

FLI



Finger Lakes Instrumentation

Engineering Excellence

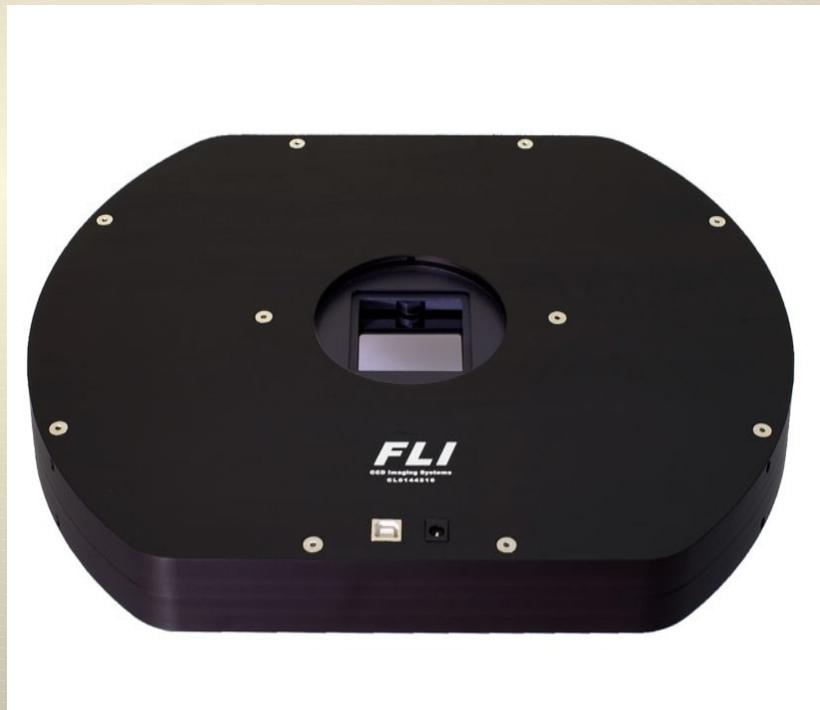
Because Your Image Depends On It

CenterLine

Filter

Wheel

User's Guide



WELCOME

Thank you for purchasing an FLI CenterLine Filter Wheel. We know that this accessory will bring you years of excellent imaging results.

This User's Guide is intended as a reference tool for you to use with the FLI CenterLine Filter Wheel. Please read it and follow the procedures to ensure trouble-free installation of your hardware and software. For information on other FLI products or to discuss your Centerline Filter Wheel, please contact:

sales@flicamera.com

If you have any questions about your purchase, please contact us.

CONTACT INFORMATION

Finger Lakes Instrumentation, LLC 1250 Rochester St. Lima, New York 14485 Web: www.flicamera.com Email: sales@flicamera.com Phone: 585-624-3760 Fax: 585-624-9879	Finger Lakes Instrumentation, LLC 15 Charles St. Suite 1E Binghamton, New York 13905 Web: www.flicamera.com Email: sales@flicamera.com Phone: 607-779-1020
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PRODUCT SAFETY



This FLI CenterLine Filter Wheel is shipped with a 12 VDC power supply. Do not use any other power supply with this FLI CenterLine Filter Wheel, or use the power supply in a way other than described in this Guide. Doing so may cause damage to the CenterLine Filter Wheel that will not be covered under the warranty.



If you are concerned about lightning strikes in the area you use your CenterLine Filter Wheel, you may want to take safety precautions as electrical surges can damage electrical equipment. We recommend that when your CenterLine Filter Wheel is not in use that you unplug the CenterLine Filter Wheel from power and any USB cables.

CENTERLINE FILTER WHEEL OVERVIEW

The CenterLine Filter Wheel features a centrally located aperture that presents a symmetrical mass distribution, eliminating the offset weight problems associated with virtually every other color filter wheel on the market. It is also ideal for prime focus installations where a zero or symmetric shading of the primary mirror is critical. The CenterLine Filter Wheel presents an easier load to handle compared to a traditional color filter wheels and it will not change a telescope's balance as it tracks across the sky. The CenterLine Filter Wheel also allows for filter combinations unavailable with traditional style color filter wheels. The CenterLine Filter Wheel holds filters in two independently operated wheels. It is powered by two internally mounted stepper motors and an innovative drive mechanism allowing for easy wheel removal and filter access. The internal wheels are supported by radial ball bearings that provide a smooth, quiet, and repeatable operation.

The bottom lip of the filter pocket acts as an aperture screen reducing the effect of filter edge reflections. The filter pocket lips on both wheels face outward, which further improves the internal reflection performance.

Light leakage inside the wheel is addressed through solid wheel construction, complemented by square optical port aperture screens on both sides of the housing.

Mechanical attachment of the CenterLine Filter Wheel is realized through the robust Zero-Tilt Adapter™ mechanism, which is incorporated into both the housing and cover side of the filter wheel and operated using easily accessible set screws. The structural rigidity and overall weight of the housing, cover, and wheels have been optimized for peak performance.

