Finger Lakes Instrumentation

CFW Colour Filter Wheel User’s Installation Guide
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Vantage House, 26A Northenden Road, Sale, Cheshire M33 3BR. United Kingdom
Welcome

Thank you for purchasing an FLI Filter Wheel. We know that your new filter wheel will bring you years of enjoyment and excellent imaging results when used in conjunction with a camera.

Please read the following instructions carefully and follow them closely to ensure trouble-free installation of your hardware and software.

A short guided tour is included that will allow you to take get aquatinted with the basic operation of your new filter wheel. Should you have any questions about your purchase, please contact us.

Check Your Shipment

Please ensure that everything has arrived safely and verify that everything you ordered was properly shipped to you. Immediately notify your FLI dealer or FLI in the unlikely event of a missing or damaged component. Your order should include the following items:

1. Filter Wheel with serial number sticker
2. USB control box
3. A USB cable
4. 15 foot flat cable
5. 12 volt power supply
6. A CD-ROM with FLI’s installation software
7. A copy of the CFW User’s Guide (on CD-ROM as an Adobe PDF)
8. Packing list

Installing the FLIFilter Filter Wheel Control Software

To be able to operate your new FLI filter wheel for the first time via your computer you will need to go through the software and hardware installation process, before you install the software please make certain that:

1. You have assembled your FLI filter wheel and you are familiar with the simple power-up procedure, please refer the text under the Assembling and Powering-Up your Filter Wheel heading.

2. Your target PC is running Windows 2000 or Windows XP.

3. If you have partially installed the FLI Software Kit in the past you will need to un-install it before re-installing. From the Control Panel click on the Add/Remove icon. Select the FLI Software Kit entry and click the Remove button.

Please disconnect your filter wheel from your computer before you attempt to install the FLIFilter software.

Place the FLI Installation Disk into your computer’s drive.

If the installer does not automatically begin, go to the appropriate CD-ROM drive and open the “FLI Installation Files” directory.
Double click “Setup.exe”. You will be presented with a number of screens as follows:

Agreeing to the License Agreement will take you to the next step. Click on Next to proceed.

Check FLIFilter to install the filter wheel control software. Check FLI Focus and FLIFilter if you are using an FLI digital focuser or FLI camera. Connect your filter-wheel to your computer, click on Next.
The installation program installs the camera drivers and software itself and further Windows intervention is not required.

When or if the Found New Hardware Wizard Window appears press Cancel.

You will now have a chance to place the installation of FLIGrab in a location of your choice.

Alternatively FLIGrab will be installed at its default directory.

To allow everyone to use the FLI Software Kit click on the ‘Everyone’ radio button. If you wish to restrict access to yourself then click on the ‘Just me’ radio button. When you are ready, click ‘Next’ to proceed.

Once installation is complete, you can install optional software or use FLIFilter to begin testing your new FLI filter wheel.
Assembling, Powering-up and Testing your Filter Wheel

Please bring together all parts. Make certain that during system assembly the filter wheel housing is firmly closed to avoid damage to the filter wheel. Only remove the cover when you want to install or remove filters, refer to the Filter Installation section in this document for more information. Please connect the various system components as follows:

**CAUTION:** Always plug your camera power cord into the filter “DC Power Jack” first, before applying AC power to the 12 volt power supply. “Hot Plugging” the filter wheel may result in a blown power supply fuse.

1. Connect 10-pin flat cable to the CFW and USB interface box.
2. Plug the 12 volt power supply connector into the USB box.
3. Plug the 12 volt power supply into a wall socket.
4. Plug a USB cable into the USB box and then into the PC’s USB connector.
5. Start FLIFilter.
6. Initially, the program will indicate that the filter position is unknown.
7. Click the “Home” button and your CFW will rotate to the home position.
8. After homing, Current Position will read “Slot 0”.

Your new FLI filter wheel should now be fully operational and you should be able to hear the internal magazine as it turns. If you experience any problems please refer to the Confirming Filter Driver Installation section that follows before consulting the Troubleshooting section.

**NOTE:** If your filter wheel has come with filters installed an accompanying sheet or similar should be included outlining the contents of all occupied filter positions.
Confirming Filter Wheel Driver Installation

To ascertain that the camera drivers have been installed properly you can do so at any time if required.

At the Windows Desktop right-click on the My Computer icon

Click on Properties.

Click on the Hardware tab.

Click on Universal Serial Bus Controllers. The FLI USB Filter Wheel entry should be present in the list.

If the FLI USB Filter Wheel does not appear in the list or there is a conflict please follow the instructions in the following section.

Conflict icon
Addressing Driver Issues
Please skip this section if you have not experienced any driver problems with the installation of the FLI Software Kit and the FLI device drivers are present with no apparent conflicts.

