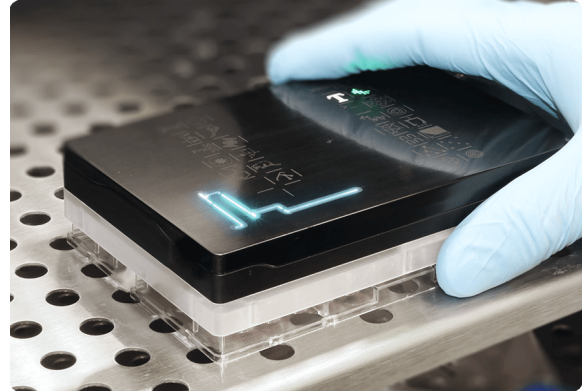


Resipher

Installation and User Guide



This guide walks through setting up the [Resipher](#) to get you up and running with real-time continuous monitoring analysis experiments. The [Resipher](#) system will enhance your experiments in cellular metabolism by converting standard cell culture plates into smart hand-held readers that sense real-time metabolic changes in response to potential therapeutics. Your data is streamed to researchers in real-time via our collaborative web platform.

A few useful tips on using Resipher

- **Start simple**

For your first ever experiment, we recommend starting simple. For example, a cell density/seeding experiment. It allows you to get familiar with the Resipher system and confirms the general oxygen consumption behavior of the cells before proceeding to more complex experiments.

- **Let the cells settle**

It's always a good idea to allow cells to adhere or fall to the bottom of the wells before placing the sensing lids onto the well plates. This prevents cells from accidentally attaching to the sensing probes.

- **100 uL media is the best**

Resipher experiments work best when there is ~100 uL of media in each well. This ensures the probes stay within liquid for the duration of the experiment and the media has a good oxygen gradient for detection.

- **Outer wells as experimental controls**

Outer wells (i.e. top and bottom rows) may be used for controls. This reduces the likelihood of evaporation interfering with important data.

- **Evaporation is inevitable**

PBS can be added to unused wells to reduce media evaporation during experiments.

- **Let the cells do their things**

It's best to minimize disruptions, i.e. opening and closing the incubator door. Resipher is a sensitive instrument that responds to small environmental changes.

- **Oxygen measurement is temperature dependent**

Since temperature influences oxygen concentration measurement, the more consistent the temperature in the incubator, the more consistent the OCR reading is. A few things can minimize temperature fluctuations:

- Limit the opening and closing of the incubator door
- Pre-condition the media by placing the container in the incubator overnight; slightly loosening the cap also allows the media dissolved gas content (i.e. 5% CO₂) to equilibrate; drug treatments can also be pre-conditioned.

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Resipher magnetically attaches to our disposable lids that rest securely on most standard 96-well plates. It will be referred to as “device” in this document.



The **Resipher** Base Station stores data from up to 8 connected devices and streams the data in real-time to our secure cloud platform. It will be referred to as the “hub”.



Individually sterilized disposable lids attach between the device and the well plate. Each lid has 32 probes with oxygen sensing material. These will be referred to as “lids”.



Lucid Hub

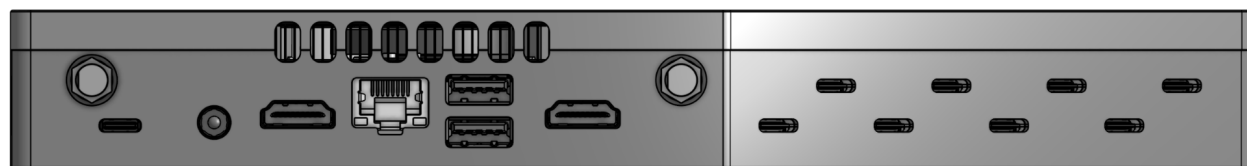
The Hub is an embedded computer, USB-C hub, and network gateway for the control of up to 8 devices. The Hub is also responsible for data storage. All experiment data is stored locally on the Hub's hard drive and streamed securely to our cloud platform. Data can then be viewed and analyzed using our cross-platform web application - [Lucid Lab](#). The Hub is intended to be located on or near a laboratory incubator as 1m is the limit for length of USB-C cable at high data transfer rates. The Hub has strong magnets in each foot that allow you to mount on any side of the incubator.

Front Panel



- 8 × device port LEDs
- 2 × USB 3.0 ports
- Power button with ring LED
- 3 × vertically-oriented Hub status LEDs

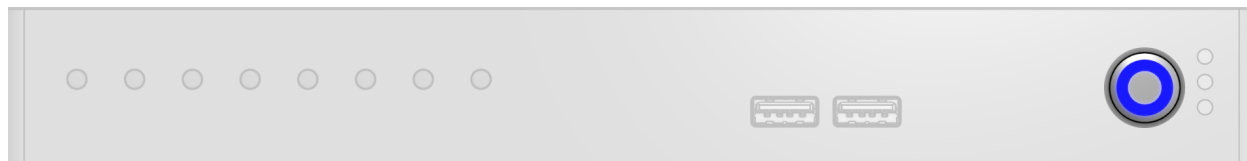
Back Panel



- 8 × USB-C device ports
- 2 × USB 3.0 ports
- 2 × HDMI output
- Gigabit ethernet
- Power

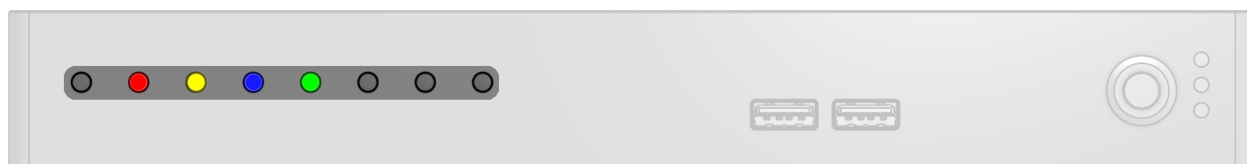
Power LED Indicator

The power button ring LED turns solid blue when the device is powered on.



Device Status LEDs

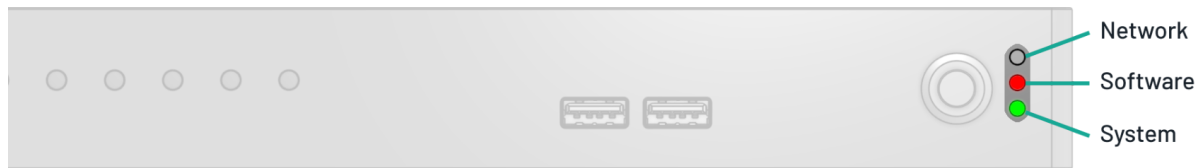
The row of 8 LEDs indicate the status of each device connected to the USB-C ports on the back.



State	Description
○ Off	No device connected
● Yellow	No lid attached
● Green	Device active, reading
● Blue	Device tilted
● Red	Device Error

Hub Status LEDs

On the right side of the front panel are 3 vertical LEDs to indicate the Hub's overall status. The LEDs represent status for the internal Hub system, connection to network/internet, and connection to our cloud infrastructure.



	State	Description
NETWORK	○ Off	Cloud disabled
	● Green	Network cloud connected
	● Yellow	Network connected, cloud not connected
	● Red	Network disconnected
SOFTWARE	● Green	Software operating normally
	● Red	Software error
SYSTEM	○ Off	System not running
	● Green	System operating normally
	● Red	System error

Connecting the Hub

Place the Hub onto or near the incubator. Connect the provided power cable to plug on the back of the Hub.



Incubators typically have an opening at the back for cables; feed the included USB-C cable through this for each device you plan on connecting. Connect one end of each cable to a device (inside the incubator) and the other end to one of the USB-C ports on the back of the Hub with the provided USB-C cable.



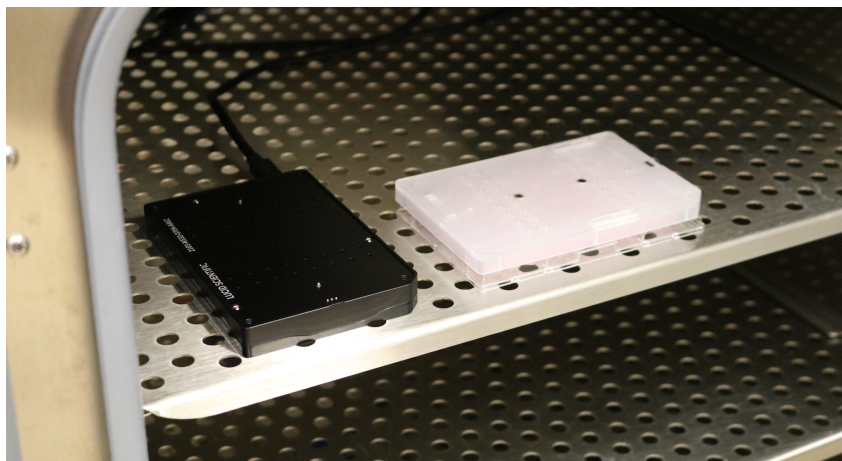
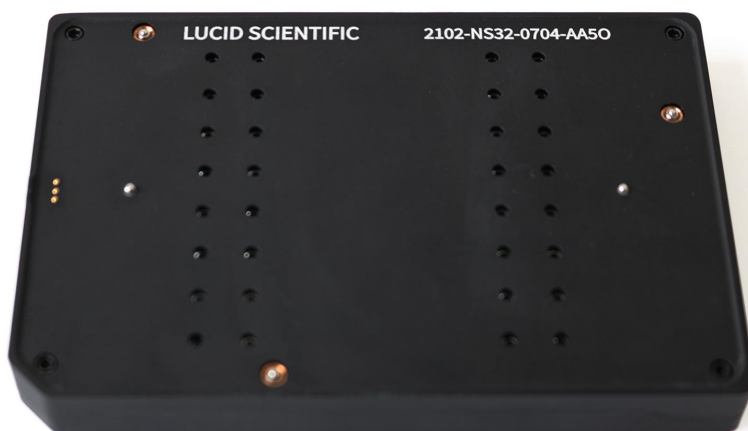
Plug in an ethernet cable to the ethernet port on the Hub. Make sure that internet connection is available from the ethernet outlet. It may be necessary for your IT department to authorize internet access to the Hub using its MAC address (located on the bottom side of the Hub).



