

## Introduction

Congratulations on your purchase of SmartBox Pro acquisition system!

This advanced new system from NeuroNexus enables and accelerates neuroscience research through its unique combination of performance, ease of use, and forward-looking advanced features, which include:

- Plug-and-play compatibility with all NeuroNexus probes and electrode arrays
- High-quality acquisition and recording of up to 1024 channels of neural and biological signals

Unique, highly interactive, probe-centric user interface that allows the researcher to remain focused on the experiment at hand.

This "Quick Start Guide" is intended to provide a brief overview of the SmartBox Pro system and some of its basic functions.

A note on basic terminology: "SmartBox Pro" refers to the hardware component of the system, i.e., the " box." "Radiens Allego" refers to the software application that interfaces with and controls the hardware box.

IMPORTANT: Please check the NeuroNexus website at <https://www.neuronexus.com/products/smartbox-pro/> and <https://www.neuronexus.com/products/software/radiens/> for new updates about SmartBox Pro and Radiens Software Suite updates.

Note: In order to ensure you have the latest version of the applications, please visit our downloads page at the link below.

<https://www.neuronexus.com/radiens-allego-download-page/>

For questions regarding operation of the system or if you have any issues with the , please email us at [support@NeuroNexus.com](mailto:support@NeuroNexus.com). You can also call us at +1.734.913.8858.

## What's in the Box

- SmartBox Pro unit
- AC Power Adapter
- USB 3.0 cable
- (2) Banana-to-banana cables
- (2) BNC-to-BNC cables
- (2) BNC-to-Alligator cables
- Selected SmartLink headstage amplifier(s) and headstage interface cable(s) that are specified in the order. For more information about our SmartLink headstages please visit our website at [www.NeuroNexus.com](http://www.NeuroNexus.com)
- (optional) Windows laptop computer that was specified in the order

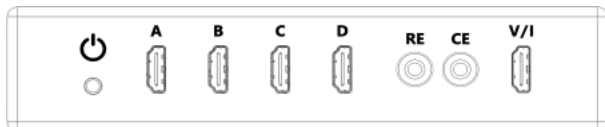
## System Requirements


The computer system requirements include:

- Storage: SSD. Traditional magnetic hard disks may not be fast enough in some recording configurations
- USB 3.0
- CPU - Intel i7-6700k 4-core or equivalent
- 16GB RAM minimum

## System Overview

### Front Panel



-  Power LED/Button
- ABCD Headstage Input Ports
- RE Reference Electrode
- CE Counter Electrode
- V/I Potentiostat/Galvanostat Port

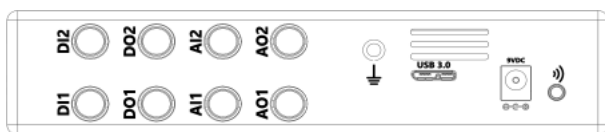
Indicates system status.



Proprietary HDMI-style ports for connecting SmartLink headstages to Ports A-D.

Banana jack for connection to Reference Electrode (potentiostat/galvanostat).

Banana jack for connection to Counter Electrode (potentiostat/galvanostat).  
Proprietary HDMI-style multifunction port for connection to the SmartBox Pro MUX adapter to provide access to potentiostat and galvanostat functions.

### Back Panel



- DI/DO Digital / Analog Inputs and Outputs
-  System Ground
- USB 3.0 USB 3.0 Connector
- 9VDC DC Power Input
-  Audio Output

BNC connectors for connecting auxiliary signals from other instruments.

Banana jack for connecting the box to a low-noise earth ground point.

Connect to a USB 3.0 port on PC/Mac using the supplied USB 3.0 cable.  
Use only the supplied AC power adapter to provide the required DC voltage input.

Stereo audio Aux jack for connection to speakers to monitor the Analog Output (AO) channels.