1. If the USB device is NOT visible under the Universal Serial Bus controllers section:
   a. unplug your FLI camera, color filter wheel or focuser
   b. re-install the software

2. If the USB device is visible under the Universal Serial Bus controllers section but shows an exclamation symbol:
   a. right click the FLI USB device entry (with exclamation symbol next to it)
   b. click uninstall and click “ok” to uninstall the device from your system
   c. unplug your FLI camera, color filter wheel or focuser
   d. re-install the software

3. If the USB device is visible under the Universal Serial Bus controllers section, ensure that:
   a. the power supply connection to the wall socket is “live”
   b. the power supply connector is properly seated into your FLI device
   c. both ends of the 10-pin cable are not damaged
   d. the 10-pin cable is firmly seated into the FLI device and USB interface
   e. Note: If you have an Ohm meter, check that each of the 10-pin connectors is indicating continuity.

4. Refer to the Troubleshooting section should the above suggestions not have the desired effect.
Filter Installation

To successfully install new filters into your filter wheel or to replace old ones please follow the following procedure closely.

Choose a clean, dust free and well-lit room to perform this procedure. You will need:

1. The filter wheel.
2. Set of Filters.
3. Allen keys supplied.
5. Filter retaining screws and washers supplied.

CAUTION: Handle the filter wheel and filters with care. Avoid touching the glass surface of the filters as this is likely to leave finger prints behind that are not easy to clean.

Opening the Filter Wheel
1. Disconnect the filter wheel from its control box.
2. Disconnect any cables from the filter wheel.
3. Place the filter wheel on a flat surface with the nosepiece facing up. You may want to rest the filter wheel on a towel to avoid any superficial damage.
4. Use the correct sized Allen key provided with the filter wheel to unscrew all nine screws.
5. Keep all nine screws together somewhere safe.
6. Use the nosepiece to lift the lid.

Lifting the lid will reveal the internals of the wheel that consist of the chain drive and filter magazine.

A board carrying the electronics as well as the electric motor are concealed behind the chain drive and filter magazine.

Filter Placement Procedure
The magazine has a number of circular pockets where the filters normally rest.

1. Place the filter in one of the pockets taking a note of the position and type of filter.
2. Place an O ring over the filter.
3. Use two retaining screws and washers to secure the filter into its pocket with the Allen key provided.
4. Repeat steps 1 to 3 to install additional filters.

Closing the Filter Wheel
1. Ensure that there are no loose parts and that nothing has been left inside the filter wheel base.
2. Place the lid over the filter wheel body and position the screw in the middle of the filter wheel, turn the screw to secure the lid but do not tighten.
3. Place and secure all screws in their positions, do not tighten.
4. Tighten all screws opposite to each other, do not over tighten.
Attaching the CFW Filter Wheel to Another Device

Every FLI color filter wheel was designed to be as thin as possible. Each CFW filter wheel cover is threaded to mate with a standard 2-inch nosepiece common to many astronomical devices. The nosepiece can be removed and replaced with any adaptor with a male SC type thread.

The CFW accepts FLI cameras directly and also mates with other camera types via a number of adapters supplied separately.

Coupling the CFW to an FLI Camera

Choose a clean, dust free and well-lit room to perform this procedure. You will need:

1. The filter wheel.
2. Camera.
3. Allen keys supplied.

**CAUTION:** Handle the filter wheel and camera with care. Avoid inserting tools into the camera or filter wheel as this could cause damage to the camera iris, installed filters, etc.

1. Use the supplied Allen key to loosen the two holding screws on the side of the filter wheel to release the black round lid.

2. Turn the filter wheel upside down, the lid should now drop to reveal the inside of the filter wheel.

3. Fit your FLI camera into the filter wheel opening and tighten up the two holding screws.

Adaptors

The following list includes a number of adapters to couple the filter wheel to various camera types and other devices. Please visit [www.fli-cam.com](http://www.fli-cam.com) for the full range of FLI adapters.

<table>
<thead>
<tr>
<th>Adapter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DT-1</td>
<td>2-inch Draw Tube that is included with your purchase (Typically mounted to the “telescope side”).</td>
</tr>
<tr>
<td>AD-1</td>
<td>Adapter for 2” SC thread cameras. Also used to mate a color filter wheel and a DF-2 digital focuser.</td>
</tr>
<tr>
<td>AD-2</td>
<td>Adapter for T-thread cameras.</td>
</tr>
<tr>
<td>AD-AP</td>
<td>Universal 2” non-marring collar adapter.</td>
</tr>
</tbody>
</table>

All of the adapters in the list with the exception of the DT-1 fit into the FLI pocket which is generally the “camera side” of the CFW.
## Troubleshooting