CENTERLINE FILTER WHEEL SPECIFICATIONS

	CL1-10	CL1-20	CL1-14
Overall Thickness	1.1"		
Weight	4.3 lbs.		
Recommended Filter Size	50mm Square	25mm Round	50mm Round
Filter Thickness Range	1 mm -5 mm		
Homing Device Type	Magnet / Hall Effect		
Motor / Drive Type	Pulley / Belt		
Software Controlled	Yes		
Frame Side Connection	3.43" Zero-Tilt Adapter™		
Cover Side Connection	3.43" Zero-Tilt Adapter™		

INSTALLING THE FLI FILTER WHEEL SOFTWARE

Obtain the most up to date software to install and test your CenterLine Filter Wheel from our website:

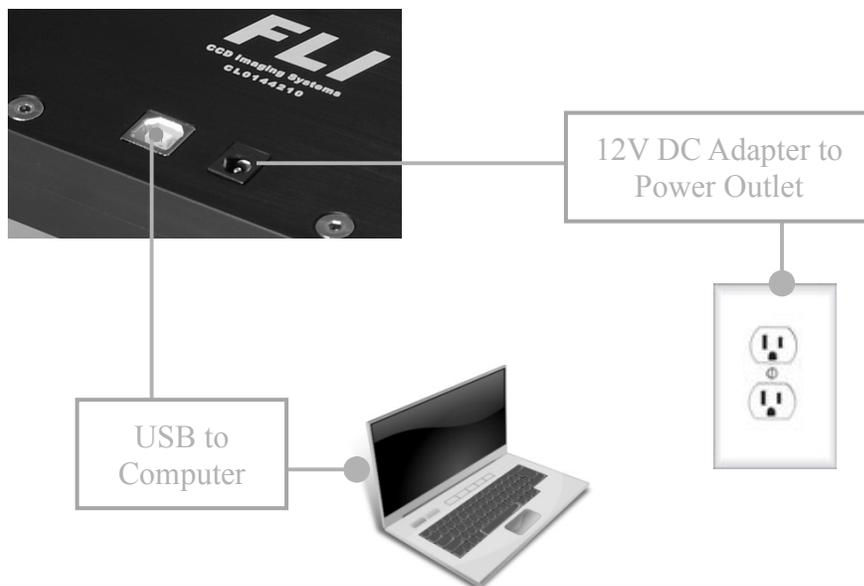
<http://www.flicamera.com/software>

Select the FLI Software Installation Kit. Follow the installation instructions given in on-screen prompts that will guide you through the installation procedure. The FLI Software Installation Kit includes drivers for FLI products as well as utilities that can be used to control the hardware.

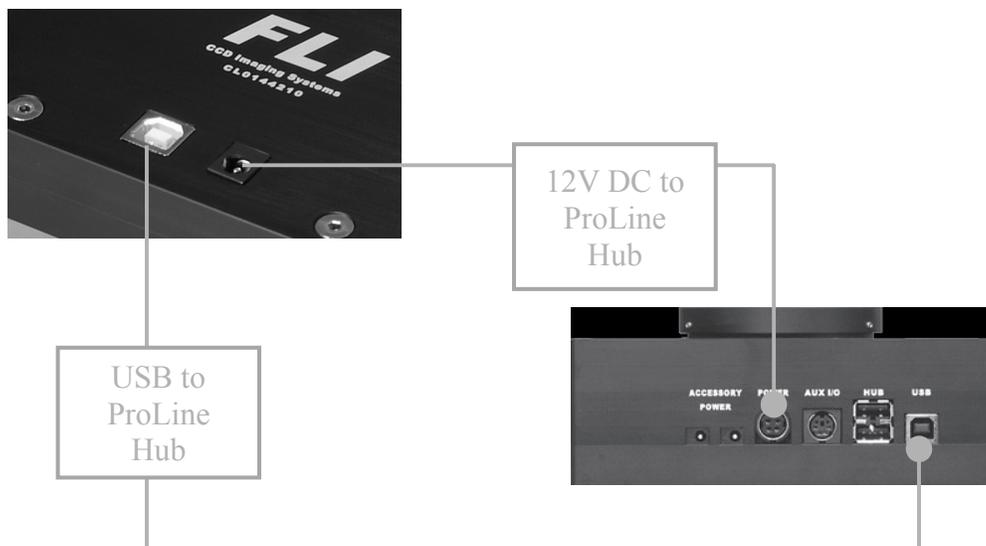
Note: Run the FLI Software Installation Kit before you set up and power the CenterLine Filter Wheel to ensure the system recognizes and correctly initializes the Centerline Filter Wheel when you connect it.

