Flying Neurons

Neurone V3.3

User's manual

The Neurone and its peripherals

Flying Neurons - Email (Support): contact@flyingneurons.com website: www.flyingneurons.com

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Modifications

Version	Date	Description
1.0	21/02/2022	First draft
2.0	24/12/2022	Modification for Neurone v3.2
3.0	1/6/2023	Modification for Neurone v3.3

Contents

This document details the installation, configuration and use of the **Neurone** and its peripherals for each use case.

Contents

1 Material description

1.1 Neurone

Neurone case

Support

Neurone

Charging cable

Radio antenna

1.2 NeuroADSB

Velcro tapes

Radio antenna

NeuroADSB

1.3 NeuroFLARM

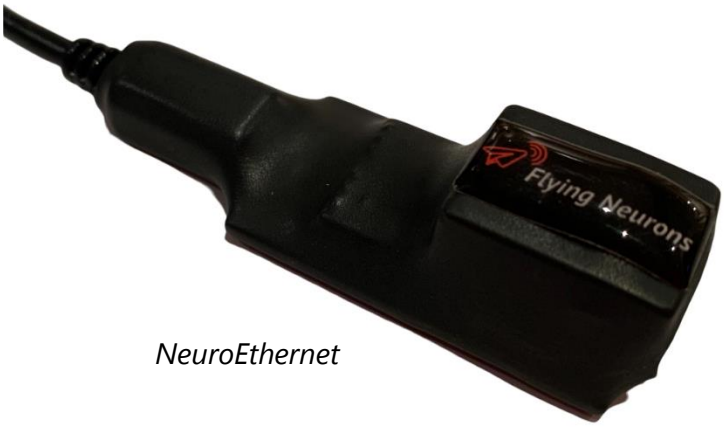
NeuroFLARM

Radio antenna

1.4 transponder cable

A specific document «**FLNO_001 Transformation of a mode S transponder into ADS-B out**» is dedicated to the **transponder cable.**

1.5 NeuroEthernet



NeuroEthernet

2 Installation

The various peripherals are connected to auxiliary connectors 1 and 2.

2.1 The Neurone

Thanks to its versatility, the **Neurone** covers a very broad spectrum of uses:

2.1.1 In general aviation

A tutorial is available on our Youtube channel .

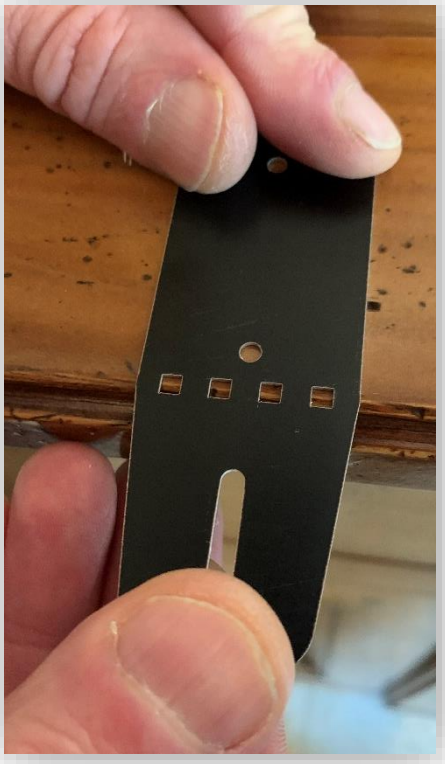
When positioning or fixing the **Neurone**, you must respect the following rules:

- The **Neurone** must have a clear view of the sky to be able to receive signals from GPS satellites and other constellations. This means that it should not be covered by any metal or carbon part.
  For metal or carbon aircraft, the ideal location is under the canopy.

- It is not necessary to use an external radio antenna. The performances of the **Neurone** are such that the supplied antenna offers very good performance while remaining inside the aircraft. However, the radio antenna must be vertical to optimize communication with other **Neurones**.
  You can optionally place the **Neurone** horizontally and use an angled antenna that you orient vertically (see the **«Accessories»** section of our shop).

- The **Neurone** must not be fixed on a vibrating part as this affects the contact quality of the connectors.