## Connect the SmartBox Pro to Your Computer

- Unpack the SmartBox Pro unit from its packaging and place it on a secure surface with adequate ventilation
- Plug the AC adapter into a standard (110–220 V) wall outlet and connect its DC power output pin into to the power port of the unit
- Connect the USB cable to the SmartBox Pro and a USB 3.0 port on your computer
- With the computer on and connected to the internet, press and release the SmartBox Propower LED switch. Your computer should indicate that it has detected new hardware (Opal Kelly XEM6310–LX45). The necessary drivers should be automatically installed with no further action necessary. If the driver does not install or the Allego recording software cannot detect your SmartBox Pro unit, try downloading and installing the driver from [www.NeuroNexus.com](http://www.NeuroNexus.com).
- Connect a SmartLink headstage amplifier to a SmartLink HDMI cable and then connect the other end to one of the SmartBox Pro amplifier ports (ports A–D)
- Optional–Use a banana cable to attach the SmartBox Pro ground port to a low–noise earth ground. This may be beneficial for removing extrinsic noise on the signal lines depending on the laboratory environment. (Note: Regardless of the ground port connections, the recording reference and ground signals are provided through the configuration of the SmartLink headstage amplifier(s))
- **Note: Do not connect the multiplexer adaptor to ports A through D**

## Download and Install Radiens Software Application

Radiens™ is the software suite designed to interface with the SmartBox Pro and other Intan-based acquisition systems, and can be used to review, visualize, and curate previously recorded data. The latest version of Radiens™ Apps can always be found on the Radiens™ page:

<https://www.neuronexus.com/radiens-allego-download-page/>

Once there, select the link for the appropriate operating system and then select “Download” to begin the transfer.



Launch the installer.

If you receive a warning against running an unrecognized app, select “More Info”, then “Run anyway.”

Allego will launch after the installation is complete.



Download the Allego installer.

Double-click the installer to launch.

Drag the Radiens App icon into the Applications folder.

Open the Applications folder by double clicking the folder icon.

In the Applications folder, double-click the Radiens App icon while holding down the control key (holding down the control key overrides the MacOS security check, which is only needed during the initial launch).

Allego will launch after the installation is complete.



On a Debian-based distro (Debian, Ubuntu, \*buntu, Linux Mint, etc):

Download the .deb file

Run 'sudo apt install <path to .deb>'

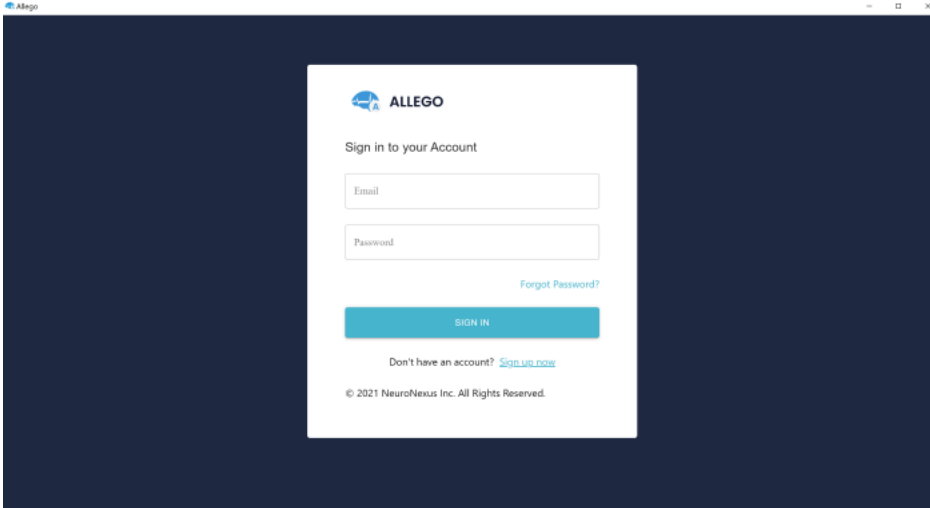
You are here: Before You Begin > What is a Radiens ID?