CENTERLINE FILTER WHEEL CONNECTIONS

Connecting the CenterLine to a Computer



Connecting the CenterLine to a ProLine Hub



ACCESSORIES

For more information on any accessories that may be available for your CenterLine Filter Wheel, please contact Finger Lakes Instrumentation, LLC by phone or email at:

585-624-3760

607-779-1020

sales@flicamera.com

A short cable kit is available for connecting the Centerline Filter Wheel to a Proline Hub more efficiently.



Fig. 1: Short Cable Kit (Part #20055)

INSTALLING FILTERS

1. Disconnect any and all power cables and USB cables from the CenterLine.
2. Remove the CenterLine cover by removing the 8 perimeter screws and 2 wheel pivot screws with a 3/32 Hex key.

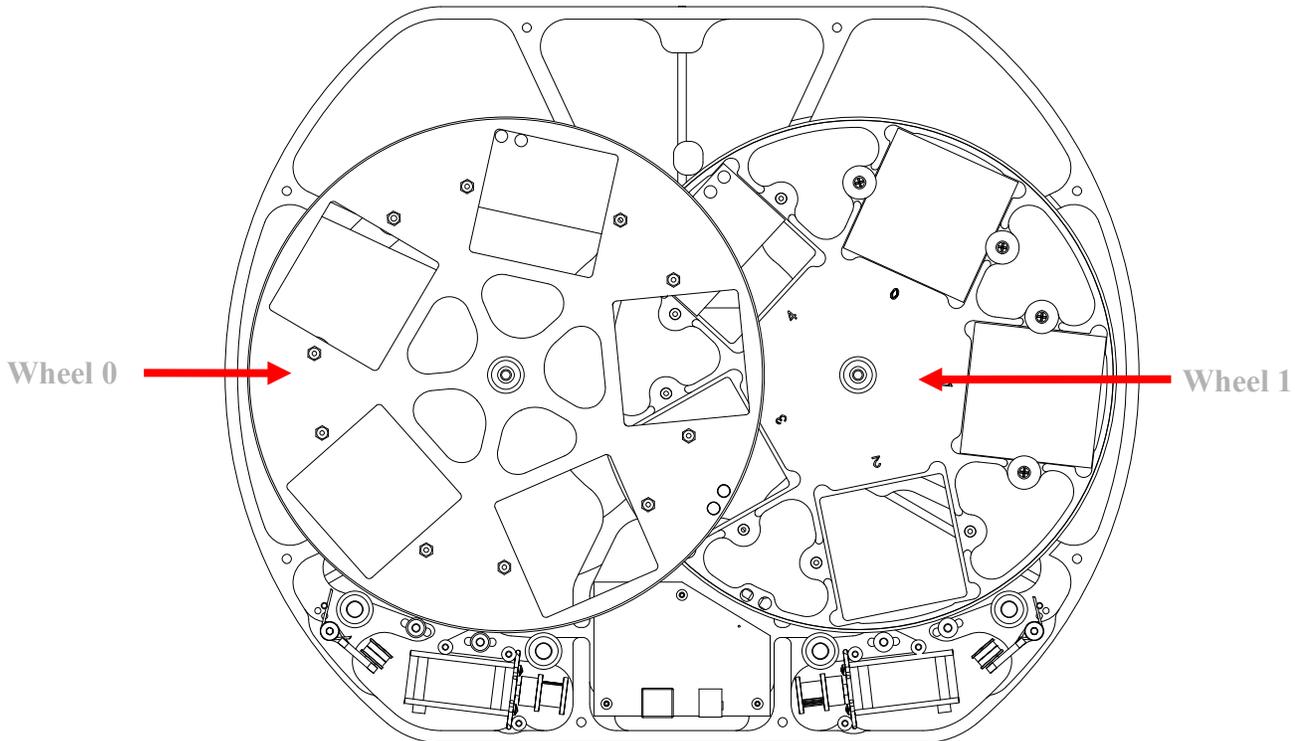


Fig. 2: CenterLine with cover removed

3. With a Phillips #1 screw driver, remove the Multi-Step filter retainers on both sides of the filter pocket to be populated.
4. Place a square filter into the square filter pocket.
5. Place two Multi-Step filter retainers over the filter with the correct step corresponding to the thickness of the installed filter. The filter thickness options supported by the Multi-Step filter retainer are 1 mm to 5 mm. With a Phillips #1 screw driver tighten the two screws to secure the filter in position. Do not over tighten the screws.
6. Repeat steps 3 through 5 to install filters in remaining pockets.

Note: Wheel 0 has to be removed to install its filters. Wheel 1 should never be removed under any circumstances.

Note: Remove wheel 0 by removing its pivot screw from the underside of the housing with a 3/32 Hex key and lifting the wheel out of the housing.