A bracket is provided to allow quick attachment and release of the **Neurone**. This support can be screwed or glued.



The fixing bracket makes it possible to place this support on any surface, whatever its inclination and to adjust the orientation of the **Neurone** afterwards. Bend the square to the desired angle on a table corner.

Secure the bracket with screws or double-sided tape, then mount the bracket to the bracket with the mounting knob. Then orient the support so that the **Neurone** antenna is vertical.

The **Neurone** has its own battery which gives it good autonomy. It can be temporarily or permanently connected to a USB connector or to any power supply between 5 and 12 volts. It is then possible to configure it so that it starts and stops automatically on power-up (see Automatic Start/Stop).

2.1.2 On a drone or model aircraft

Due to its ultra-small size, the **MiniNeurone** is more suitable than the **Neurone** for mounting on a drone or model aircraft, but the **Neurone** is nevertheless possible.

When positioning or fixing it, you must respect the following rules:

- The **Neurone** must have a clear view of the sky to be able to receive signals from GPS satellites and other constellations. This means that it should not be covered by any metal or carbon part.

- The radio antenna should be vertical to maximize the communications range. You can optionally place the **Neurone** horizontally and use an angled antenna that you orient vertically (see the " **Accessories** " section of our shop).

Other more flexible antennas can be used, contact Flying Neurons if you wish.

A bracket is provided to allow quick attachment and release of the **Neurone**. This support can be screwed or glued.

2.1.3 In ground station

For ground station use, the **Neurone radio antenna** must be located outside buildings and have a clear view of the surroundings. Place the antenna high if you want to improve the range of the station.

The **Neurone** itself can be inside a building and does not need to receive GPS signals or other constellations.

You can opt for high gain antennas that you connect to the **Neurone** by a coaxial cable. Choose a low-attenuation cable and reduce its length as much as possible. You will thus obtain ranges that can exceed 100 kilometers. Contact Flying Neurons for more information.

2.1.4 In mobile station

To track or retrieve a drone or model aircraft, the **Neurone** can operate as a mobile station.

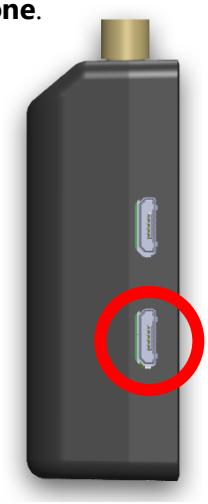
It allows to track devices equipped with **MiniNeurones**.

It can be placed in a pocket, armband, or any other place. Contact of the antenna with the human body reduces the radio range. Try to keep the antenna vertical as much as possible.

For more comfort, a more flexible antenna can be used, contact Flying Neurons if you wish.

