ARCO camera rotator and field de-rotator

USER MANUAL

VERSION 3.3

Update 08-07-2024



ARCO 2” **ARCO 3”**

ARCO is manufactured by PrimaLuceLab SpA (Italy). For any matters relating to the use, service and warranty, please refer to the addresses given in the relevant documents.

English

WARNING

If improperly handled, ARCO may be damaged. Please follow the instructions below:

- Do not disassemble the unit
- Do not drop, subject to excessive impact open, or subject to electric shock any part of ARCO.
- Do not short the electronic elements
- Do not expose to temperatures below -20°C and above +60°C
- Do not burn or incinerate any component.
- Do not expose to rain or other atmospheric effect related to water
- Do not bend, modify or force any part of ARCO

QUALITY CONTROL

After being manufactured in our laboratories, each ARCO unit is tested by PrimaLuceLab technical experts to verify all mechanical and electronic components. If you find any malfunction, please contact us immediately (+ 39-0434-1696106 or support@primalucelab.com). Do not try to disassemble, repair or modify the ARCO yourself, without our written approval, in order maintain the manufacturer's warranty.

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Component Identification



Package contents

- ARCO camera rotator and field de-rotator
- 2mm Allen key
- Rotator port cable - 220mm long
- Rotator port cable - 690mm long
- ARCO quick start guide

CAUTION

In order to correctly use ARCO, you have to:

1) Connect to an SESTO SENSO 2 focusing motor or ESATTO focuser: ARCO is not a standalone unit and it has been specifically developed to be used with SESTO SENSO 2 focusing motor or ESATTO focuser.
2) SESTO SENSO 2 or ESATTO have to use at least the 3.0 firmware: previous firmware releases don't support ARCO rotator. Please use PLAY software to update firmware to the latest release.

Technical specifications

	ARCO 2"	**ARCO 3"**
Power	Through rotator port of ESATTO or SESTO SENSO 2	
Working temperature	-20°C / +60°C	
Payload capacity	4 kg	7 kg
Control with:	ESATTO robotic focuser SESTO SENSO 2 robotic focusing motor	
Resolution	1 arc second resolution per step	
Thread on draw tube, camera side	M56x1 male	M81x1 male
Body thickness	20mm	23mm
Free aperture	50.9mm	76.3mm
Compatible software	PLAY software for control with Windows 10 or 11 operative systems ASCOM driver for control from external software (tested with ASCOM platform 6.4) Virtual HandPad for WiFi control	
Weight	435 gr.	1060 gr.

NOTE

In order to proceed with installation you have to download the PLAY software from the

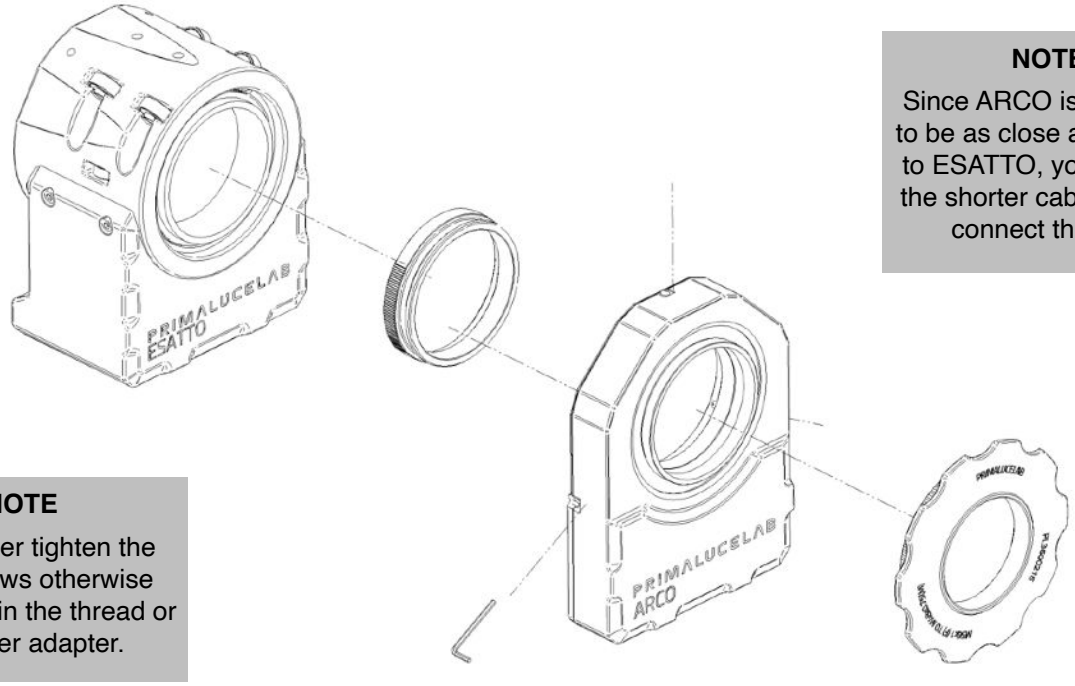
DOWNLOAD

section of our website www.primalucelab.com

Save the package (it's in zip format) onto the EAGLE or computer you want to use to control the ARCO and unzip it with the proper unzip software (You can right-click and select "Expand" or you can use software from https://www.winzip.com).

Installing ARCO on ESATTO focusers

If you want to install ARCO rotator on one of the ESATTO focusers, you have to add one of the many available optional adapters based on the models of ESATTO focuser and ARCO rotator you own. First of all please connect the optional adapter to the ESATTO focuser, by threading it to the draw tube. Then connect ARCO rotator to the adapter and tight the 3 grub screws (that are inserted in the ARCO body) by locking it to the adapter. Now you can connect one of the many camera adapters of visual back, the same you can connect to the ESATTO draw tube.



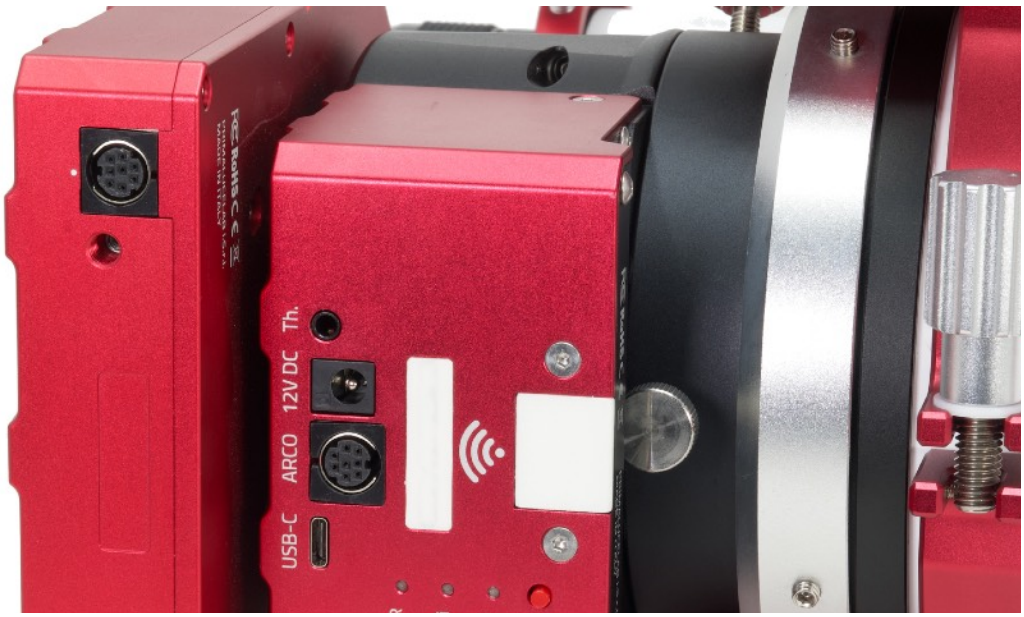
NOTE

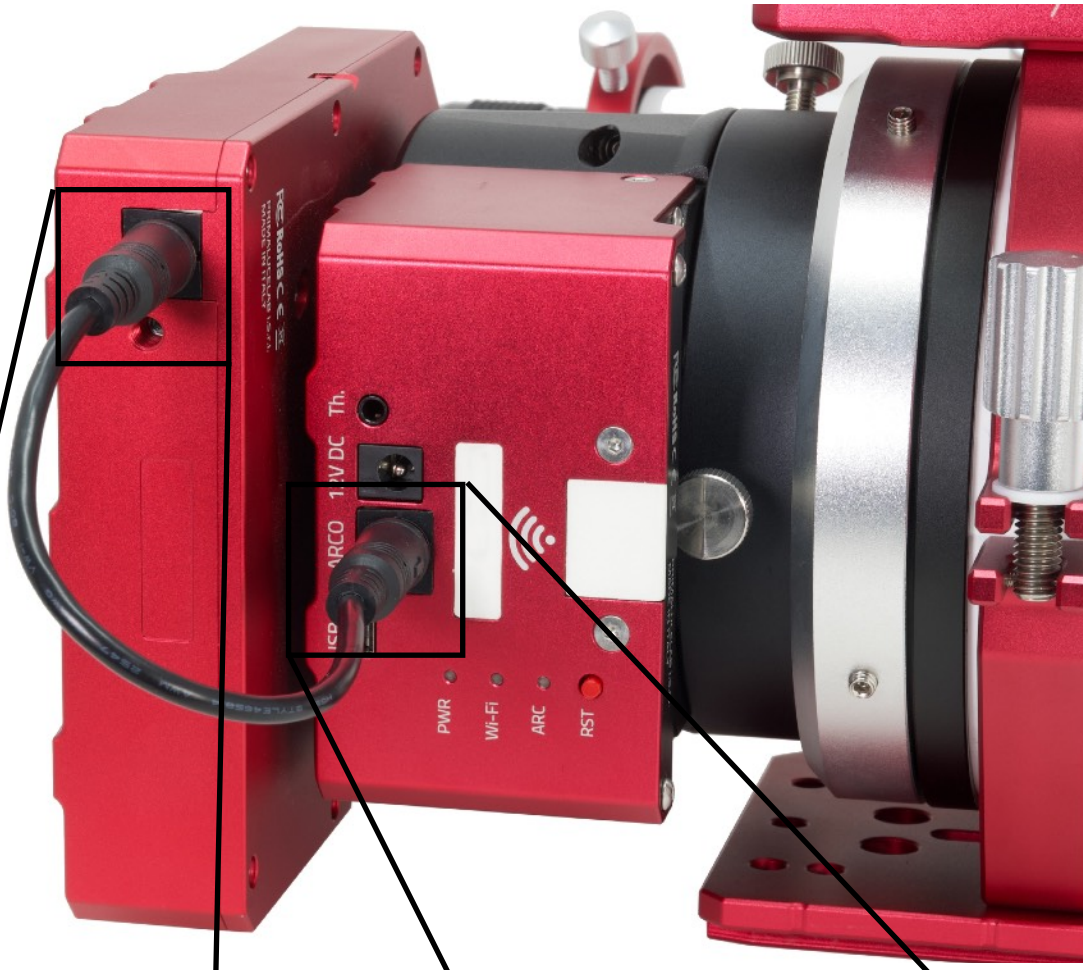
Since ARCO is designed to be as close as possible to ESATTO, you can use the shorter cable to interconnect the two.

NOTE

Do not over tighten the grub screws otherwise you may ruin the thread or the inner adapter.

Now you can connect the cable from the ARCO port of the ESATTO to the port below the ARCO body. **Take great care when connecting the cable to the ARCO port of the ESATTO and the port below the ARCO. Take a look at position of internal pins in the connector and rotate the cable connector until it corresponds to the port on ESATTO or ARCO. Then connect the cable with a gently press. If it doesn't fit, please do not press too much the connector otherwise the internal pins may break.**







ATTENTION

On the port of the ARCO rotator, the arrow position on the cable's connector has to correspond to the white point.