Once the Hub is powered on and connected to the internet, the power button ring should be blue and the three LED lights to the right of the power button should be green.

Connecting the device

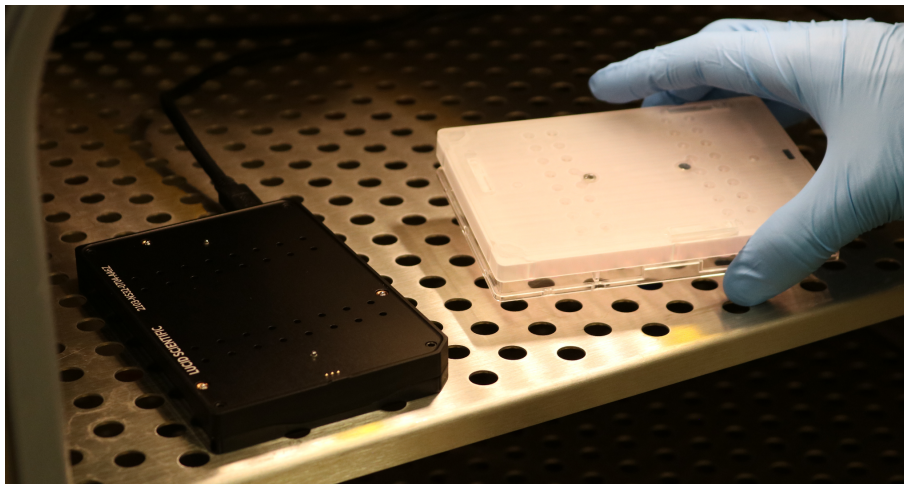
Put the device into the incubator with the oxygen sensor side facing up and connect the USB-C coming from the Hub.



Check the front of the Hub and make sure one of the LEDs on the left is lit up in blue, indicating that a [Resipher](#) is connected.

Place the sensing lid onto the seeded well-plate

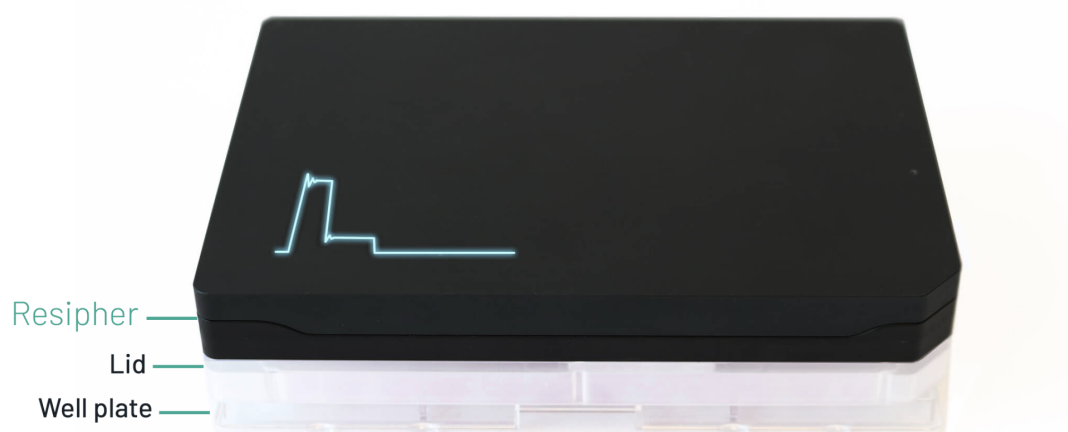
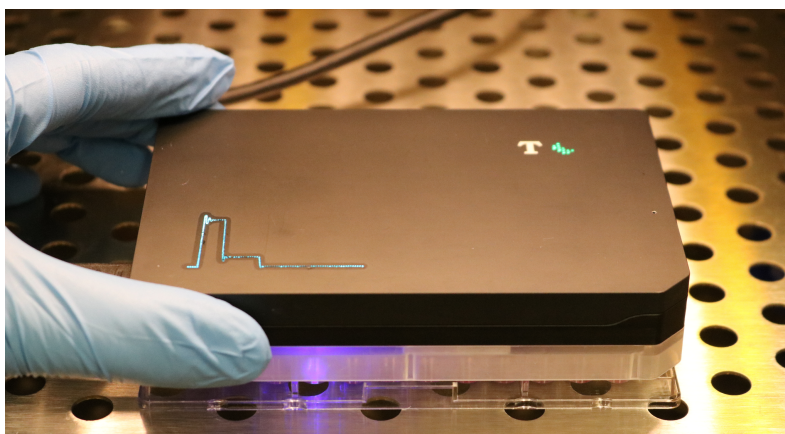
After the cells have settled to the bottom of the wells, place the sensing lid onto the well plate. The sensing lid/well-plate assembly can then be transferred to the incubator.



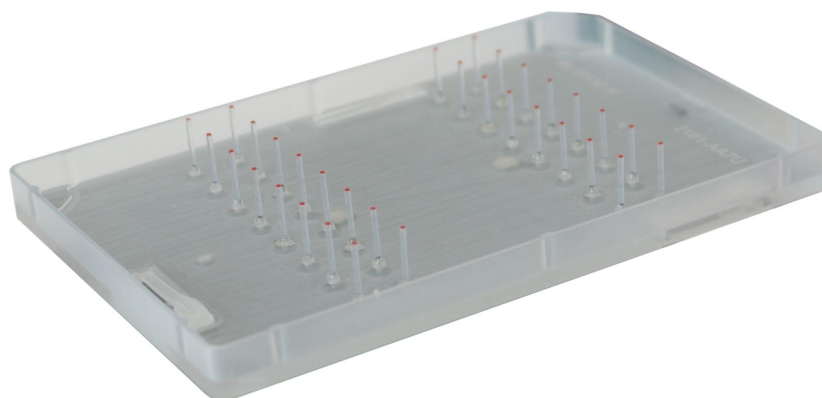
Place the Resipher onto the sensing lid/well-plate assembly

Attach the Resipher to the top of the sensing lid. It will snap and fit snugly onto the sensing lid because of magnets embedded in the device and lid. Make sure they are attached properly. There should be no gaps between the sensing lid and the Resipher.

Once they are attached to each other, the indicator LEDs on both the Resipher and the Hub should flash green. The flashing green LED should turn to solid green once the Resipher actuation begins and is stable.



Lids



The 32x sensing lid

Sensing lids arrive sterilized and calibrated and are compatible with standard 96-well plates including Nunc and Falcon. They can be used immediately after being removed from the packaging, just like pre-sterilized well-plates.

Important!

Our sensing lids are customized to fit their designed plate styles. They should only be used with their matching plate styles. Please check the label on the lid packaging for its well plate type.

Using mismatching well-plates can damage sensing lids, resulting in failed experiments.