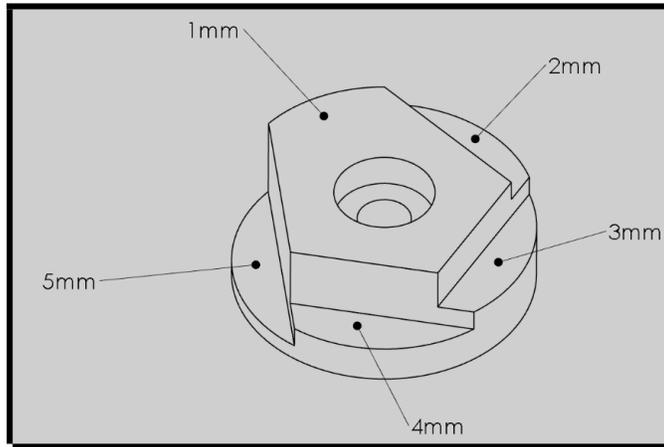


Fig. 3: Multi-Step retainer

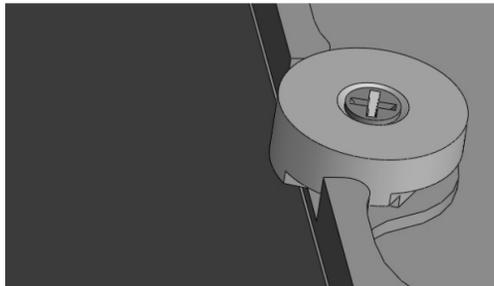


Fig. 4: Multi-step retainer orientation for securing a filter with 1 mm thickness

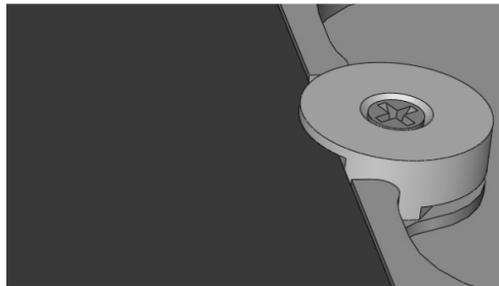


Fig. 5: Multi-step retainer orientation for securing a filter with 5 mm thickness

7. To reinstall wheel 0, first pull the belt over the idler as shown:

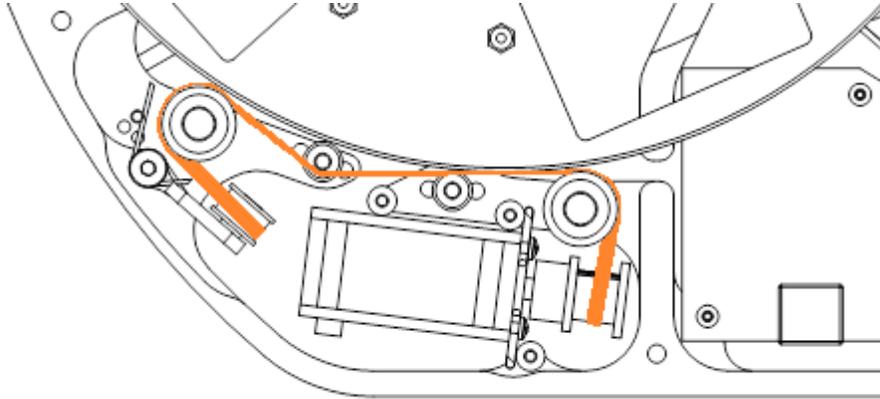


Fig. 6: belt over idler for reinstalling wheel 0.

With the side of the wheel with engraved filter numbers facing down, insert the wheel pivot into the pivot hole in the housing and lower the wheel until it starts to engage the belt. Pull the belt off of the idler. The belt will snap to the wheel and engage it fully. Slowly spin the wheel and lightly press it down until it is fully seated in the pivot hole. Install and tighten the pivot screw on the underside of the housing with a 3/32 Hex key.

8. Place the cover back onto the housing then install and tighten the 8 perimeter screws and 2 wheel pivot screws with a 3/32 Hex key.

SET-UP AND POWERING CENTERLINE FILTER WHEELS

We recommend you assemble all components in one area before beginning the set up procedure. Before operating the Centerline Filter Wheel for the first time, ensure you have completed the successful software installation described in the section titled “Installing the FLI Filter Wheel Software”.

1. Plug the power supply cable into the CenterLine Filter Wheel.
2. Attach the USB cable between the CenterLine Filter Wheel and your computer.
3. Plug the power supply cable into a wall socket or switched AC power strip.
4. Run the FLI Filter software to operate the CenterLine Filter Wheel and make control selections.

The following notes are provided to assist you with the FLI Filter Software:

- The FLI Filter software will automatically recognize the type of Color Filter Wheel that is attached to your computer, and displays the correct number of filter positions. If the computer does not correctly identify this information, refer to the Troubleshooting section of this guide (page 16) for instructions.
- Upon successful driver, software, and filter installation, you should initiate a Homing procedure. To do this, click Home on the FLI Filter dialog. The filter combination in the aperture position is displayed at the bottom of the dialog. Will show (0,0) after the Homing sequence completes.
- You can move the CenterLine Filter Wheel to a particular preset filter pocket/cup position combination. To do so, click the button corresponding to the preset on the FLI Filter dialog. The CenterLine Filter Wheel will align the selected filter combination position in the aperture.