ATTENTION

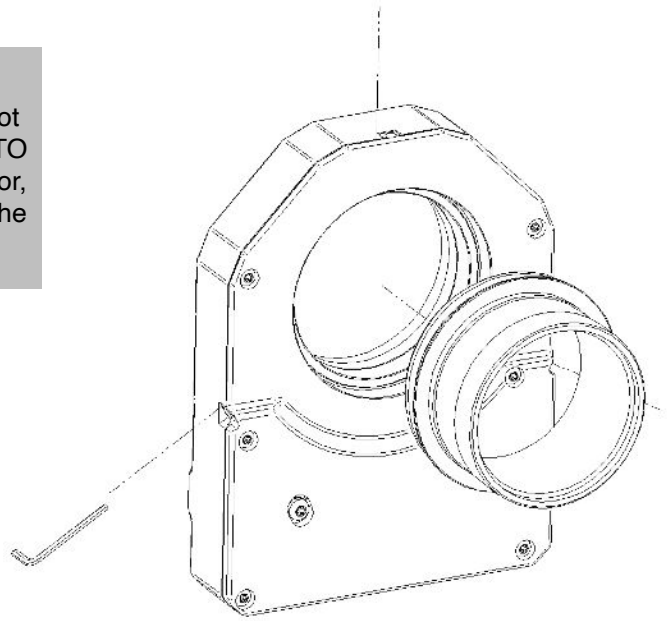
On the ARCO port of the ESATTO, the arrow position on the cable's connector has to be set to the side of the white label with ESATTO serial number.

Installing ARCO on focusers with SESTO SENSO 2 focusing motor

If you want to install ARCO rotator on a focuser with SESTO SENSO 2 focusing motor, first of all you will have to add one of the many available optional adapters based on connector you have on your focuser's draw tube: you may choose between a nose or an adapter for different threads. In any case, first of all please connect the optional adapter to the ARCO body by tightening the 3 grub screws (that are inserted in the ARCO body) to locking it to the adapter. Then connect the ARCO to your focuser (this will vary based on your focuser specifications).

NOTE

Since ARCO may be not really close to the SESTO SENSO 2 focusing motor, we suggest the use of the 700mm length cable.

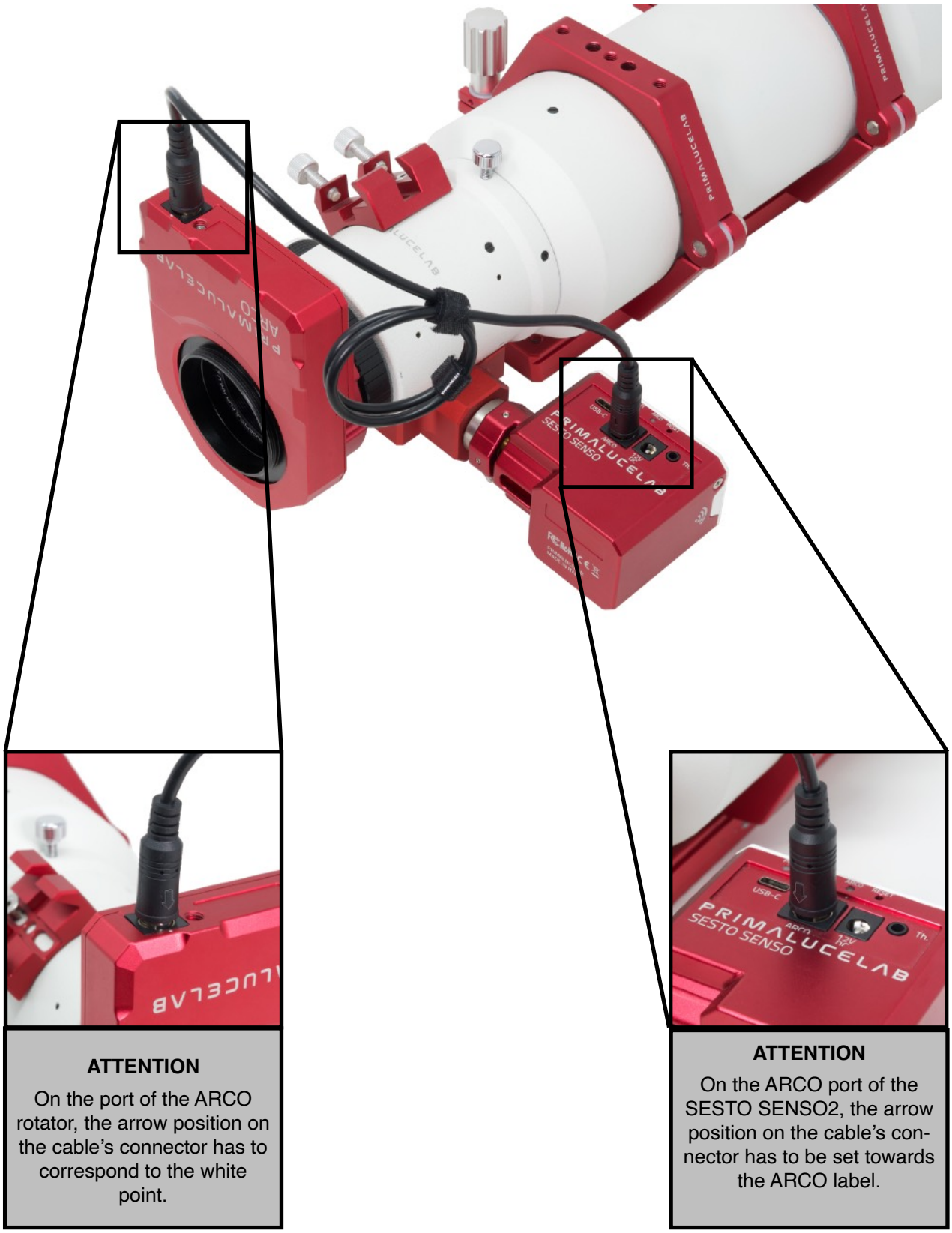


NOTE

Do not over tighten the grub screws otherwise you may ruin the thread or the inner adapter.

Now you can connect the cable from the ARCO port of the SESTO SENSO 2 to the port below the ARCO body. **Take great care when connecting the cable to the ARCO port of the SESTO SENSO 2 and the port below the ARCO. Take a look at position of internal pins in the connector and rotate the cable connector until it corresponds to the port on SESTO SENSO 2 or ARCO. Then connect the cable with a gently press. If it doesn't fit, please do not press too much the connector otherwise the internal pins may break.**





ATTENTION

On the port of the ARCO rotator, the arrow position on the cable's connector has to correspond to the white point.

ATTENTION

On the ARCO port of the SESTO SENSO2, the arrow position on the cable's connector has to be set towards the ARCO label.

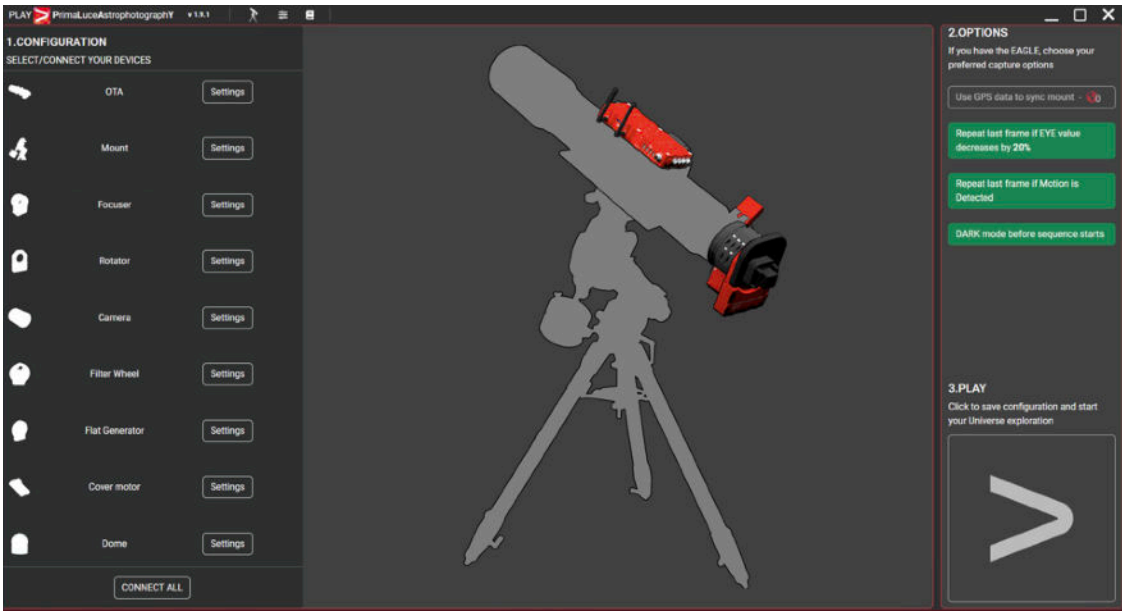
NOTE

Before moving to the next step, please check that che cable is long enough to let ARCO move for the total extension of the focuser's draw tube. Try to extend your draw tube in full out position and check that the cable is long enough in order to let the draw tube freely move.

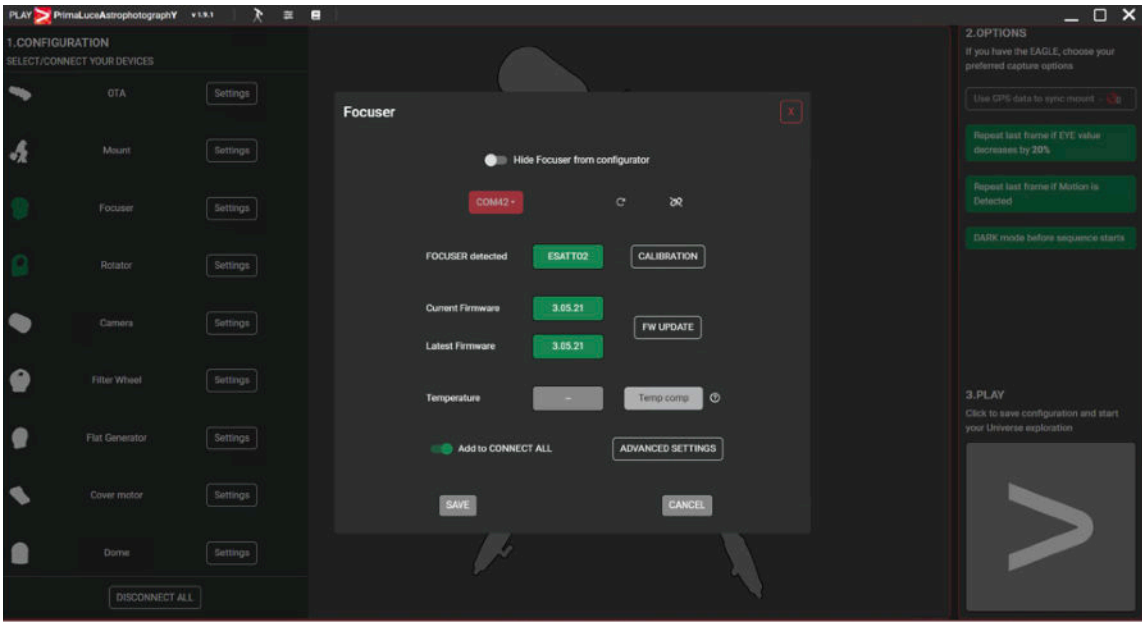
Use ARCO as camera rotator with EQ mounts and PLAY

ARCO can be used as camera rotator by using the PLAY software you can download from the DOWNLOAD section of www.primalucelab.com website. **In order to use ARCO with PLAY, you have to use ESATTO or SESTO SENSO with at least firmware version 3.0. Please refer to the ESATTO or SESTO SENSO 2 user manuals in order to read how to update firmware with PLAY.** If you want to use ARCO as camera rotator with your telescope equatorially mounted, please follow these steps in PLAY software:

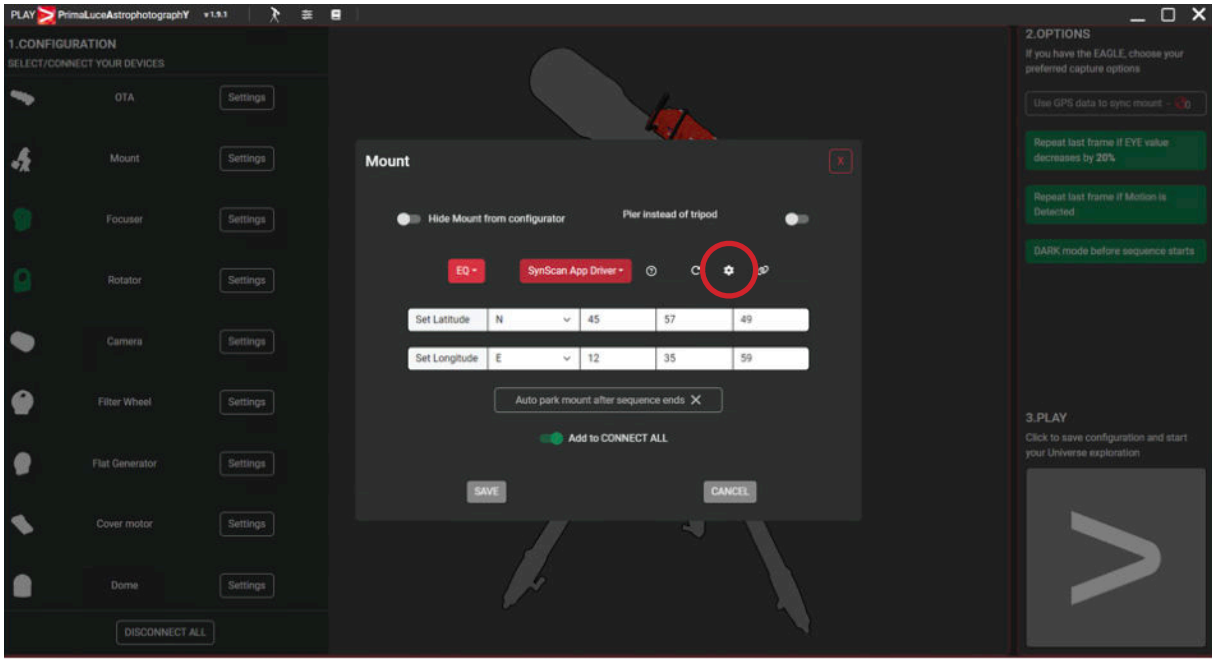
1) Launch PLAY software and you will see the **CONFIGURATOR** section where set your devices connection.



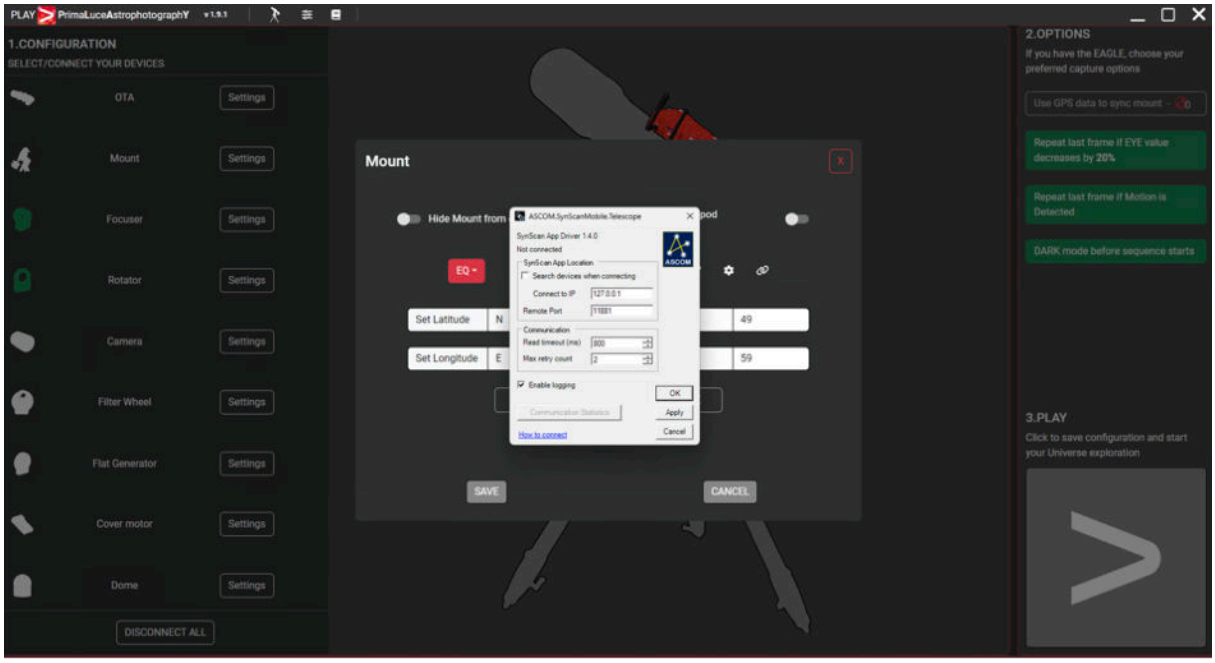
2) Click on the **Focuser** section (you can click both on the Focuser shape of the central image or on the Focuser text in the left column). This will open a popup window where you can set the COM port number associated to your ESATTO or SESTO SENSO 2. If you don't know what is the COM port associated to your ESATTO or SESTO SENSO 2, you can enter in Windows Device Manager and check what COM port number Windows creates when you plug the USB cable of your ESATTO or SESTO SENSO 2. In order to better identify it, you can also connect and disconnect the USB cable since this will update the Device Manager list. The press the **Connect** icon in order to start the connection to your focuser.



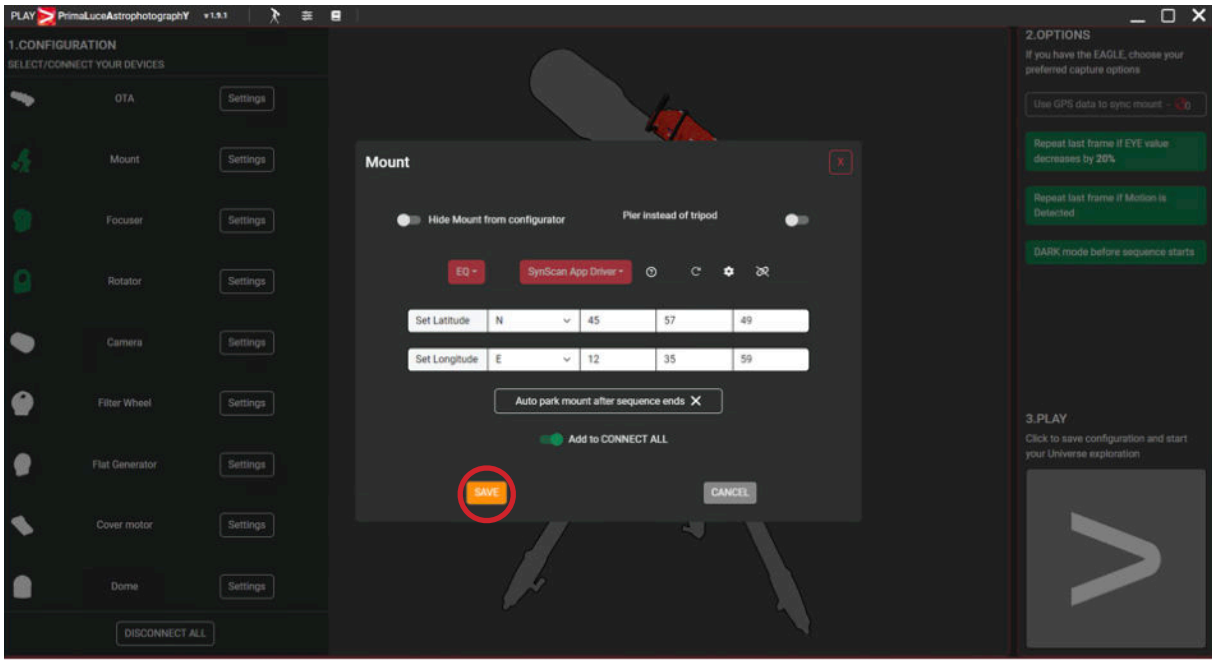
3) Click on **Mount** to connect to your mount. Since you have an equatorially mounted telescope, select EQ type, then use the “Select Ascom Driver” window to select your mount type. Then click on the gear icon in order to show the ASCOM properties. **PLEASE NOTE: in order to connect your ASCOM mount to PLAY, you have to use the latest ASCOM Platform (tested with 6.6 version and later) and your mount ASCOM drivers. Please refer to your mount user manual in order to check how to correctly use it with ASCOM platform. Your mount has to be polar aligned, in home position and correctly set for remote control with a computer. Then connect the cable from the mount to your EAGLE or Windows computer.**



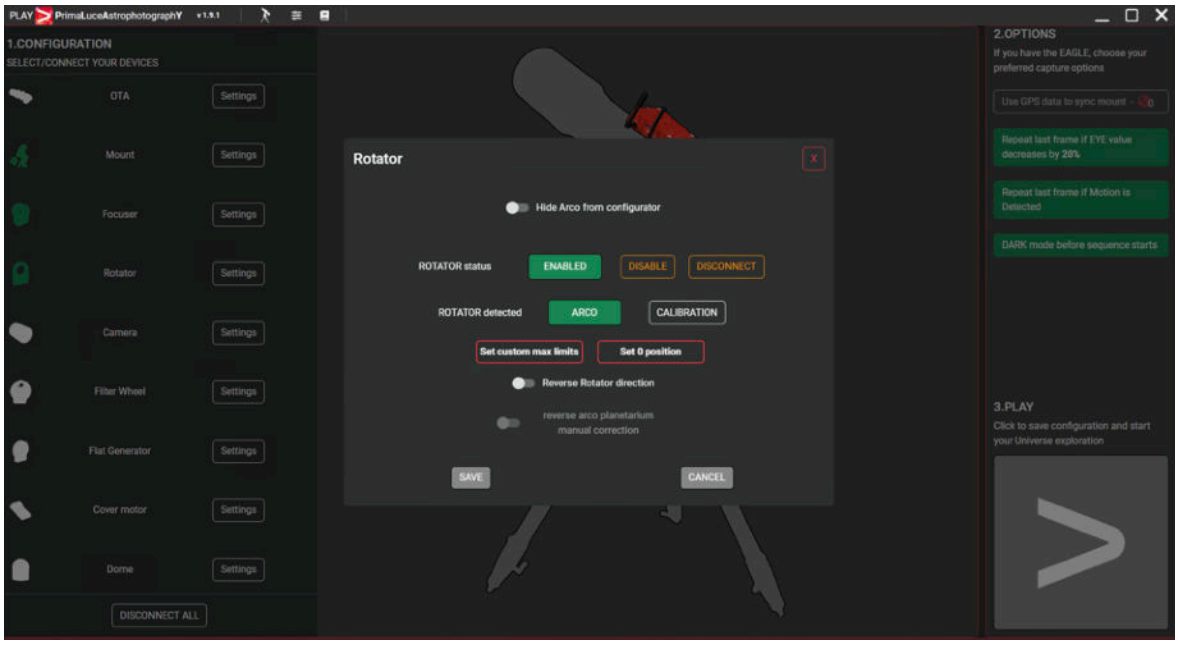
4) In the ASCOM properties window that opens, please set the communication port based on the way the ASCOM driver is designed to work. For example you can enter in Windows Device Manager and check what COM port number Windows creates when you plug the USB cable that connects your mount handpad to your EAGLE or Windows computer. In order to better identify it, you can also connect and disconnect the USB cable since this will update the Device Manager list. Then, if present in your ASCOM driver, please type the Latitude and Longitude values for your location and press **OK** button to confirm.



