

Quick Start Guide



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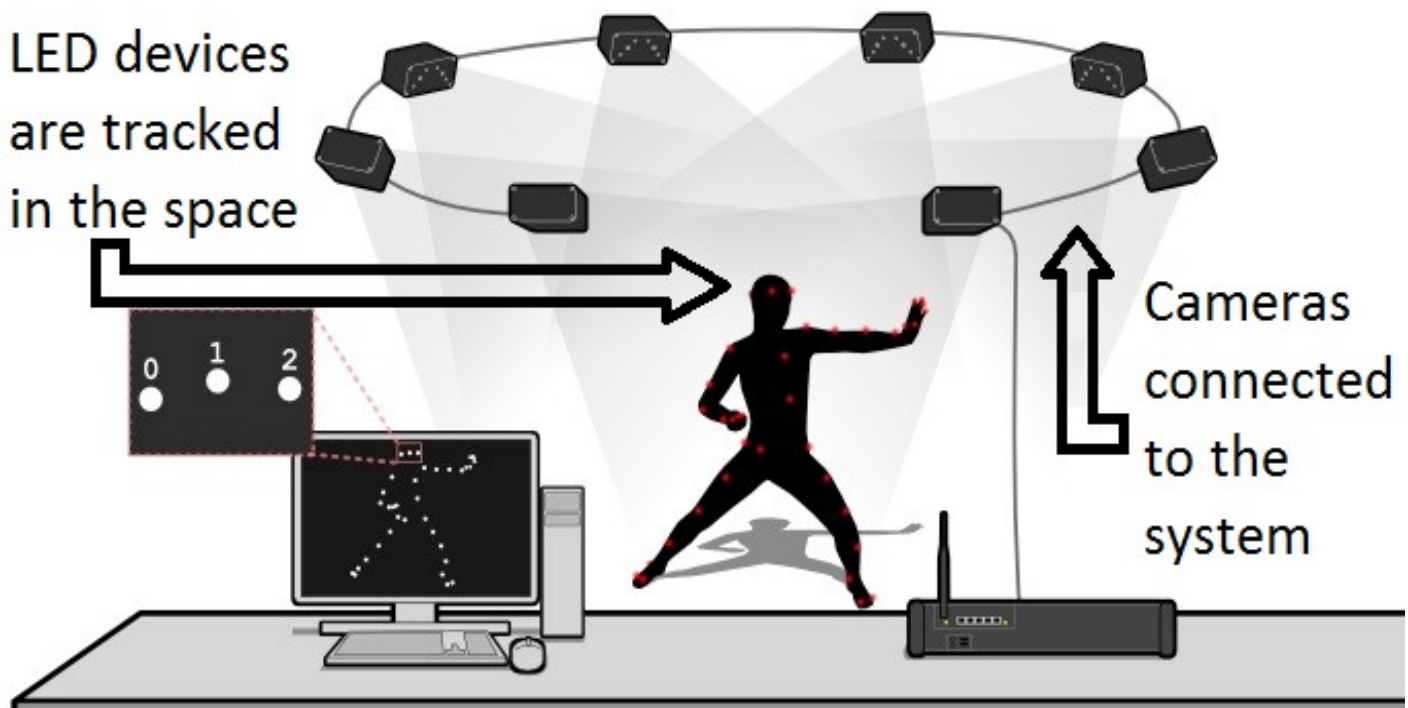
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Introduction

This guide will take you through the steps to setup your PhaseSpace system and begin streaming and recording. There are four main steps in the setup process:

1. Initial setup of the cameras
2. Registering your LED devices
3. Calibration of the system
4. Alignment of the system

In total the setup will generally take less than twenty minutes to complete.



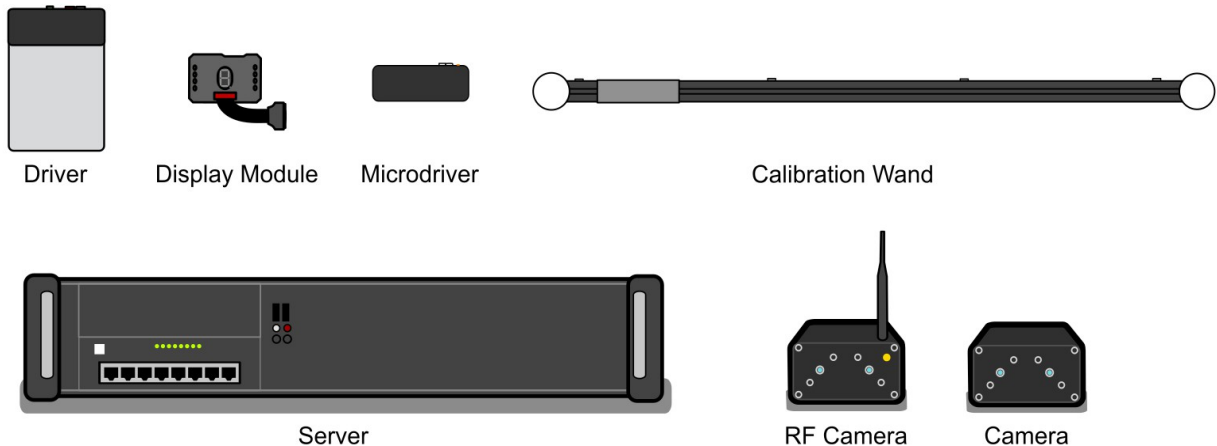
Standard Equipment

The basic requirements to operate a PhaseSpace system are cameras, a calibration object, a driver for that object and a server. You will also need a computer to access the PhaseSpace Master Client application, as well as a web browser (Firefox or Chrome is recommended) to access the Configuration Manager.

- **Cameras** – Cameras have a 60° field of vision.
- **RF Camera** – Camera with a radio antenna. An RF camera is required for the system to operate.
- **Server** – Contains the hub for the cameras.
- **Drivers** – Powers LED devices and drives their LED markers.
- **Micro Drivers** – Smaller drivers, cannot power as many LED markers as a Driver, but

are a more convenient size.

- **Calibration Object** – LED device used for calibration and alignment. In this guide we will use a Calibration Wand. There is also a smaller micro calibration wand that is utilized similarly.



- **PhaseSpace Master Client** – Included with your PhaseSpace system.
- **Configuration Manager** – The main interface for configuring and monitoring PhaseSpace systems. Accessible from any browser on the same network, this interface enables remote configuration of the motion capture system.

Step 1: Initial Setup



The initial setup for the PhaseSpace system involves placing the cameras in position around the space you want to capture, and then making sure they are connected correctly by checking the camera list in the Configuration Manager.

Equipment you will need to complete this step:

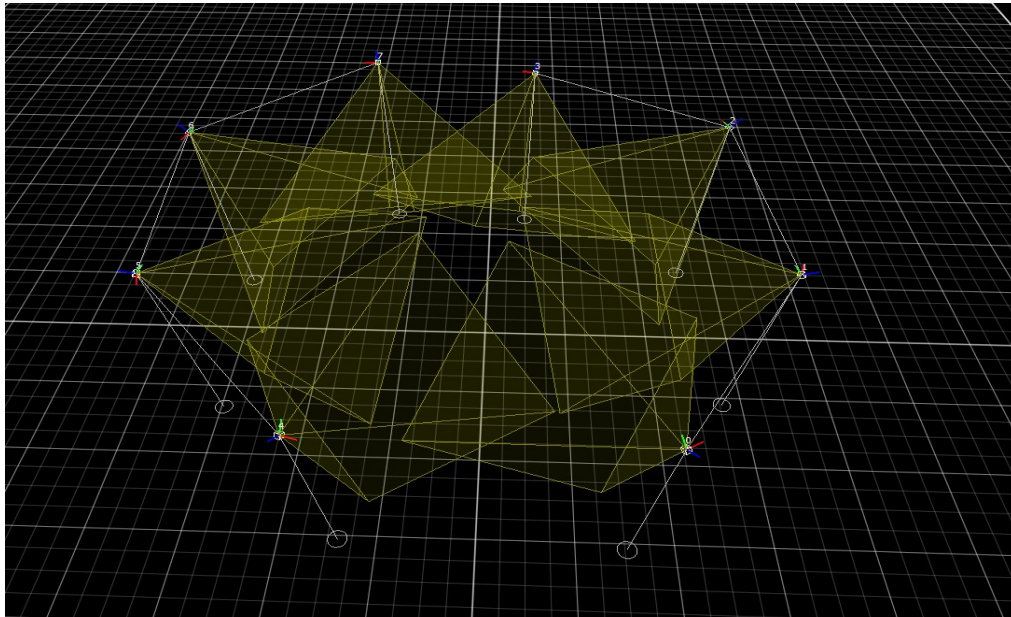
- Cameras
- RF camera

- Server
- Connecting cables
- Computer with a web browser and the PhaseSpace Master Client installed

Complete the following, in order, to setup your system:

Identify your Space

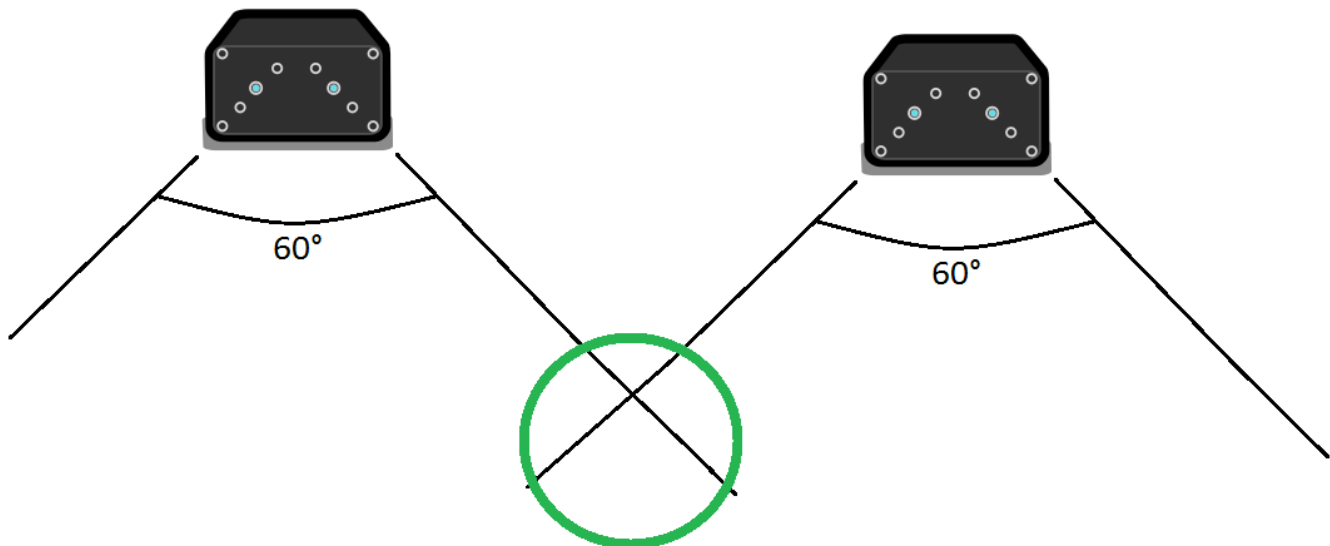
1. Position the cameras around the area you wish to capture. The arrangement will vary based on the size and shape of your capture space.



A circular camera arrangement

Note: The RF camera must be one of the cameras used in the configuration.

In order to accurately capture the space, cameras will need to be positioned so that they have some overlap, but try and distribute them evenly around your space at least a few feet or more apart.

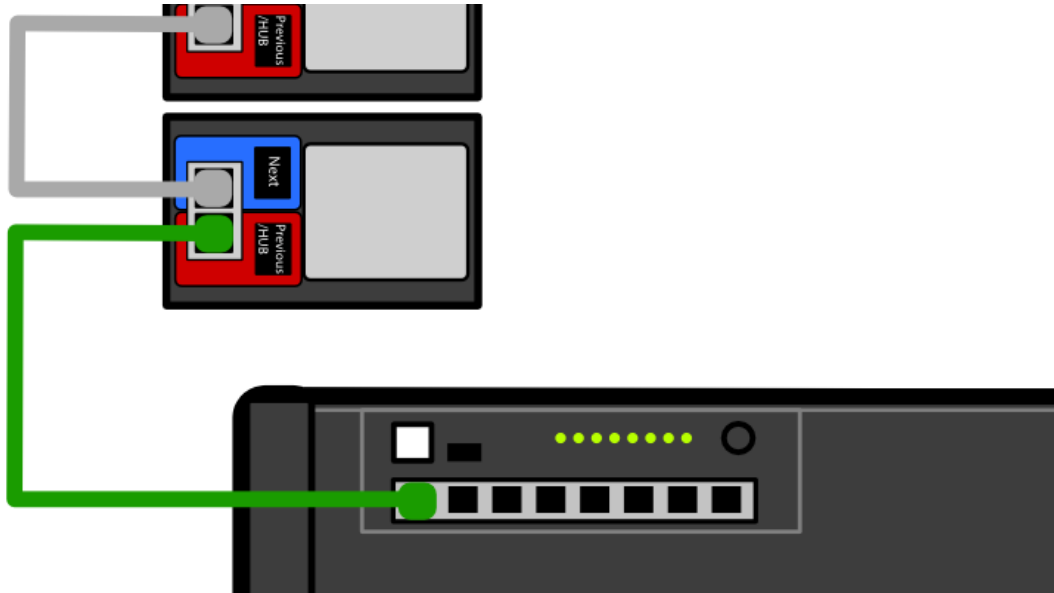


Camera sights overlap

Connect the Cameras

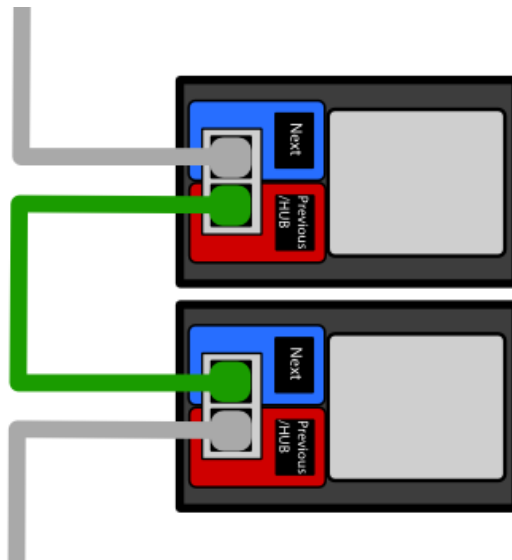
2. Once you are satisfied with your camera positions, link them together in chains of up to a maximum of 6. Start by connecting a camera to the server's hub by inserting cables from the red Previous/HUB port of the camera to a port on the hub.

WARNING: Do not connect or disconnect cameras while the system is streaming or the hub is on, as it can damage the cameras or the hub. Shut down the hub by pressing the large white button above the hub ports.



3. Extend the chain by connecting cables from the blue Next port of a camera to the red Previous/HUB port of the next camera in the chain. Continue connecting blue ports to red ports until your chain is finished.

On the last camera in the chain, the blue Next port will remain empty.



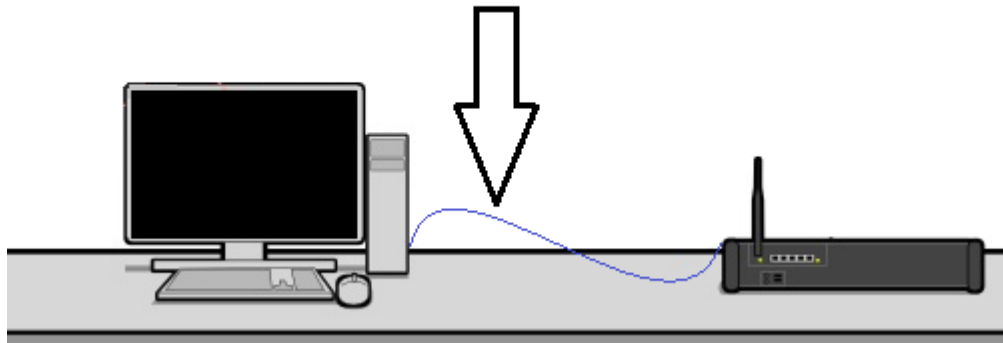
When you have connected six cameras together in a chain, you will need to start a new chain. Repeat step 2, connecting a camera into the server's hub, and continue building the new chain.

4. Repeat steps 2 and 3 until all cameras are connected to the hub.

Connect Client and Verify Connections

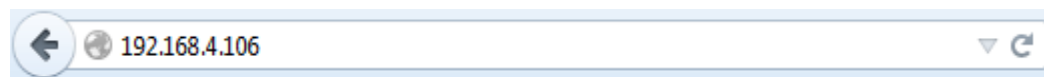
5. With camera setup complete, you now need to connect your computer to the system. Connect the client machine (your computer) to the server. Consult your network administrator or PhaseSpace technical support for the proper connection procedure.

Connect client to port on back of server



WARNING: The Ethernet port is located on the back of the server. All front ports are hub ports for the cameras only. Connecting unauthorized devices to the hub ports can damage the devices or the hub.

