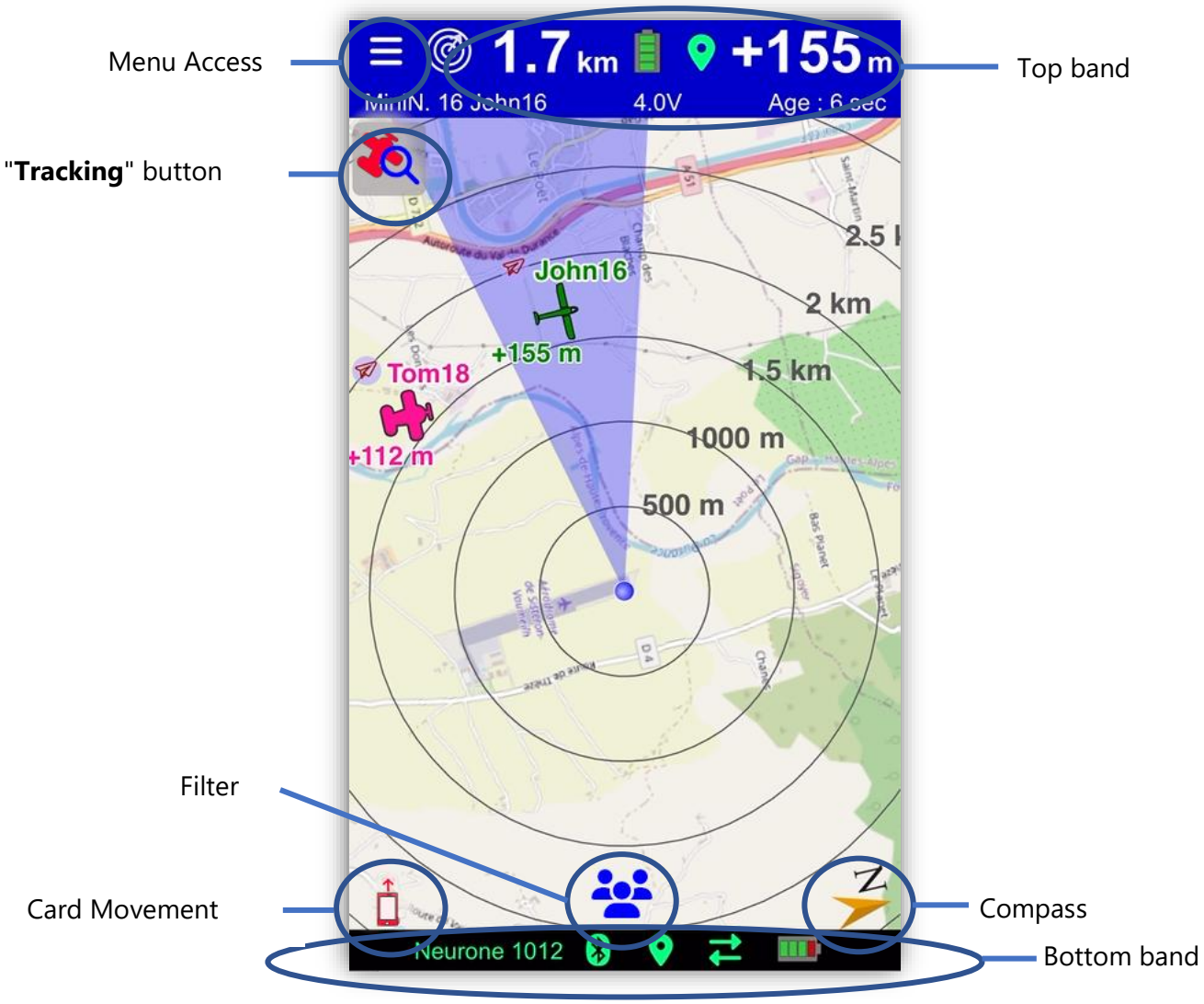
NeuroTrack is available for iOS (Ipad and iPhone) via the AppStore and for Android (Version > 9.0) on the Play Store.

Télécharger dans l'App Store

DISPONIBLE SUR Google Play

See the chapters for installation and login in NeuroTrack.

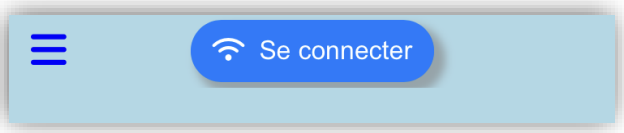
15.1 The main screen



15.1.1 The top banner: The main information

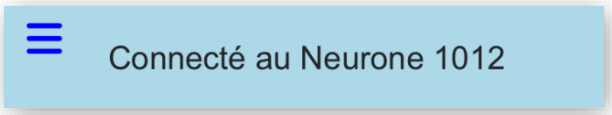
This banner summarizes the main information for the user. The order of priority is that of the presentation of the following different information, from the least important to the most priority:

- **Waiting to connect to a Neurone:**



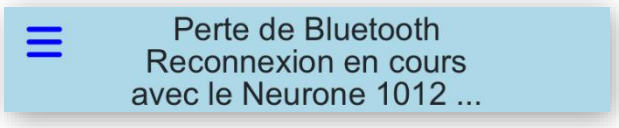
  - In a sky blue background with the "**Connect**" button flashing.
  - Connecting to a Neurone as a mobile station receiving aircraft positions is a prerequisite for any tracking.

- **Neurone connected, no breakdowns, no tracking in progress:**



  - On a sky blue background, the information of the number of connected Neurone is displayed: the surrounding aircrafts are displayed on the map but no tracking is in progress

- **Neurone connection problem:**



  - On a sky blue background, a message indicates the loss of connection and the reconnection attempt. In addition, a voicemail and a red error popup is displayed.

- **Tracking in progress:**

  - Dark blue background: tracking is in progress. Information about the aircraft being tracked is displayed in the banner. See the "Tracking" chapter for more details.

15.1.2 The bottom banner: the status of the system

The bottom banner displays the status of the main elements of the receiving system (Neurone and NeuroTrack):

  - **Connected Neurone Number**: If applicable, for your information, the number of the Connected Neurone is displayed.

  - **Bluetooth pairing with a Neurone**:
    - Gray: No Neurone connected, but no connection request in progress: normal waiting situation.
    - Green: Neurone connected.
    - Orange: The Neurone is not found or the Bluetooth connection has failed. Attempt to reconnect the Neurone in progress.
    - Red: Bluetooth error. The connection to the Neurone cannot be established. Check the app's permissions for Bluetooth use.

  - **GPS Position**: This is the GPS position of the Neurone. The Neurone outside can take about a minute to position itself when it is turned on.
    - Grey: no Neurone connected, the Neurone's GPS is not retrieved: normal waiting situation.
    - Red: The Connected Neurone has no GPS position
    - Green: The Neurone has a precise GPS position.

- **Telephone network connection**: the exchange arrow indicates the connection of NeuroTrack to the GSM network and therefore to our servers.
  -  Green: The connection to our server is established. You retrieve the positions of the aircraft via the OGN network (FLARM, OGN trackers, SafeSky or PilotAware) and, during the flight, your position as well as that of the Neurones/MiniNeurones received is exchanged in real time.
  -  Red: there is no connection to the server (no telephone network or WIFI connection). You do not receive any position from the OGN network or exchange yours in real time on NeuroSky. Also note that the basemap is not updated if the connection is lost

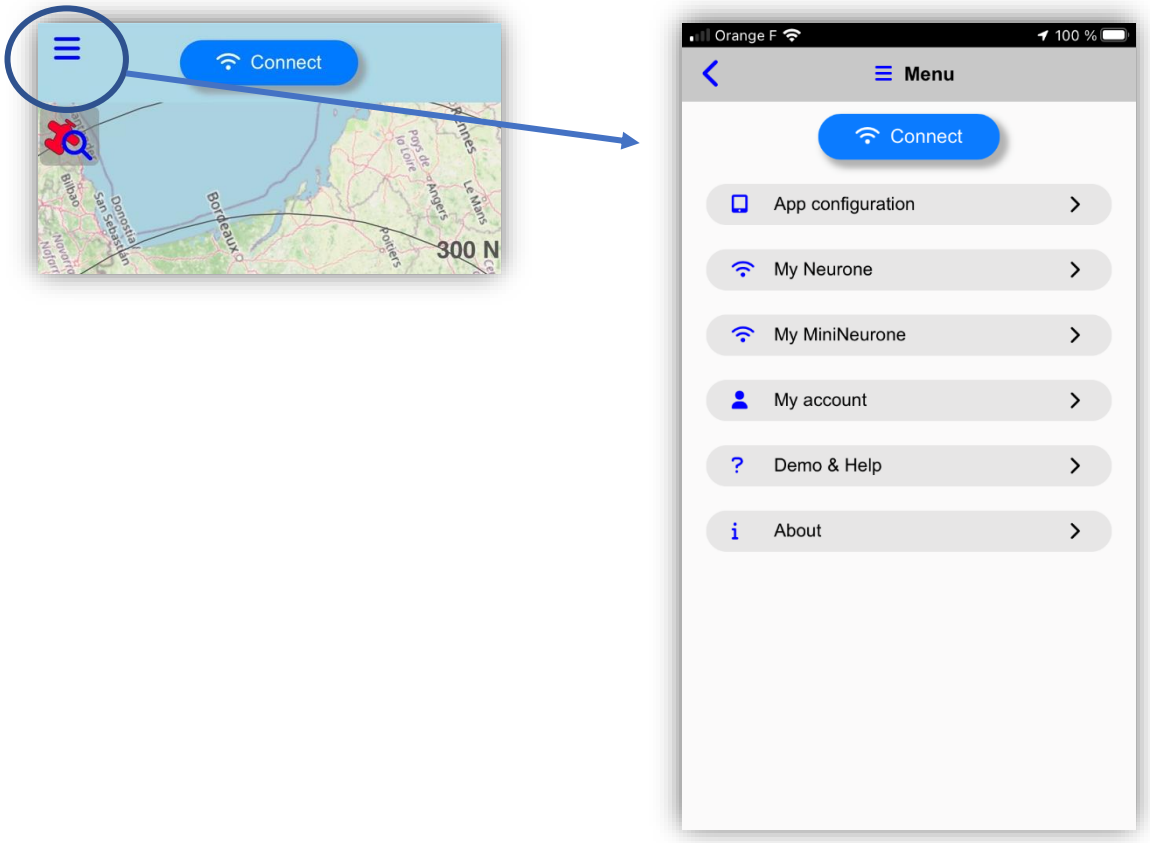
Note: *The lack of a network does not prevent NeuroTrack from working with the Neurone (Neurone connection, detection, tracking).*

NeuroTrack is constantly trying to connect to the network and retrieves it without any action on your part as soon as possible. The temporary loss is usually due to a "white" area of the GSM network.