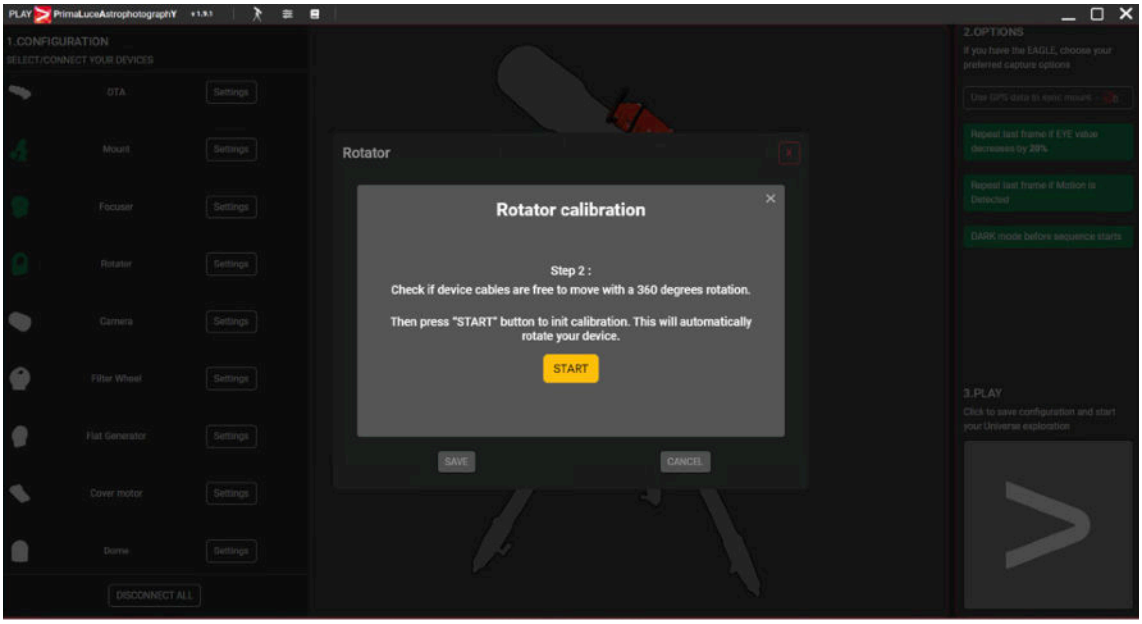
5) Type your Latitude and Longitude in the proper fields and then press the **Connect** icon to start connection to your mount. You will see a notification to confirm that the mount connection is completed. Press **SAVE** button to confirm.



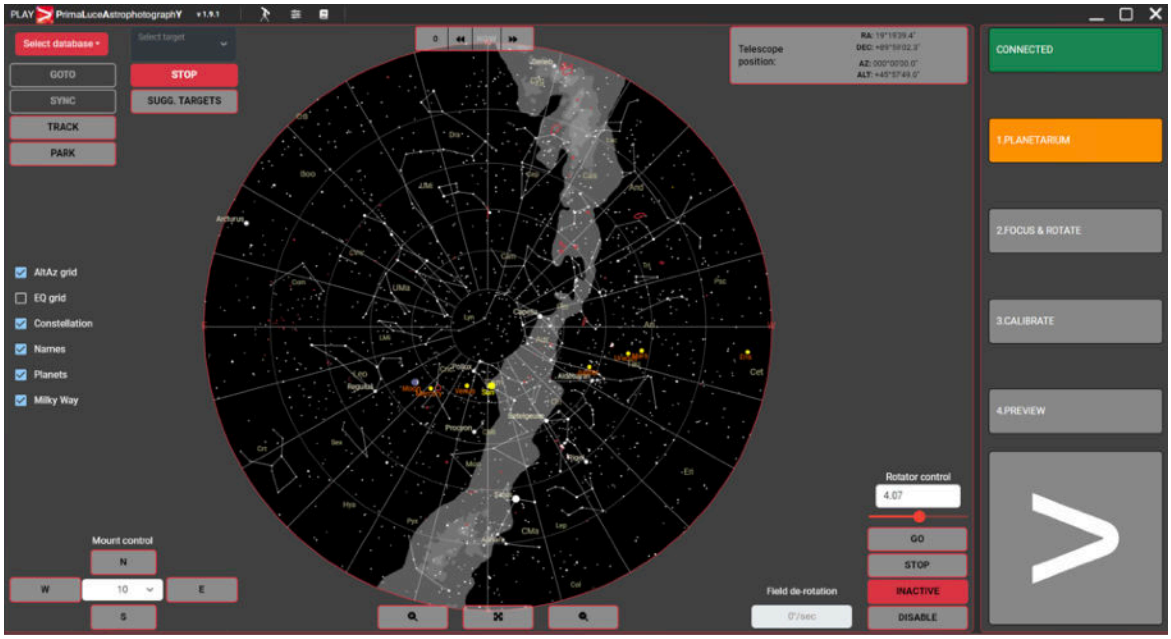
6) Click on the **Rotator** section (you can click both on the Rotator shape of the central image or on the Rotator text in the left column). This will open a popup window where you can see if the rotator is enabled. If it's not enables, please click on the **ENABLE ROTATOR** button. Then, if this is the first time you enable ARCO rotator with your ESATTO or SESTO SENSO 2, please click the **CALIBRATION** button. **Please note: rotator calibration has to be done every time you enable/disable the ARCO rotator with your ESATTO or SESTO SENSO 2. After you enable and calibrate ARCO the first time, you can keep it enabled and there is no need to deactivate it. For the same reason, the calibration has to be done again if you mechanically rotate your ARCO in respect to your focuser.**



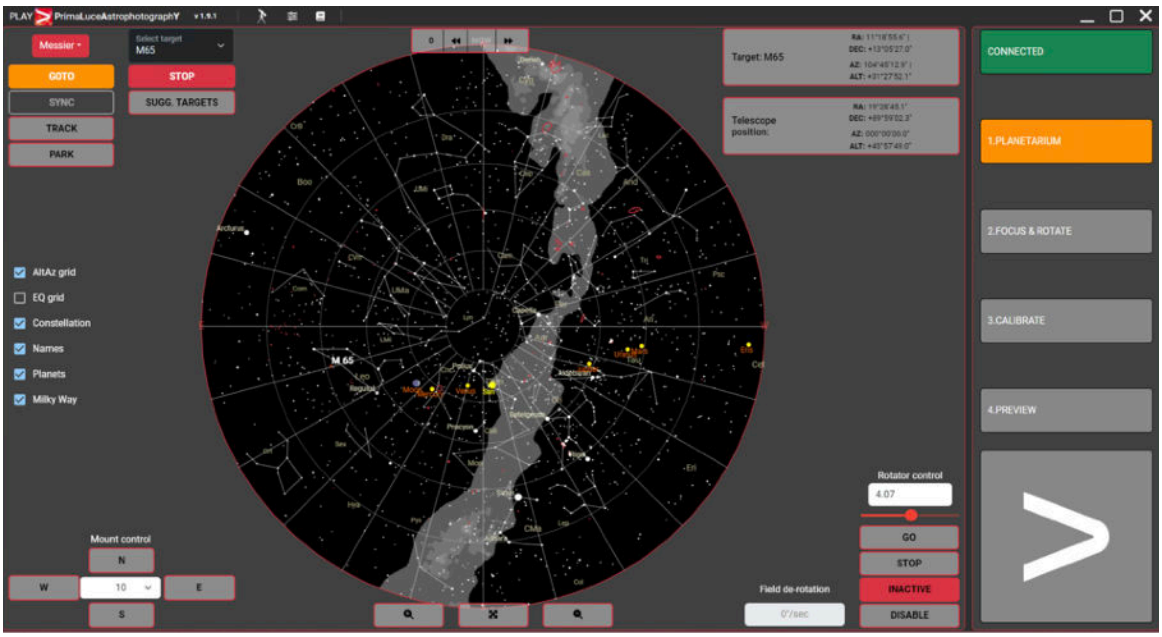
7) The press the **CALIBRATION** button in order to start the calibration. **Before starting calibration, you have to verify that the camera or other accessories that you installed after ARCO rotator are free to move with a complete 360° rotation. If not, before starting calibration, please check your cables (and arrange them in order to allow a 360° rotation) or disconnect camera / other accessories cables.** Press the **START** button in the Calibration window to start calibration and ARCO will make a rotation. Please wait until it completes the calibration, then press the **Close** button to confirm.



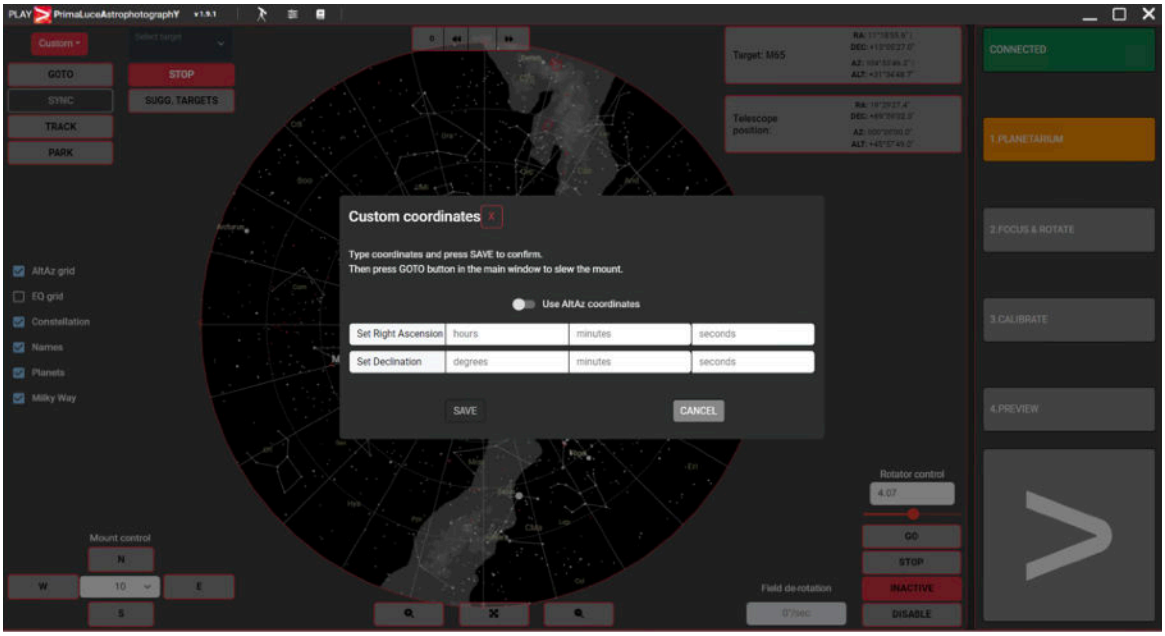
8) Now that the connection to your devices is confirmed, please click on the large **PLAY** button (bottom-right) to proceed to the CAPTURE section of PLAY software where you can control your devices in order to make astrophotography. At the top-right part of the screen you can see the green CONNECTED notification that shows you that the devices (you set in the previous steps) are connected. In this **PLANETARIUM** tab you can see the sky chart and you can move your mount with the N-S-E-W buttons in the bottom-left part of the screen.



9) In the top left part of the **PLANETARIUM** tab, you can select your target (among Stars, Messier, NGC, IC, Planets, Custom). You can now press the **GOTO** button to point the mount to the desired object, **STOP** button to stop the mount movement, **SYNC** button to sync telescope position to the target.