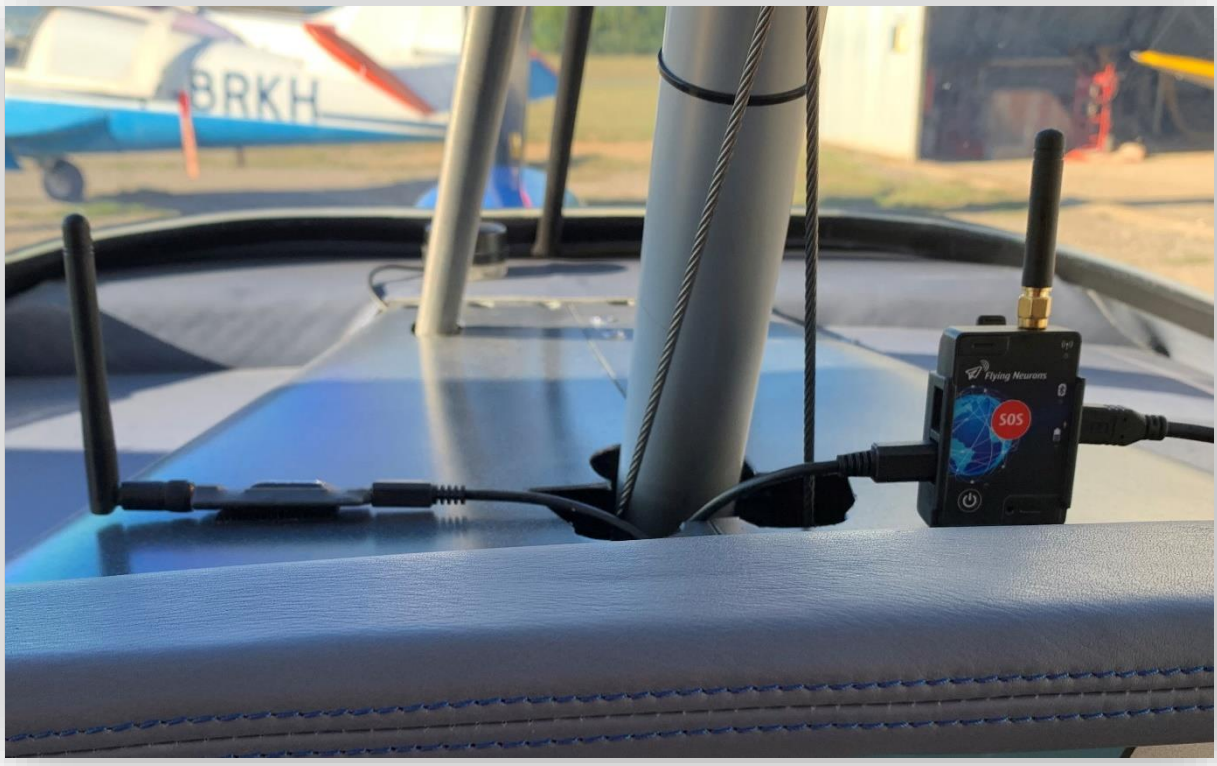
2.2 The NeuroADSB

The optional **NeuroADSB** device is an **ADS-B IN device.** It makes it possible to receive radio messages from ADS-B, S and C transponders and communicates them to the **Neurone**.

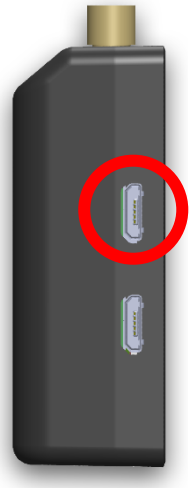


The **NeuroADSB** is connected to the auxiliary connector 1 of the **Neurone** using the micro-USB cable. Like the **Neurone,** it must have a clear view of the sky to properly receive radio messages from other transponders.

Place the antenna vertically if possible. However, transponders transmitting with high power, the position and orientation of the antenna is not critical and tolerates being slightly masked or tilted.