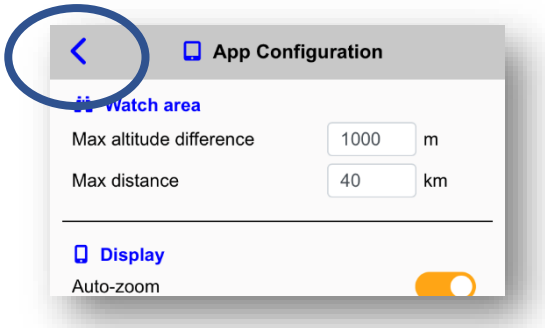
- **Battery**   : This is the charge level of the Neurone. The lightning bolt indicates the power on.

15.1.3 The menu and dialogs

- Access to the menu is via the button ☰ at the top left of the screen.



- The various dialogs available in this menu are described in the following chapters of this manual. Use the key ‹ in the top left to go back.



15.1.4 The map

The map allows you to view your position and that of aircraft near you, within your surveillance area (see the chapter "Configuring the App").

15.1.4.1 Contents of the map:

The content of the map depends on your configuration choices.

- **Your Neurone as a "mobile station":**
  - When your Neurone has a GPS position, it is displayed with a blue ball in the center of the circles (radar style centered on you). Otherwise, a "question marker" symbolizes the GPS position of the smartphone.
- **Distance circles:**
  - They are centered on the connected Neurone (or the smartphone if the Neurone does not have a GPS position) and adapt to the zoom level. Their unit is defined in the "**App Configuration**".
- **The orientation of the map:**
  - The direction of North is displayed at the bottom right of the map.

- **Basemap:**
  - Several options are available in "**App Configuration**".
    - Map: A map is displayed
    - Satellite: A satellite view is displayed
    - Clear: A bright background is displayed, allowing better visibility in bright light.
    - Dark: A dark background is displayed, allowing for better visibility in high/low light.

- **Other aircraft:**
  - The display of any aircraft depends on your configuration (see the " App Configuration" chapter).

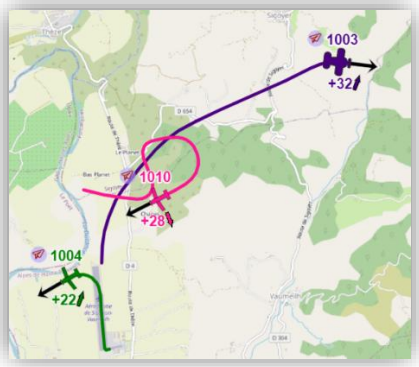
    - The icon corresponds to the type of aircraft, for exam
      - The color is random (fixed by the aircraft identifier) in order to easily differentiate between aircraft.

    - a label is written above, if not deactivated in the configuration (see the chapter "App Configuration"). This label contains:
      - An icon describing the source of the position:
        - MiniNeurone or Neurone received directly by your Neurone.
        - : MiniNeurone or Neurone, ADSB, FLARM, OGN tracker, SafeSky and PilotAware received via the telephone network.
      - The aircraft identifier:
        - The name or registration of the aircraft if provided by the user. Otherwise, its Neurone or MiniNeurone number, or even its ICAO number (preceded by h) or its address (FLARM, SafeSky).

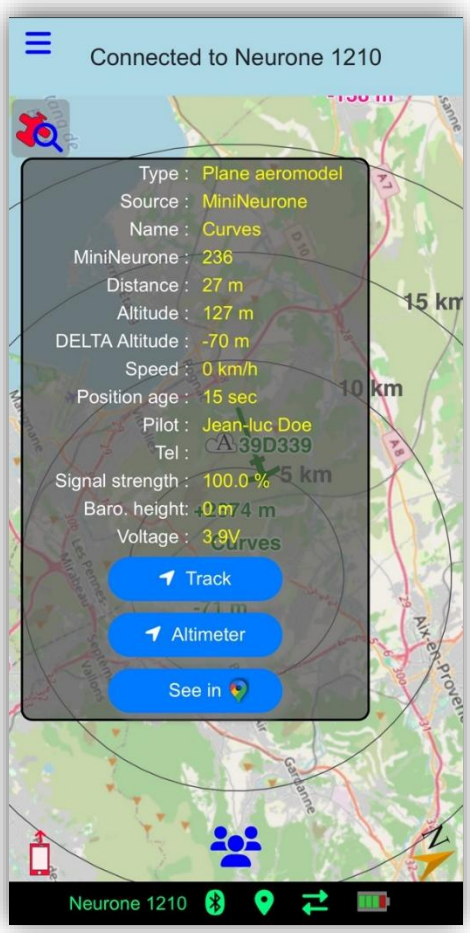
    - The altitude of the aircraft or its altitude relative to the position of the connected Neurone (positive if it is above you). The unit (meter or foot) is defined in the "**App Configuration**".

    - If requested in configuration, the direction of travel of the aircraft is indicated by an arrow.

    - A trip representing the last minute of the aircraft positions (in the color of the aircraft) is also optionally displayed.



- **Aircraft Details:**
  - By clicking on an aircraft, detailed information is displayed. Click on the information panel itself to make it disappear.



This panel also allows direct access to very important features for the selected aircraft via the 2 or 3 buttons at the bottom of the window:

- **"Follow"**: NeuroTrack then goes directly to the Tracking mode of this aircraft.
- **"Altimeter"**: this button is only displayed if it is a MiniNeurone: if it belongs to the list of your MiniNeurones, you can then directly see its last altimeter curve. See the "Altimeter" chapter for more information.
- **"See in "**: The GoogleMaps app is displayed with the aircraft's position as a landmark, allowing you to choose it as a destination in the navigation app.

15.1.4.2 Map Movements:

Depending on the choice with the "Card Movement" button, the interactive and automatic card movements are different:

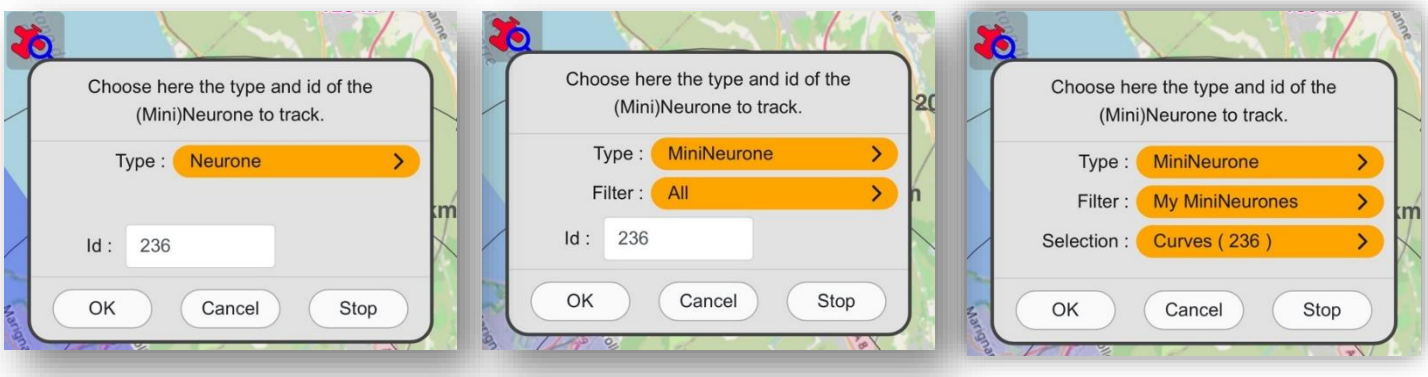
- **Translation and Rotation:**
  -  **"Auto" mode:**
    - If a Neurone is connected and has a GPS position, the map is centered on the position of the Neurone. Otherwise, the map is centered on the position of the Smartphone.
    - The card is oriented in the direction of the Smartphone if the Neurone has a low speed and the icon is  . If the Neurone has a speed of more than 4 km/h (in a car for example), the map is oriented in the direction of movement and the icon is  .

  -  **"Manual" mode:**
    The card can be moved by swiping a finger or rotated by rotating 2 fingers on the card.
    - The map defaults to north when switching to manual mode.
    - It is possible to put the map back with the North at the top by clicking on the "compass" at the bottom right of the screen.

- **Zoom:**
  - An automatic zoom mode exists (see the " App Configuration" chapter); it adapts the zoom of the map according to the aircraft being tracked (to make it clearly visible) or a default distance in the absence of tracking. It is only active in "auto" or "north" mode.
  - In any case, it is possible to zoom in by pinching the map with 2 fingers. If auto zoom is enabled, it will take over after a few seconds.

15.1.4.3 The "Tracking" button:

The button  allows you to start or stop tracking a Neurone or MiniNeurone in tracking mode : by entering its number in the displayed dialog or by choosing it from the list, and clicking on "**OK",** the tracking starts. By pressing "**Stop**", the current tracking is stopped.