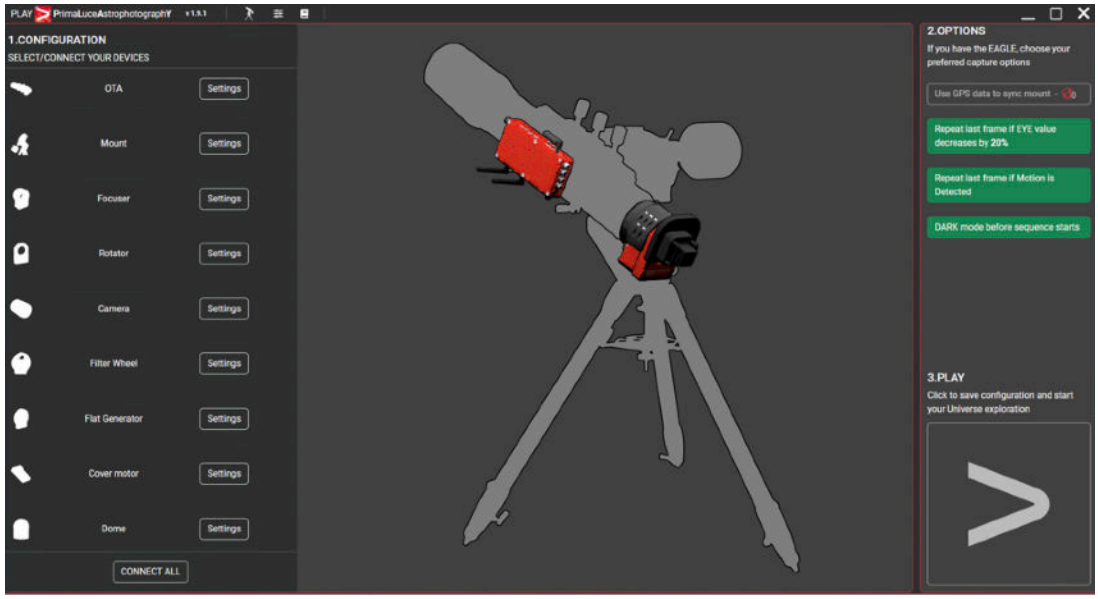
10) If you want to use ARCO to rotate camera and better frame your targets, you can now use the slider in the bottom-right part of the window or you can type the requested value on the area and press the GO button to start the rotation movement. The value of rotation angle will update until ARCO will reach the desired position. If you want to stop the rotation movements, you can press the STOP button.



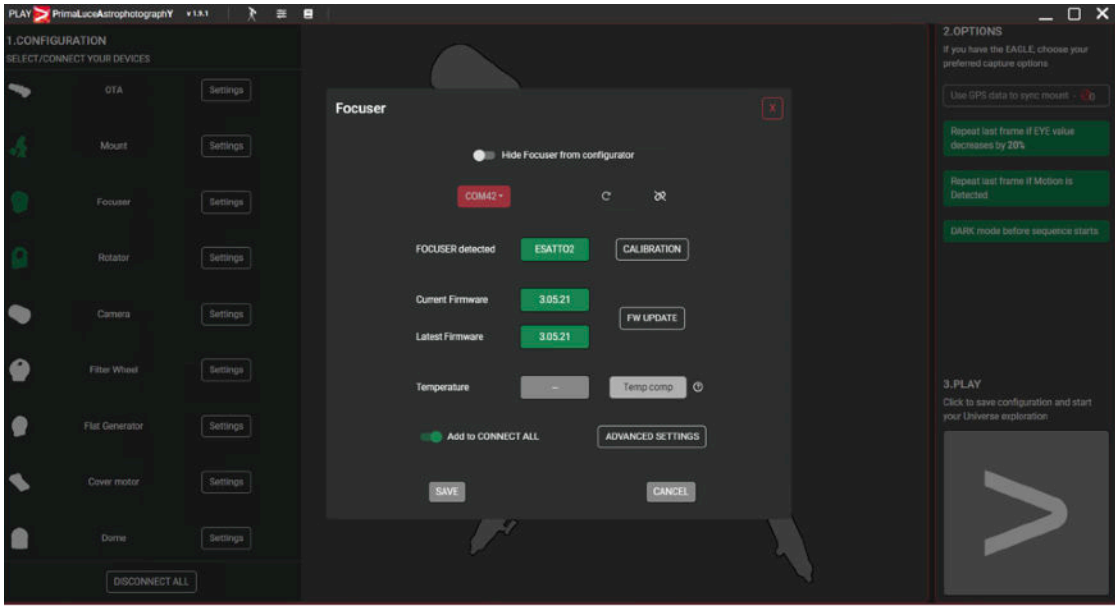
Use ARCO as field de-rotator rotator with Alt-Az mounts and PLAY

ARCO can be used as field de-rotator by using the PLAY software you can download from the DOWNLOAD section of www.primalucelab.com website and selected Alt-Azi mounts (currently tested with SkyWatcher AZ-EQ6 and AZ-EQ5 mounts provided with USB port on the mount head and with Panther TTS-160 mounts). **In order to use ARCO with PLAY, you have to use ESATTO or SESTO SENSO with at least firmware version 3.0. Please refer to the ESATTO or SESTO SENSO 2 user manuals in order to read how to update firmware with PLAY.** If you want to use ARCO as field de-rotator with your telescope and a supported Alt-Azi mount, please follow these steps in PLAY software:

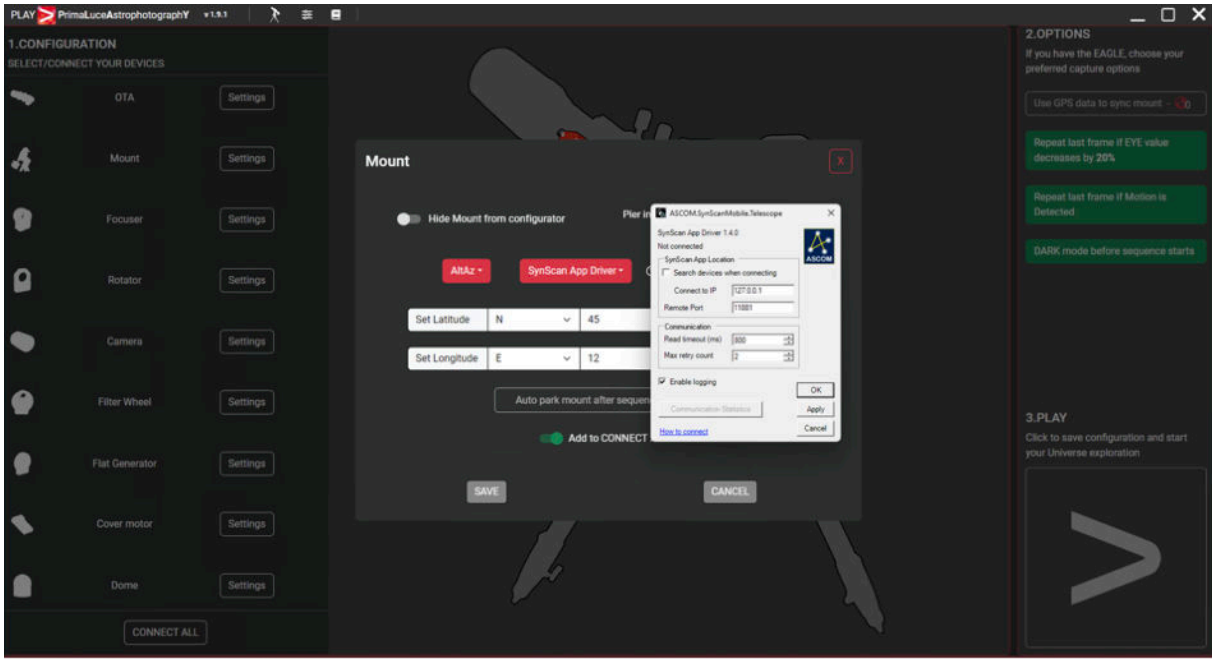
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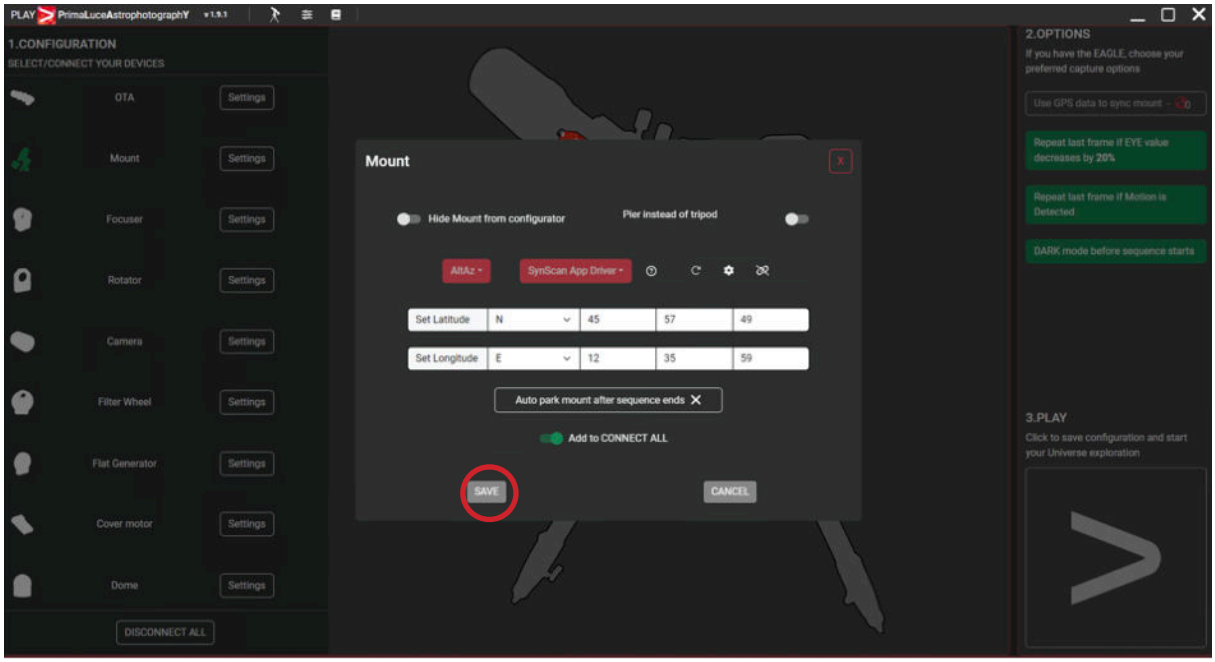
2) Click on the **Focuser** section (you can click both on the Focuser shape of the central image or on the Focuser text in the left column). This will open a popup window where you can set the COM port number associated to your ESATTO or SESTO SENSO 2. If you don't know what is the COM port associated to your ESATTO or SESTO SENSO 2, you can enter in Windows Device Manager and check what COM port number Windows creates when you plug the USB cable of your ESATTO or SESTO SENSO 2. In order to better identify it, you can also connect and disconnect the USB cable since this will update the Device Manager list. The press the **Connect** icon in order to start the connection to your focuser.