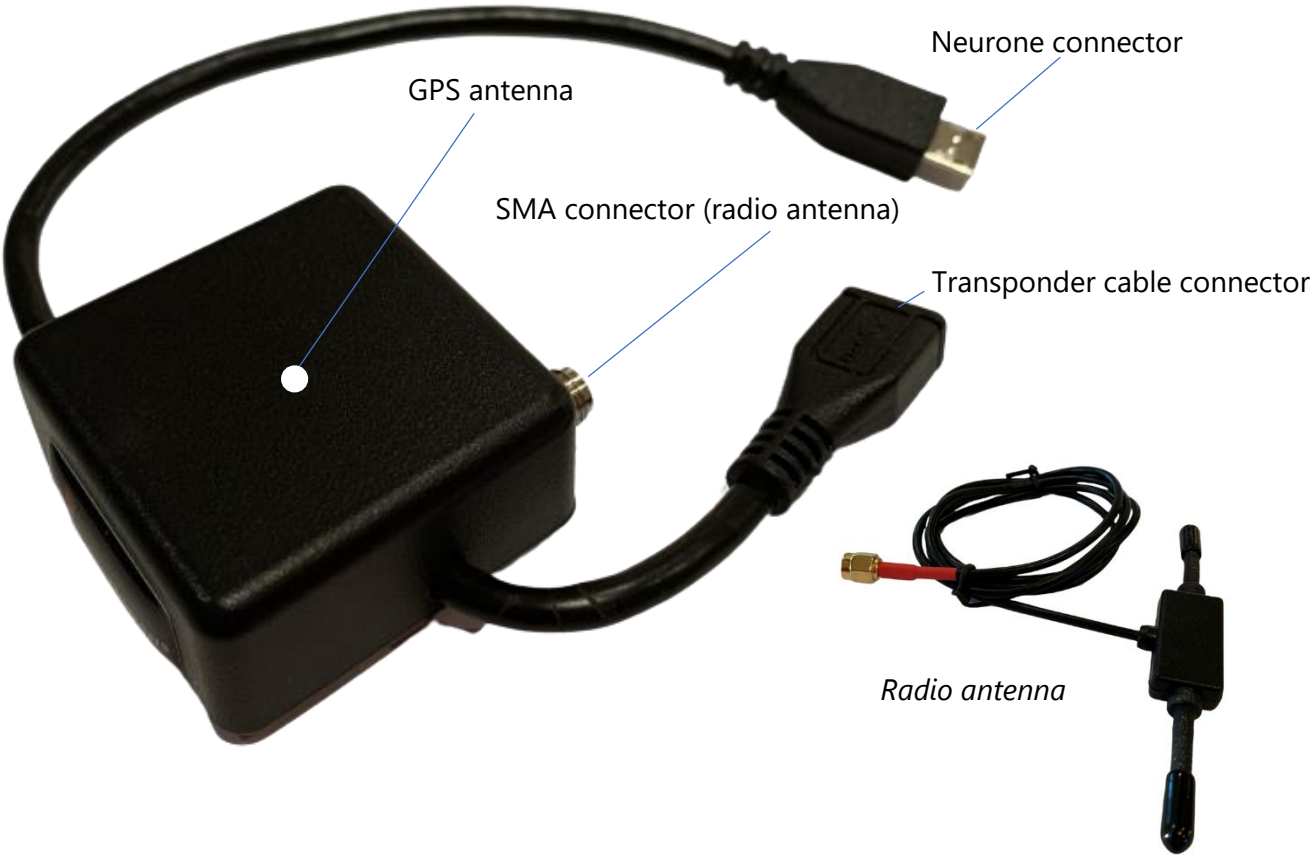
2.3 The NeuroFLARM



The optional **NeuroFLARM** peripheral is a **transmitter and receiver** designed in partnership with the **FLARM** company. It therefore allows you to see and be seen, live by radio, by all **FLARM** compatible devices.

The **NeuroFLARM** is connected to the auxiliary connector 2 of the **Neurone.**

It incorporates its own GPS antenna and must therefore have good visibility of the sky and be placed horizontally.



The radio signals from **FLARMs** are of low power, which makes the positioning of the radio antenna very important. For good performance, follow these tips:

- Place the antenna vertically,
- Check that the antenna is not hidden by a metal or carbon element
- Check that the antenna has a clear view of the sky

A good solution is to attach it to the canopy using double-sided tape.

The female micro-USB connector of the **NeuroFLARM** is used to connect the **transponder cable** if all the connectors of the **Neurone** are already used.

2.4 The transponder cable

A specific document «**FLNO_001 Transformation of a mode S transponder into ADS-B out**» is dedicated to the **transponder cable.**

2.5 The NeuroEthernet

The optional **NeuroEthernet peripheral** allows the **Neurone** to connect to an Ethernet network and communicate:

- Either with the Flying Neurons server using the Flying Neurons proprietary protocol,
- Either with a server of your choice using an open format.

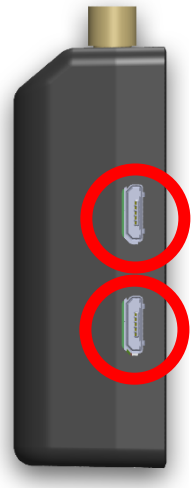
RJ45 Plug

All traffic information detected by the **Neurone** and its peripherals is sent to the server.

Contact Flying Neurons for the description of the open format.

All IP parameters are configurable through the **NeuroFly** application**.**

The **NeuroEthernet** can be connected to the auxiliary connector 1 or the auxiliary connector 2 of the **Neurone.** If it is free, prefer connector 1 because it allows the use of higher speeds.