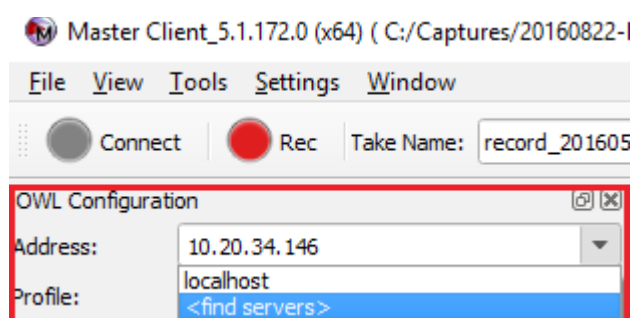
6. Turn the server on. The blue 'power' light will turn on.
7. On the client machine, open a web browser and enter the IP address of the server.



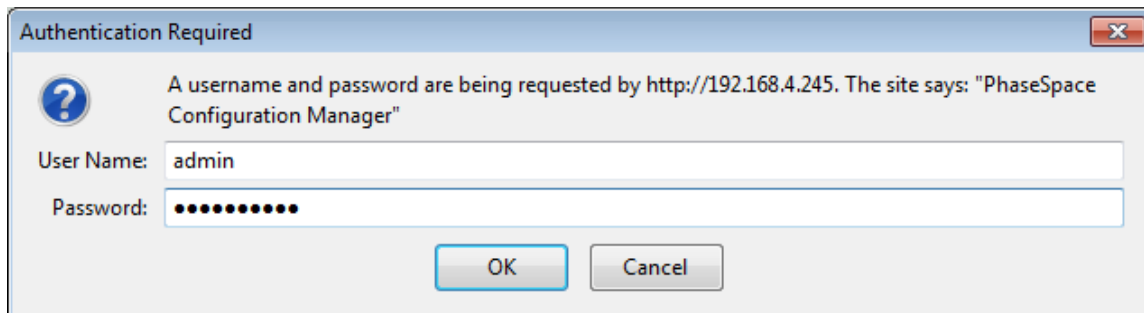
An example IP address

If you are unsure of the address of your server, it can be found in the Phasespace Master Client application:

- Open the Phasespace Master Client application.
- Look in the **OWL Configuration** panel.
- Clicking on the **Address** box will open a drop down menu with the option to '<find servers>'.



- Click '<find servers>' and Master Client will fetch a list of servers it can access. Copy and Paste the IP address into the browser.
- The browser will then prompt you for login credentials. Enter **admin** as the user name and **phasespace** as the password.



Authentication Required

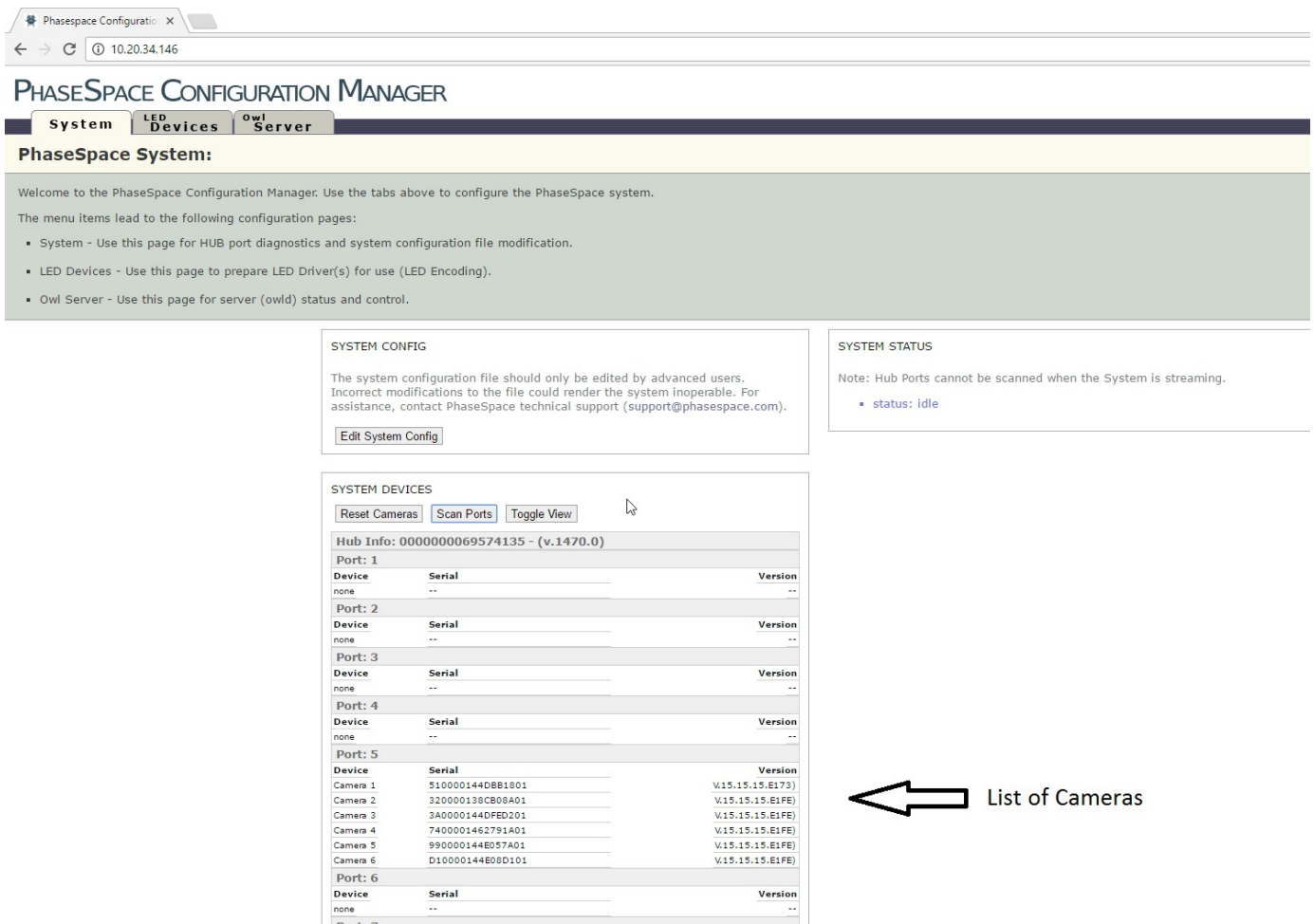
A username and password are being requested by http://192.168.4.245. The site says: "PhaseSpace Configuration Manager"

User Name: admin

Password: ••••••••

OK Cancel

- When you successfully login, you will be in the **Configuration Manager**. The server will attempt to find the cameras connected to the hub and will display them in a list. You can manually search for cameras by clicking the **Scan Ports** button.



PHASESPACE CONFIGURATION MANAGER

System LED Devices Owl Server

PhaseSpace System:

Welcome to the PhaseSpace Configuration Manager. Use the tabs above to configure the PhaseSpace system.

The menu items lead to the following configuration pages:

- System - Use this page for HUB port diagnostics and system configuration file modification.
- LED Devices - Use this page to prepare LED Driver(s) for use (LED Encoding).
- Owl Server - Use this page for server (owld) status and control.

SYSTEM CONFIG

The system configuration file should only be edited by advanced users. Incorrect modifications to the file could render the system inoperable. For assistance, contact PhaseSpace technical support (support@phasespace.com).

Edit System Config

SYSTEM STATUS

Note: Hub Ports cannot be scanned when the System is streaming.

- status: idle

SYSTEM DEVICES

Reset Cameras Scan Ports Toggle View

Hub Info: 0000000069574135 - (v.1470.0)

Port	Device	Serial	Version
Port: 1	Device	Serial	Version
	none	--	--
Port: 2	Device	Serial	Version
	none	--	--
Port: 3	Device	Serial	Version
	none	--	--
Port: 4	Device	Serial	Version
	none	--	--
Port: 5	Device	Serial	Version
	Camera 1	5100001440BB1801	V:15.15.15.E173
	Camera 2	320000138CB08A01	V:15.15.15.E1FE
	Camera 3	3A0000144DFED201	V:15.15.15.E1FE
	Camera 4	7400001462791A01	V:15.15.15.E1FE
	Camera 5	990000144E057A01	V:15.15.15.E1FE
	Camera 6	D10000144E0D101	V:15.15.15.E1FE
Port: 6	Device	Serial	Version
	none	--	--
Port: 7	Device	Serial	Version
	none	--	--

← List of Cameras

10. If cameras are missing from the list, check the camera chains for connection problems (there may be flashing orange lights on camera connection ports signaling an error) and scan the ports again after fixing them. Be sure to turn off the hub, with the large white button, before disconnecting and connecting cameras.