Compatible 96-well plates

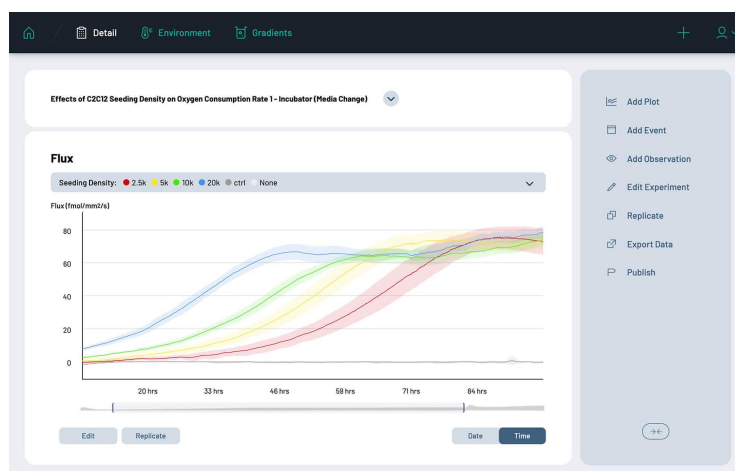
Nunc (Thermo Fisher)

Cat. No.	Surface	Well Design	Color	Total Vol.	Sterile	Lid	No. Per Pack	No. Per Case
167008	TC-treated	Flat Bottom	Clear	400 μ L	Yes	Yes	1	50
168055	TC-treated	Flat Bottom	Clear	400 μ L	Yes	No	1	50
269787	Non-treated	Flat Bottom	Clear	400 μ L	Yes	No	1	50
156545	TC-treated	Flat Bottom	Clear	400 μ L	Yes	No	10	180
161093	TC-treated	Flat Bottom	Clear	400 μ L	Yes	Yes	10	160
243656	Non-treated	Flat Bottom	Clear	400 μ L	Yes	Yes	6	108
260860	Non-treated	Flat Bottom	Clear	400 μ L	Yes	Yes	10	160
260887	Non-treated	Flat Bottom	Clear	400 μ L	Yes	Yes	10	160
266120	Non-treated	Flat Bottom	Clear	400 μ L	Yes	Yes	25	100

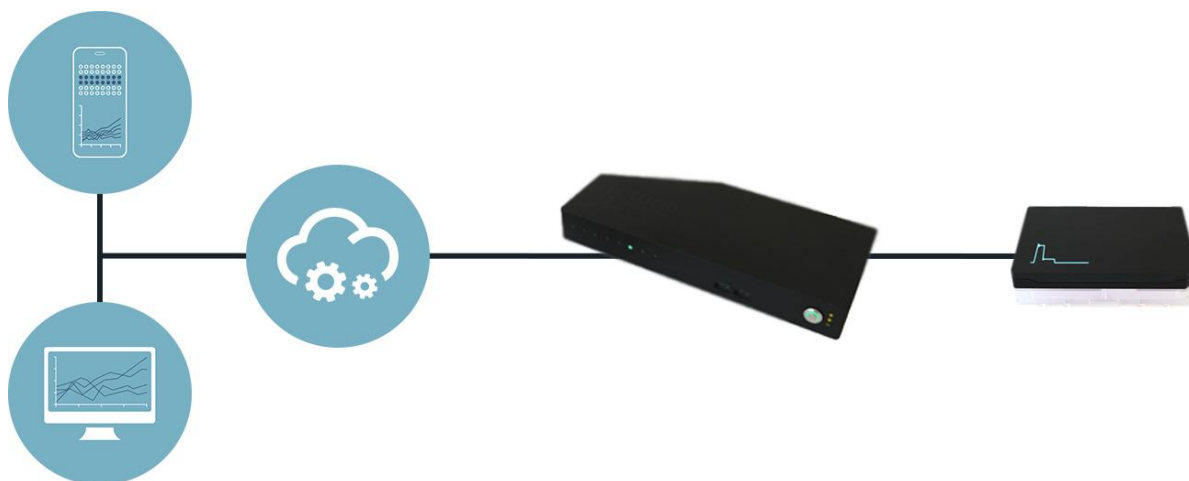
Falcon (Corning)

Product No.	Surface	Well Design	Color	Total Vol.	Sterile	Lid	No. Per Pack	No. Per Case
353072	TC-treated	Flat Bottom	Clear	0.37 mL	Yes	Yes	1	50
351172	Non-treated	Flat Bottom	Clear	0.37 mL	Yes	Yes	1	50
353075	TC-treated	Flat Bottom	Clear	0.37 mL	Yes	Yes	5	50
353916	TC-treated	Flat Bottom	Clear	0.37 mL	Yes	Yes	25	100
353936	TC-treated	Flat Bottom	Clear	0.37 mL	Yes	Yes	14	84

Cloud platform and Lucid Lab



Experiment data is securely stored both on the Hub and in the cloud. [Lucid Lab](#) is our cross-platform web application that allows your team to create and manage experiments, stream and monitor data from devices in real-time, and generate plots that are ready for publishing. Each member of your team can get an account to login and use [Lucid Lab](#) with your organization's devices. Team members can collectively monitor and access experiments, monitor device and Hub statuses, receive troubleshooting tips, and even connect with us directly for more advanced support. [Lucid Lab](#) is full-featured and accessible on desktop and mobile. Lucid Scientific provides continuous software updates and SSL support.



Key Terms and Concepts

OCR/Flux

Oxygen Consumption Rate (OCR) / Extracellular Oxygen Flux is the key measurement provided by Resipher. This measurement is derived from readings of the dissolved oxygen concentration at various depths within the media above the cells. Without any assumptions about the surrounding environment, the system measures the Oxygen Flux (i.e. the amount of oxygen going in or out of a fixed volume). If we assume something below the probe is consuming oxygen (e.g. cells) and that practically all oxygen is being consumed through the media from the air above (e.g. in a plate well), then the OCR and Flux are equivalent measures. Flux/OCR is reported in units of femtomoles per square millimeter per second (fmols/mm²/s).

O₂C

Dissolved Oxygen Concentration (O₂C) is what each individual probe measures at a given instant. In a typical 5% CO₂ at 37 Celsius, O₂C is around 180 micromolar (um). While the absolute value of O₂C is important in many applications, the relative values of O₂C at different probe heights is what matters for Resipher Flux measurements.

O₂C Gradient

When cells are consuming oxygen out of the atmosphere through a volume of fluid, a gradient of oxygen concentration forms across that fluid. That is, the oxygen concentration at the top of the fluid is higher towards the top of the fluid and is lower in the fluid closer to the cells. When there is no flux/consumption, there is no gradient (it is “flat”). With increasing flux/consumption the oxygen gradient increases (it becomes “steeper”).

Probe

The lid contains an array of oxygen probes. The probes consist of an optical fiber with an oxygen-sensitive material at its tip. The probes are moved up and down within the media of the well to measure oxygen at different depths/heights.

Temperature Dependence

The oxygen-sensitive probes are temperature dependent as the measurements they produce may vary with temperature as well as with oxygen concentration (i.e. they are “cross-sensitive” to temperature). As a result, the flux estimates are temperature dependent as well. Large swings in environmental temperature (e.g. opening an incubator door) induce temporary jumps or dips in reported measurements which are not reflective of the true oxygen flux. Therefore, it is critical to maintain a stable temperature environment (don’t open the incubator door often or else your experimental results will be affected). If possible, keep the incubator door closed throughout the experiment.

A few tips on seeding cells

Resipher is best suited for experiments with adherent cells

Unlike traditional oxygen sensors (i.e. Seahorse), Resipher oxygen consumption sensing probes move up and down vertically during experiments. The typical movement range of our sensing probe is 500 μm ; the probe moves as close as 500 μm to the bottom of the wells. If your experimental setup requires a different movement range and clearance to the well bottom, please contact Lucid for adjustments. The probe actuation allows Resipher to accurately measure oxygen consumption rates without the need to individually calibrate each probe. Instead of measuring oxygen concentration, Resipher measures the gradient of oxygen content as the probes move vertically within each well. Our software converts the oxygen gradient into oxygen consumption rate and presents the data in an easy-to-read, intuitive fashion. With such dynamic reading technology, we recommend using Resipher with adherent cells that settle and attach to the bottom of the wells. This will ensure a stable environment in each well for oxygen gradient reading. (If oxygen concentration measurements for suspension cells are desired, please contact Lucid Scientific for further discussion before proceeding).

Columns 3, 4, 9, and 10 are used for the 32x Resipher

For the 32x Resipher, the sensors are located at wells in columns 3, 4, 9, and 10. PBS or media can be added to the rest of the wells to slow down the rate of evaporation.

Allow cells to settle and adhere to the bottom of the wells after seeding

To avoid cells accidentally attaching to the sensing probes, which may lead to errors in oxygen consumption reading, it is best to allow cells to settle and adhere to the bottom of the wells after seeding. Typically one hour should be sufficient; depending on how adherent the specific cells are. This waiting period can be done by sitting the seeded well plates in an incubator or in a biosafety cabinet at room temperature.

Clean Resipher before placing inside an incubator or workstation

Before placing the Resipher device into an incubator or workstation, it should be cleaned to reduce the risk of contamination. **Important - Avoid spraying ethanol directly onto the Resipher; it may cause damage to the electronic components.** First, wet a Kimwipe with ethanol, then wipe the Resipher with the wet Kimwipe by lightly wetting the entire surface.