<table>
<thead>
<tr>
<th>Issue</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have checked my packing list and items are missing.</td>
<td>In the unlikely event please contact your FLI dealer immediately.</td>
</tr>
<tr>
<td>The filter wheel turns but does not work or works erratically.</td>
<td>Make certain that all cables are well seated and are not stretched.</td>
</tr>
<tr>
<td>FLIFilter cannot locate the filter wheel. Sometimes I get a Windows “Communication” error or similar problems.</td>
<td>Please turn off your computer and camera and leave them switched off for 2-3 minutes. This will flash the USB chips. Try again.</td>
</tr>
<tr>
<td>Everything is connected and FLIFilter has been installed but the software cannot locate the filter wheel.</td>
<td>Please make certain that you have installed the software and drivers as per the instructions in this manual. Letting Windows to locate the filter wheel during installation is likely to create problems. Uninstall the FLI Software Kit and install again as per the instructions provided in this manual.</td>
</tr>
<tr>
<td>Everything is connected and FLIFilter has been installed but the software cannot locate the filter wheel. I have already reset my machine.</td>
<td>Make certain that there are no USB conflicts. Right click on My Computer and click on Properties. Under System Properties → Hardware click on Device Manager, then click on Universal Serial Bus controllers in the list. The FLI Filter Wheel driver should show no conflicts. If there are no conflicts there might be other devices that cause the problem. Check all other devices in Device manager that they do not show conflicts. Conflicts may need to be resolved. Refer to the manual of the device that causes the conflict. You may have to disable the offending device and re-insatll the FLI Software Kit.</td>
</tr>
</tbody>
</table>

Conflict icon

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Technical Data

CFW-7 Diagram

Adapter Pocket
\( \phi 2.93 \times 28 \)
Adapters held in
by (2) set screws

\( \phi 8.41 \)

2.005 - 24UNS-28
for mounting adapter
Filter Wheel Specifications

<table>
<thead>
<tr>
<th>Models</th>
<th>CFW-1 Five 50mm filters</th>
<th>CFW-2 Eight 28mm filters</th>
<th>CFW-7 Seven 50mm filters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Diameter</td>
<td>6.50&quot;</td>
<td>6.50&quot;</td>
<td>8.4375&quot;</td>
</tr>
<tr>
<td>Longest Dimension</td>
<td>7.990&quot;</td>
<td>7.990&quot;</td>
<td>9.625&quot;</td>
</tr>
<tr>
<td>Body Thickness (-motor)</td>
<td>.810&quot;</td>
<td>.810&quot;</td>
<td>.810&quot;</td>
</tr>
<tr>
<td>Camera Coupling Pocket</td>
<td>2.930&quot;</td>
<td>2.930&quot;</td>
<td>2.930&quot;</td>
</tr>
<tr>
<td>Filter Cup Depth</td>
<td>.185 to .190&quot;</td>
<td>.185 to .190&quot;</td>
<td>.205&quot;</td>
</tr>
<tr>
<td>Filter Cup Diameter</td>
<td>2.005&quot;</td>
<td>1.11&quot;</td>
<td>1.976&quot;</td>
</tr>
<tr>
<td>Internal wheel material</td>
<td>Sintra</td>
<td>Sintra</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Power Supply Output</td>
<td>12VDC, 1000 mA</td>
<td>12VDC, 1000 mA</td>
<td>12VDC, 1000 mA</td>
</tr>
<tr>
<td>O-ring thickness</td>
<td>.10</td>
<td>.10</td>
<td>.10</td>
</tr>
<tr>
<td>PC Interface</td>
<td>USB</td>
<td>USB</td>
<td>USB</td>
</tr>
<tr>
<td>Path Increase</td>
<td>.540&quot;</td>
<td>.540&quot;</td>
<td>.540&quot;</td>
</tr>
<tr>
<td>Weight</td>
<td>1.6 lb.</td>
<td>1.6 lb.</td>
<td>2.6 lb.</td>
</tr>
</tbody>
</table>
FLI Range of Scientific Grade Cameras

The FLI MaxCam, IMG and top-of-the-range ProLine cameras are designed to use several types of CCDs that include: Full frame front-illuminated, full frame back-illuminated, and interline sensors. (Depending upon the sensor size and type, various sensor defect classifications are available.) Regardless of sensor used, every FLI camera delivers un-compromised performance.

The MaxCam imagers are small form-factor, cost effective imaging solutions that employ research grade sensors from Kodak and E2V. The IMG series utilize large array sensors (up to 16 mega-pixel) and state of the art electronics for low noise, high cooled operation. Back-Illuminated research grade sensors from SITE, E2V and Fairchild Imaging are available.