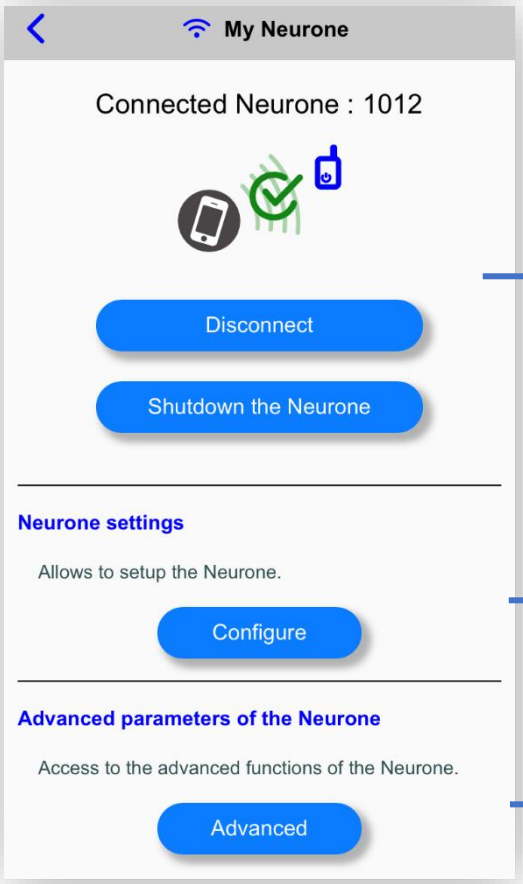
As seen above, it is possible to start the tracking mode of an aircraft by clicking on this aircraft and on the "Track" button displayed in the information window.

15.1.4.4 The "Filter" button:

In case a lot of Neurones or MiniNeurones are displayed on the map, you can filter the display by pressing the button  to reveal only your own MiniNeurones (listed in "**My MiniNeurones").** It then appears as follows:  . And conversely, by pressing this button, you review all the MiniNeurones and Neurones. This makes it easier to view and click on one of your own MiniNeurones in the event of a high influx.

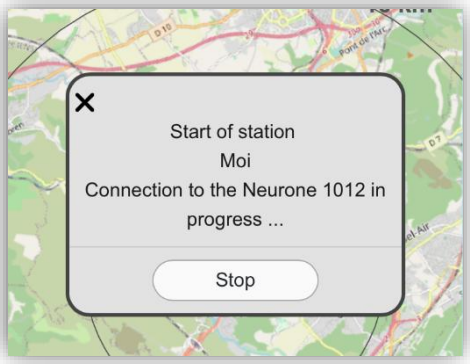
15.2 My Neurone

You have access to pairing, disconnecting, configuring the Neurone (once connected), and advanced Neurone actions.



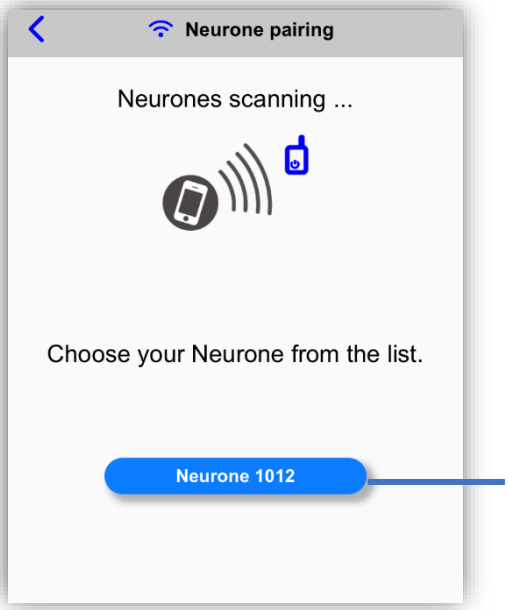
15.2.1 Connection to the Neurone

When the session starts, NeuroTrack will try to immediately connect with the Neurone you were previously paired with. The first time, you need to press the "**Connect**" button to start the connection. A dialog and voice announcement informs you of the connection attempt in progress:



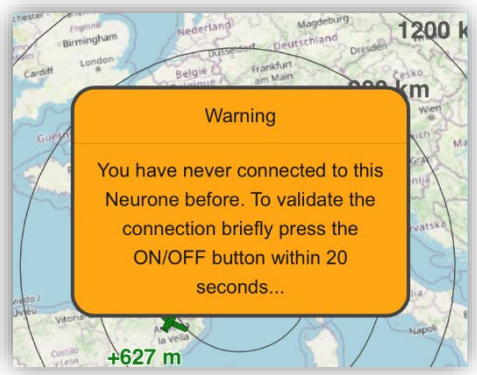
If you want to change Neurones, go to the menu and choose "**My Neurone**".

Then press "**Find a Neurone**": a scan is launched and the Neurones found (Neurones running around you and not connected to another smartphone) are listed.



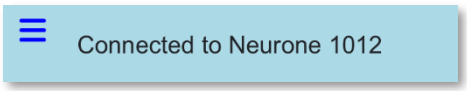
Click on the Neurone in the list to pair with it. If you exit the dialog without choosing a Neurone, the scan is stopped and no session is started.

Once the Neurone has been chosen, if this Neurone has already been paired to NeuroTrack on this smartphone with your account, your flight will start immediately. Otherwise, a dialog appears asking you for confirmation for pairing (to validate that it is indeed your Neurone the first time): click on the Neurone button as requested.

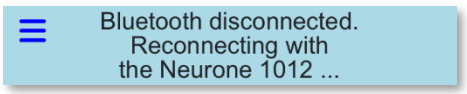


A voice announces the start of the connection: if no voice is heard, check the volume of your phone, the connection to your headset or change your voice in the "**App configuration**".

Once the Neurone is connected, if it is working correctly, the Neurone number is displayed in the banner and NeuroTrack remains silent.

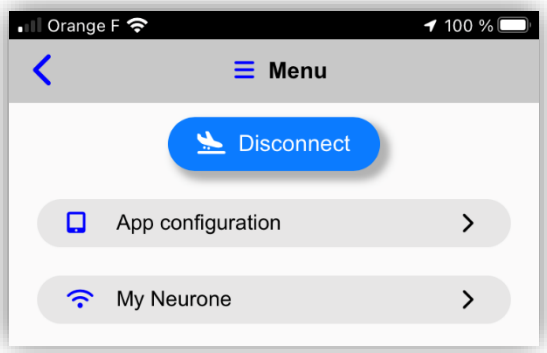


If a connection failure is detected at the Neurone (loss of Bluetooth connection), an audible message informs you of the problem and the headband as well. Attempts to reconnect are launched.



15.2.2 Disconnection of the Neurone

To end a session and exit the Neurone, press the "**Disconnect**" button in the menu or stop the Neurone itself.

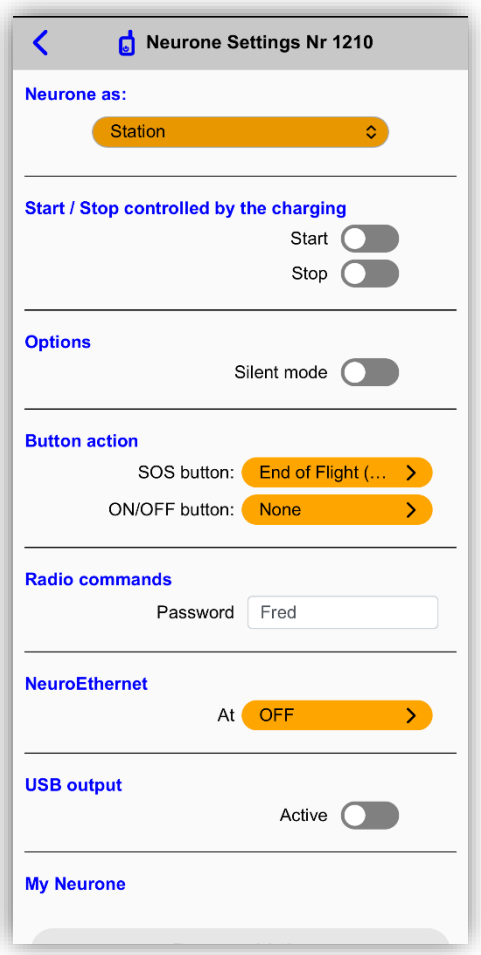


Do not log out of your account at the end of the session: simply close the application (it goes into background) or stop it via your phone's system. Your account will be retained and will not be requested the next time you use NeuroTrack. If you log out of your account (via the "**My Account**" menu), your login (with password) will be requested again and an internet connection may be required to log in again.

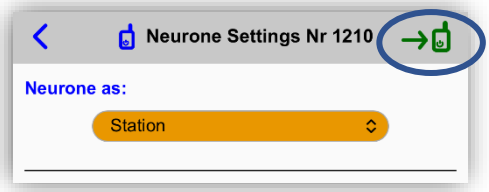
15.2.3 Neurone Configuration

You can configure the Neurone connected to NeuroTrack. This configuration, accessible in the menu by "**My Neurone"** then **" Configure**", allows you to activate or not certain properties/peripherals of the Neurone.

- The following screen appears:

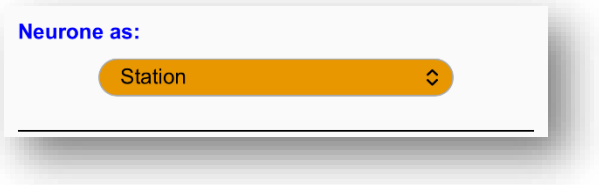


You can modify all of the properties defined below. As soon as a property is changed, a button appears in the top right:  Click on it to confirm all the changes to the configuration and send it to the Neurone. Exiting the menu by the arrow  will undo your changes.



15.2.3.1 Neurone Type: As a Station or Target

It is very important to define what the Neurone corresponds to. There are two very different cases:



- The Neurone is on board the vehicle you want to follow: you must then choose the corresponding type of vehicle. It will be displayed as such in NeuroTrack for any user.
- The Neurone is a receiving station (fixed or mobile) that allows you to view other Neurones or MiniNeurones on a smartphone connected with NeuroTrack or to retrieve positions for sending to a network or PC.

The following configuration options and how the Neurone works depend on the type of Neurone, whether it is a station or a target.