Lucid Lab - Setting up an experiment

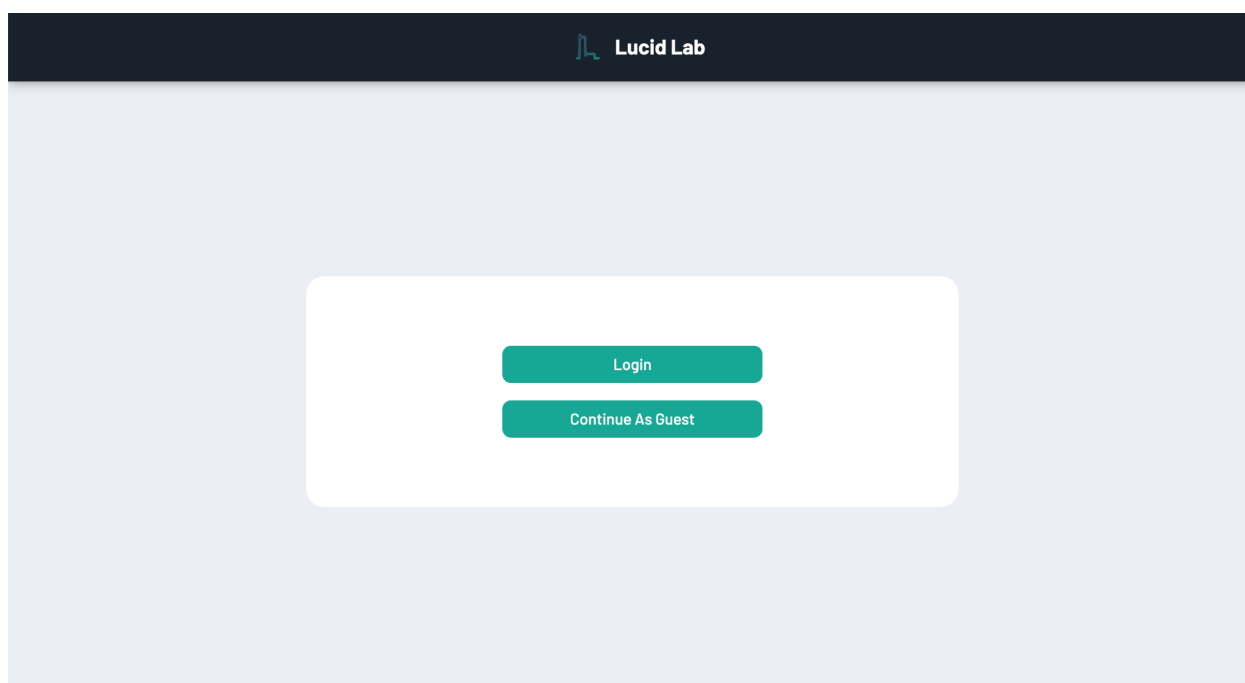
User Training

Prior to the first experiment, all customers are trained by Lucid on experimental and system setup. Once your Hub is connected to the internet, our customer success team will reach out to you and schedule a training session or provide access to training materials. If your Hub is connected but your training session has not been scheduled, please contact us at info@lucidsci.com.

Login to your account

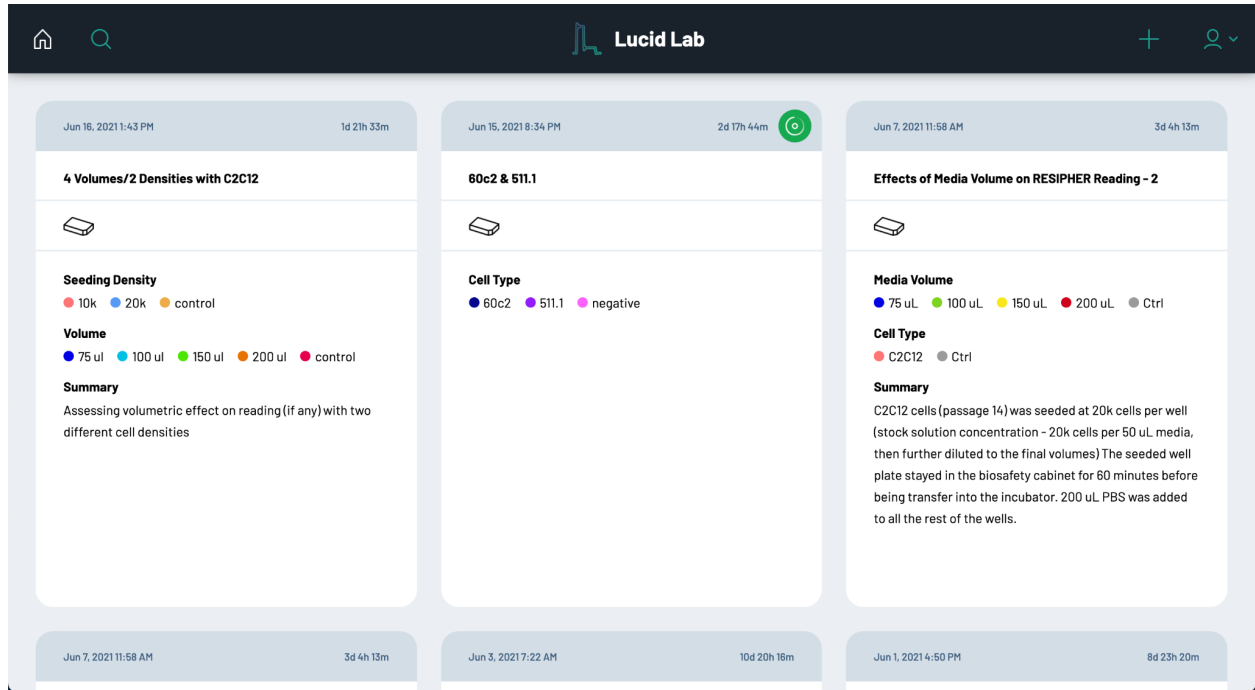
Make sure the Hub is connected to an active ethernet port with access to the internet. If you have created an account, visit <https://lab.lucidsci.com> to log onto your user account. If you don't have an account, go ahead and create one. We will confirm your account registration in a timely manner so you can get going with your experiment quickly.

Every user must create their own account. Shared accounts (i.e. one account for the entire research group) is not permitted due to security reasons.



Create an experiment

Click the “+” button in the top right to create a new experiment



The screenshot shows the Lucid Lab interface with a dark header bar containing a home icon, a search icon, the "Lucid Lab" logo, and a "+" button for creating a new experiment. Below the header, there is a grid of experiment cards. Each card displays the experiment title, a timeline bar with a date and time, a well plate icon, and a list of parameters with their corresponding color-coded values.

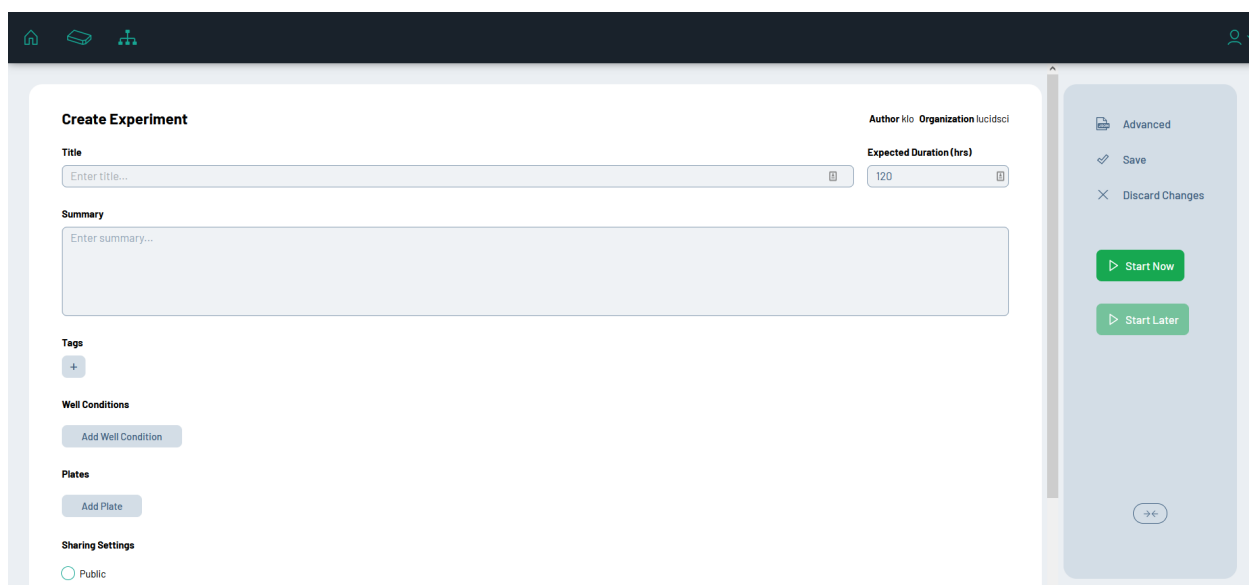
Experiment Title	Date & Time	Duration	Parameters
4 Volumes/2 Densities with C2C12	Jun 16, 2021 1:43 PM	1d 21h 33m	Seeding Density: 10k, 20k, control; Volume: 75 ul, 100 ul, 150 ul, 200 ul, control
60c2 & 511.1	Jun 15, 2021 8:34 PM	2d 17h 44m	Cell Type: 60c2, 511.1, negative
Effects of Media Volume on RESIPHER Reading - 2	Jun 7, 2021 11:58 AM	3d 4h 13m	Media Volume: 75 uL, 100 uL, 150 uL, 200 uL, Ctrl; Cell Type: C2C12, Ctrl
	Jun 7, 2021 11:58 AM	3d 4h 13m	
	Jun 3, 2021 7:22 AM	10d 20h 16m	
	Jun 1, 2021 4:50 PM	8d 23h 20m	

Summary
Assessing volumetric effect on reading (if any) with two different cell densities

Summary
C2C12 cells (passage 14) was seeded at 20k cells per well (stock solution concentration ~ 20k cells per 50 uL media, then further diluted to the final volumes) The seeded well plate stayed in the biosafety cabinet for 60 minutes before being transfer into the incubator. 200 uL PBS was added to all the rest of the wells.