11. If the number of cameras in the list matches the number of cameras in your system, the initial setup is complete.

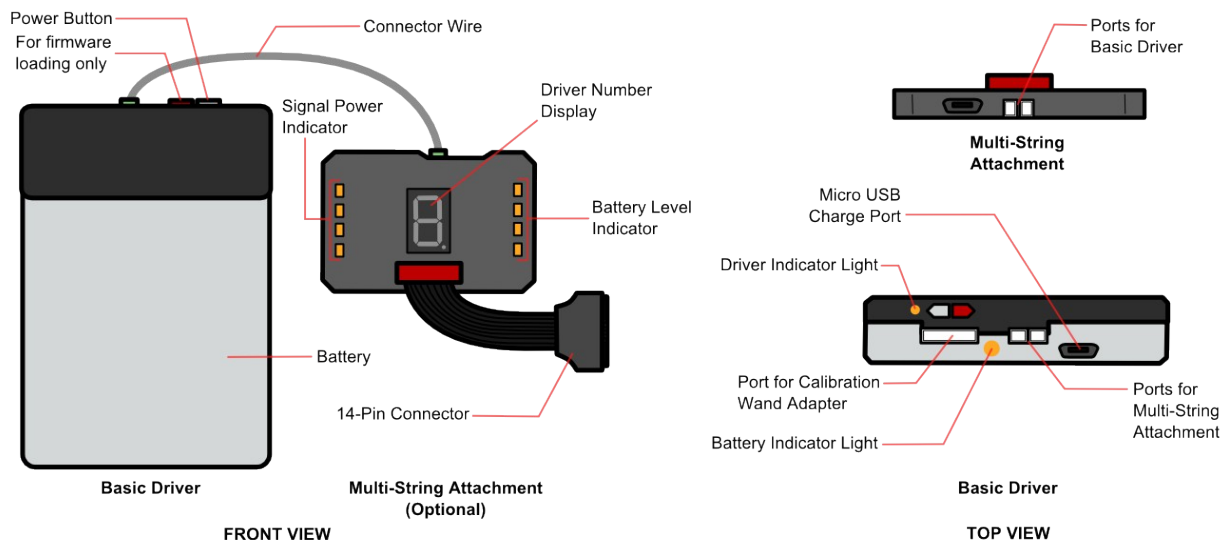
Step 2: Registering Devices



Now that you have the cameras setup you need to setup the LED devices. LED devices are used to convey motion data to the PhaseSpace system. Examples include:

- Calibration wand
- VR headsets with a few LEDs on them
- Full body suits covered in LEDs

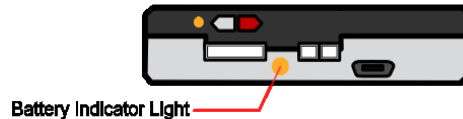
In order for devices to be tracked by the system, they first need to be registered. This is a simple process, where you will scan for new devices in the Configuration Manager, and then pair the device's **drivers** to the server.



A driver is what powers the LED devices. You will want to charge the battery in the drivers before use to ensure they remain functional while you setup and use your system.

Note: *The battery indicator light:*

- *Turns off when the battery is low or has entered standby mode. To get the battery out of standby, briefly connect the battery to a USB charger.*
- *Blinks while the Driver is idle.*
- *Flashes quickly when the Driver is active.*
- *Glowes steadily when the Driver is charging.*



WARNING: *Do not connect the Multi-String Attachment to the Basic Driver while the system is streaming data. Doing so may damage one or both devices.*

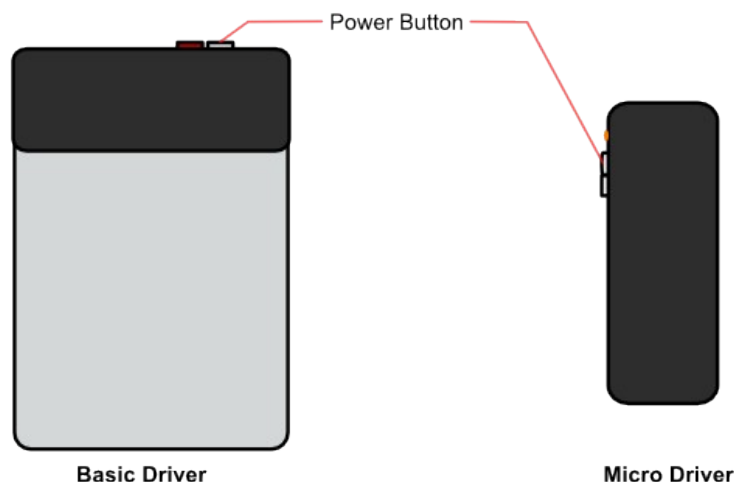
Equipment you will need to complete this step:

- Driver or microdriver
- Computer with access to PhaseSpace Configuration Manager (see Step 1: Initial Setup)
- Phasespace system that has completed Initial Setup.

Note: *If you are using a normal 8 LED calibration wand, you will need a basic driver. If using a 4 LED micro calibration wand, you will need a microdriver instead.*

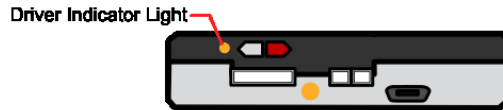
Complete the following, in order, to register a device with the system:

1. Turn on the Basic Driver by pressing the power button (the driver indicator light above the power button will turn on when the device is active). Additional drivers and Micro Drivers can be powered on in the same way.



Note:

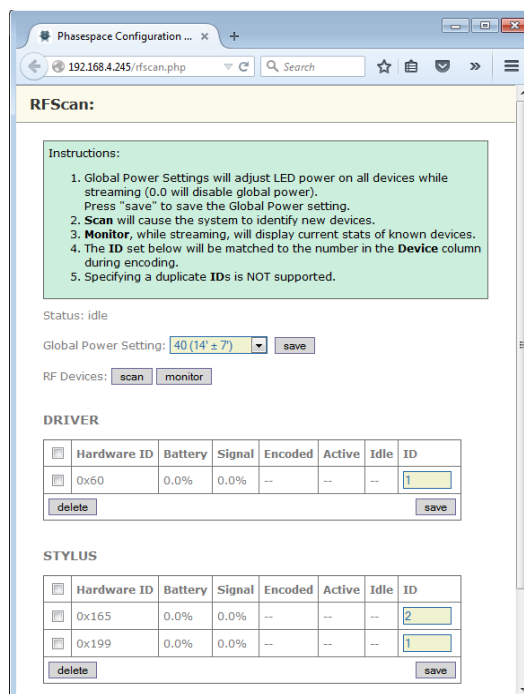
- To put the devices in standby mode - press the power button again (the indicator light will blink slowly to indicate standby mode)
- To completely turn off the devices - press and hold the power button until the driver indicator light has blinked seven times (the indicator light will stay off afterwards).



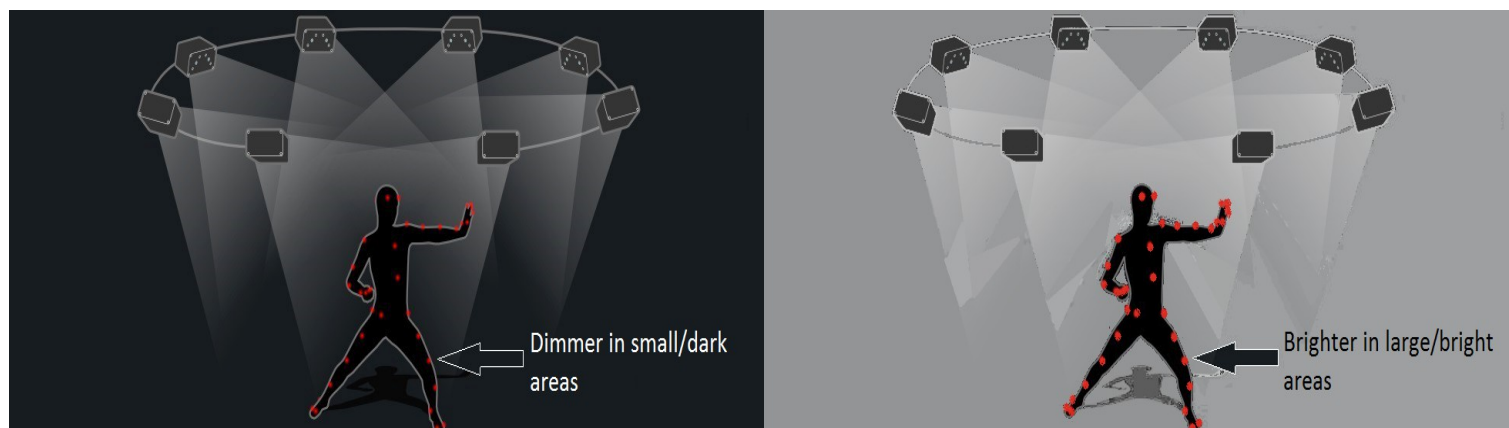
2. Once your driver is on (the indicator light is on), go to the PhaseSpace Configuration Manager, and select the **LED Devices** tab.



3. Click **Scan & Monitor Devices** to open the RFScan dialog.



4. In the **Global Power Setting** dropdown, select an appropriate power level for the size of your space. The measurements in parenthesis are estimates on how far the cameras will be able to pick up LED devices at that power level.



Example: If you have a 25'x25' capture space, you will want a power level in the range of 45-55, as you want the cameras to be able to see across most of the space.