3 Functioning

3.1 Antenna mounting

The antenna connector is of the female SMA type. You can mount antennas of all kinds, directly, or deport them via coaxial cable.

3.2 Manual start

Press the **ON/OFF** button for 3 seconds. The red LED flashes quickly then more slowly. The flashing remains red until the **Neurone** determines its position. The flashes then change to green. The **Neurone** needs a good view of the sky to determine its position.

3.3 Manual shutdown

Press the **ON/OFF** button for 3 seconds.

3.4 Auto On/Off

If the **Neurone** is permanently connected to an electrical source via the battery charging connector, you can configure it so that it starts and stops automatically depending on the electrical source (see Automatic on/off controlled by charging) . The battery charging voltage must be between 5 and 12 volts.

Please note, if the Neuron is powered by a source other than a USB power supply, the D+ and D- wires (green and white) of the USB cable must be connected to each other for automatic on/off to work.

3.5 S.O.S.

You can send a locating message by pressing the **SOS button** on the front of the **Neurone** or on the **NeuroFly** application**.** This message is sent by radio to all the surrounding **Neurones** and by SMS to all the contacts you have defined in your account. All **NeuroFly users will see an SOS** symbol appear on your aircraft.

3.6 Other configurations of the 2 buttons

You can reconfigure the role of the 2 buttons on the front panel (see Configuration).

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

- Send an SOS (default)
- Control the end of flight of a drone or a model aircraft (**RDT**)

When pressed briefly, the **ON/OFF** button can have the following functions:

- No function
- Remote flash on or off

Whatever the configuration of the buttons, a long press of 3 seconds controls the start and stop of the **Neurone.**

3.7 LEDs

They allow to control the state of the Neurone

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

3.8 Battery charge

It is done via the micro USB connector near the battery icon. The load can be made **Neurone** on or off:

- running **Neurone**
  - **Orange** flash every 5 seconds.
- Shutdown **Neurone**
  - **orange** flash while charging.
  - Flashing **orange / green** rapidly at the end of charging.

3.9 Sound

The **Neurone** emits sounds:

- At each radio reception
- In various configurations
- When pressing the buttons
- During Bluetooth connections or disconnections
- ...

The sound can be disabled (see Options).