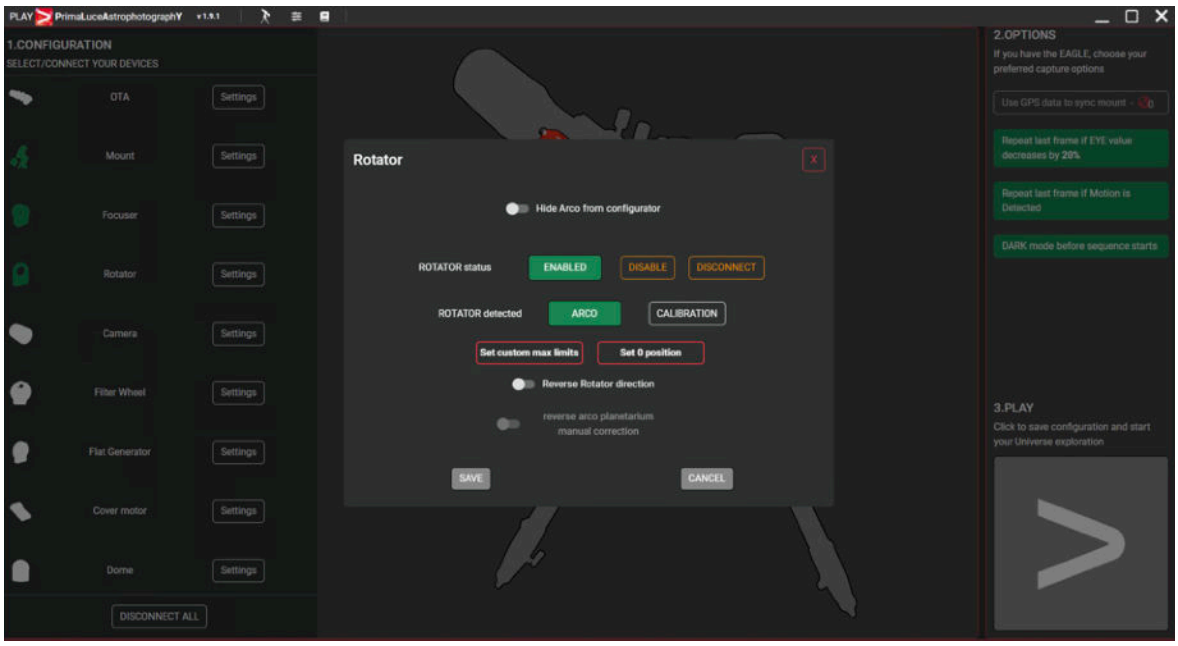
3) Click on **Mount** to connect to your mount. **PLEASE NOTE: in order to use SkyWatcher AZ-EQ6 or AZ-EQ5 mount in alt-az mode with ARCO as field de-rotator, the mount has to be mechanically set in alt-az mode and it has to have the telescope pointed to North (Azimuth = 0) and to the horizon (Elevation = 0), with counterweight bar pointing West. Then refer to PLAY user manual in order to check for the suggested ways to connect and control your alt-azi mount.** Then press the **Connect** icon to start connection to your mount.



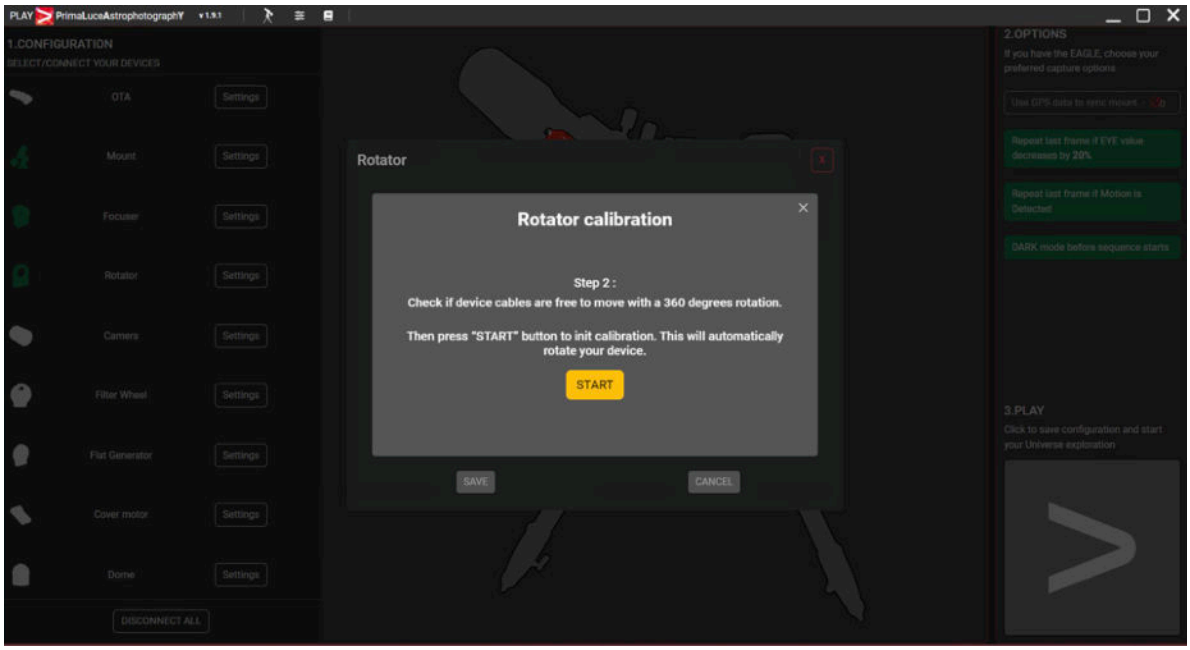
4) You will see a notification to confirm that the mount connection is completed. Press **SAVE** button to confirm.



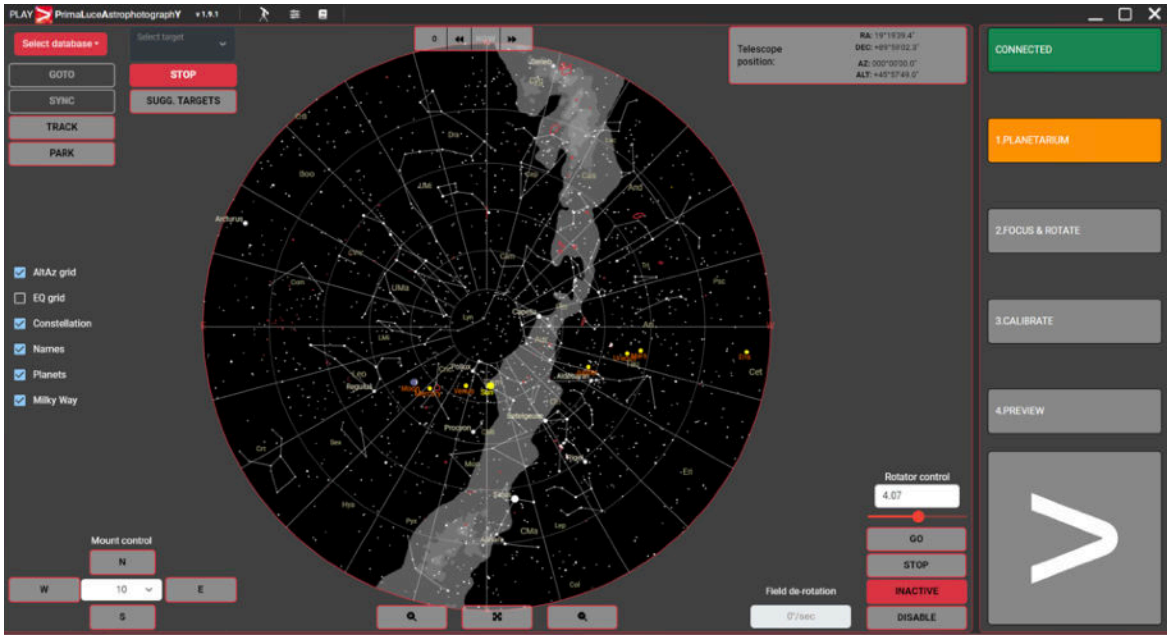
5) Click on the **Rotator** section (you can click both on the Rotator shape of the central image or on the Rotator text in the left column). This will open a popup window where you can see if the rotator is enabled. If it's not enables, please click on the **ENABLE ROTATOR** button. Then, if this is the first time you enable ARCO rotator with your ESATTO or SESTO SENSO 2, please click the **CALIBRATION** button. **Please note: rotator calibration has to be done every time you enable/disable the ARCO rotator with your ESATTO or SESTO SENSO 2. After you enable and calibrate ARCO the first time, you can keep it enabled and there is no need to deactivate it. For the same reason, the calibration has to be done again if you mechanically rotate your ARCO in respect to your focuser.**



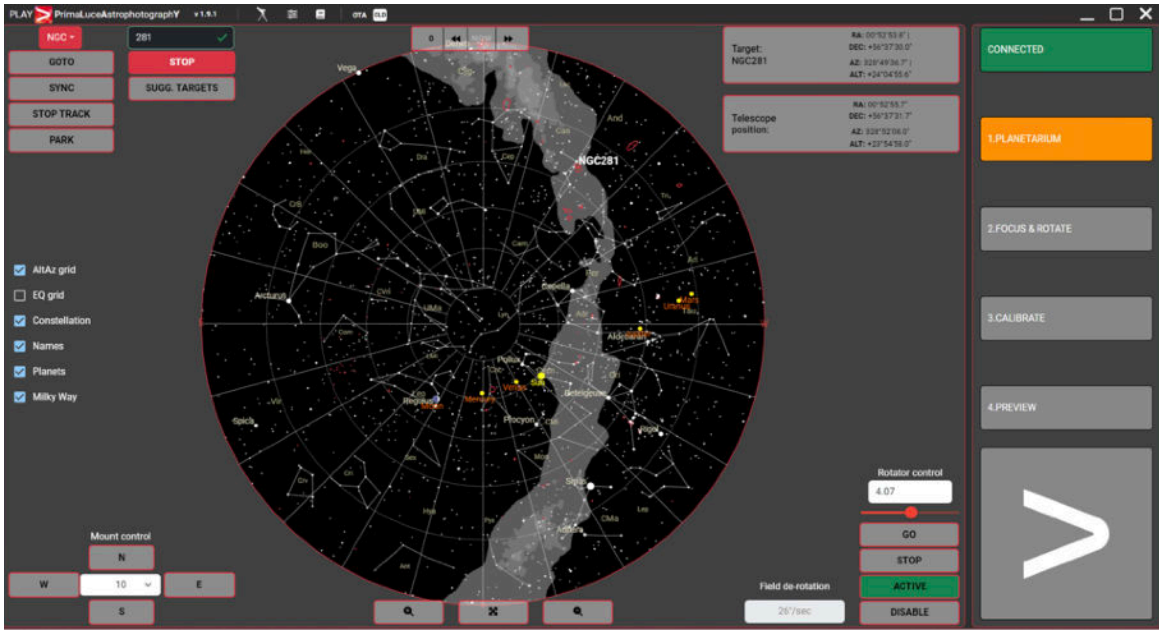
6) The press the **CALIBRATION** button in order to start the calibration. **Before starting calibration, you have to verify that the camera or other accessories that you installed after ARCO rotator are free to move with a complete 360° rotation. If not, before starting calibration, please check your cables (and arrange them in order to allow a 360° rotation) or disconnect camera / other accessories cables.** Press the **START** button in the Calibration window to start calibration and ARCO will make a rotation. Please wait until it completes the calibration, then press the **Close** button to confirm.