15.2.3.2 Start/Stop controlled by the charging

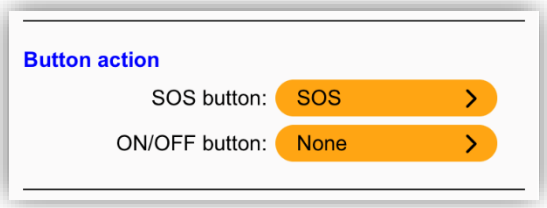
- Check the "**Start**" toggle to have the Neurone automatically start when a voltage is detected on the charging connector.
- Check the "**Stop**" toggle to have the Neurone stop when removing the voltage after a time set in "**Stopping delay**".

15.2.3.3 Options

- Check the "**Silent Mode**" toggle to delete all sounds made by the Neurone.

15.2.3.4 Button action

Here you can configure the action of simply pressing the buttons of the Neurone, which is very useful if you have MiniNeurones:



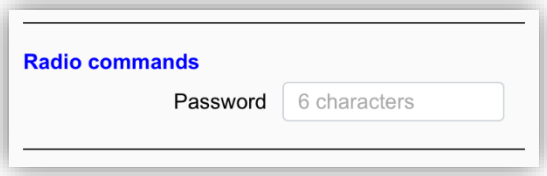
SOS Button:

- "**None**"
- "**SOS**" (default): the Neurone will send an SOS message by radio or SMS if you have configured recipient numbers in "My Account".
- "**End of Flight (RDT)**": in this case an RDT command will be sent to the MiniNeurones whose radio password is that of the Neurone below in radio commands.

ON/OFF button:

- "**None**" (default).
- "**Flash**": in this case a command of Flashes (start or end) will be sent to the MiniNeurones whose radio password is that of the Neurone below in radio commands.

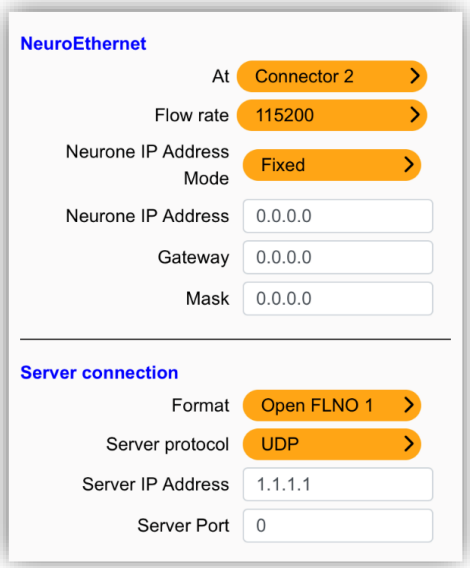
15.2.3.5 Radio commands



If you want to control MiniNeurones, choose a **password** (6 characters maximum). Only MiniNeurones with this password will respond to commands from this Neurone.

15.2.3.6 NeuroEthernet (for Neurone station only)

This option allows you to output the positions received by the Neurone Station on a network or a PC connected via NeuroEthernet to one of the connectors 1 or 2 of the Neurone.

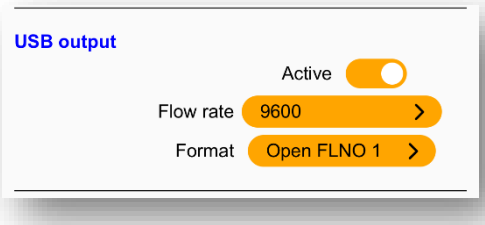


- If you have a NeuroEthernet, select the connector to which it is connected.
- Preferably choose the maximum accepted throughput (921600 on connector 1 and 115200 on connector 2).
- You can opt for an automatic choice of IP parameters or specify them (**Address, Gateway and Mask**).
- The frame format is to be chosen between the "**Proprietary**" format of Flying Neurons and an open format "**Open FLNO 1, 3 or 4**". See the appendices at the end of the document for a description of open formats.

- If you have opted for the open format, you can choose:
  - **The UDP** or **TCP** protocol.
  - **The IP address** or **server name** .
  - The **IP port**.

15.2.3.7 USB output (for Neurone station only)

This option, if enabled, allows you to output the positions received by the Neurone Station on a USB connection of a PC connected via the Neurone's USB connector.

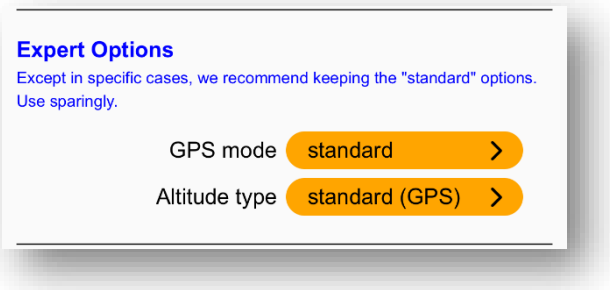


- Choose the **flow rate**

- The **format** of the frames is to be chosen from the open formats "**Open FLNO 1, 3 or 4**". See the appendices at the end of the document for a description of open formats.

15.2.3.8 Expert Options (for Non-Station Neurones)

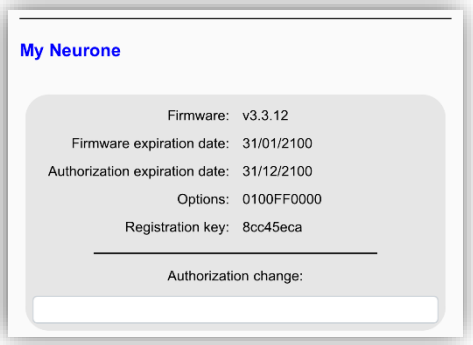
You can configure certain characteristics of the Neurone for specific uses. It is recommended that you keep the default options.



GPS mode: for certain applications, leading to strong accelerations, it may be useful to choose the **dynamic GPS mode** which filters trajectories less and better reproduces sudden changes in trajectory.

Altitude Type: For some applications requiring very precise altitudes, barometric elevation can be used. The **reference altitude 0** is then the starting point of the Neurone.

15.2.3.9 My Neurone



This last part of the screen informs you of the software version of the Neurone (**Firmware**) as well as its expiration date. New versions are regularly made available automatically. It is advisable to charge them because they improve the system or correct detected malfunctions.

The "**change of authorisation**" is reserved for future uses.

15.2.4 Advanced features

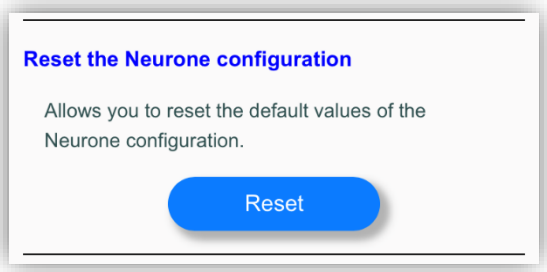
In the "Advanced" dialog you have access to some specific features of the Neurone:

15.2.4.1 Compass calibration and orientation configuration

These features are not of interest on a Neurone (station or not) used with NeuroTrack.

15.2.4.2 Reset the Neurone configuration

This function allows you to reset the configuration values of the Neurone to its default values. The Neurone must be connected to NeuroTrack beforehand.



15.2.4.3 Firmware update

During the Neurone update, it is advisable not to call or use other applications on the Smartphone or tablet performing the update. Similarly, do not move the smartphone or tablet away from the Neurone.

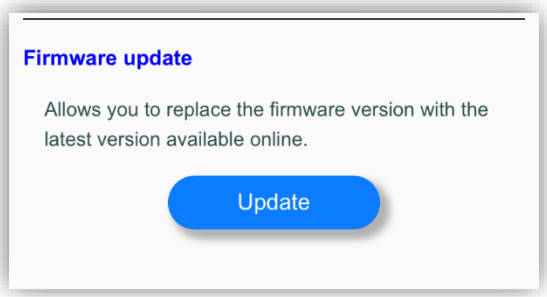
The update operation takes about 1 minute and 30 seconds.

15.2.4.3.1 Automatic update

Neurone updates are automatically offered to you when you log in to the NeuroTrack app. We advise you to accept them as they bring new features and fixes.

15.2.4.3.2 Manual update

You can force an update of the Neurone connected to NeuroTrack in the "**Advanced**" dialog by clicking on **"Update"** in the **"Firmware Update"** section**,**



15.2.4.3.3 Neurone Stuck Following Update

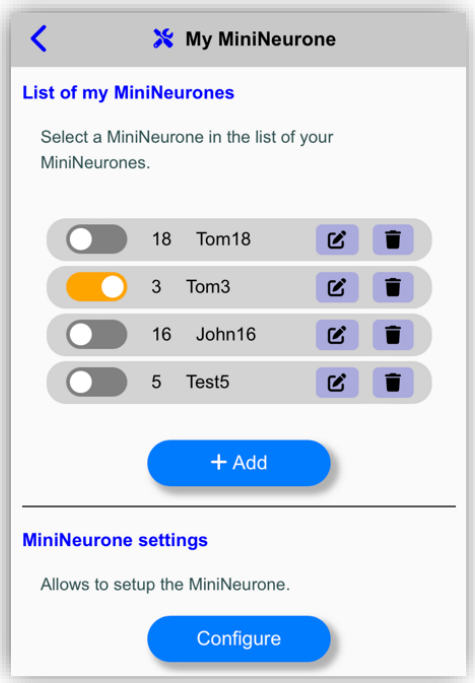
If the update has not been completed (stopping the application, logging out, etc.), it is possible to restart it:

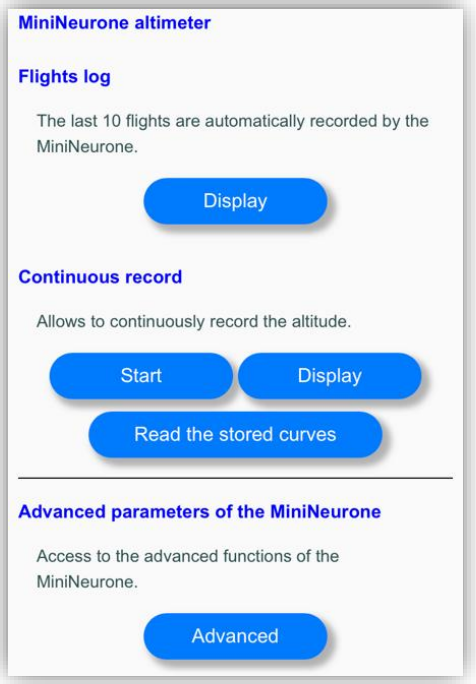
- Go to the **"Advanced"** menu**.**
- Click " **Update"** under **the "Firmware Update"** section.
- Answer **"No"** to the question **"Can you connect?"**
- Enter the number of the Neurone.
- Click **"OK"**

If the update does not work, contact Flying Neurons.