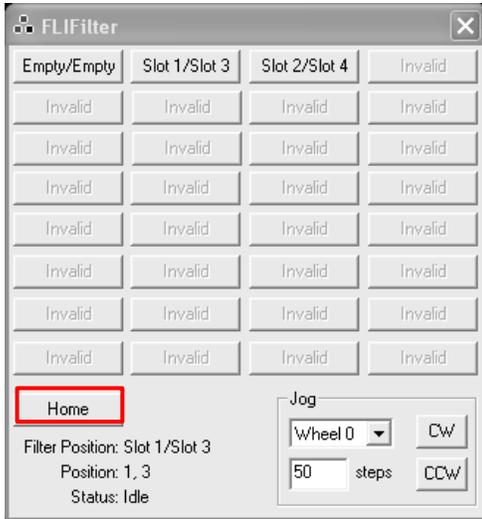


Fig. 7: Filter Combination Selection Window

- The **Jog** section allows you to rotate the wheel by a fraction of the adjacent filter distance.
- Use the CW and CCW buttons to rotate the clockwise and counter-clockwise by the number of steps entered in the text box.
- **Filter Position** displays the filter positions of the currently selected preset using the user designated names.
- **Position** displays the current slot for Wheel 0 and Wheel 1
- **Status** displays the current action of the Filter Wheel
- Both wheels rotate counter-clockwise when moving to filter position (when viewed from the top). The standard filter sequence for Wheel 0 (left) is 0-4-3-2-1, the sequence for Wheel 1 (right) is 0-1-2-3-4.
- To rename a slot, right-click on the FLI Filter dialog box and select “Configure Filter Positions”. Select the Wheel and Slot number you wish to rename and enter the desired name, then click “Apply” to confirm the change.

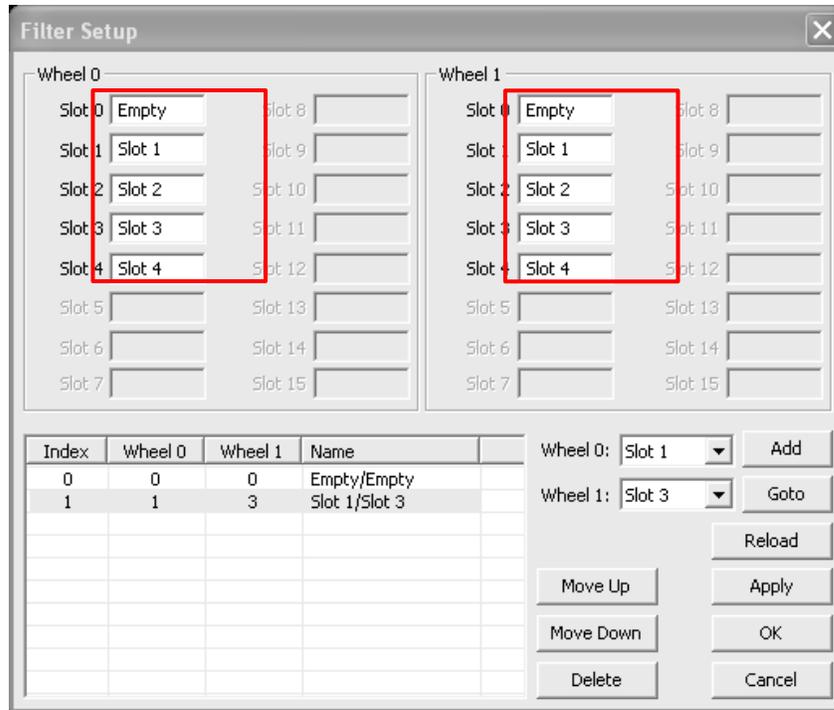


Fig. 8: Filter Setup window

- To configure the filter combination presets, right-click on the FLI Filter dialog box and select “Configure Filter Positions”. Choose the slot for both Wheel 0 and Wheel 1 for the new preset, then click “Add”. You will notice that the combination you have chosen is now listed in the table to the left, along with a listing of the associated slot numbers/names.

Note: All custom filter position configurations will be stored with the CenterLine Filter Wheel. These will be retained even if the CenterLine Filter Wheel is connected to a different computer.