Enter basic information

Enter a “Title” and indicate the “Expected Duration (hrs)” for your experiment. Note that your experiment does not terminate at the end of the expected duration; the system will simply send you a reminder when the expected duration is reached . You also have an option to further describe your experiment by including detailed information in the “Summary” section. Inserting keywords about your experiment into “Tags” will provide ease of searchability later.



The screenshot shows the 'Create Experiment' form in the Lucid Scientific interface. The form is divided into several sections:

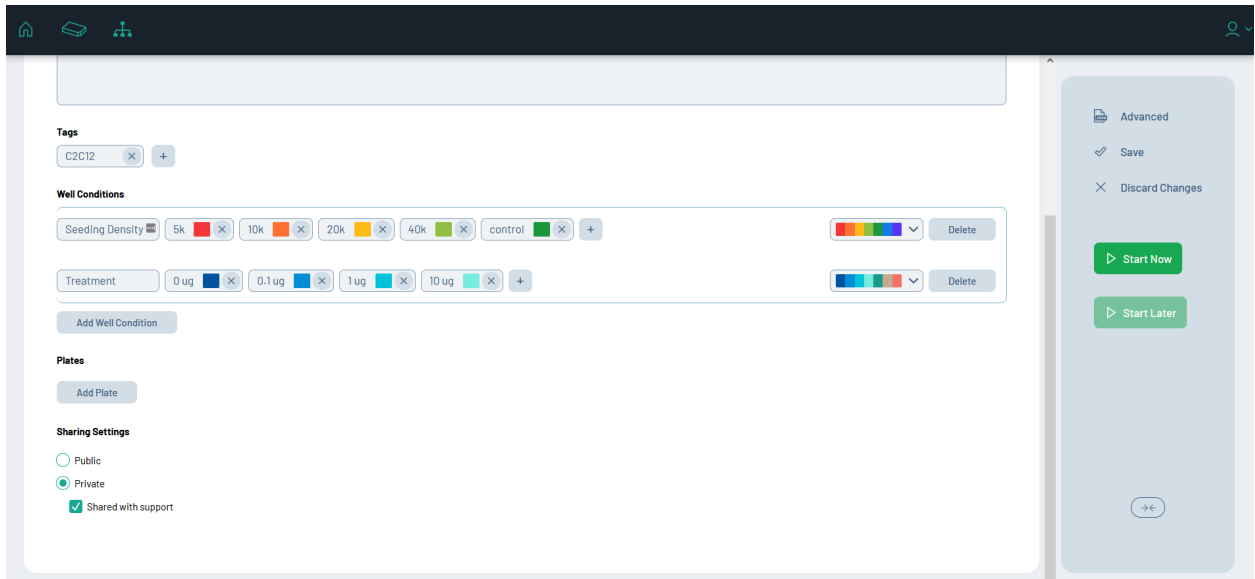
- Title:** A text input field with a placeholder 'Enter title...' and a small icon to the right.
- Expected Duration (hrs):** A numeric input field with a placeholder '120' and a small icon to the right.
- Summary:** A large text area with a placeholder 'Enter summary...'.
- Tags:** A section with a plus icon to add tags.
- Well Conditions:** A section with an 'Add Well Condition' button.
- Plates:** A section with an 'Add Plate' button.
- Sharing Settings:** A section with a radio button labeled 'Public'.

On the right side of the form, there is a sidebar with the following options:

- Advanced:** A button with a document icon.
- Save:** A button with a checkmark icon.
- Discard Changes:** A button with an 'X' icon.
- Start Now:** A green button with a play icon.
- Start Later:** A green button with a play icon.
- Back:** A button with a left arrow icon.

Create well conditions and values

Click the “Add Well Condition” button, then enter new experimental conditions or select pre-existing ones that appear. Type in experimental values one at a time, press the ENTER key on the keyboard to register each value.



The screenshot displays the Lucid Scientific web interface for creating well conditions. The main content area is divided into several sections:

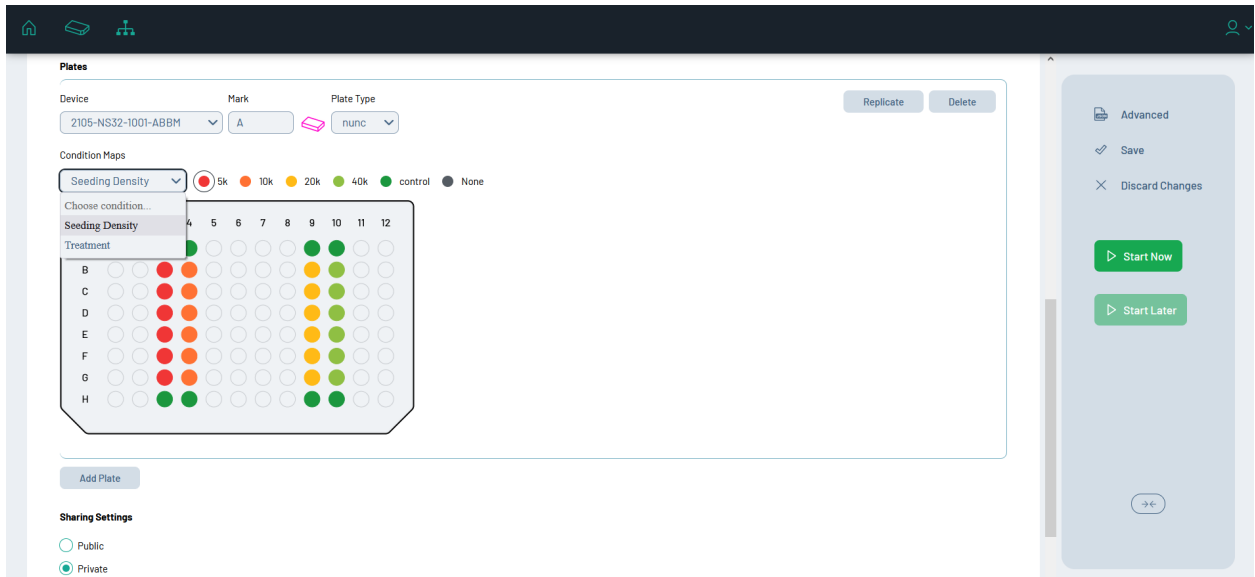
- Tags:** A single tag 'C2C12' is shown with a close button (X) and an add button (+).
- Well Conditions:** This section contains two rows of conditions, each with a dropdown menu, a color-coded button, and a delete button (X).
 - Row 1: 'Seeding Density' with buttons for 5k (red), 10k (orange), 20k (yellow), 40k (green), and control (dark green).
 - Row 2: 'Treatment' with buttons for 0 ug (dark blue), 0.1 ug (blue), 1 ug (teal), and 10 ug (light green).
- Plates:** A single 'Add Plate' button is present.
- Sharing Settings:** Options for 'Public' (radio button), 'Private' (radio button, selected), and 'Shared with support' (checkbox, checked).

On the right side, a sidebar contains the following options:

- Advanced (document icon)
- Save (checkmark icon)
- Discard Changes (X icon)
- Start Now (green button with play icon)
- Start Later (green button with play icon)
- Export (arrow icon)

Configure plates

Once you add values for all “Well Conditions”, scroll down to the “Add Plate” button. Identify each well by their experimental conditions. Select the correct plate type and device that will be used for the experiment from the drop down menu. The mark indicator can be used when multiple devices are used at the same time to identify plates and devices.



The screenshot displays the 'Plates' configuration page in the Lucid Scientific application. At the top, there are dropdown menus for 'Device' (2105-NS32-1001-ABBM), 'Mark' (A), and 'Plate Type' (nunc). Below these are 'Replicate' and 'Delete' buttons. The main area is a grid of wells (A-H, 1-12) with various conditions assigned. A legend indicates seeding densities: 5k (red), 10k (orange), 20k (yellow), 40k (green), control (dark green), and None (grey). The 'Add Plate' button is visible at the bottom left. On the right, there are buttons for 'Start Now' and 'Start Later'.

If your experiment is set up and ready to run, click “Start Experiment” to begin. Otherwise, click “Save Changes” to continue editing later. All the finished, running, and draft experiments will appear in the “Home” page.

Lucid Lab - Plots

Adding a plot

When creating a plot, first add a descriptive title and select a data type (Flux or O₂C) from the pulldown. View allows you to choose between raw data from each individual well or the average values of each condition. The conditions drop down allows you to select filter specific conditions to appear in the plot.



The plate map drop down lets you toggle between multiple plates and remove/choose specific wells.