## What is a Radiens ID

Your Radiens™ ID is your email address. Use the same Radiens™ ID to keep all your Radiens products associated with a single account. Radiens™ ID is essential for a secure and personalized experience with Radiens apps and services, and is required when you want to buy and use Radiens™ products.

## Create or Update Your Radiens ID

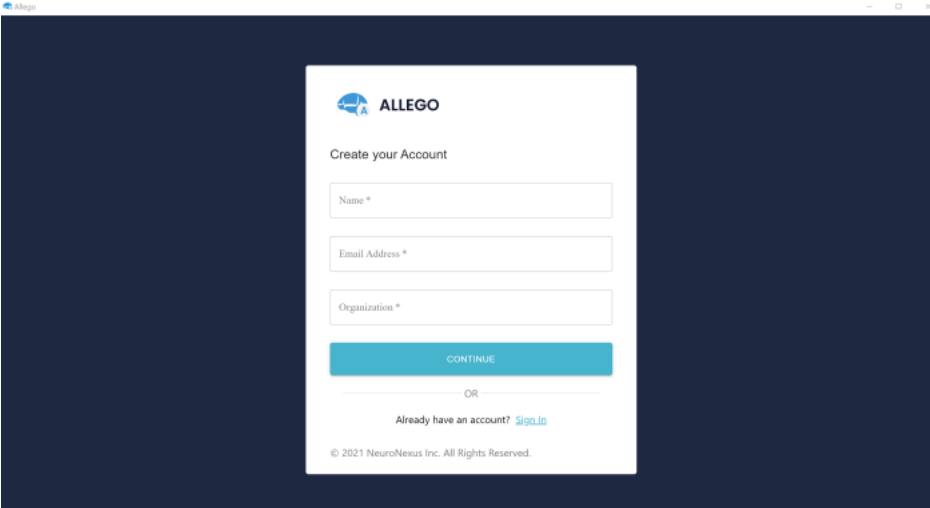
- Launch Allego. Once it has finished initializing , select Sign up now to create an account.



A screenshot of the ALLEGO web application's sign-in page. The page has a dark blue background. At the top left, the ALLEGO logo is displayed. Below the logo, the text "Sign in to your Account" is centered. There are two input fields: "Email" and "Password". To the right of the Password field is a link that says "Forgot Password?". Below the input fields is a blue button labeled "SIGN IN". At the bottom of the form, there is a link that says "Don't have an account? Sign up now". At the very bottom, there is a small copyright notice: "© 2021 NeuroNexus Inc. All Rights Reserved."

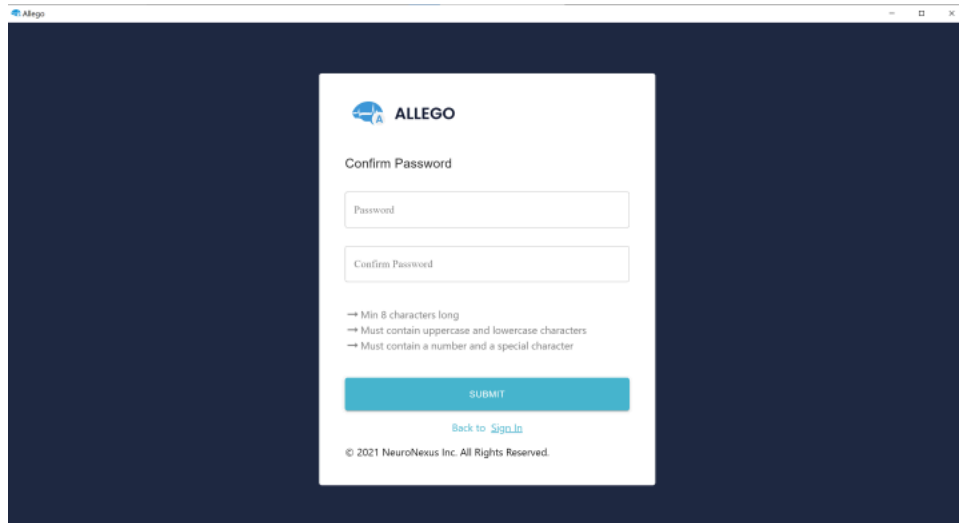
- On the Sign up now screen, create your account by providing the necessary information. Then select continue.