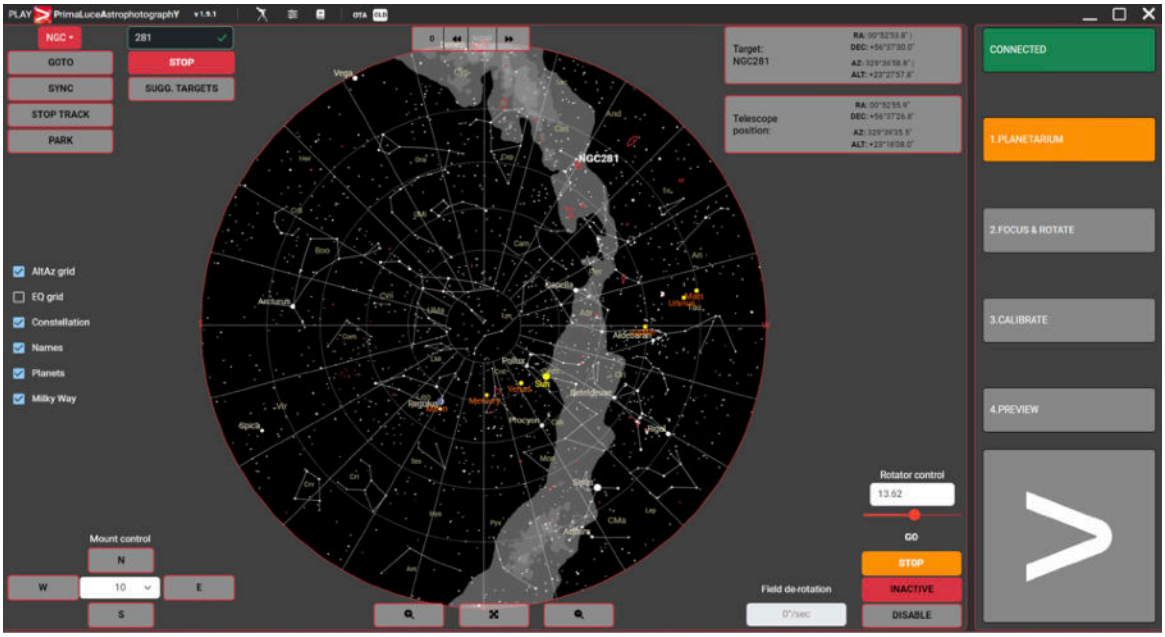
7) Now that the connection to your devices is confirmed, please click on the large **PLAY** button (bottom-right) to proceed to the CAPTURE section of PLAY software where you can control your devices in order to make astro-photography. At the top-right part of the screen you can see the green CONNECTED notification that shows you that the devices (you set in the previous steps) are connected. In this **PLANETARIUM** tab you can see the sky chart and you can move your mount with the N-S-E-W buttons in the bottom-left part of the screen.



8) In the top left part of the **PLANETARIUM** tab, you can select your target (among Stars, Messier, NGC, IC, Planets, Custom). You can now press the **GOTO** button to point the mount to the desired object, **STOP** button to stop the mount movement, **SYNC** button to sync telescope position to the target. Since you have previously selected an alt-azi mount model, when the telescope reaches the desired target and the mount start to track it, PLAY automatically starts field de-rotation of ARCO (in fact, the Field de-rotation button at the bottom-right becomes **ACTIVE**).



9) If you want to use ARCO also to rotate camera and better frame your targets, you can now use the slider in the bottom-right part of the window or you can type the requested value on the area and press the GO button to start the rotation movement. The value of rotation angle will update until ARCO will reach the desired position. If you want to stop the rotation movements, you can press the STOP button. During rotation, de-rotation stops and the de-rotation status becomes INACTIVE, then it comes back to ACTIVE as soon as the commanded camera rotation completes.



Controlling ARCO with Virtual HandPad

ARCO can be controlled without the need of an EAGLE or Windows computer, by controlling it through the ESATTO or SESTO SENSO 2 WiFi connection and using the included Virtual HandPad. **Please note: ESATTO or SESTO SENSO 2 have to use firmware at least version 3.0 (that adds the compatibility with ARCO rotator).** In order to use ARCO through WiFi, please follow this guide (that has been created on a smartphone with iOS operative system but it's similar for Android devices)



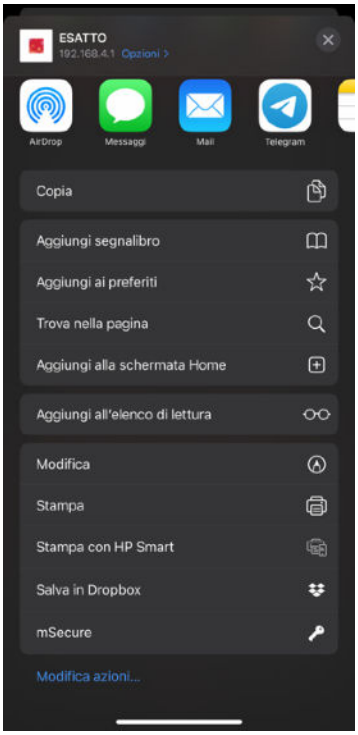
After you power up the ESATTO or SESTO SENSO 2 turn on the WiFi of your device you want to use to control ARCO.

You will see the network created by your ESATTO or SESTO SENSO 2, the network name corresponds to your device serial number. Select the device network. Using the keyboard (virtual or physical) of your device insert "primalucelab" as the default password (or the password you chose if you modified the default password) and then press the "Login" button. The next time you want to access your ESATTO or SESTO SENSO 2,, you will no longer have to enter the password: your device will automatically connect when you select the network created by ESATTO or SESTO SENSO 2, unless you change the login password. Wait for a few seconds until you get confirmation that your device is connected to the WiFi network.

If you see a "No connection" notification on the selected ESATTO or SESTO SENSO 2 network, this is to tell you that there is no internet connectivity and this is normal since ESATTO or SESTO SENSO 2 are not an internet connected router.



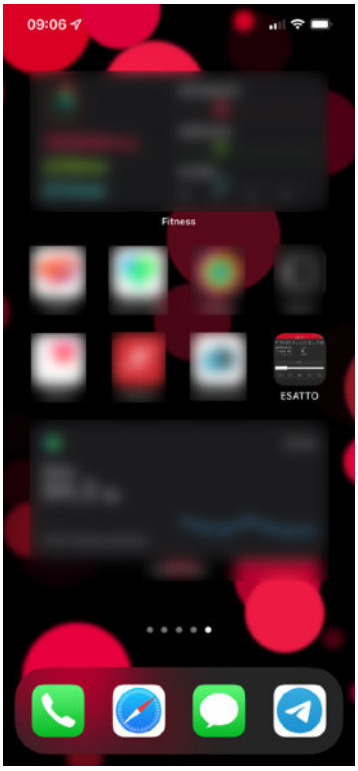
Now you can open the browser of the device (for example Chrome or Safari), in the url area (in the field where you usually write the url like www.-primalucelab.com), type the address 192.168.4.1 and press the button RETURN: you will see the Virtual HandPad on your screen.



To create a link directly to your device desktop, simply press the "share" button and then "Add to Home".

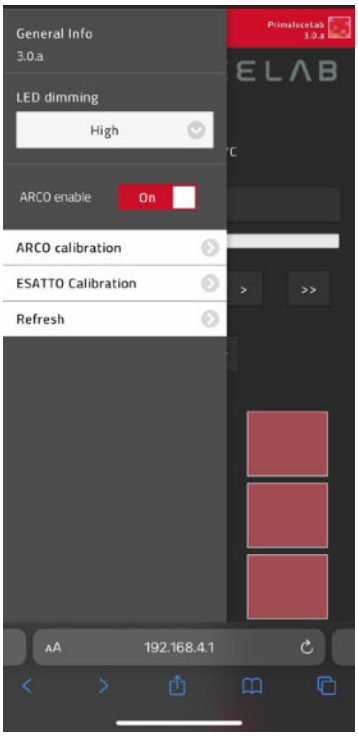


You can personalize the name. Press Add button to confirm.



The ESATTO or SESTO SENSO 2 connection will be created and you will have a direct connection in your device.

Press the ESATTO or SESTO SENSO 2 button to start the Virtual Hand-Pad that allows you to control and use ESATTO or SESTO SENSO 2 without the need to be connected to an EAGLE or to a Windows computer.



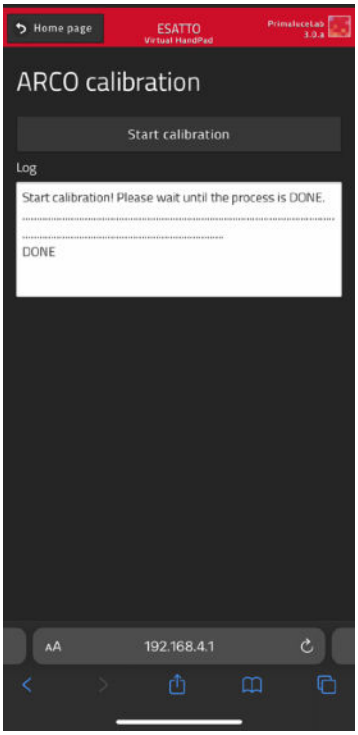
Press the menu button on the top-left part of the Virtual HandPad to reveal the left menu. Press the “ARCO enable” option (the slider will turn ON) and, if you previously didn’t calibrate it already, you will see the ARCO LED light blinking on your ESATTO or SESTO SENSO 2. This means you have to calibrate ARCO rotator, please press the “ARCO calibration” button.

If the LED light is not blinking, it means that the ARCO rotator is already calibrated and you can start using it.



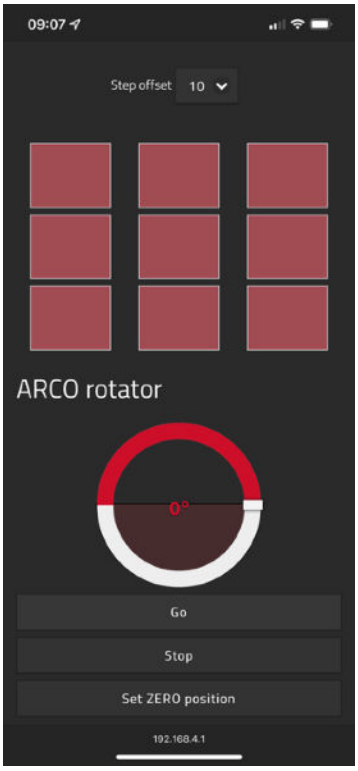
If you pressed the “ARCO calibration” button, in the calibration page please press the “Start calibration” button and you will see a “Start motor calibration?” notification. Please press OK to proceed. This will start ARCO calibration that may take several minutes, you will see ARCO rotating.

ATTENTION: when you use ARCO, please take care of the cables and check that, in any rotation position of the ARCO, cables won’t pull too much. If they pull too much, they may break or they may damage your devices.



At the end of calibration procedure, you will see the DONE message, please press the “Home page” button to come back to main window of the Virtual HandPad.

Calibration is saved on firmware so you don’t need to make a new calibration if later you want to control ARCO from your EAGLE or standard Windows computer.



Now, in the bottom part of the Virtual HandPad now you find also the control for ARCO rotator and you can use it as camera rotator.

In order to use ARCO to rotate your camera, you can rotate the slider until you reach the desired position and then press the GO button. ARCO will start the camera rotation and you will see the slider updating the position on the Virtual HandPad.

If, for any reason, you want to immediately stop the movement, you can press the STOP button.

In order to set a new ZERO position, you can press the “Set ZERO position” button. You will see a notification asking confirmation, please press OK to confirm. This will reset the actual position to 0 and you will see the slider reset to 0 (zero).

PLEASE NOTE

ARCO can’t be used as field de-rotator when used with the Virtual HandPad. In order to use ARCO as field de-rotator with selected Alt-Azi mounts, you have to use PLAY software.