These estimates are for an average setting with normal lighting, so a darker room will require a lower setting, and a brighter room or the outdoors will require a higher setting.

After setting the power setting, you are ready to register the drivers for the devices.

5. Click the **Scan** button to start searching for new devices. When the server discovers a Basic Driver, its details will appear in the Drivers section. Any additional Basic Drivers will also appear in the Drivers section, while detected Micro Drivers will appear in the MicroDrivers list.

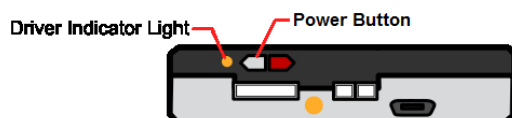
RF Devices: scan monitor ☒ RF encoding

DRIVERS

<input type="checkbox"/>	Hardware ID	Battery	Signal	Encoded	Active	Idle	Version	ID
<input type="checkbox"/>	0x52e	100%	100%	2016-12-05T10:19:22	112	0	15.12.70bb0eee	1
<input type="checkbox"/>	0x534	0%	0%	--	--	--	--	2
delete selected force encode selected edit IDs								

When the scan button turns green and the front light on the RF camera is blinking, proceed to the next step to add new drivers to the list.

6. Add new drivers to the list by pairing them. This is done by pressing and holding the power button on the driver until the driver indicator light has blinked three times. The driver should then appear in the list.



- Once connected to the server, the driver's indicator light will blink rapidly when the device is being scanned or the system is streaming. The system must be streaming for a device to pair.

Note: If the driver does not appear in the list, make sure the battery indicator light is on (briefly plug into USB charger) and try pairing it again. You can highlight a driver in the list by pressing the red button, next to the power button on the driver.

DRIVERS

<input type="checkbox"/> Hardware ID	Battery	Signal	Encoded	Active	Idle	Version	ID
<input checked="" type="checkbox"/> 0x101	80%	93%	2017-01-04T09:59:09	9	0	14.01.e1953ee6	2
<input type="checkbox"/> 0x3bf	0%	0%	--	--	--	--	1
delete selected				force encode selected			edit IDs

Highlighted driver in blue after pressing red button.

- Once drivers are successfully paired, they will be tracked in the space while connected to their LED devices.

Step 3: Calibration



To calibrate the system you will need a paired driver and a calibration object, in this case we will use a calibration wand. Small adjustments will be made to the cameras, and then you will collect calibration data by walking around in your capture space with the calibration object.

Equipment you will need to complete this step:

- Calibration wand

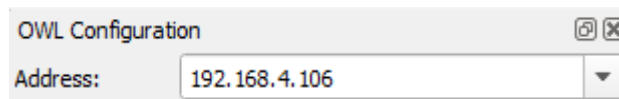
- Registered driver (see Step 2: Registering Devices)
- Phasespace system that has completed Initial Setup.
- Computer with the Master Client connected to PhaseSpace System

Note: if using a 4 LED micro calibration wand, you will need a registered **microdriver** instead of a driver.

Complete the following, in order, to calibrate the system:

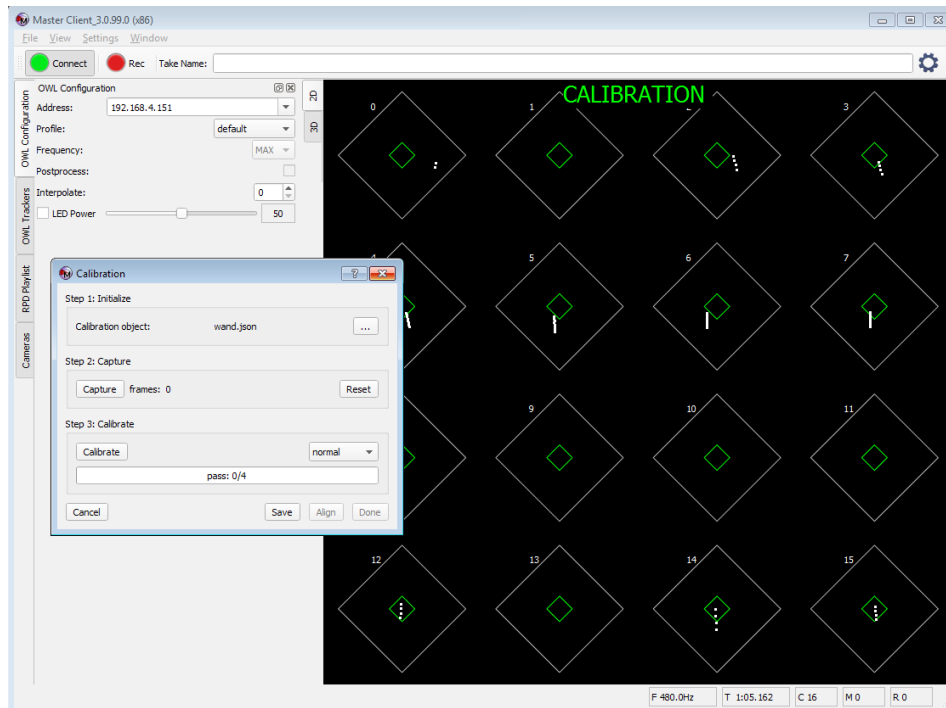
Getting the Equipment Ready

1. Start up the PhaseSpace Master Client.
2. In the OWL Configuration panel, enter the the IP address of the server to be calibrated or select the IP address from the drop-down menu in the **Address** box.



An example IP address

3. Once the server is selected, in the **Tools** menu, select **Calibration** to enter calibration mode. This will open the Calibration dialog box and automatically connect to the server.



4. If prompted for the calibration object's tracker file, select *wand.json* (or *wand-micro.json* if using a micro wand), which corresponds to the calibration wand. This can be found in the folder in which Master Client is installed. To change the tracker file, click the ... button in the Initialize section.

Step 1: Initialize

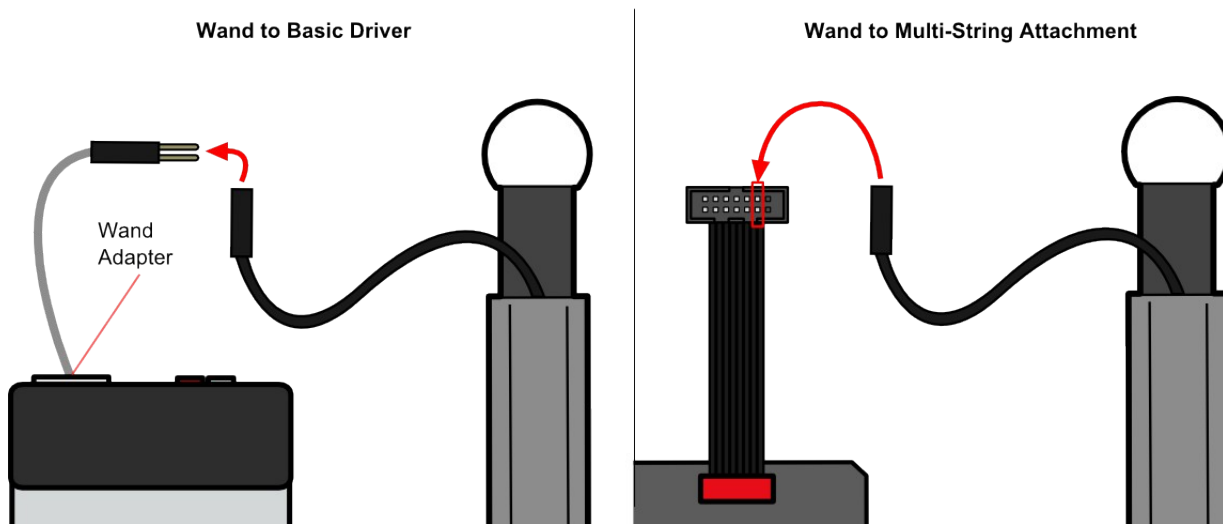
Calibration object: wand.json ...

Note: A calibration wand has 8 LEDs and two rounded ends. The micro wand has just 4 LEDs, and only has the bottom rounded.

5. Once the appropriate calibration object tracker file is selected, you are ready to activate the calibration object.

Activate the Calibration Wand

6. Connect a registered Basic Driver to the calibration wand.



Note: If you are using a micro calibration wand, connect a **microdriver** to the top of the wand.

7. The driver for the calibration object must have an ID of 1. You can confirm or change this in the Configuration Manager:
 - Click the **LED Devices** tab.
 - Click the **Scan & Monitor Devices** button to open the RF scan dialogue.
 - Click **edit IDs**.
 - Adjust the IDs of the drivers(far right column).
 - Click **save IDs**.