15.3 My MiniNeurone

If you have a MiniNeurone, you can set it up, access its altimeter, and update it through the functions in this menu.





15.3.1 List of my MiniNeurones

To set up and act directly on a MiniNeurone, you must have it in your MiniNeurone list.

Add a MiniNeurone by clicking on the "**Add**" button , and then enter its number, as well as its name which will be displayed on the map (for you and all other NeuroTrack users). A good practice is to combine your first or last name with the MiniNeurone serial number (e.g. "John 36").

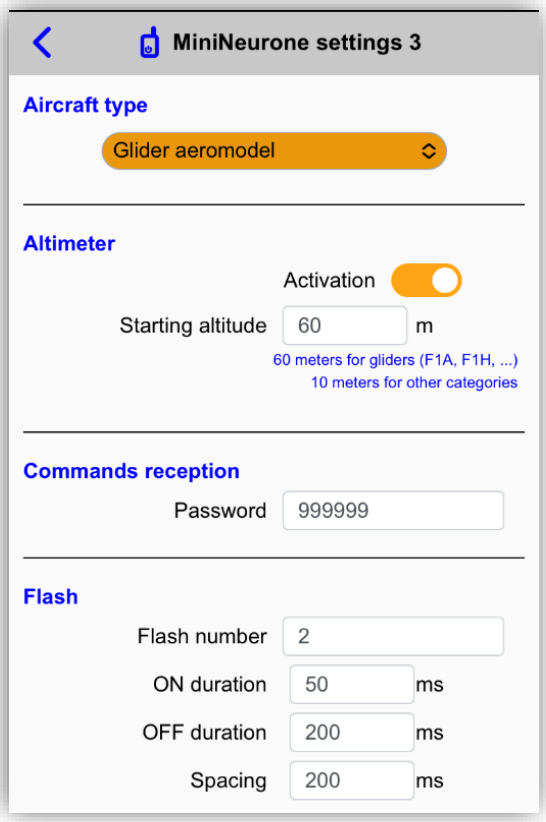
Once a MiniNeurone has been added to the list, you can edit it (number and name) or destroy it via the corresponding buttons  .

To use the following features, you must have selected a MiniNeurone from the list with the toggle, your MiniNeurone must be running near you, and you must be in a bluetooth connection with a Neurone.

Note: Only the MniNeurones listed here will be displayed on the map (if present) if you activate the filter with the button which then becomes .

15.3.2 MiniNeurone Configuration

Click on the "**Configure" button**. The following dialog will appear allowing you to configure the MiniNeurone.



15.3.2.1 Aircraft Type

Choose the type of aircraft in which the MiniNeurone is installed here.

15.3.2.2 Altimeter

Check the toggle if you want to use the MiniNeurone altimeter.

If the altimeter is activated, choose **the starting altitude** for automatic recordings; It is an altitude in relation to the ground.

As soon as your model exceeds this altitude, the automatic recording of altitudes begins, including the previous 10 seconds.

It is advisable to define:

- 10 meters for models such as F1G, F1B, F1C, F1H, F1S, drones, ...
- 60 meters for winched gliders with 50 meters of cable.

Do not take a value that is too low because the altimeter may start before the start of the flight, due to fluctuations in the altimeter measurements.

See the chapter "Altimeter" for more information.

15.3.2.3 Commands reception

In case you want to control the MiniNeurone with the Neurone's buttons (for RDT or flashes), enter here the same **password** (6 characters maximum) as the one for the Neurone's configuration.

15.3.2.4 Flash

Set up your flash sequence. Spacing is the length of time between two consecutive sequences.

See this paragraph for the operating principle.

15.3.2.5 End of flight

Choose your End of Flight System (RDT) and its settings.

See this paragraph for the operating principle.

15.3.3 Altimeter

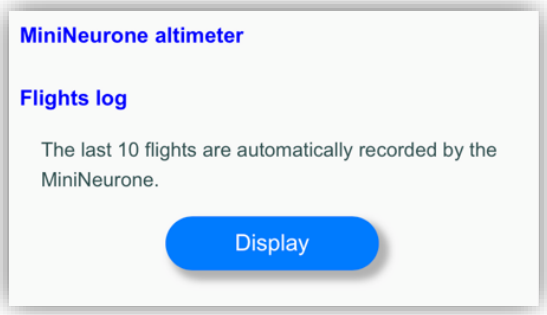
The altimeter must be activated beforehand in the MiniNeurone configuration (see the chapter "MiniNeurone configuration").

15.3.3.1 Automatic flight log recording

As soon as your model exceeds the starting altitude (see the chapter "MiniNeurone configuration"), the automatic recording of altitudes begins, including the previous 10 seconds.

The end of flight is automatically detected when the altitude remains constant.

Ten flights can be registered. Any new theft automatically erases the oldest one.



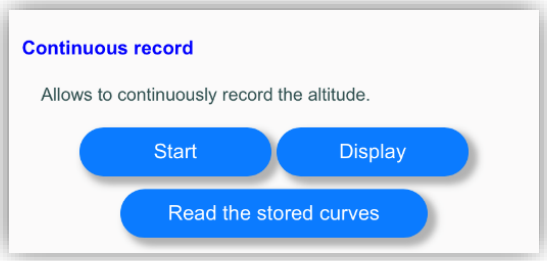
To view the flights recorded and stored in the MiniNeurone, click on "**View**" in the flight log and then choose the number of flights to display.

15.3.3.2 Continuous recording

Continuous recording allows altitude to be recorded at all times, whether the model is in flight or not. It complies **with the FAI EDIC certification**.

The advantage of continuous recording compared to automatic recording is that in the event of non-detection of the departure (glider dropped at less than 60 meters for example), the recording will be effective.

The disadvantage is that it must be started manually and requires a manual curve analysis in order to extract the flight you are interested in.

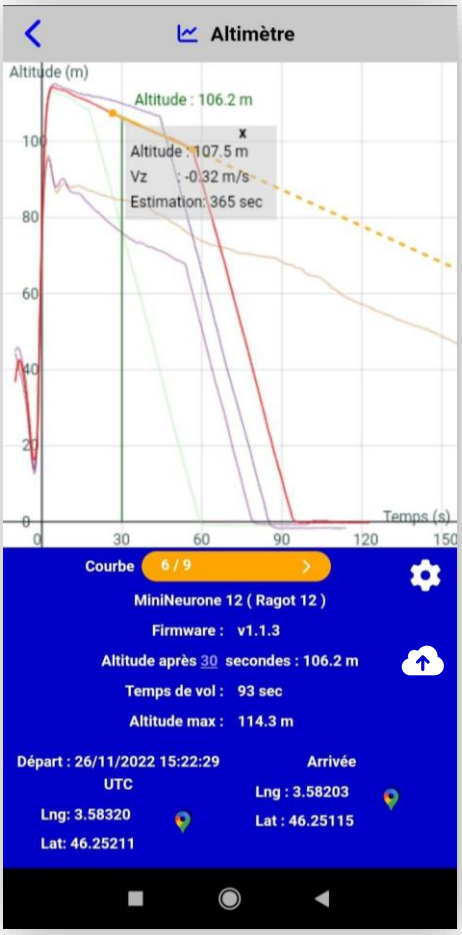


Click "**Start**" to enable continuous recording. An audio message confirms the start and the MiniNeurone flashes green with a periodicity of 1 second. The MiniNeurone can store more than 2 hours of altimetry information.

To view the recording, click "**Display**." Recording continues when displayed.

Once displayed, the curve is stored in the memory of the smartphone or tablet so that it can be consulted later without requiring the use of the MiniNeurone via the "**Read the stored curves**" button.

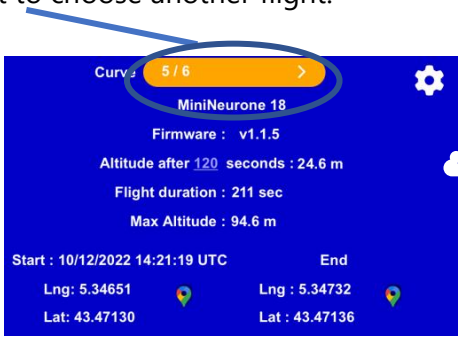
15.3.3.3 Viewing elevation records



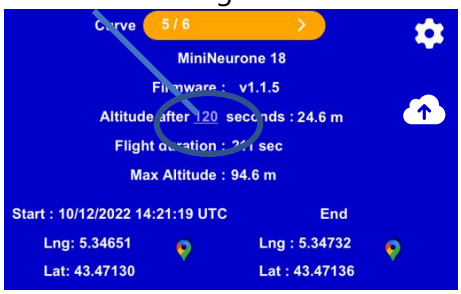
It is possible to zoom in or move around the graph with your fingers.
The flights are time-stamped and geolocated to avoid any dispute if they are used in competition.

Many tools are then available:

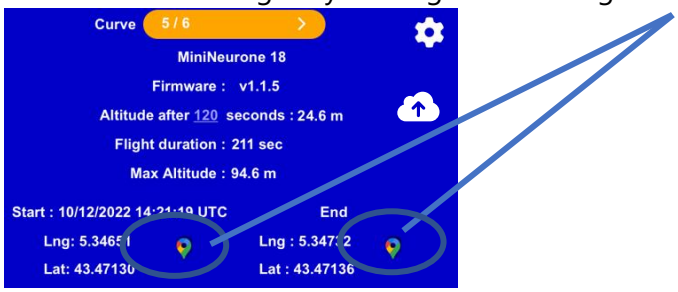
- Flight selection if multiple flights are displayed. The curve of the selected flight appears in red. Click on the list to choose another flight.