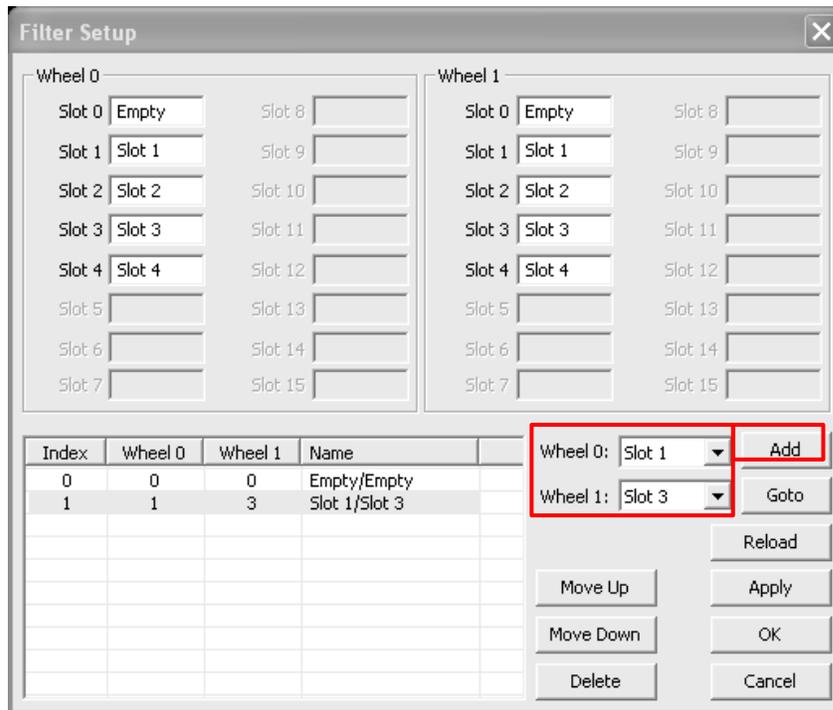


Fig. 9: Filter Combination Window

- If you wish to delete a configured combination, simply select the configuration and press “Delete”.
- By selecting “Goto”, the Filter Wheel will move to the location that is displayed in the Wheel 0 and Wheel 1 drop down selection boxes.
- The “Reload” button will reset all unapplied changes that have been made.

Note: Be sure to select “apply” to save any changes, failure to do so will result in the loss of any alterations made.

CONNECTING ADAPTERS TO THE FILTER WHEEL

FLI CenterLine Filter Wheels employ the Zero-Tilt Adapter™ mechanism to attach to other components in the imaging train. This easy-to-use mechanism provides an extremely rigid connection. The locking mechanism is actuated with three set screws accessible at the perimeter of the housing in a manner similar to a more traditional V-groove connection. Both sides of the CenterLine Filter Wheel feature the same mechanical interface and accept the same adapters. The symmetry of the design of the CenterLine Filter Wheels eliminates the orientation preference of the housing with respect to the optical train for optimal performance.

Follow the steps below to attach adapters to the CenterLine Filter Wheels.

1. Insert the V-groove side of the adapter in to the CenterLine aperture. If necessary, loosen the three set screws around the perimeter of the housing using the supplied 5/64 Allen key to ease the insertion of the adapter into the aperture. Ensure that the adapter flange is flush with the CenterLine housing before proceeding to the next step.
2. Tighten the three set screws around the perimeter of the housing with the supplied 5/64" Allen key in the order shown below:

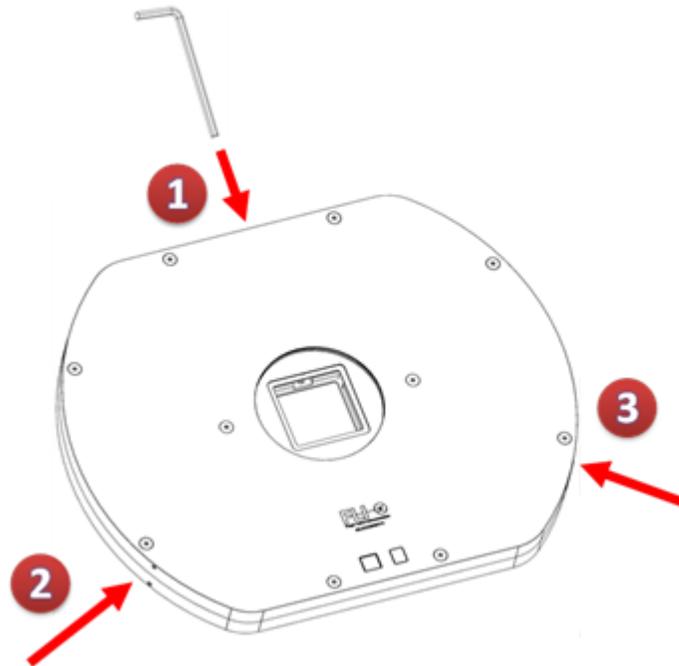
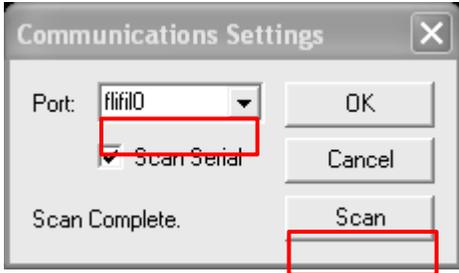


Fig. 10: perimeter screw location and order

Visit the Color Filter Wheels section of our website <http://www.flicamera.com/> to view an animation demonstrating the operation of the Zero-Tilt Adapter™.