**Note:** The email address that you enter will be your Radiens ID, so use a frequently used address that you will remember.

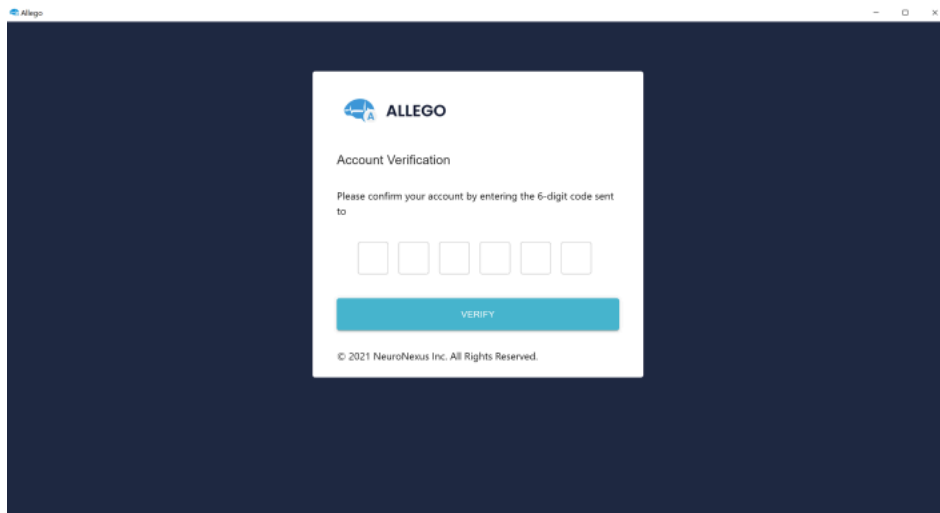


A screenshot of the ALLEGO web application's "Create your Account" page. The page has a dark blue background. At the top left, the ALLEGO logo is displayed. Below the logo, the text "Create your Account" is centered. There are three input fields: "Name \*", "Email Address \*", and "Organization \*". Below the input fields is a blue button labeled "CONTINUE". Below the button is the text "OR" and a link that says "Already have an account? Sign In". At the very bottom, there is a small copyright notice: "© 2021 NeuroNexus Inc. All Rights Reserved."

- On the new page, confirm password and submit.



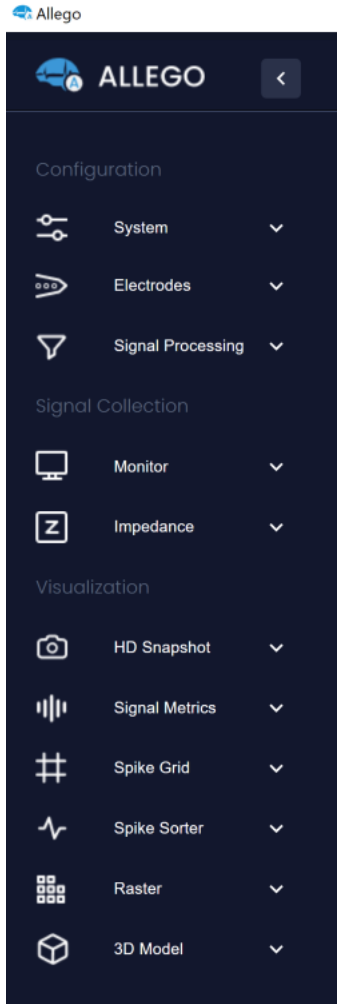
- You will receive a verification email with a 6-digit code to verify and confirm your account. You may have to wait for some time before receiving the email.



- Once you verify your account you should be able to login with the Email ID and password that you already created.


## Module Drawer

On the left side of the display is the Module Drawer showing module icons. The drawer can be accessed by clicking the arrow button in the top left corner of the window.