- Choice of flight time defined by the organizer for tiebreaker flights based on altitude. Click on the time value in blue to change it.



- Geolocation of the start and end of the flight by clicking on the Google Maps icon 

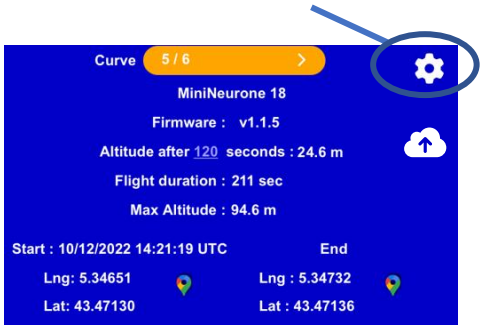


- Exporting the curve to **AboutTime**: click on the icon  to export the curve displayed in abouttime, a server available here , which allows you to store flight curves for your own history or for free flight competitions.

For automatic recordings: Study of Vz and the estimated time of flight without DT by clicking on a point on the curve.

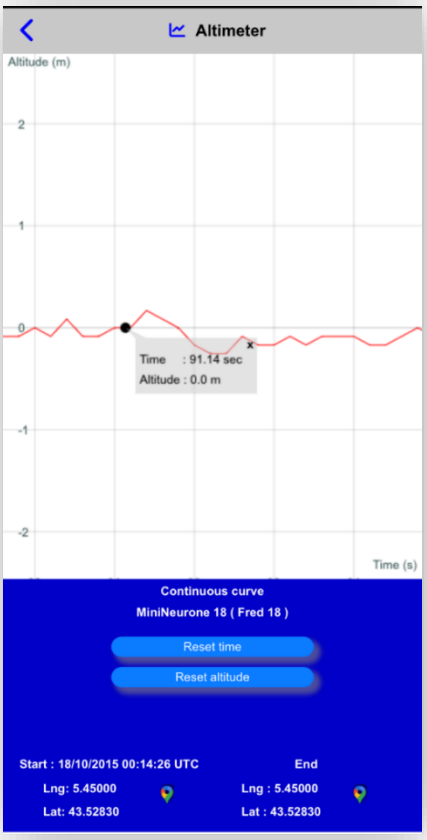
Click on the gray box containing the information to make it disappear.

The time used for the slope estimation can be changed by clicking on the setting icon (cogwheel).

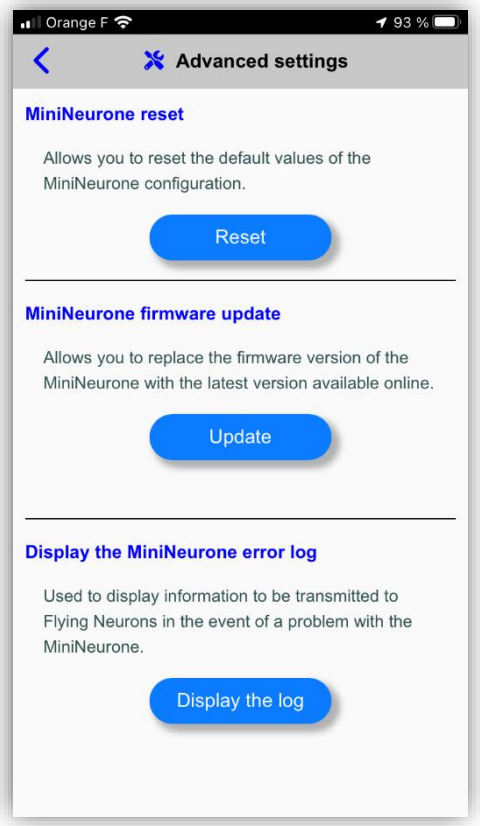


For continuous recordings, it is necessary to define the ground altitude as well as the start time:

- Walk along the curve until you find a point that corresponds to the elevation of the ground.
- Click on this point.
- Click on "**Set the altitude to 0**".
- Walk the curve again to find the beginning of the flight.
- Click on this point.
- Click on "**Set time to 0**".



15.3.4 Advanced features



15.3.4.1 MiniNeurone Reset

Click the "**Reset**" button to reconfigure your MiniNeurone with factory settings.

15.3.4.2 MiniNeurone firmware update

Click "**Update**" to replace the firmware version. The operation takes about 3 minutes. Avoid any other use of the smartphone during this operation.

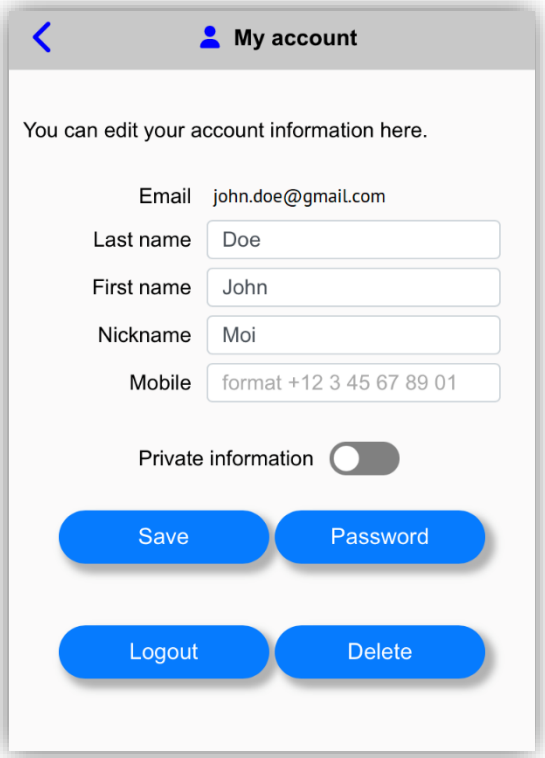
15.3.4.3 Error log

If you have a problem with the MiniNeurone, contact Flying Neurons: this log may be used to analyze malfunctions.

15.4 Account Definition

Accessible in the "**My Account**" dialog, the information relating to your account is:

- The non-editable account identifier (**email**).
- Your **name, first name, nickname, telephone number**: this information is optional.
- The **nickname** is the name that will be provided to other drivers for your Neurone. If this nickname is not provided, the Neurone number is displayed.
- The choice to keep your information private or not: if you publish it, the drivers receiving the signal from your Neurone will have access to your personal information (Name, First Name, Phone) entered in this dialog.



You can also change your password via the "**Password**" button.

Your account remains in the app even after it is stopped. This way, you don't have to log in again every time you launch NeuroTrack. Do not log out of your account to end your session. Use "**Logout**" only to change the user account on the smartphone/tablet.

By using "Logout", all information and configurations will be deleted. In addition, you will need to have a network to reconnect when you launch NeuroTrack. Don't use it to end your session: just close NeuroTrack or run the app in the background.

You can destroy your account and all of its information within Flying Neurons with the "**Delete**" button . It will delete you from our database.

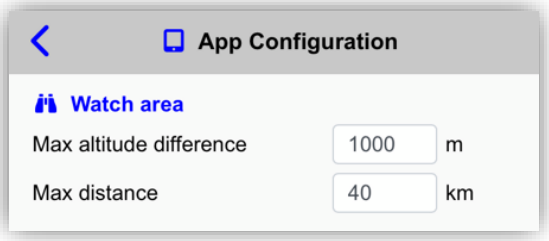
15.5 Tracking

NeuroTrack allows you to follow the evolution of an aircraft around you equipped with a Neurone or MiniNeurone. It gives you a way to track or recover a model aircraft or drone.

15.5.1 Start tracking

15.5.1.1 The Watch area:

In order not to pollute the display and to focus on the interesting aircraft around you, you must define the surveillance area around you on which the aircraft are located. This zone corresponds to a horizontal range (default 30 km) and a vertical range (default -1000m to +1000m in relation to you). It is defined in the "**App Configuration**".



15.5.1.2 Start tracking:

Note that if during the last session, an aircraft was tracked, NeuroTrack will automatically track that aircraft again.

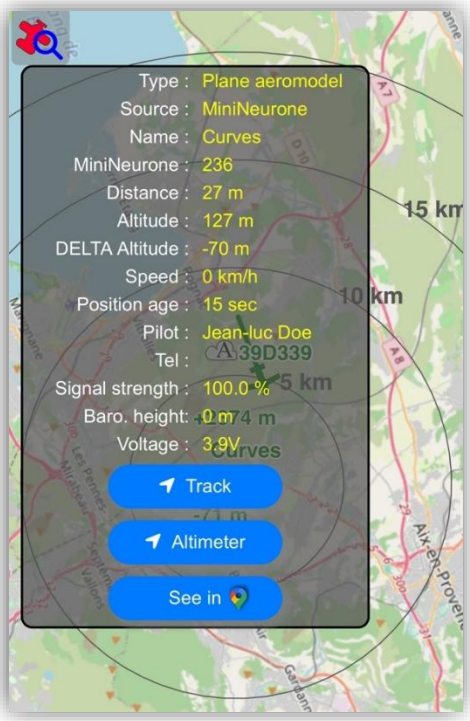
The Neurone keeps track of the last position received and – even if it is old – it will be displayed on the map until the aircraft provides a new position. Check the age of the position in the headband.

In the event of a non-precise GPS position, the symbol is a "question mark".

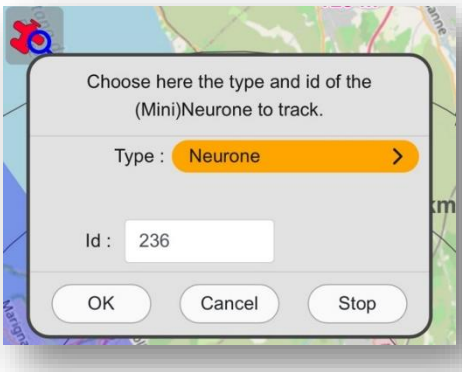
To track a Neurone or MiniNeurone, you need to choose this one.