Front-illuminated and interline sensors from Kodak are available. ProLine epitomises FLI’s commitment to provide state-of-the-art imagers that incorporate various high quality sensors including CCDs from Fairchild. Fairchild Imaging CCD sensors are on board the NASA Cassini mission to explore Saturn as well as the Huygens mission which has landed on Saturn's largest moon, Titan. Fairchild back-illuminated CCD sensors were used on the NASA Deep Impact Mission to discover the composition of the comet, Tempel 1.

CCD Sensors and Coatings

Monochrome sensors are generally employed due to their wide spectral range (200nm-1100nm) and high quantum efficiencies (up to 93%). High quality color images can be obtained in conjunction with the FLI’s filter wheels and digital focusers. FLI also employs ‘single shot’ monochrome and color sensors up to 40 megapixels. Sensor coatings to enhance the CCD’s performance are available Options include Ultra-violet (UVAR), narrowband, multi-band and broadband coatings. Quantum Efficiency can rise dramatically to 93% under certain wavelengths to reveal additional detail and reduce exposure times resulting to images of exceptional quality.

Sensor Cooling

All FLI cameras incorporate fan-assisted 2 and 3 stage TEC cooling that reduces the temperature of the sensor up to 50°C (MaxCam) 60°C (IMG) and 60°C (TBC) ProLine below ambient. In general noise halves of every 6°C drop in temperature.

While water-cooling is available on all cameras as standard, it is generally not required to reach the desired operating temperatures. Due to the camera’s solid design and use of advanced thermal transfer compounds and implementation techniques, the cameras do not suffer from ‘thermal runaway’ nor require special cooling techniques or precautionary measures. At the same time FLI is constantly searching for improvements in materials and thermal interfaces.
FLI Range of Accessories

FLI provides a universal range of high quality accessories especially designed for modern CCD astronomy. These include the renowned FLI Digital Focusers and Filter Wheels, a range of research grade filters as well as adaptors to allow the use of FLI products with various optical instruments. Please contact us for more information or visit our website at [www.opticstar.com](http://www.opticstar.com).

The FLI PDF is a state-of-the-art digital focuser with temperature compensated focusing. It has an 85mm aperture.

The FLI DF-2 is a high quality digital focuser with a 50mm aperture specifically designed for modern CCD astronomy.

The FLI Color Filter Wheel (CFW-1) has 5 x 50mm filter positions. Also available with LRGB or UBVRI filters installed.

The FLI Color Filter Wheel (CFW-2) has 8 x 28mm filter positions. Also available with LRGB or UBVRI filters installed.

The FLI Color Filter Wheel (CFW-7) has 7 x 50mm filter positions. Also available with LRGB or UBVRI filters installed.

The FLI Color Filter Wheel (CFW-2) has 20x28mm filter positions. Also available with LRGB or UBVRI filters installed.

FLI research grade filters are available in 28mm LRGB, 28mm UBVRI, 50mm LRGB and 50mm UBVRI.

FLI manufactures and provides an extensive range of high quality adapters and accessories.

Please visit the Finger lakes Instrumentation website for more information on these and other products. [www.opticstar.com](http://www.opticstar.com)
Third Party Software
A number of third party software is available that allows you to control the functions of your camera, filter wheel and digital focuser, as well as process images captured with your camera system.

Such software include Astroart from MSB software that has a multi-lingual interface, MaximDL from Diffraction Ltd and CCDSoft from Software Bisque.

Before acquiring one of these or any other software to control your camera and accessories you are strongly advised to check with the software vendor that your camera and accessories are supported.

Cameras, accessories and versions of the software are always been released and may differ in functionality than previous versions of the same software.

You can obtain information on these software by visiting the following websites.

MSB Software: www.msb-astroart.com
Diffraction Ltd: www.cyanogen.com
Software Bisque: www.bisque.com

Art packages including Adobe Photoshop and Paint Shop from Corel can be used to manipulate and enhance your images. Such software vary considerably in functionality and price. You will need to decide for yourself which one will best fulfil your requirements.

Adobe: www.adobe.com
Corel: www.corel.com

If you are interested on research grade astronomical analysis software Mirametrics offers a suite of such software under the MIRA label. Please visit www.opticstar.com for more information and to ascertain whether this software can fulfil your requirements.
## Contact Details

<table>
<thead>
<tr>
<th>UK Mail:</th>
<th>WWW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opticstar Ltd</td>
<td>Web:  <a href="http://www.opticstar.com">www.opticstar.com</a></td>
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<td>Email: <a href="mailto:info@opticstar.com">info@opticstar.com</a></td>
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<td>Sale, Cheshire M33 3BR</td>
<td>Phone: +44(0)161 969 9008</td>
</tr>
<tr>
<td>United Kingdom</td>
<td></td>
</tr>
</tbody>
</table>