The modules will now be displayed as a list. Clicking on an item will either open a new tab of the selected module or will bring an already opened tab into focus. Additionally, multiple tabs of the same type can be saved in the workspace, and all of them can be accessed from the module drawer. Creating tabs in a new window to extend the interface to other monitors can also be done easily. Right-clicking on a module will produce a context menu which allows the option of opening a new tab in a new window.

## CONFIGURATION

 System: Configure signal sources, which ports will be used, sampling frequency, and D/A (Outputs)

The System module contains all the basic configuration options for how the recording system type should function and which recording system is being used. The Sample Rate can be set here, along with information on any connected headstages for each port, analog and digital output control, triggering.



**Electrodes:** Connected probe designs are selected, along with which port and SmartLink headstage will be used

The Electrodes module is where the headstage and probe types are defined for each port on the recording system. Here, one can enable and disable individual or groups of probe electrode sites, as well as arrange the voltage traces visualized in the Monitor tab. Wireframe models of NeuroNexus probes are shown here.



**Signal Processing:** Create various filter types and combine them to create DSP groupings

The Signal processing module contains filtering options that will impact only visualized data, or both visualized and saved data.

## SIGNAL COLLECTION



**Monitor:** Shows the signals currently being streamed

The Monitor module is where biological data and peripheral device activity are visualized.



**Impedance:** Impedance testing

Probe impedance can be measured at 1 kHz in this module.

## VISUALIZATION



**HD Snapshot:** Takes a high resolution still picture of signals for closer inspection

The HD Snapshot module provides the ability to visualize a waveform of a recorded signal using all captured data points. This results in a very accurate depiction of a signal of interest.



**Signal Metrics:** Configure spike detection parameters and view key performance indicators/signal quality characteristics

The Signal Metrics module allows the user to characterize activity across electrode sites using several different metrics, such as mean and standard deviation. Probe geometry is used to visualize relationships between the activity recorded in different locations on the probe.



**Spike Grid:** Set spike detection threshold using voltage or standard deviation of background noise from the mean. Displays detected spikes across all channels

The Spike Grid module allows the user to setup spike detection based on threshold types and values including amplitude threshold crossing or the standard deviation (SD) of background noise.



**Spike Sorter:** Grouping of the spikes into the clusters

Spike Sorter module groups detected spikes and extracts information like yield and signal-to-noise ratio from the streamed data.



**Raster:** Analyze spike trains of single neurons

The raster plot is a simple way to display spiking activity of neurons across all active channels over time.



## 3D Model: The interactive brain model with presentation of network activity

The 3D Model module is a powerful and unique way to visualize an experiment and any detected activity in real time. The probe design being used for the experiment can be positioned and visualized within a 3D brain of the chosen animal model.



## Settings: Activate the software, set visual themes and set the recording file name and location

Software licensing, save paths, and various other features of Allego are configured in this module.

## Status Bar

The Status bars are located at the top and bottom of the window.

At the top, it contains the Stream and Record buttons and provides current information on the recording and streaming duration. The Settings module is also accessible from here.





The connected headstage and channel count can be found on the bottom status bar as shown in the image below.





## Save Workspace and User's Profile

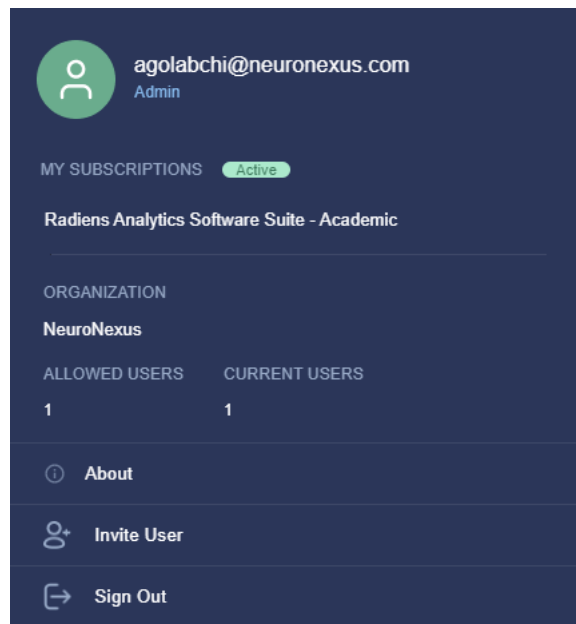
In the upper right area of the display, there are workspace buttons.