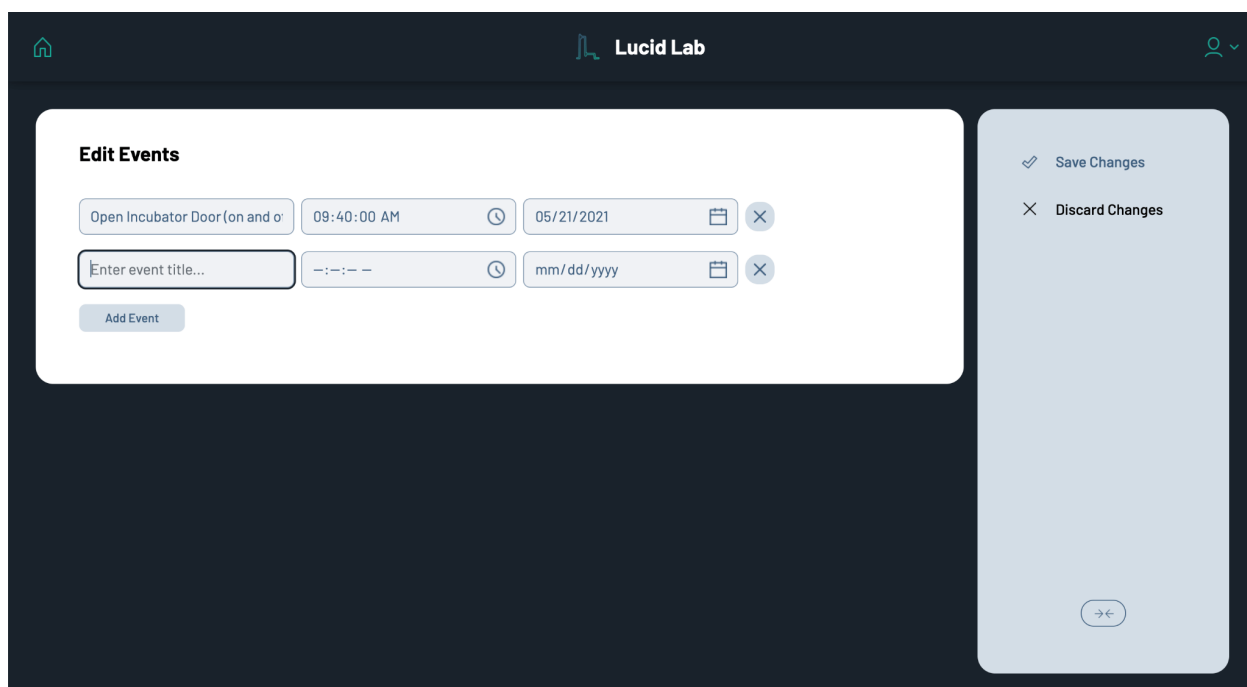
In the top right corner, the three buttons are “Replicate plot”, “Export plot data”, and “Download plot image” in that order. Exporting the plot data will only export what is shown on the plot itself, not all of the data. Exporting complete data will be shown in a later section in the guide.



Lucid Lab - Experiments

Add Event

Events can be used to indicate media changes, treatment times, or general changes to cells done at any time during the experiment. When adding an event, type a short description and select a specific time and date. Once finished, be sure to save changes.

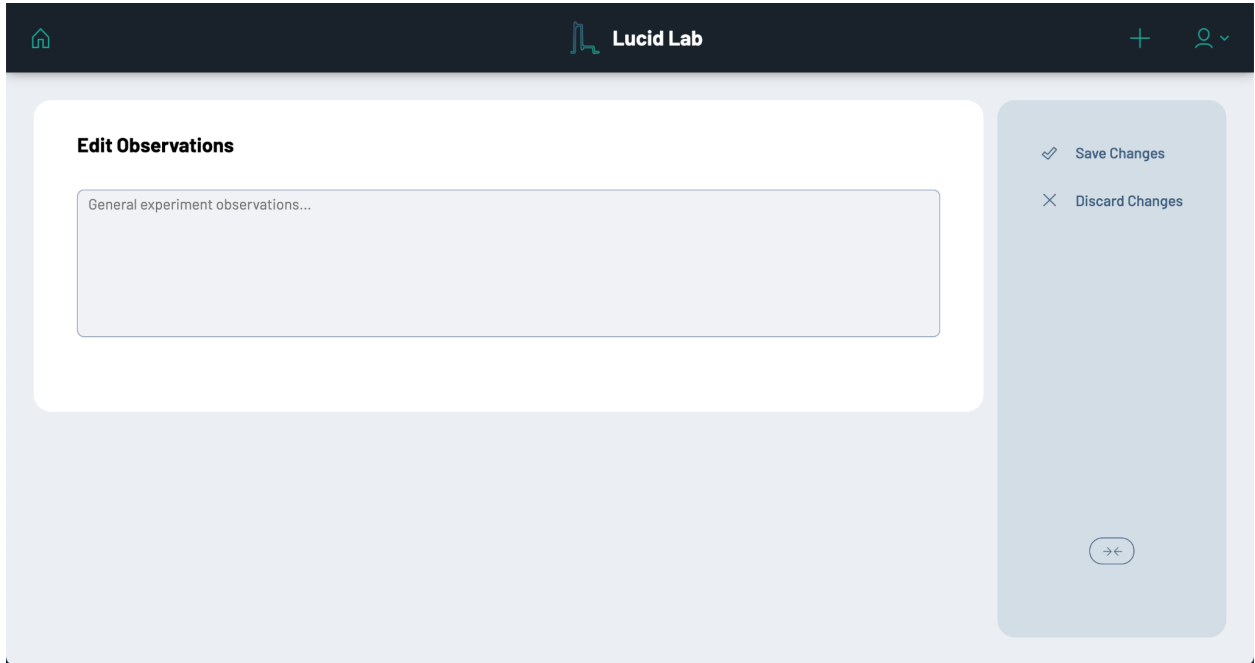


The screenshot shows the 'Edit Events' interface in the Lucid Lab application. The interface is dark-themed with a white modal for editing events. The modal contains two rows of input fields. The first row has a text input 'Open Incubator Door (on and o', a time input '09:40:00 AM', and a date input '05/21/2021'. The second row has a text input 'Enter event title...', a time input '--:--:--', and a date input 'mm/dd/yyyy'. Below these fields is an 'Add Event' button. To the right of the modal is a sidebar with two buttons: 'Save Changes' (with a checkmark icon) and 'Discard Changes' (with an 'X' icon). At the bottom of the sidebar is a back arrow button.

An added event will appear on graphs as an "E" icon with a line as seen in the plots.

Add Observation

Observations are more general notes about an experiment that are not necessarily associated with a specific point in time such as general behaviors, color changes, etc.



The screenshot shows the 'Edit Observations' interface within the Lucid Lab application. The top navigation bar is dark blue with a home icon, the 'Lucid Lab' logo, and a user profile icon. The main content area has a light blue background. On the left, there's a white box titled 'Edit Observations' containing a large text input field with the placeholder text 'General experiment observations...'. On the right, there's a light blue sidebar with two buttons: 'Save Changes' (with a checkmark icon) and 'Discard Changes' (with an 'X' icon). At the bottom of the sidebar is a button with a double-headed arrow icon.

Edit Experiment

Editing an experiment will take you back to the original create experiment page. This allows you to make any changes, i.e. add new conditions.

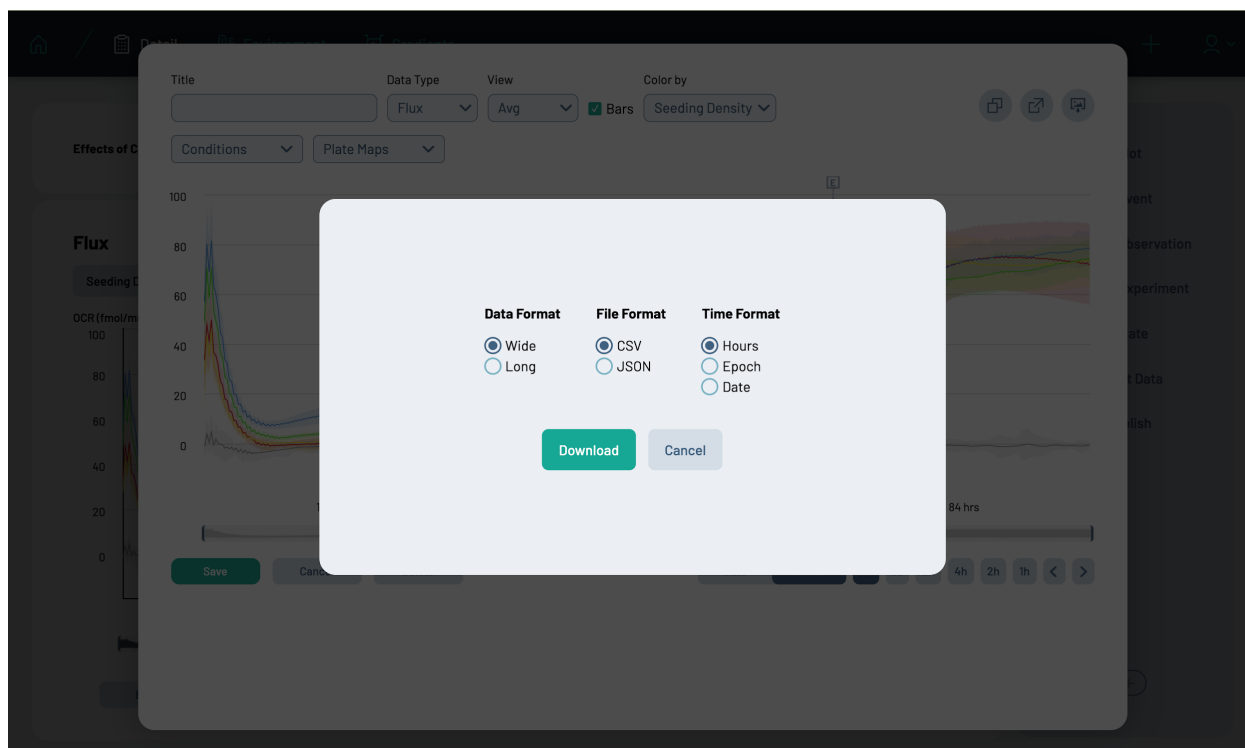
Replicate Experiment

This copies and creates a new experiment with the exact same experimental setup as the original.