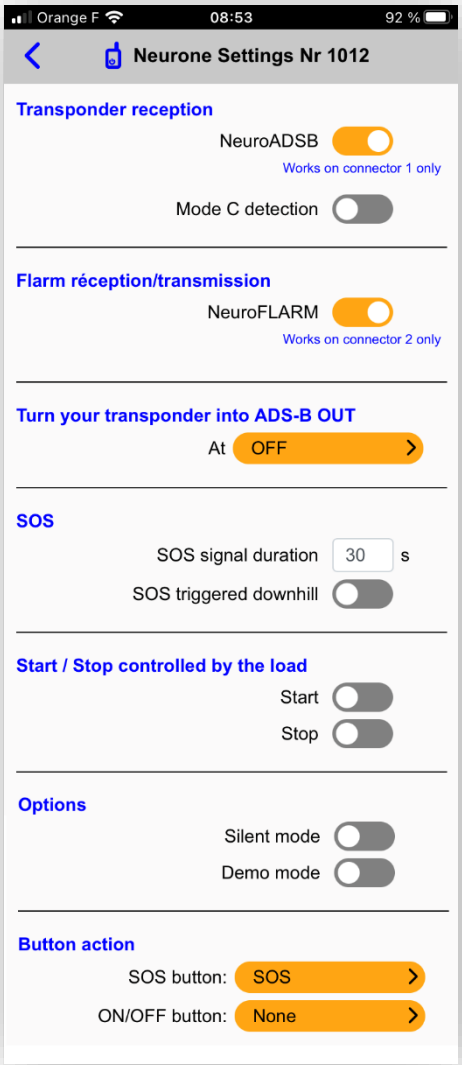
3.10 Neurone Reset

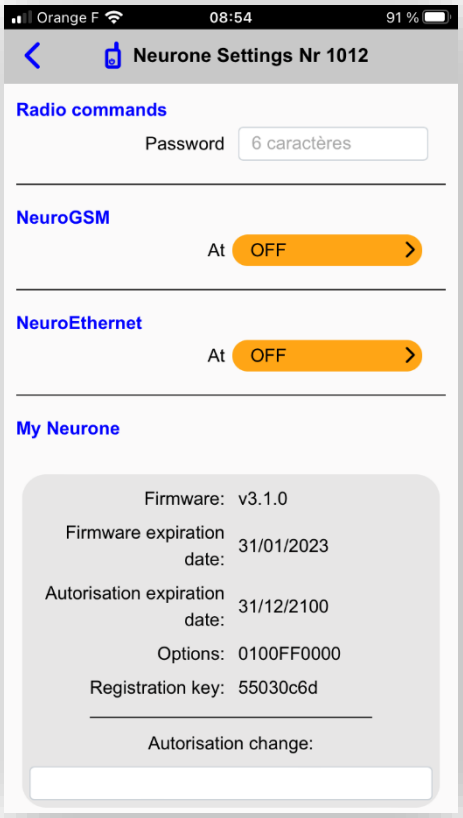
If the **Neurone does not work,** you can reset it by pressing with a fine point such as a paper clip, in the reset hole. The **Neurone** flashes in all colors for a few seconds then restarts.

4 Configuration

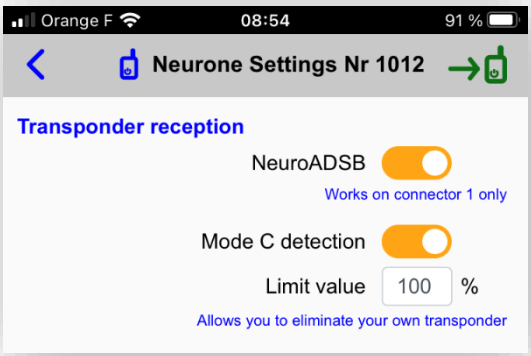
- Connect to the **Neurone** from the **NeuroFly** or **NeuroTrack** App**.**
- In the menu, select «**My Neurone**» and click on «**Configure**».
- The following screen is displayed:

Please note that in NeuroTrack, only part of this information is displayed.





4.1 Reception of transponders

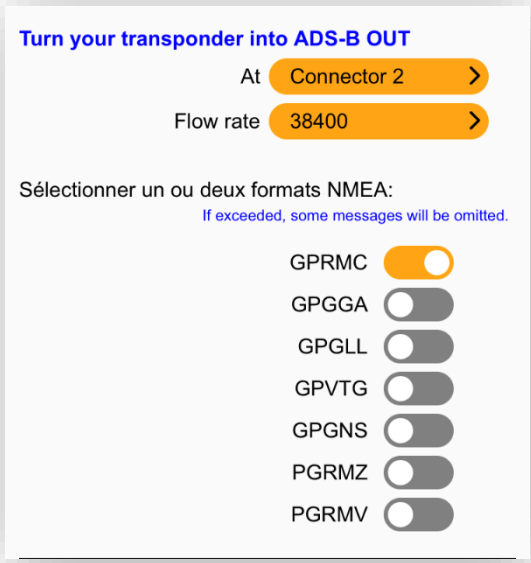


- If you have a **NeuroADSB,** check the toggle «**NeuroADSB**»**.**
- The «**Mode C detection**» toggle activates the detection of **Charlie mode transponders.** This activation is not recommended because many ADS-B OUT or TCAS also transmit in "Charlie mode" leading to information redundancy. However, if you activate this option, the «**Limit value**» allows you to avoid receiving your own transponder, based on the reception power. Adjust this value between 0 and 100% until you no longer receive it. A good value is 80%. If you still receive your transponder, lower this value.

4.2 Flarm reception

- If you have a **NeuroFLARM** , check the toggle «**NeuroFLARM**» .

4.3 Transformation transponder to ADS-B OUT

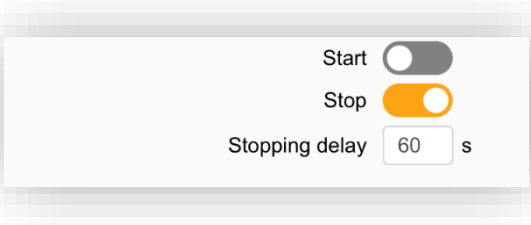


- If the **Neurone** is connected to your transponder via the **transponder cable,** select the connector used. Refer to the document «**FLNO_001 Conversion of a mode S transponder to ADS-B out»** to configure the rate and the NMEA formats to be selected.