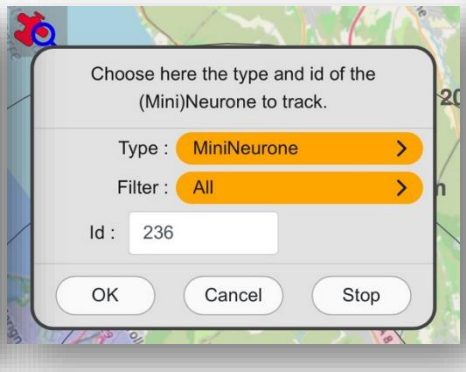
There are two ways to do this:

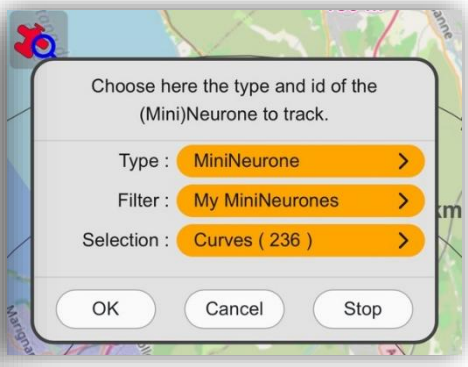
- **Method 1**: **Directly in the map**: If the Neurone or MiniNeurone is visible on the map, click on the symbol. A window with the information about this aircraft or model aircraft will be displayed on the screen and you can then track it by clicking on the "**Track**" button.



- **Method 2**: **With the magnifying glass**: click on the magnifying glass. A window will allow you to enter or choose the number of the MiniNeurone or Neurone to follow.

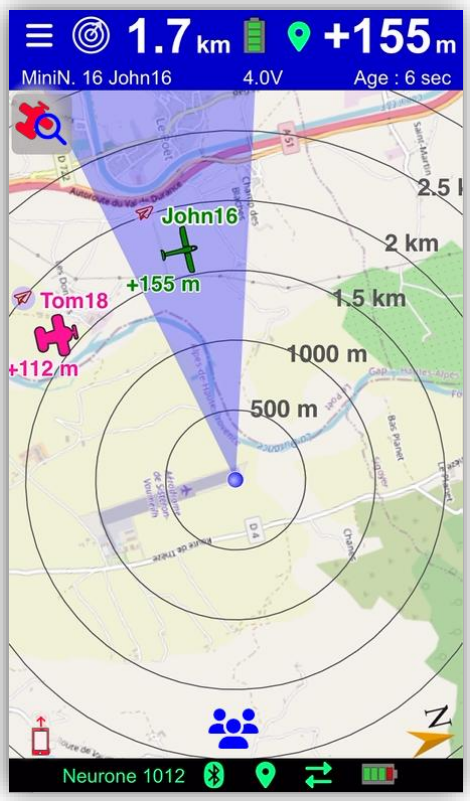






If the Neurone has not acquired a GPS position (or has a connection problem, battery level), no tracking results are displayed.

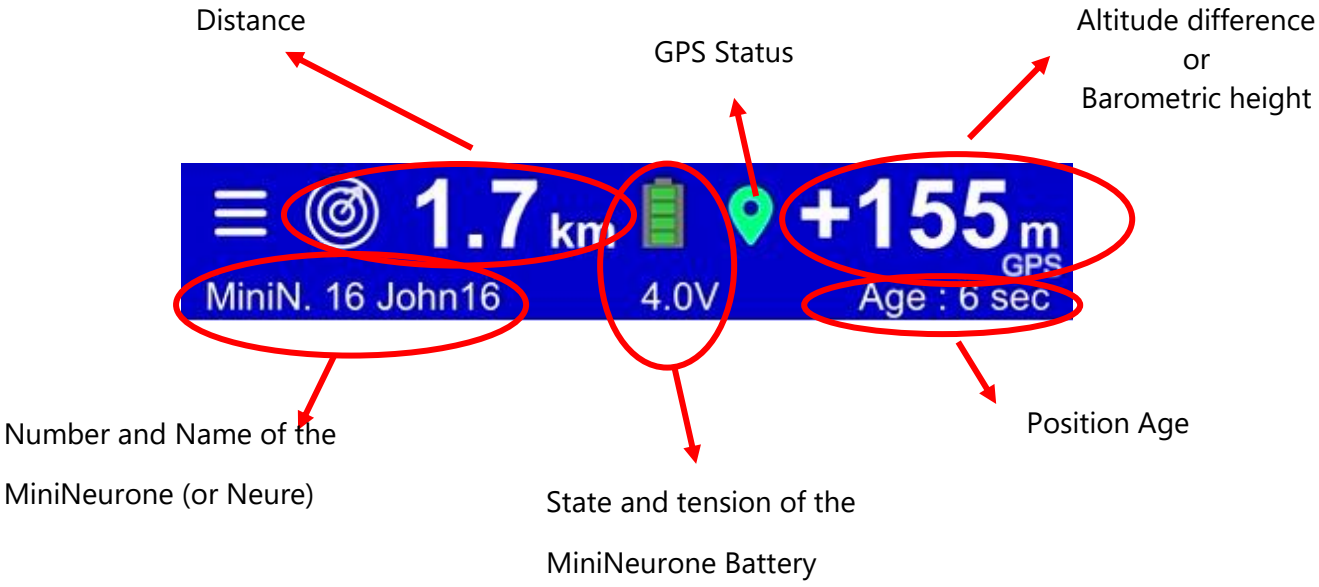
15.5.2 Tracking information



When tracking is activated, if the position of the Neurone or MiniNeurone is known, it is displayed and a blue cone shows you the direction of the aircraft.

Note that the last position received (even old or obtained in a previous session) is used.

In addition, the top banner, in dark blue, shows you the distance, the altitude difference of the aircraft, the battery status of the MiniNeurone and the age of the last reception.



As soon as one of the parameters in the banner is abnormal, this parameter is displayed in red.

If the MiniNeurone or Neurone is out of range or does not have a GPS position or no longer works, the last received position (even in a previous session) is displayed with the corresponding age of reception in red. In addition, the aircraft is symbolized on the map by a question mark  on its last known position.

The battery voltage is displayed in red if it is low.

The GPS position symbol is displayed in red if the MiniNeurone or Neurone being tracked is unable to determine its position.

If the altimeter is activated on the MiniNeurone being monitored, the MiniNeurone's flight height from its starting position is displayed (barometric measurement more accurate than GPS) with the "Baro" symbol. Otherwise, the GPS altitude difference between Neurone (mobile station) and MiniNeurone is displayed (the "GPS" symbol is then displayed below the value).

Audio announcements specify height and distance (e.g. "distance 400 meters, altitude 200 meters at the top,"). These ads can be skipped and configured in the "**App Configuration**" menu.

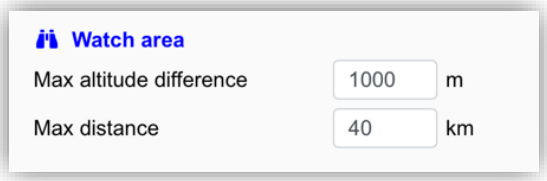
Note:

- *The sound announcement is triggered even if NeuroTrack is in the background.*

15.6 Setting up the App

This very important dialog allows you to configure the whole of NeuroTrack:

15.6.1 Watch area:



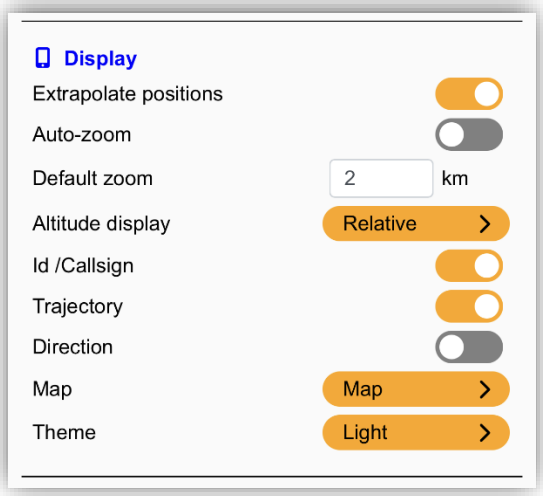
Only aircraft detected in this area will be displayed on the map and considered for tracking.

Maximum altitude difference: Aircraft with a higher altitude difference from you (top and bottom) will not be displayed. Thus, the airliners below you are not displayed unless you use a very large value of the order of 40,000 feet.

Maximum Distance: Aircraft that are more than this distance away from your location will not be displayed. A distance of 30km is usually sufficient. By using a large value, you have a view of the traffic in the distance, via the telephone network.

15.6.2 Display

This topic allows you to configure the display of the map:



- **Extrapolate positions:** the position is extrapolated between two landings with the previously known speed. Since the position is sometimes received every 30 seconds, this is sometimes disturbing and you can disable this extrapolation: the displayed position is then exactly the last position received.

- **Auto Zoom**: If checked, the map zoom automatically adjusts based on the aircraft being tracked. Thus, a zoom is made in order to keep this aircraft at about half a screen width to make it clearly visible.
  Similarly, if you (de)zoom in the map by pinching with 2 fingers, the zoom returns to its default value or to the value imposed by the tracking after a few seconds.

- **Default zoom**: this is the initial zoom which is also the zoom value in the "**Auto Zoom**" mode when there is no tracking in progress.

- **Altitude display**: There are two modes for displaying the altitude under the aircraft symbol:
  - "**Absolute**" altitude: The altitude displayed is the GPS altitude of the aircraft in relation to sea level. The unit is the one defined in the "**Units**" section below.
  - "**Relative**" Altitude: The altitude displayed is the difference in altitude between you and the aircraft. The value is negative if it is below you. The unit is the one defined in the "**Units**" section below.

- **Identifier/Callsign**: If checked, the names or registrations of the aircraft on the map will be displayed if provided by the user. Otherwise, the identifiers of Neurone or MiniNeurone, or even the ICAO numbers (preceded by h) or addresses (FLARM, SafeSky) will be displayed. If the toggle is not checked, no information is written next to the aircraft symbols on the map.

- **Routes**: Displays the route representing the last minute of aircraft positions (in the aircraft color).

- **Direction**: displays an arrow giving the direction of movement of the aircraft.