Status: idle

Global Power Setting: 50 (16' ± 8') save

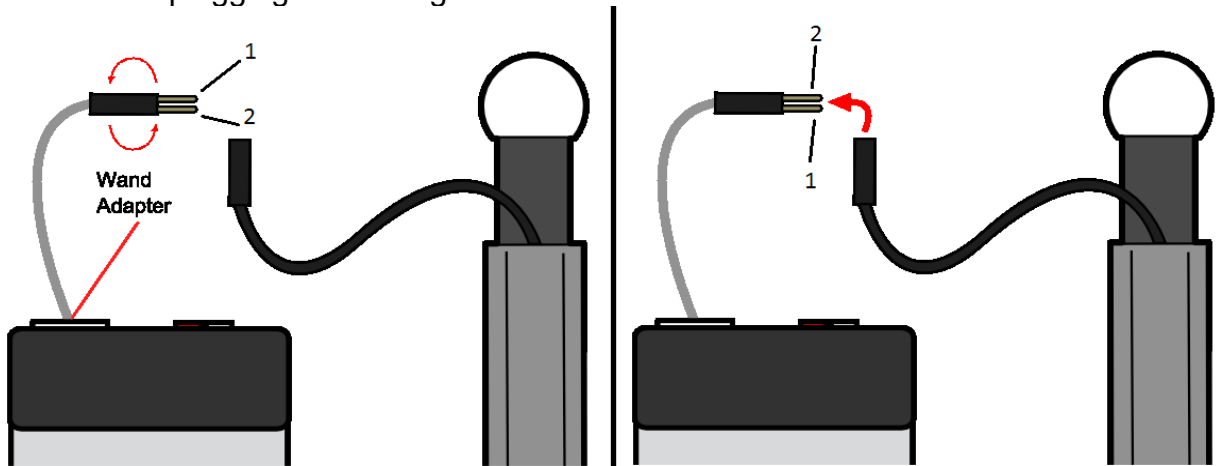
RF Devices: scan monitor ☒ RF encoding

DRIVERS

<input type="checkbox"/> Hardware ID	Battery	Signal	Encoded	Active	Idle	Version	ID
<input type="checkbox"/> 0x52e	0%	0%	--	--	--	--	1
<input type="checkbox"/> 0x534	0%	0%	--	--	--	--	2

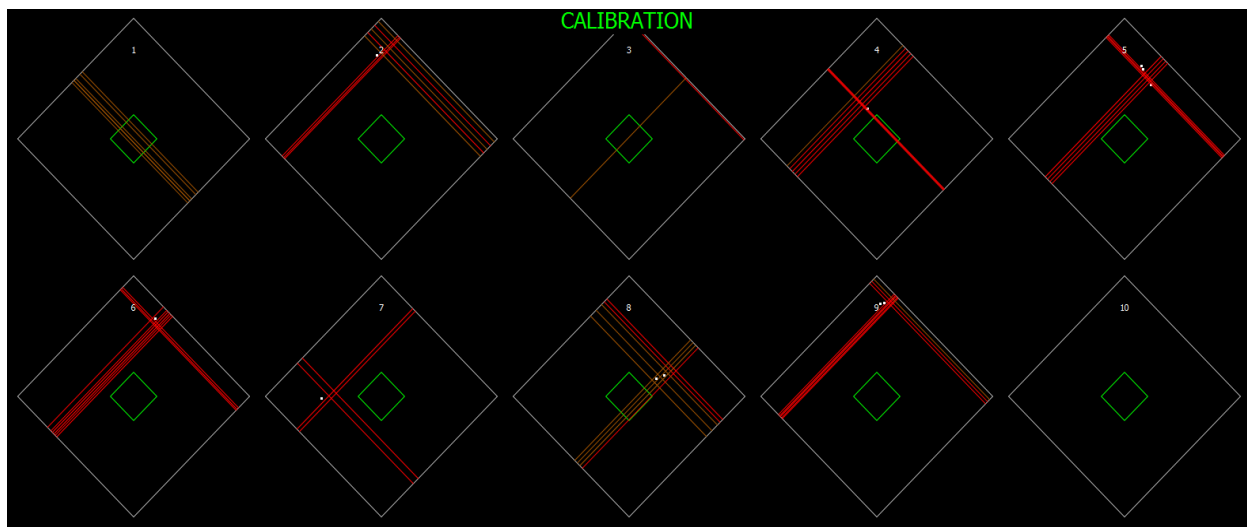
delete selected force encode selected edit IDs

8. Once connected, turn the driver on to activate the calibration wand's markers, lighting up the LEDs. If the markers do not activate, try turning the prongs on the wand adapter over and plugging them in again.



Note: If the wand still does not turn on when it is correctly connected to the Basic Driver, check the battery indicator light. If the indicator light is off, the battery may require a recharge or it needs to be taken out of standby by briefly connecting the battery to a USB charger.

9. If the calibration wand is successfully activated and in the capture space, white points corresponding to the wand's markers should appear in the camera views in the Master Client 2D panel.



10. There may also be colored lines going through the white points. These lines represent the light levels the cameras are detecting from the LEDs on the wand.

There are three colors you will want to pay attention to:

- Yellow: Too strong, the camera is receiving too much light from the marker
- Brown: A very weak detection, the camera is not receiving enough light from the marker.
- Red: The camera cannot tell which point the light is coming from. Usually because

the markers are overlapped in the camera's view or are much too bright.

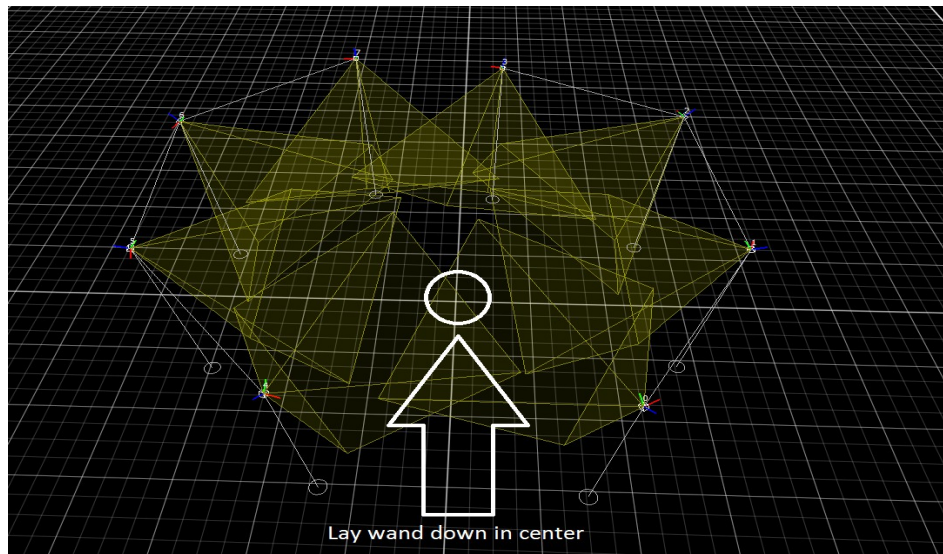
Note: Some red is fine, but if the vast majority of the views are filled with red lines (such as the image above) you will want to adjust the LED power levels.

Do not worry too much yet about the light levels of your system, as you will be making adjustments in the following steps.

11. When the wand is successfully appearing in the 2D panel while the system is connected (Connect button in Master Client is green and RF camera front light is blinking), you are ready to proceed.

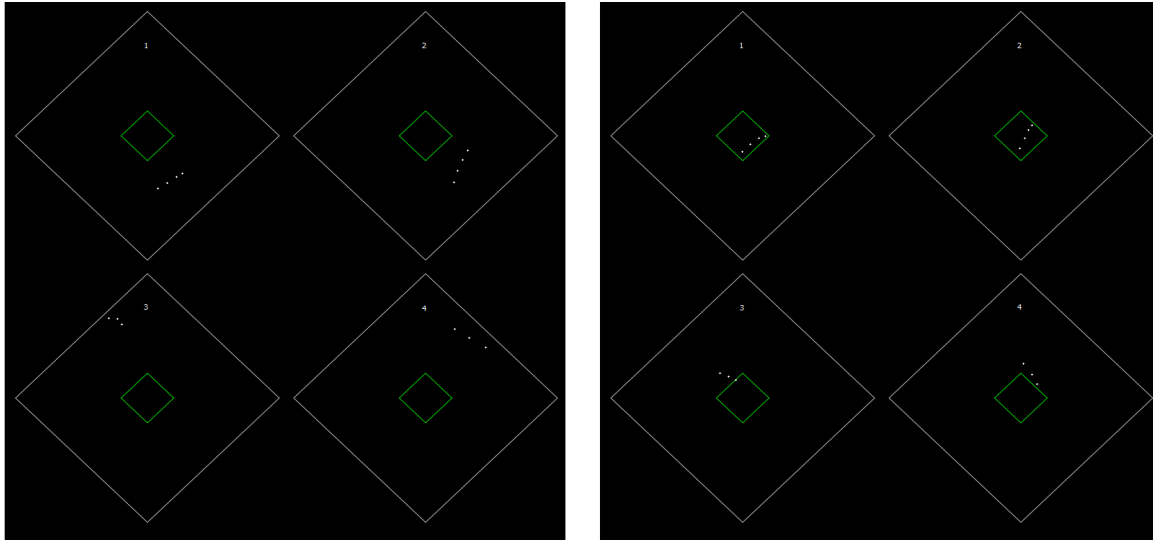
Making Adjustments

12. Place the calibration wand in the center of the space you want a camera to capture.



Make sure the LEDs on the wand face upwards so the cameras can see them.