APPENDIX A - TROUBLESHOOTING

Issue	Remedy
<p>The computer does not correctly identify the attached CenterLine Filter Wheel.</p>	<p>Check that the CenterLine’s power supply and USB cable are properly connected. If so, follow the steps below.</p> <ol style="list-style-type: none"> 1. On the FLI Filter dialog box right click on the top of the dialog box and select “Communications Settings”. 2. On the new dialog box click “Scan”. The system will display “flifil0” or “flifil1” in the port window. <div style="text-align: center;">  </div> <ol style="list-style-type: none"> 3. Click OK. The system will highlight the correct number of positions for your filter wheel. 4. If a problem persists, unplug the CenterLine power and USB cable, then uninstall and reinstall FLI Filter.
<p>A filter is not centered in the CenterLine Filter Wheel aperture</p>	<p>In the FLI Filter dialog box, click Home. The CenterLine moves to place the filter in position 0 in the aperture.</p>
<p>The filter pocket cup I want to see is not displayed in the aperture.</p>	<p>On the FLI Filter dialog box, click any button that identifies a filter pocket/ cup position to move that filter pocket/cup into the aperture position.</p>

APPENDIX B – WARRANTY FOR FLI PRODUCTS

Limited Warranty Coverage

If your Product does not properly function because of a defect in its materials or workmanship, Finger Lakes Instrumentation, LLC (“FLI”) will, at its sole option and for the length of the period indicated on the chart below, which period begins with the date of original purchase (the “Warranty Period”), either:

- (a) repair your Product with new or refurbished parts;
- or
- (b) replace your Product with a new or refurbished product.

The decision to repair or replace, the parts used to repair, or the new or refurbished product used to replace your Product, as applicable, shall be made by FLI in its sole discretion. Without limiting its discretion, where FLI determines that your Product shall be replaced with a new or refurbished product that is different from your Product, FLI will use its commercially reasonable efforts to replace your Product with a new or refurbished product that is as close to equivalent to your Product as practicable.

This Limited Warranty is offered to the original purchaser of a new product from FLI, which was not sold on an “as-is” basis. A legible purchase receipt or other verifiable proof of purchase for your Product is required to receive Limited Warranty parts or service.

This Limited Warranty does not apply in special circumstances in which prior arrangements have been made and separate documentation has been supplied prior to, or with, your Product; in such cases, the warranty (if any) provided in such documentation shall supersede and replace this Limited Warranty for your Product.

Item or Part Name	Warranty Period
Your Product, except those items listed in this table below	One (1) Year
Your Product’s Application Software (if included) and Batteries	None

Parts and Service

You must carry-in or mail-in your Product during the Warranty Period to receive the Limited Warranty parts or service. Prior to mailing or carrying-in your Product to FLI, you are required to contact FLI at the e-mail address or telephone number provided in the “Directory Information” Section of this Limited Warranty to receive a warranty service identifier code (and any other reasonably required identifiers, as directed by FLI) that you must provide in legible writing included within the package in which you mail FLI your Product.

The Limited Warranty does not include costs of shipping your Product, installation or re-installation of your Product, insurance relating to shipping your Product, or travel to carry your Product to FLI, except that FLI shall bear the costs of shipping your Product to and from FLI’s service center (but not insurance or travel) for Product Internal Environment Limited Warranty service claims made within one (1) year from the date of original purchase when shipped within the continental United States.

All products and services are F.O.B. Lima, NY.

Directory Information

Finger Lakes Instrumentation, LLC

15 Charles St, Suite 1E

Binghamton, New York 13905

Phone: 585-624-3760

Fax: 585-624-9879

This directory information is provided as a courtesy, and is subject to change without notice.

Please verify this directory information by consulting FLI’s website located at:

<http://www.flicamera.com>

Product Software

As noted in the chart in the section of this Limited Warranty titled “Limited Warranty Coverage,” the Limited Warranty does not apply to your Product software. Software supplied with your Product is for demonstration purposes only. FLI supplies the necessary information, drivers, and libraries, for users and third party vendors to develop software for their specific purposes. FLI seeks to maintain compatibility with many third party software vendors, but does not, and cannot, warrant or guarantee operation with non-FLI software. FLI is not responsible for changes, upgrades, or errors in third party programs.