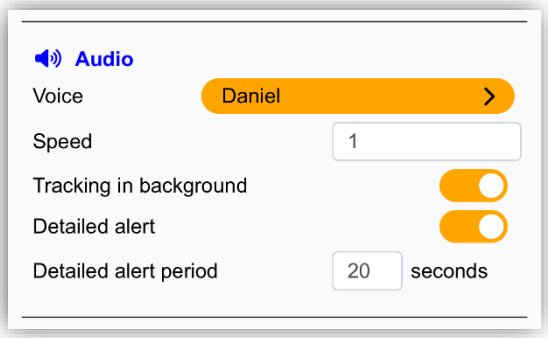
- **Map:**
  - Several possibilities are available:
    - Map: A map is displayed
    - Satellite: A satellite view is displayed
    - Clear: A bright background is displayed, allowing better visibility in bright light.
    - Dark: A dark background is displayed, allowing for better visibility in high/low light

- **Theme**: Allows you to choose between the theme of NeuroTrack's dialog ("light" or "dark")

15.6.3 Units and Language

Here you can define the units and language used in the display and audio announcements.

15.6.4 Audio



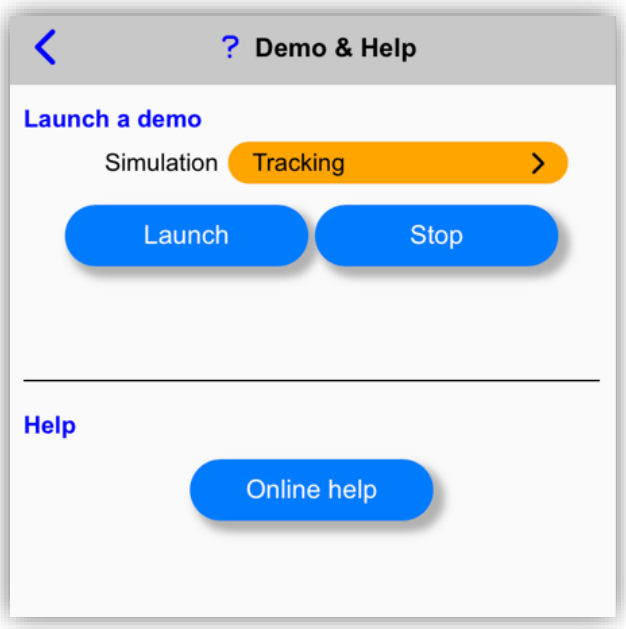
This topic lets you choose the voice used in the audio announcements and the speed at which the voice speaks.

If no voices are heard when starting the session or when choosing from the list of voices provided, change your voice, the voices may not be downloaded to your smartphone. You can update your smartphone's voices in the smartphone's settings (under Accessibility > Spoken Content > Voice >English on iOS and under Accessibility > Text-to-Speech on Android).

In terms of the sound "alerts" allowing you to locate the Neurone or MiniNeurone being tracked, you can configure:

- Its operation in the background: if unchecked, the tracking stops when the application is in the background, which saves the battery of the smartphone and is not disturbed by voice announcements.
- The level of detail (the detailed alert specifies height and distance (e.g. "distance 400 meters, altitude 200 meters high,") and the frequency of voice alerts are also configurable here.

15.7 Demo & Help



Use this dialog to launch the tracking demo which simulates the tracking of a model flight by being fixed, then the approach to this landed model.

Any flight in progress will be stopped and the demo flight will start as soon as you press "**Launch**".

The "**Online Help**" button takes you to our Help Center on our www.flyingNeurones.com site where you will find our manuals and our list of questions and answers (FAQs).

Also check out our videos on our YouTube channel.

16 Technical characteristics

16.1 Neurone

Dimensions (excluding antenna)	55*35*20mm
Off-Antenna Weight	44 grams
Battery life at 20°C (without peripherals)	5 p.m.
Operating Temperature	-20°C to 80°C
Battery charging time at 20°C	3 hours
Load Range	0°C to 45°C
Charging voltage	5 to 12 Volts
Charging current	500 mA
Radio range (with 50 mm antenna included)	More than 15 kms
Radio frequency	ISM band 868 Mhz
Transmitted radio power (with 50 mm antenna provided)	500 mW
Battery	Lithium polymer 1200 mAh
Radio Antenna Connector	SMA female. Impedance 50 ohms
Positioning constellations	GPS, GLONASS, BEIDOU, GALILEO
Bluetooth	Bluetooth Low Energy (BLE)
Sensors	Acceleration, Compass, Pressure, Temperature
Peripheral connectors	2 micro USB connectors
Charging connector and USB 2.0	1 micro USB connector
LEDs	6 indicator LEDs
Sound	Speaker microphone
Waterproofing	No

16.2 MiniNeurone

Dimensions (excluding antenna)	29*15*5.7mm
Weight	2.7 grams
Power	3.3 to 5 volts
Battery life at 20°C powered by a 350 mAh Lithium battery	7 to 11 hours depending on movement
Operating Temperature	-20°C to 80°C
Radio Range	More than 15 kms
Radio frequency	ISM band 868 Mhz
Transmitted radio power	500 mW
Connector	Hirose DF52-10P-0.8C
Positioning constellations	GPS, GLONASS, BEIDOU, GALILEO
Sensors	Pressure, Temperature
LEDs	4 indicator LEDs
Waterproofing	No

17 ANNEX

17.1 USB and NeuroEthernet output formats

17.1.1 Format FLNO1

$FLNO1, Serial_number, Second, GPS _Fix, Latitude, Longitude, Altitude, Heading, Vh, Vz

Each frame ends with \r\n

Example:

$FLNO1,1250,59,1,-4361309,-4528926,555,180,100000,-5000

$FLNO1: Header.

Serial_number: Serial number. Whole.

Second: Second GPS. Integer from 0 to 59.

GPS_Fix: 0 = old position, 1 = current position.

Latitude: Integer. Unit = 10^{-5} degrees, negative in the South.

Longitude: Integer. Unit = 10^{-5} degrees, negative in the West.

Altitude: Above sea level. Integer in meters.

Heading: Relative to the North. Integer in degrees.

Vh: Horizontal speed. Integer in mm/s.

Vz: Vertical speed. Integer in mm/s. Negative downhill.

17.1.2 Format FLNO3

$FLNO3, Type, Serial_number, Vehicle_type, Hour, Minute, Second, GPS_Fix, Latitude, Longitude, Altitude, Heading, Vh, Vz

Each frame ends with \r\n

Example:

$FLNO3,N,1250,13,23,59,59,1,-4361309,-4528926,250,180,100000,-5000

$FLNO3: Header.

Type:

- N = Neurone
- A = ADSB
- F = FLARM

Serial_number: Serial number. Whole.

Vehicle_type: Integer from 0 to 255.

Hour: UTC time. Integer from 0 to 23.

Minute: Minute UTC. Integer from 0 to 59.

Second: Second UTC. Integer from 0 to 59.

GPS_Fix: 0 = old position, 1 = current position.

Latitude: Integer. Unit = 10^{-5} degrees, negative in the South.

Longitude: Integer. Unit = 10^{-5} degrees, negative in the West.

Altitude: Above sea level. Integer in meters.

Heading: Relative to the north. Integer in degrees.

Vh: Horizontal speed. Integer in mm/s.

Vz: Vertical speed. Integer in mm/s. Negative downhill.

17.1.3 Format FLNO4

$FLNO4, Type, ID24_type, ID24, Callsign, Vehicle_type, Hour, Minute, Second, GPS_Fix, Latitude, Longitude, Altitude, Heading, Vh, Vz

Each frame ends with \r\n

Example:

$FLNO4,A,1,3685AC,FPLANE,13,14,23,59,1,-4361309,-4528926,250,180,100000,-5000,0,180

$FLNO4: Header.

Type:

- N = Neurone
- MN = MiniNeurone
- SN = SuperNeurone
- A = ADSB
- F = FLARM
- Etc ...

ID24_type:

- 0 = Flying Neurons
- 1 = ICAO
- 2 = FLARM
- Etc ...

ID24: 24-bit identifier. Whole.

- Integer for ID24_type = Flying Neurons
- Hexadecimal for ID24_type = ICAO or FLARM

Callsign: maximum 8 characters.

Vehicle_type: Integer from 0 to 255.

Hour: UTC time: Integer from 0 to 23.

Minute: Minute UTC. Integer from 0 to 59.

Second: Second UTC. Integer from 0 to 59.

GPS_Fix: 0 = old position, 1 = current position.

Latitude: Integer. Unit = 10^{-5} degrees, negative in the South.

Longitude: Integer. Unit = 10^{-5} degrees, negative in the West.

Altitude: Above sea level. Integer in meters.

Heading: Relative to the north. Integer in degrees.

Vh: Horizontal speed. Integer in mm/s.

Vz: Vertical speed. Integer in mm/s. Negative downhill.

Rot_rate: Rotational speed in degrees/s (positive clockwise).

Compass heading: Integer in degrees relative to the North (from 0 to 359, positive to the East).

Please note: some fields may be undefined and result in 2 consecutive commas.

17.2 Types of vehicles

The Vehicle type field of the output formats is detailed below:

Vehicle_type	Description
0	Not defined
1	Transportation UAV
2	Slow UAV
3	Fast UAV
4	Slow UAV fixed wing
5	Fast UAV fixed wing
6	Military plane
7	Airliner
8	Cargo airliner
9	Spray
10	Plane
11	High performance plane
12	Paramotor
13	Ultralight
14	Motor glider
15	Autogyro
16	Towplane
17	void
18	Glider
19	Small Helicopter
20	Fast helicopter
21	void
22	Paraglider
23	Balloon
24	Light jet
25	void
26	void
27	Station
28	Mobile station
29	Multilateration station
30	Plane aeromodel
31	Glider aeromodel
32	Helicopter aeromodel
33	Rocket aeromodel
34	void
35	void
36	Space rocket
37	void
38	void

39	void
40	Person
41	Because
42	Bike
43	Bicycle
44	Boat
45	void
46	void
47	void
48	void
49	void
50	Obstacle point
51	Set of points obstacle
52	Line obstacle