The Save Workspace button, , saves the current configuration of the workspace.

The trashcan icon, , will remove the selected window from the saved workspace.

The restore button, , will restore the tabs to their saved locations upon launching Allego.

User's profile, , is located at the top right corner of the Allego window. Subscription status and Allego version can be found in that section as shown below.



agolabchi@neuronexus.com  
Admin

MY SUBSCRIPTIONS Active

Radiens Analytics Software Suite - Academic

ORGANIZATION  
NeuroNexus

ALLOWED USERS	CURRENT USERS
1	1

- About
- Invite User
- Sign Out

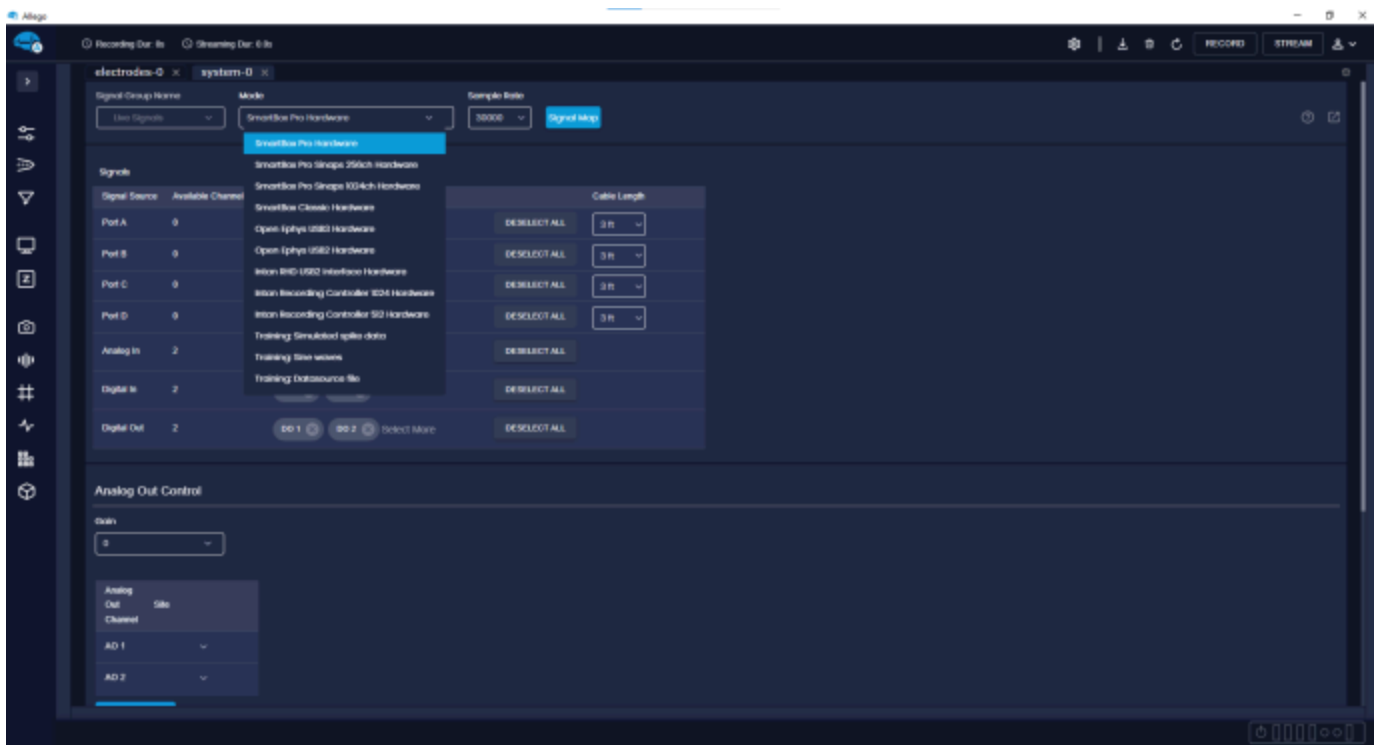
## Dashboard Configurability

The module tabs in Allego are easily moved and repositioned by clicking on the tab header and dragging it to any other location on the Dashboard. Tabs can be viewed simultaneously via split screen or stacked together allowing them to be viewed like tabbed web browsers. Clicking and dragging the tab header around the display will provide a preview of the layout in real time.

## Checking Hardware Connection

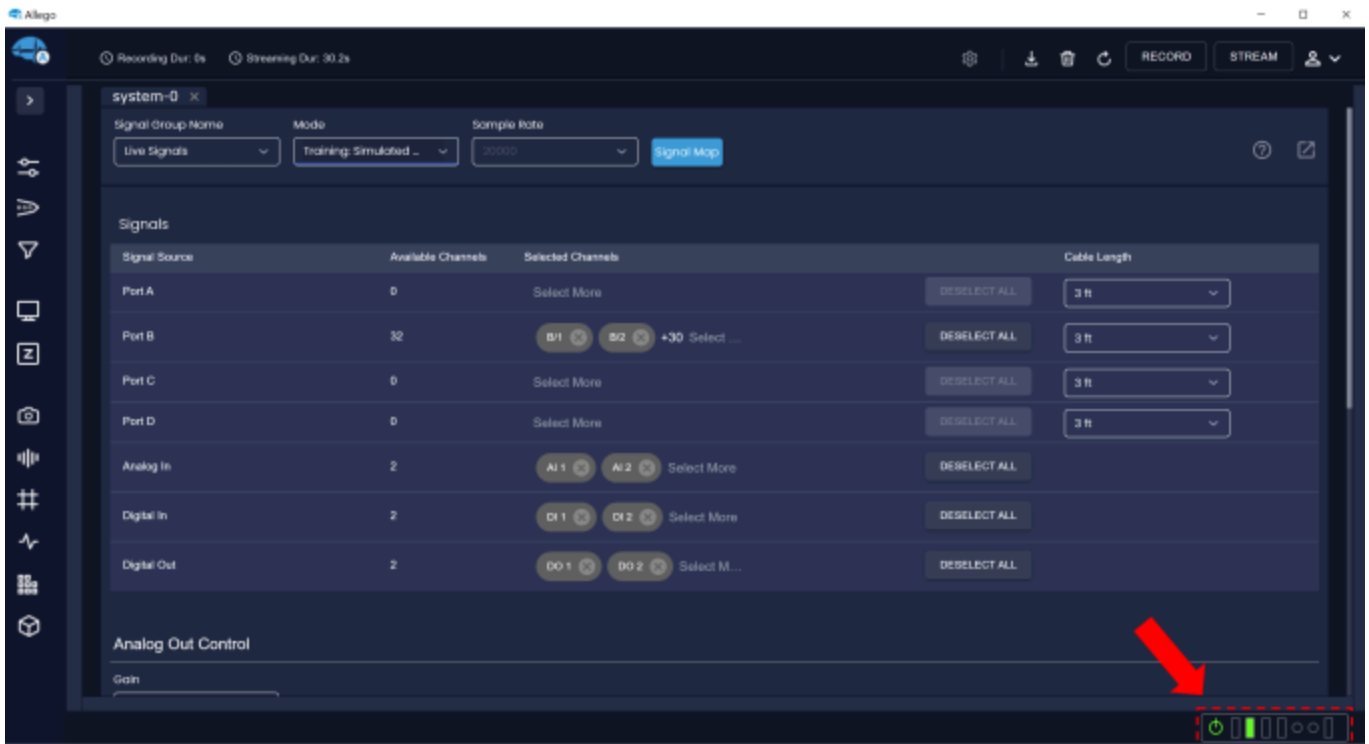
Navigate to the Dashboard and hit the System button. In the System tab, select SmartBox Pro Hardware from the Mode dropdown.