Important Limited Warranty Information

This limited warranty ONLY COVERS failures due to defects in materials and workmanship, and DOES NOT COVER normal wear and tear or cosmetic damage. This limited warranty ALSO DOES NOT COVER damages which occurred in shipment, or failures which are caused by or to products not supplied by FLI, or failures which result from accidents, misuse, abuse, neglect, mishandling, misapplication, alteration, improper maintenance, power supplied to your Product (including, without limitation, over-voltage, mechanical shock, reverse polarity, or power surges), electrostatic discharge, modification, or commercial use, rental use of your Product, service to your Product by anyone other than FLI at an authorized service center, damage due to environmental conditions (including, without limitation, extreme temperatures, exposure to excessive moisture or humidity, radiation, or electromagnetic fields), damage occurring after condensation or moisture has appeared in the Product inner (sealed) chamber, or damage attributable to acts of God (including, without limitation, lightning).

- THERE ARE NO EXPRESS WARRANTIES EXCEPT AS LIMITED UNDER “LIMITED WARRANTY COVERAGE.” FLI IS NOT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THIS PRODUCT, OR ARISING UNDER ANY BREACH OF THIS WARRANTY.
- ALL EXPRESS WARRANTIES MADE IN THIS LIMITED WARRANTY ARE LIMITED TO THE WARRANTY PERIOD OF THE LIMITED WARRANTY, AND ARE OTHERWISE HEREBY DISCLAIMED TO THE FULLEST EXTENT PROVIDED BY LAW.
- ALL IMPLIED WARRANTIES, INCLUDING THE WARRANTY OF MERCHANTABILITY, ARE HEREBY DISCLAIMED TO THE FULLEST EXTENT PROVIDED BY LAW.
- PARTS AND SERVICE WHICH ARE NOT COVERED BY THIS LIMITED WARRANTY ARE YOUR RESPONSIBILITY.

If your locality does not permit all or a portion of this Limited Warranty, this Limited Warranty may not apply to you. Please consult your local laws, rules, and regulations for any differences that may be present in your jurisdiction and apply to you. If you do not meet all of the criteria for this Limited Warranty or are outside of the Warranty Period, please be advised that you are not covered by this Limited Warranty and there may be a charge for any servicing and parts for your Product – please contact FLI using the directory information in this Limited Warranty for more information.

The Product is not authorized for use as critical components in life support or medical diagnostic applications where failure to perform could result in injury, faulty diagnosis, or other risk to patients or personnel.

The Product is not authorized for use in robotic control systems where malfunction or failure could cause system motions hazardous to personnel.

APPENDIX C – FLI RETURNS PROCEDURE

If you need to return a product, please follow the instructions outlined below.

1. Contact FLI by phone or email to obtain a Return Material Authorization (RMA) number to return the camera/product and:
 - a. If you are outside the United States, contact your Customs Authority to register the merchandise to be returned to the United States for warranty repair or refund. Use the Harmonized Code number 9801.00.1012 on your shipping documentation. The monetary value you place on the item should be stated for insurance purposes. Clearly state that the “Value is for Customs purposes ONLY.” When FLI returns the repair item to you, we will use the same monetary value.
 - b. If you are outside the United States, prepare a ProForma invoice to accompany the shipment with the following statement:

For Equipment not covered under warranty: “American goods returned for repair only with NO Commercial Value. Temporary return only”

For Equipment covered under warranty: “American goods returned for Warranty Repair only with NO Commercial Value. Temporary return only”
 - c. For all customers, if you are requesting service under warranty or a return, a copy of your original receipt.
 - d. For your records, make a copy of these documents.
 - e. Prepare a large shipping label with the appropriate return address (FLI or distributor) and for shipments from outside the U.S., include the Harmonized Code number.
2. Locate the original shipping boxes in which your item(s) was packaged. These boxes are designed to protect the products.

Notice: If you do not have the original shipping boxes, obtain a rigid box that is at least 3” (7.5 cm) larger in all dimensions than the items. A smaller box will not allow appropriate cushioning. Tape the side and bottom seams to secure the box.
3. If you have the original packing materials, place the item(s) in the original plastic bag(s) and place the bagged item in the appropriate foam cutout in the proper orientation. Insert other items into their appropriate compartments.

Notice: If you do not have the original bag, place the item(s) in a plastic bag and seal it. Wrap the bagged item(s) with at least two layers of bubble wrap or two bubble wrap bags. Wrap other items in the same manner. At the bottom of the box, place two inches of packing material (Styrofoam peanuts or additional bubble wrap). Place the item(s) on the

bottom layer with space around each. Surround each item completely with additional packing material.

4. Write a letter that includes the following:
 - a. Reason the item is being returned to FLI or distributor
 - b. Your complete contact information (name, phone number(s), email address, return shipping address)
 - c. If appropriate, payment method and information. On top of the item(s) in the box, add the required paperwork described in step 1 and the letter described in step 4. Seal the box with packing tape. Tape the top flaps and label the box with the shipping label prepared in step 1.
5. Contact a shipper for pickup or bring it to a reliable carrier. As noted in step 1, use the appropriate value on shipping forms. FLI is not responsible for damage to any item or items when they are in the possession of a carrier.