13. In the Master Client 2D viewer there are green diamonds representing the centers of each camera's view. Adjust each camera's angle or position until the white dots are near the center of the camera's view.



Before and after camera position adjustments

If the wand is not appearing for a camera, you can rotate the wand in place on the ground so that the LED markers are facing the camera in question.

Note: *Pointing of the cameras does not have to be exact, near the center will work fine. Standing behind the cameras and then pointing them at the wand will generally get you most of the way there.*

The goal is to create an overlap of the cameras views, as this will allow for greater coverage of the capture space.

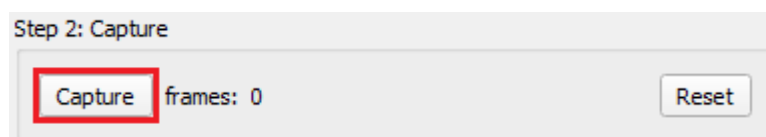
14. Once the cameras are in place, you can also adjust the LED Power slider in the OWL Configuration panel to appropriate levels for your environment. This would be whatever power level produces the least amount of colored lines.



15. When the views in the 2D panel are able to capture the wand and are mostly free of colored lines, you are ready to capture calibration data.

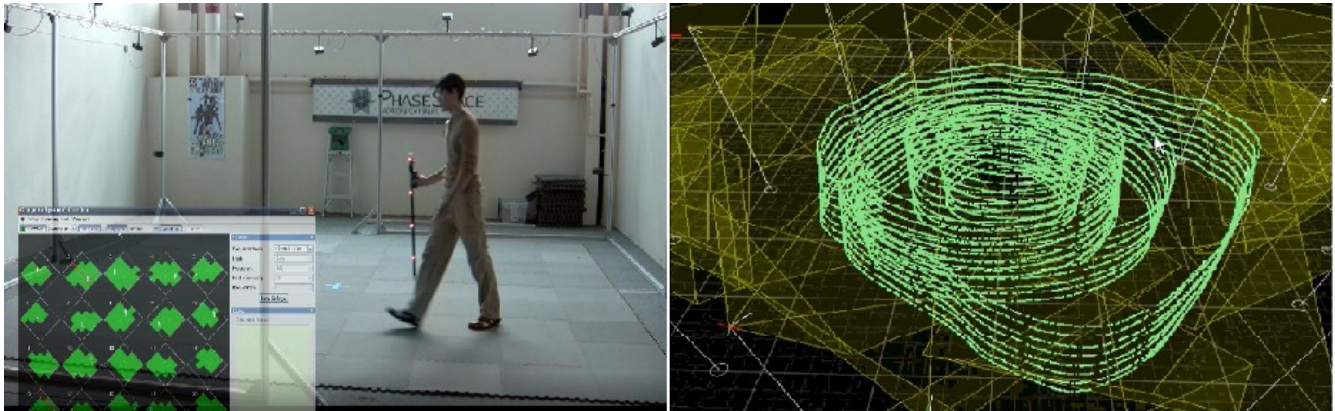
Collecting Data and Calibrating

16. Click the **Capture** button to start the data capture process.



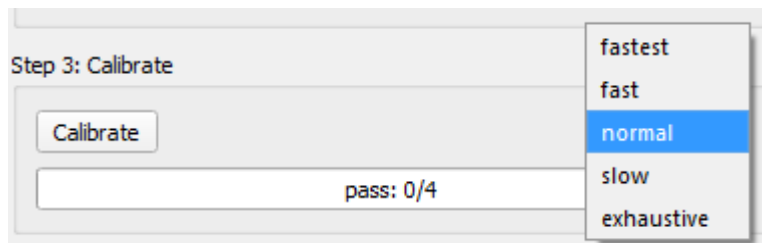
17. Move the calibration object around in the capture space to generate calibration data

points. Hold the object so the LED lights face outwards, away from your body, towards the cameras. Each camera's view will be filled in with solid green as the system collects data. Capture data until all camera views are at least 50% filled in.

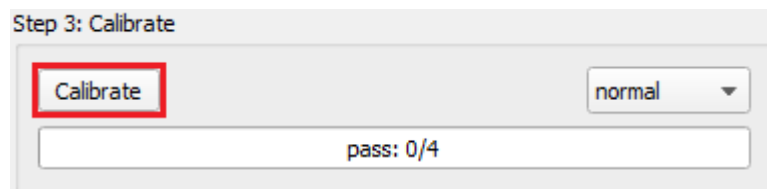


Capturing data(left) and the wand's trail around the space(right).

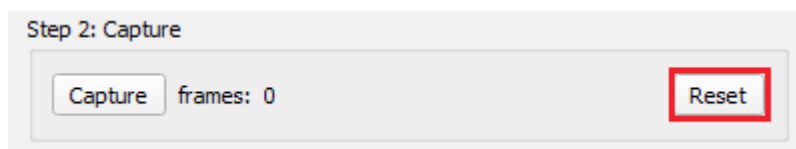
18. Set the calibration quality with the drop select (fastest, fast, normal, slow, exhaustive). Higher quality calibration will take longer to compute. For most purposes the 'normal' setting will do.



19. Click the **Calibrate** button to start the calibration process. After four passes, calibration is complete.



If the calibration fails, press the Reset button and repeat the capture process(steps 16-17) to create a new set of data.



Note: If you are having trouble, check the LED power levels for an over abundance of yellow, brown, or red lines in the 2D viewer, and adjust the power level accordingly.

Also, make sure the LEDs are facing the cameras as you move around the space, and that you are turning your body as you move to not block the sight of the cameras during the capture process. The goal is to have the wand visible to as many cameras as possible at all times.

20. Once successful, click the **Save** button to save the completed calibration. The system is now calibrated, the last remaining step is to align it.

Step 4: Alignment



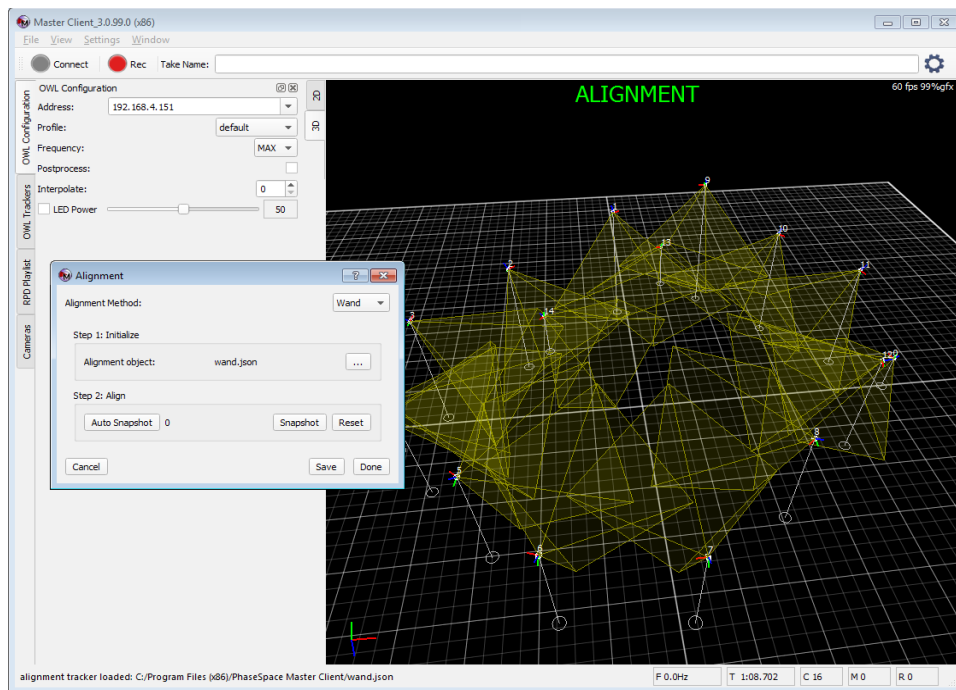
The final step in setting up the system is alignment. This will orient the system, creating XYZ coordinates to give points in the space context. The alignment process is easy, you will simply stand in place with the calibration wand as the system marks the points.