With the SmartBox Pro on and connected to SmartLink headstages, your software recognizes connected SmartLink headstages automatically. If you are using a different Intan-based system, click on the Mode menu and select the appropriate option.

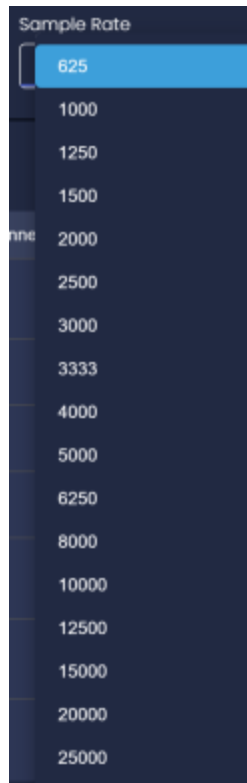


On the SmartBox Pro outline, you can check the status of connected ports to the SmartLink headstages. Green light indicates which ports are in use.

The SmartBox Pro supports simultaneous recording of up to 1024 channels across all four ports. For example, below shows the status of one 32 channel SmartLink headstage connected to port B.



The sample rate on the System view can be changed to values from 625 Hz to 30 kHz.







## Frequently Asked Questions

Here is a brief list of frequently asked questions about Radiens. If you are not able to find the answers to your questions please [contact us](#).

Once we receive your inquiry, it will be routed to the appropriate support engineer at NeuroNexus. Please expect to get a personal follow up message via email within one business day.

### How do I set up my experiment using Allego?

- You can find detailed instructions in the Allego manual documentation, but briefly, choose your electrode and headstage based on your experiment, then open the monitor tab and click on streaming button.

### Is Allego compatible with other data acquisition systems?

- Yes, currently besides SmartBox Pro and SmartBox classic, the OpenEphys and Intan recording systems are supported. For other data acquisition systems please [contact us](#).

### What is the allowable range of sample rates?

- Allego allows users to select 17 sample rates ranging between 1,000 and 30,000 samples/sec. This range is sufficient for nearly all electrophysiological applications.

### How do I track behavioral files using Allego?

- Time stamps will be part of the recorded data. Please find detailed instructions in the manual documentation.

### I could not find my probe map in Allego. What should I do?

- Our Allego library is equipped with the mapping of the majority of the standard NeuroNexus probes. If you could not find it in our current library please [contact us](#). We will either help you in finding it or built you the new one if your electrode is customized.


### What should I do if my electrode is not made by NeuroNexus?

- We have default maps for different channel counts. If you'd like to have the exact design and mapping of your electrode provider, [contact us](#). We support all available electrodes in the market.

### Is Allego available for Windows, Mac, and Linux computers?

- Yes, Allego is fully compatible with Windows, Mac and Linux systems and runs natively on each system. Allego runs with roughly comparable performance across each type of system. We do not recommend one type of system over another; it is up to the user and the lab.

### How I can view the recorded data using Radiens?

- Videre is the software that is designed for offline visualization of recorded data. Open data sources tab in Videre and look for the data that you are interested to view. Then click on the replay button, , to create a replay file. Once the replay file is created you should be able to view that from the monitor tab. Remember to change the Signal Group name at the top of your monitor window.

### How do I setup the thresholds of my data streaming?

- The Threshold can be manually selected in Spike Grids or Signal Metrics tabs.

## **What are the file formats that I can save my recordings?**

- We save raw data alongside meta-data in popular, non-proprietary file formats for straightforward integration into existing data analysis workflows with NeuroExplorer and kilosort2. Matlab, Python, and R friendly.