4.4 S.O.S.

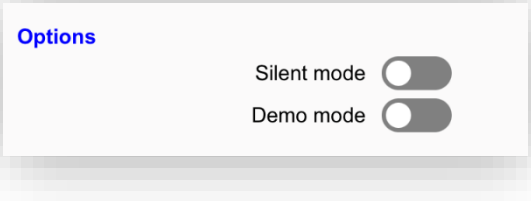
- When you send an SOS, either by pressing the button on the **Neurone**, or by pressing the **SOS** button on the application, a SOS signal is sent by radio and by SMS to all your predefined contacts in your account. The duration of the radio signal can be changed by specifying «**SOS Signal Duration»**.
- By checking the «**SOS triggered during descent»** toggle, it is possible to automatically send a SOS signal if the descent speed exceeds the value specified in "«**Trigger speed»**.

4.5 Start/ Stop controlled by the charging



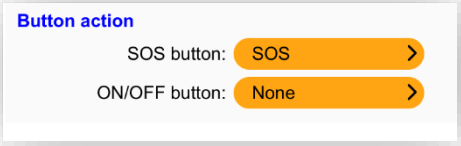
- Check the «**On**» toggle so that the **Neurone** starts automatically when a voltage is detected on the charging connector.
- Check the «**Shutdown**» toggle to have the **Neurone** shut down when voltage is removed after a «**Shutdown delay**».

4.6 Options



- Check the «**Silent mode**» toggle to suppress all sounds emitted by the **Neurone.**
- Check the «**Demo mode**» toggle to simulate the presence of about 40 aircrafts around you. Remember to delete it before flying.

4.7 Button action



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

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

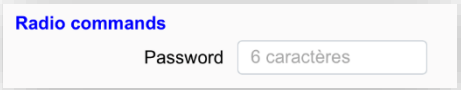
- Send an SOS (default)
- Control the end of flight of a drone or a model aircraft (**RDT**)

When pressed briefly, the **ON/OFF** button can have the following functions:

- No function
- Remote flash on or off

Whatever the configuration of the buttons, a long press of 3 seconds on the **ON/OFF** button controls the start and stop of the **Neurone.**

4.8 Radio commands

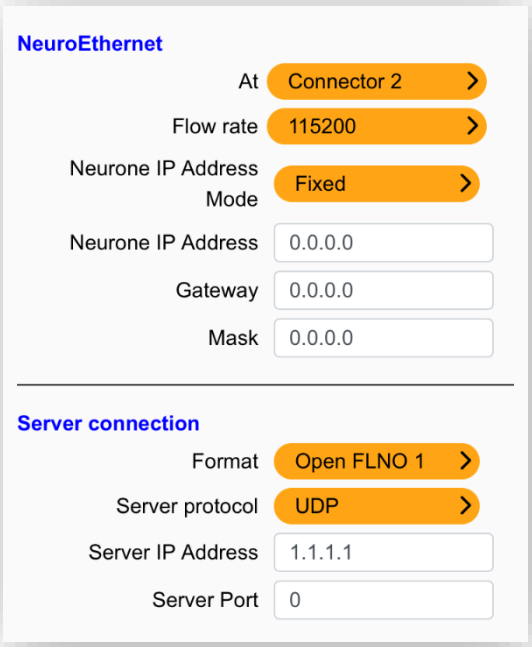


- A password can be set for the radio commands. Only the **MiniNeurones** with the same password will process the commands sent by the **Neurone**.