Equipment you will need to complete this step:

- Registered driver (see Step 2: Registering Devices)
- Alignment object (In this case the calibration wand)
- Phasespace system that has completed Initial Setup
- Computer with the Master Client connected to the PhaseSpace System
- PhaseSpace system that has been calibrated. (see Step 3: Calibration)

Complete the following, in order, to align the system:

1. If in Calibration mode, click the **Align** button to enter alignment mode. This will also open the Alignment dialog box. Alternatively, navigating to **Tools->Alignment** will also enter alignment mode.

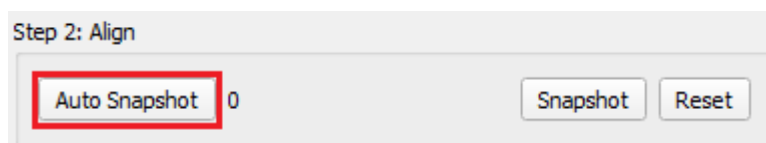


Alignment Mode

2. Check the alignment objects tracker file, and that it matches your alignment object (wand.json for 8 LED calibration wand, wand-micro.json for 4 LED micro wand). You can change the tracker file by clicking the ... button.

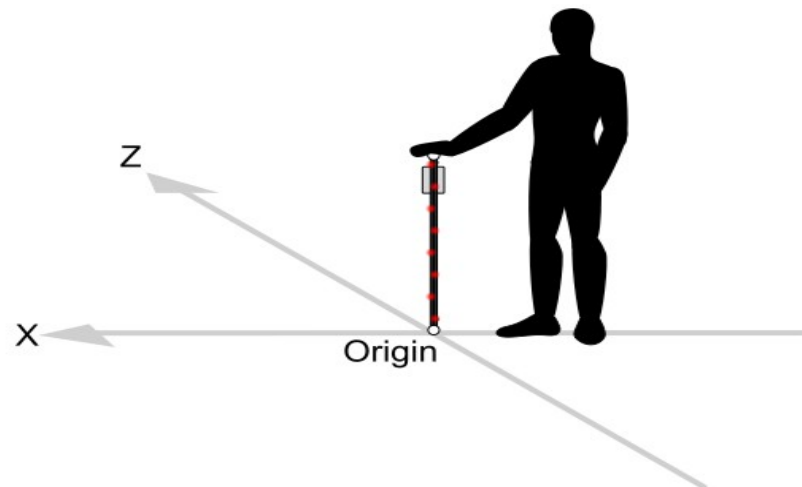


3. Click the **Auto Snapshot** button to have Master Client automatically place alignment points as you position the alignment object in the capture space. The Client will take snapshots whenever the alignment object is still, so be sure to keep moving the object until it is in the desired position.



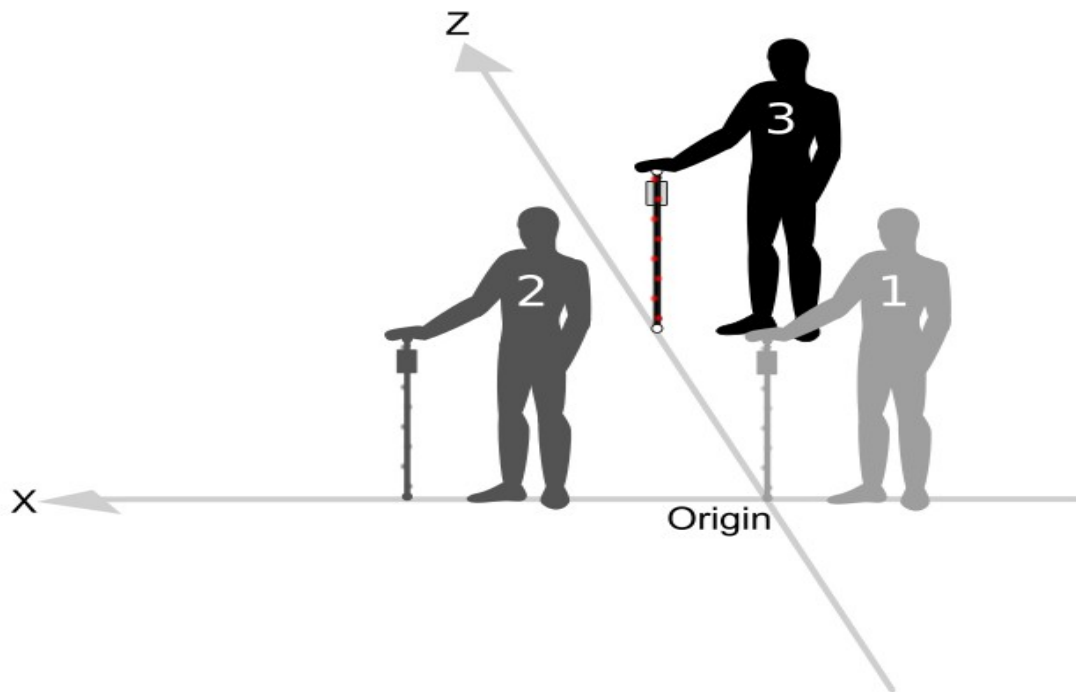
4. Three points are needed for alignment: the origin and points to determine the X and Z axes. Stand in the center of the capture space and face the direction that will be determined as 'forward'. Keep the wand moving to avoid accidental snapshots.
5. Set the origin of the capture space by placing the wand on the ground upright and still. The bottom of the wand is the end furthest from the attached driver.

Note: This is the same for the micro wand, the microdriver is on the top of the wand and the ball on the opposite end designates the bottom.

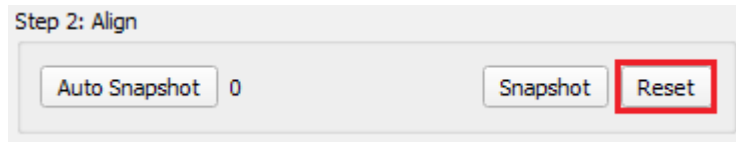


The 3D viewer will flash green once the Client detects the wand has stopped moving and set the origin point. Now move the wand again as you prepare to mark the X axis.

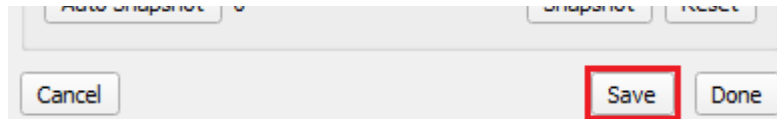
6. Without turning, take a step to the left and place the wand down and upright to set the X axis.
7. When the screen flashes again step back to the origin and take a step forward to mark the Z axis. When finished move the wand again to avoid further snapshots.



8. If you wish to start over or change the alignment, simply press the **Reset** button and repeat the process.



9. If you are satisfied, avoid further snapshots by taking the wand with you out of the space, and click the **Save** button to save the completed alignment.

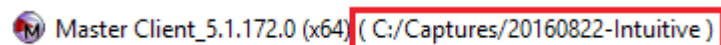


10. Click the **Done** button to close the alignment dialog. You now have a functional PhaseSpace System.

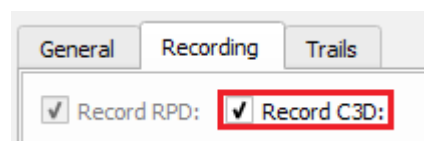
Streaming & Recording

Once setup of the system is complete, you can use the Master Client to stream and record data.

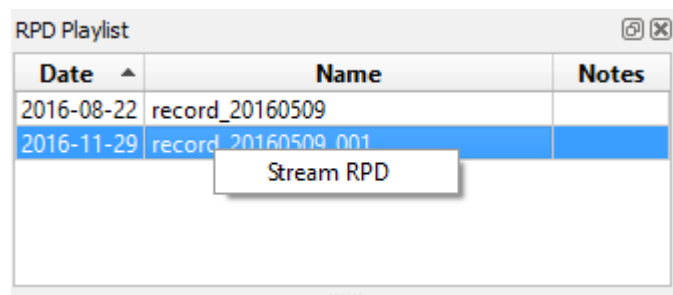
1. In the **Profile** drop-down menu, select the desired tracking mode. If needed, adjust the server settings in the OWL Configuration panel.
2. Click the **Connect** button to start the live stream. Lights on the camera's sides will flash and then settle on green when connected properly. The RF camera will have a blinking yellow light on it's face.
3. To record in the Master Client, first select **File->Working Directory** to set the directory in which recordings will be saved. Your working directory will be displayed in the top toolbar.



4. Start recording by clicking the **Record** button. A timer will appear in the viewer during recording.
5. Click the **Record** button again to end the recording. Recorded takes are automatically saved as .RPD files in the working directory. If .C3D files are also desirable, navigate to **Settings->Configure** and click the **Recording** tab. Checking the **Record C3D** checkbox will save a .C3D file in the working directory, in addition to the .RPD.



6. To stream a recording, right click a file in the **RPD Playlist** panel, and select **Stream RPD**. Only .RPD files can be streamed from the Master Client.



7. To stop a recording that is streaming press the **Connect** button.