Export Data

Data can be downloaded in multiple formats, including wide/long, CSV/JSON, and hours/epoch/date time. When downloading data, you can also choose which measurements you want downloaded. These include Flux (OCR), raw oxygen concentration, and the environmental data. When downloading two or more data sets, each of them will be downloaded as a separate file within a .zip folder.

- Wide - sensor data points time-aligned
- Long - sensor data points raw time
- CSV - comma delimited for use in Excel, etc.
- JSON - standard syntax with meta-data
- Hours - since experiment start
- Epoch - seconds since January 1, 1970
- Date time - actual date and time in format YYYY-MM-DDTHH:mm:ss.sssZ

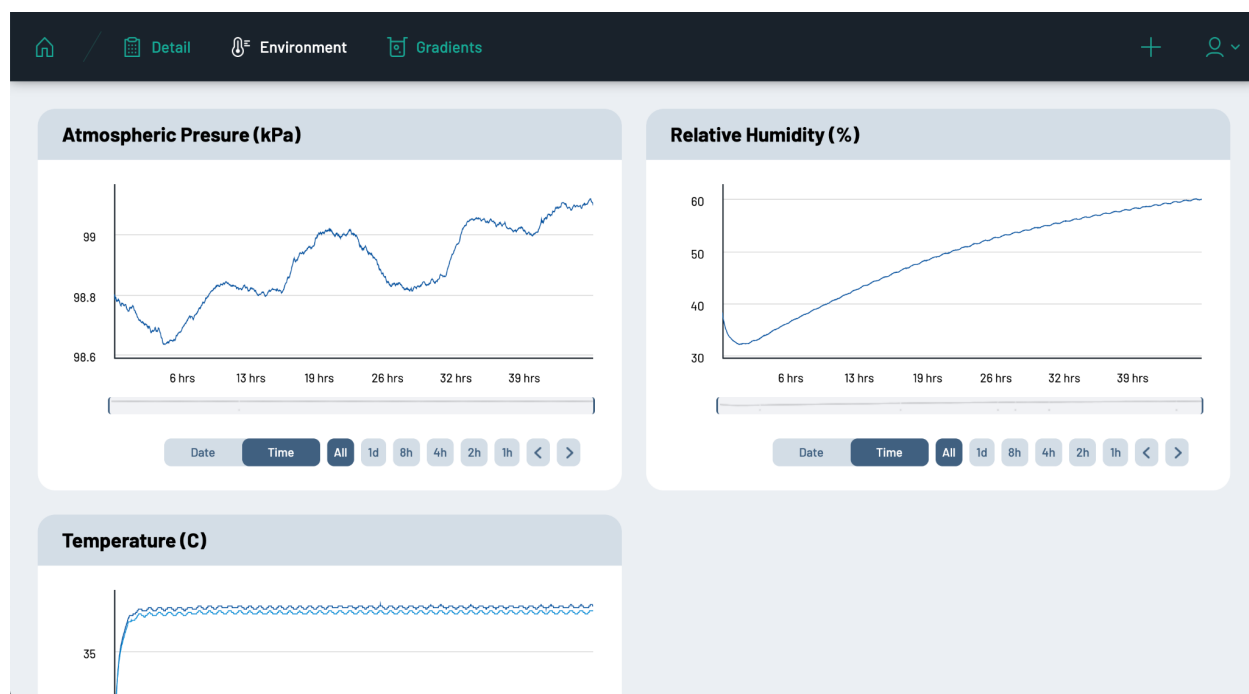


Publish

Selecting “Publish” will make your experiment and its results visible to every user on the platform, including guests. Doing so allows users to easily collaborate with other scientists.

Viewing environmental data

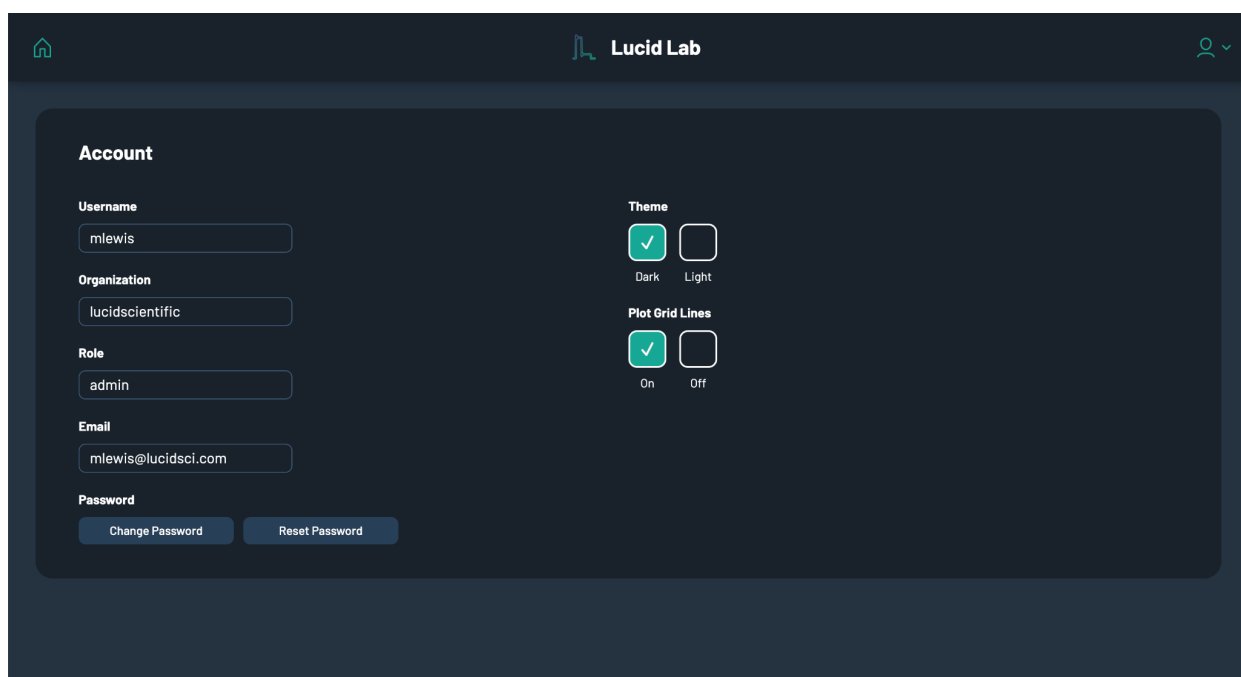
To view environmental data for an experiment, click on the environment tab. This shows you atmospheric pressure, humidity, and temperature data over the entire duration of an experiment.



Lucid Lab - Account

Changing/resetting passwords and account info

In the top right corner of the app, click on the person icon to see a drop down menu. By clicking your username, a new page will open and show your username, organization, role, and registered email address. You can also change and reset your password from here and toggle between light & dark themes.

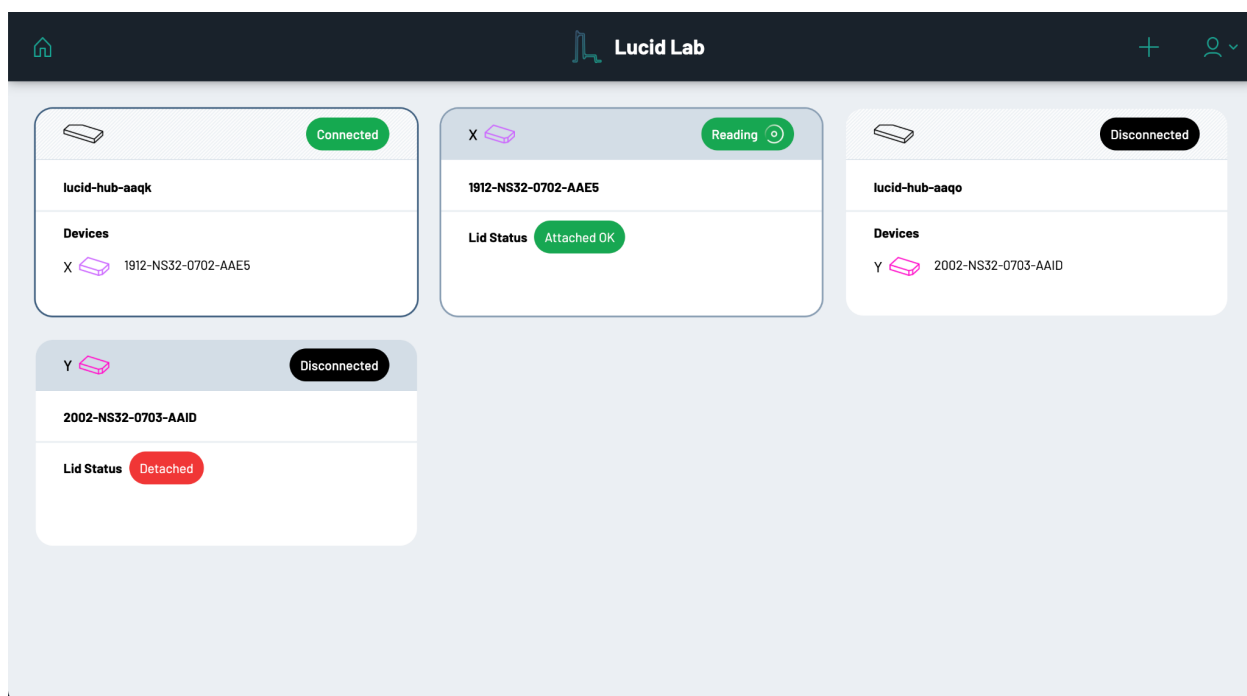


The screenshot shows the 'Account' settings page in the Lucid Lab application. The page has a dark theme. At the top, there is a navigation bar with a home icon, the 'Lucid Lab' text, and a user profile icon. The main content area is titled 'Account' and contains several sections:

- Username:** A text input field containing 'mlewis'.
- Organization:** A text input field containing 'lucidscientific'.
- Role:** A text input field containing 'admin'.
- Email:** A text input field containing 'mlewis@lucidsci.com'.
- Theme:** Two toggle buttons: 'Dark' (selected with a green checkmark) and 'Light'.
- Plot Grid Lines:** Two toggle buttons: 'On' (selected with a green checkmark) and 'Off'.
- Password:** Two buttons: 'Change Password' and 'Reset Password'.

Lucid Lab - Devices

The second option in the account drop down menu will show you all devices that have been or are connected to your Hub currently. It will also show the status of the devices, including whether or not they are connected or running.



The screenshot displays the Lucid Lab interface with a dark header bar containing a home icon, the 'Lucid Lab' title, and a user profile icon. The main content area shows four device cards arranged in a 2x2 grid. Each card represents a different hub and its associated devices.

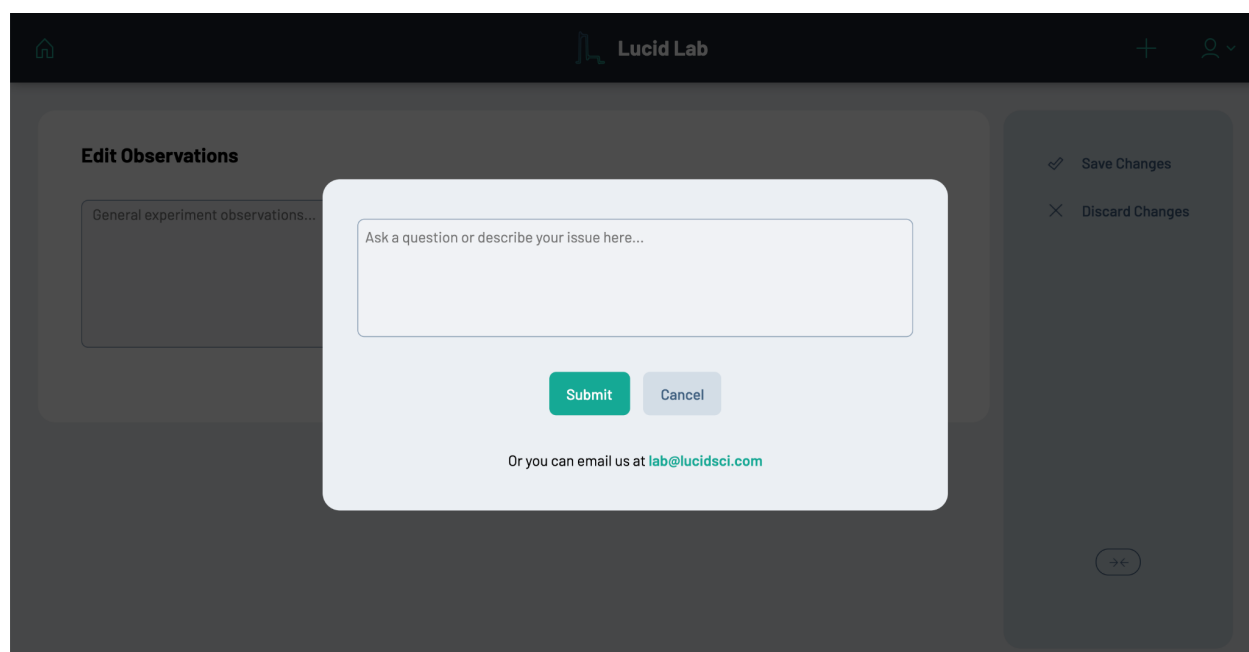
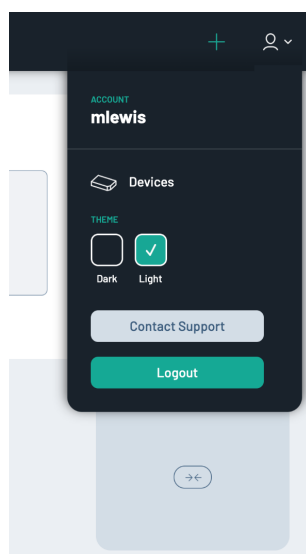
Hub	Status	Device ID	Lid Status
lucid-hub-aaqk	Connected	X 1912-NS32-0702-AAE5	Attached OK
lucid-hub-aaqo	Disconnected	Y 2002-NS32-0703-AAID	Detached

Detailed description of the interface elements:

- Header:** A dark blue bar with a home icon on the left, the text 'Lucid Lab' in the center, and a user profile icon on the right.
- Device Cards:**
 - Top Left Card:** Header 'lucid-hub-aaqk' with a green 'Connected' badge. Under 'Devices', it lists 'X' with a pink device icon and ID '1912-NS32-0702-AAE5'. The 'Lid Status' is 'Attached OK' in a green badge.
 - Top Right Card:** Header 'lucid-hub-aaqo' with a black 'Disconnected' badge. Under 'Devices', it lists 'Y' with a pink device icon and ID '2002-NS32-0703-AAID'. The 'Lid Status' is 'Detached' in a red badge.
 - Bottom Left Card:** Header '2002-NS32-0703-AAID' with a black 'Disconnected' badge. The 'Lid Status' is 'Detached' in a red badge.
 - Bottom Right Card:** This area is currently empty.

Lucid Lab - Support

The last few options allow you to toggle between light/dark themes, contact support, and logout from your account. Should you have any questions, do not hesitate to put your questions into the support box and we will answer you promptly.



Certifications

Federal Communications Commission (FCC) Interference Statement

The device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operations.

This device has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This device generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

Open Source Software

The Hub and device contain third-party software including free/open-source licensed software. To request for more information (such as obtaining access to this software), please contact us at info@lucidsci.com.

Data Restrictions

This system is for research use only. While it is designed and implemented to securely store and access data, users are instructed not to enter sensitive information such as PII/PHI. The Hub and web app are not certified for HIPAA or GLP/GMP. The system is intended for research purposes only and should not be used for clinical or diagnostic purposes.

IT Support FAQ

Q: Why does the Hub require WAN/Internet access?

A: Primarily for remote system performance monitoring, data analysis support, and software updates. The internet connection also enables researchers to monitor their experiment data remotely.

Q: How do I connect the Hub?

A: Via ethernet to a DHCP-enabled network.

Q: What OS does the Hub run?

A: Ubuntu 24.04 LTS (some older hub for may still have 20.04 or 18.04 LTS)

Q: Is this a network-level hub or switch?

A: No, it is a USB hub and embedded computer - not a network-level hub.

Q: Does the Hub require inbound firewall access?

A: No, all WAN connections are outbound TCP connections initiated by the Hub.

Q: What domains does the Hub connect to?

A: *.lucidsci.com and *.amazonaws.com

Q: Can you provide the specific subdomains?

A: Yes, please contact us for an up-to-date list of the specific subdomains.

Q: What outbound ports are the connections made with?

A: 443 (https) and 22 (ssh) and 8883 (mqtt)

Q: Where is the data stored?

A: The data is stored both locally on the Hub's hard drive and on AWS S3.

Q: Is the cloud data transmitted and stored securely?

A: All data is sent to and retrieved from AWS using TLS/SSL. The data is stored encrypted at rest using AWS S3.

Q: Does the Hub support WiFi?

A: Yes, but a wired connection is preferred.

Q: Is there a default password?

A: No, each Hub has a unique factory generated password.

Q: Can I install network monitoring software agents on the Hub?

A: Yes, we support the installation of linux-supported network monitoring agents such as CrowdStrike Falcon.

Q: Is there support for advanced network configuration options such as assigning a static IP address?

A: Yes, by connecting a keyboard and an HDMI monitor to the Hub and pressing `ctrl+alt+F2` you can access the network connection editor. This UI supports advanced configurations such as manual IPv4 configurations.