4.9 NeuroGSM

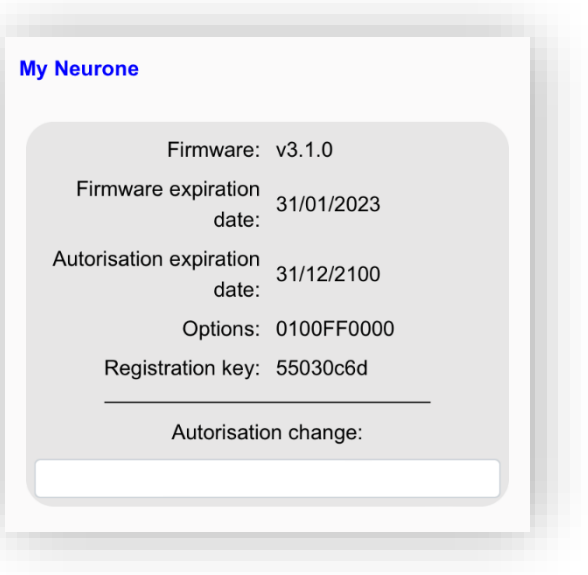
This option is currently not available. Keep the toggle on « **OFF** ».

4.10 NeuroEthernet



- If you have a **NeuroEthernet,** select the connector to which it is connected.
- Preferably choose the maximum rate accepted (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 format of the frames is to be chosen between the **«Proprietary»** format of Flying Neurons and an open format **«Open FLNO 1»**. Contact Flying Neurons for the description of the open format.
- 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.**

4.11 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 load them because they improve the system or correct detected malfunctions.

The « **Authorization change**» is reserved for future use.

5 Neurone Upgrade

During the Neurone update, you are advised not to call or use other applications on the smartphone or tablet performing the update. Likewise, do not move the Smartphone or tablet away from the Neurone.

The update operation takes approximately 1 minute and 30 seconds.

5.1 Automatic update

Neurone updates are automatically offered to you when you connect to the **NeuroFly** or **NeuroTrack** Application**.** We advise you to accept them because they bring new features and corrections.

5.2 Manual update

You can trigger an update of the **Neurone.**
Go to «**My Neurone» then** «**Advanced»** and in the «**Firmware Update»** section**,** click on «**Update».**

5.3 Neurone blocked following an update

If the update has not been completed (application shutdown, disconnection, etc.), it is possible to restart it:

- Go to the «**Advanced»** menu**,** «**Firmware Update»** section.
- Click on «**Update».**
- Answer «**No»** to the question «**Can you connect? ».**
- Enter the **Neurone number.**
- Click «**OK».**

If the update does not work, contact Flying Neurons.

6 Technical characteristics

6.1 Neurone

Dimensions (excluding antenna)	55*35*20mm
Weight without antenna	44 grams
Autonomy at 20°C (without peripherals)	17 hours
Operating temperature	-20°C to 80°C
Battery charging time at 20°C	3 hours
Charging range	0°C to 45°C
Charging voltage	5 to 12 Volts
Charging current	500mA
Radio range (with supplied 50 mm antenna)	More than 15 km
Radio frequency	ISM band 868 MHz
Transmitted radio power (with supplied 50 mm antenna)	500mW
Battery	1200mAh Lithium Polymer
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	Micro-speaker
Waterproof	Nop

6.2 NeuroADSB

Dimensions (excluding antenna)	54*21*8mm
Weight without antenna	9 grams
Operating temperature	-20°C to 80°C
Radio range (with supplied antenna)	More than 150 km
Radio frequency	1090Mhz _
Radio antenna connector	SMA female. Impedance 50 ohms
Connector to Neurone	1 micro-USB connector
Waterproof	No

6.3 NeuroFLARM

Dimensions (excluding antenna)	40*40*20mm
Weight without antenna	34 grams
Operating temperature	-20°C to 80°C
Radio range (with supplied antenna)	More than 10 km
Radio frequency	ISM band 868 MHz
Transmitted radio power	25mW
Radio antenna connector	SMA female. Impedance 50 ohms
Connector to Neurone	1 micro-USB male connector
Connector to transponder cable	1 female micro-USB connector
Waterproof	No

6.4 NeuroEthernet

Dimensions	48*25*20mm
Weight	15 grams
Operating temperature	-20°C to 80°C
Possible link speeds to Neurone	4800 to 921600 bps
Ethernet connector	RJ45
Connector to Neurone	1 micro-USB connector
Waterproof	No