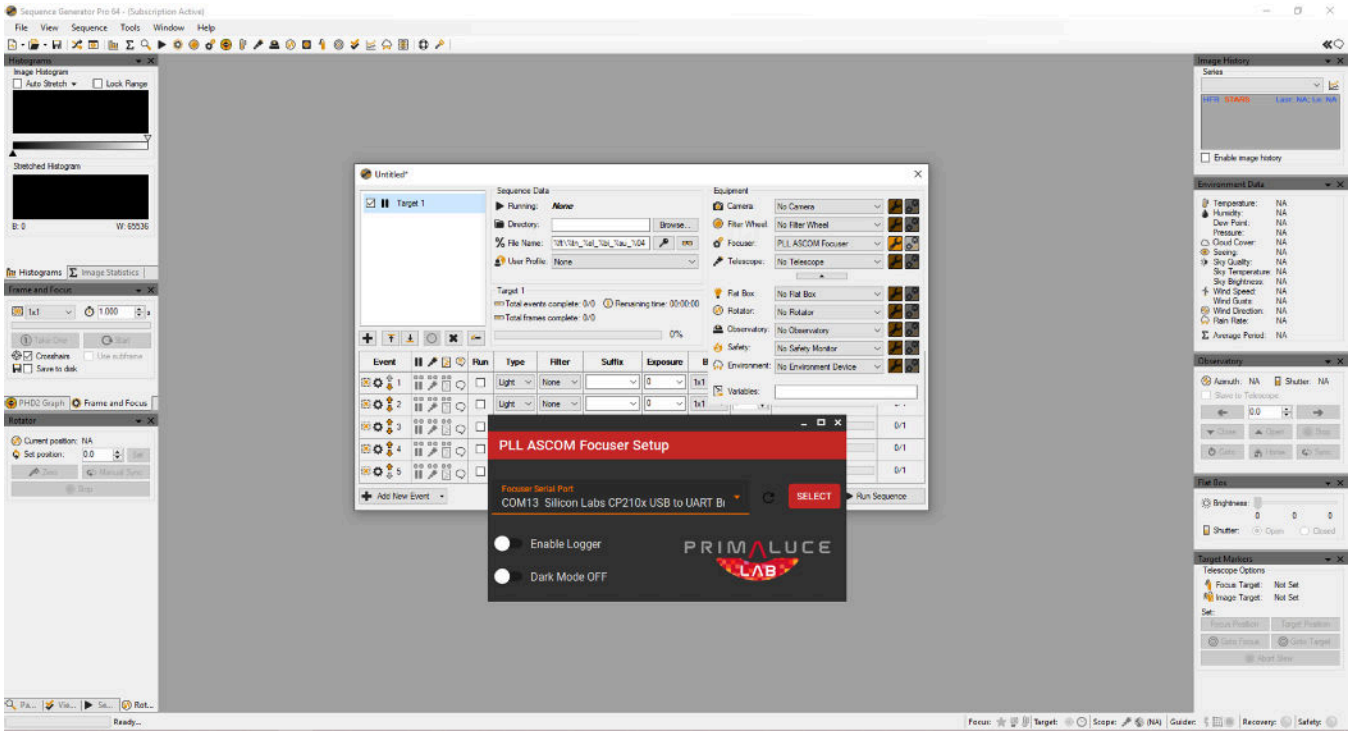
Controlling ARCO with ASCOM drivers and third party softwares

In order to control your ARCO rotator you can also use third party softwares. **In order to use ARCO with ASCOM driver and third party softwares, you have to use ESATTO or SESTO SENSO with at least firmware version 3.0. Please refer to the ESATTO or SESTO SENSO 2 user manuals in order to read how to update firmware with PLAY.** In order to do this, you can use the "PLL ASCOM Focuser" driver (at least version 3.0) together with ASCOM platform at least version 6.4. If you haven't the ASCOM platform, please install it (download from ASCOM website https://ascom-standards.org) before installing the "PLL ASCOM Focuser" driver.

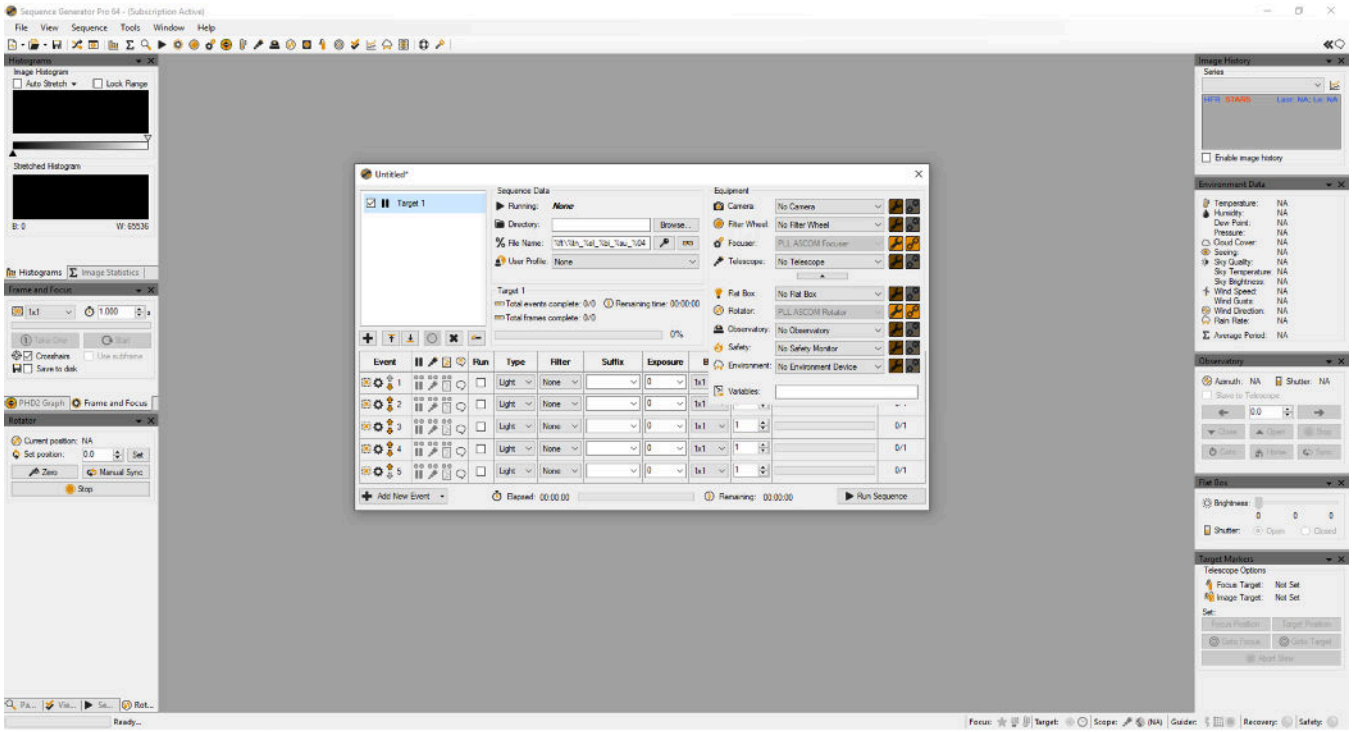
In order to install "PLL ASCOM Focuser" driver in the EAGLE or Windows computer you use to control ESATTO or SESTO SENSO 2 with ARCO, make a double click on the PLL ASCOM Focuser.exe file that is part of the ESATTO, SESTO SENSO 2 or ARCO software package 3 you can download from DOWNLOAD section of the www.primalucelab.com website. A new window will appear, select "I accept the agreement" and press Next button to proceed. In the next window, press the Install button to proceed with installation. When the installation is completed, press the Finish button.

In this example we'll show how to control ARCO rotator with Sequence Generator Pro http://mainsequencesoftware.com but you can use any other third party software that supports ASCOM rotators.

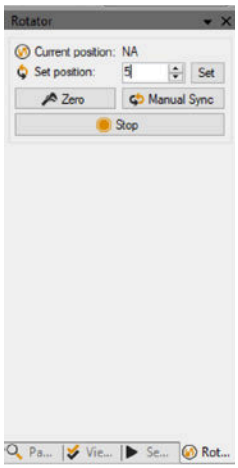
Start Sequence Generator Pro and, in the Focuser line of the Equipment profiler, select "PLL ASCOM Focuser" then click on the first icon  to the right. This will open a new window asking for the COM port number. Select the COM port related to ESATTO or SESTO SENSO 2 and press the **SELECT** button. This will close the "PLL ASCOM Focuser Setup" window, press the connect icon  to connect to ESATTO or SESTO SENSO 2.



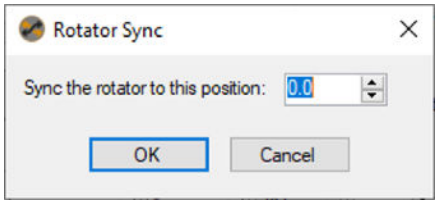
In the Rotator line of the Equipment profiler, select "PLL ASCOM Rotator" then click on the connect icon  to connect to ARCO.



Now you can use ARCO as camera rotator. In order to command a rotation angle, type the angle you want ARCO to rotate the camera to and press the “Set” button. In order to come back to the 0 position, press the “Zero” button.



If you want to manually sync a rotator position to a precise angle, you can press the “Manual Sync” button and this will open a new window. Here you can type the angle value you want to assign to the actual rotation position.



Troubleshooting

Q: ARCO rotator is not moving

A: If you can connect and control ARCO rotator but, when you command a rotation movement (also during calibration) ARCO is not moving and/or you hear a clicking sound, this could be due to 2 factors:

1. *12V power is missing*: First of all please check your providing 12V power to ARCO rotator connected to your ESATTO focuser or SESTO SENSO 2 focusing motor. If you power focuser and rotator only with USB, your computer may not provide enough power to both devices so this could bring to this type of problem. As a reminder, ARCO gets power from ESATTO or SESTO SENSO 2 via the dedicated port and you have to power your ESATTO or SESTO SENSO 2 with a 12V (at least 1A) power unit with 5.5/2.5mm power plug (center positive tip)

2. *worm gear adjustment is needed*: if you correctly provide 12V power but still ARCO is not moving, most likely you have to adjust tightening torque of worm gear with the motor. This is a very simple operation to do: you have to adjust the screw highlighted in the picture below while the motor is moving. You will notice that by moving it upwards, ARCO will make more friction and vice versa downwards. In order to make this adjustment, you just have to make a small movement both clockwise and counterclockwise until you will see ARCO moving.



INFORMATION TO USERS



According to art. 26 of Decreto Legislativo 14 marzo 2014, n. 49 "Attuazione della Direttiva 2012/19/UE sui rifiuti di apparecchiature elettriche ed elettroniche", the symbol of the barrel placed on the equipment or its packaging indicates that the product at the end of its useful life must be collected separately from other waste.

The user will therefore have to give the end-of-life equipment to the appropriate separate collection centers for electronic and electrotechnical waste or to return it to the reseller upon the purchase of a new type of equivalent equipment, one by one.

Properly differentiated collection for the subsequent start of dismantled equipment for recycling, treatment and environmentally compatible disposal helps to avoid possible adverse effects on the environment and health and favors the reuse and / or recycling of the materials contained in the equipment.

The abusive disposal of the product by the user implies the application of the administrative sanctions as per D.Lgs. 152/2006.

Compliance with the RAEE legislation (D.Lgs. 49/2014)
PrimaLuceLab is registered to AEE Register with number IT17030000009790
PrimaLuceLab adheres to Sistema Collettivo ERP Italia for the compliance to RAEE legislation.

European Recycling Platform

WARRANTY

1) The PrimaLuceLab product warranty is effective from the date of purchase and is valid only if it is with the invoice (or receipt) of purchase.

2) The warranty covers the product against defects in workmanship and includes the cost of the replaced material and labor.

3) The warranty does not cover any damage caused to the product or defects or failures that occur due to improper installation , improper use and/or deterioration due to normal wear.

4) THE GUARANTEE DOES NOT APPLY IN THE FOLLOWING CASES:
   - Repair by anyone not authorized by PrimaLuceLab .
   - Invasive interventions or tampering with internal and/or external parts.
   - Missing of the invoice (or receipt) of purchase.

TERMS OF SERVICE
Technical assistance is performed exclusively by PrimaLuceLab or its authorized resellers. All returns must be received with our permission (to be asked writing an email to support@primalucelab.com) . YOU HAVE TO add to the shipping the invoice (or receipt) of purchase and the detailed description of the defect. For products without the invoice (or receipt) of purchase, repair and shipping costs are always paid by the customer.