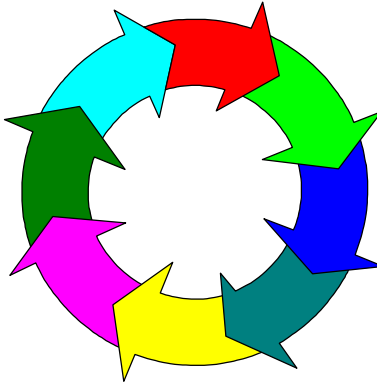


Serial No. _____

OPERATING INSTRUCTIONS
FOR

**TYPE CFW-1
COLOR FILTER WHEEL**



FINGER LAKES INSTRUMENTATION, LLC

DANSVILLE, New York

U. S. A.

Color Filter Wheel

Instruction Manual

Introduction

The CFW-1 Color Filter Wheel is the perfect compliment to the IMG series cameras, and is designed to slip over the standard camera nosepiece. This allows the filter wheel to add only .54" to the optical path, far less than most other designs. It accepts up to five filters, either unmounted 2" filters, or mounted 49mm photographic filters. Please read all instructions before proceeding with installation.

Installation

Install the control unit on an available serial port, COM1-COM4. The color filter wheel attaches via its cable to the RJ style jack on the opposite end of the control unit. Plug the DC power connector from the wall supply into the circular jack on the side of the control unit, and plug the wall supply into a suitable 120VAC outlet.

Copy the control program (FLIfilter.exe) and its associated dll file (FLI.dll) from the supplied disk into any convenient directory.

Run FLIfilter.exe. When prompted, enter the COM port that the control unit is attached to. This selection will only appear the first time the software is run and the registry entries are created. The filter wheel control window will now appear on screen.

Verify operation and filter location as described below before mounting the unit on the camera and telescope.

The color filter wheel fits over the camera nosepiece, and is secured with two set screws located on the outer edge. Use a 5/64" hex key wrench to gently tighten them. The unit can be rotated to any desired position to avoid interference with telescope controls. The opposite side is fitted with a standard 2"-24 thread and can be mounted directly to compatible systems, or fitted with the FLI 2" adapter tube. Note that adapters threading into the CFW-1 must be limited to a depth of less than 0.125" with a shoulder or lock ring.

Operation

The first time the filter wheel is operated, it will rotate until the home position is located (#0). It will then continue on to the selected filter. After that, the software will keep track of the wheel position and go directly to the selected filter. Any time you wish to reestablish the home position, click on the home button and the process will be repeated. If the wheel is already home, it will rotate away, then back, to insure correct positioning.

The five filter positions are identified as #0 to #4. The normal RGB filter positions as installed by FLI are: #0=empty, #1=clear, #2=red, #3=green, #4=blue. For CMY sets it would be #0=empty, #1=clear, #2=cyan, #3=magenta, #4=yellow.

For maximum protection of the filters, set the wheel to the home position (if empty) before transportation or storage.

The on-screen filter selection buttons default to the corresponding filter numbers, however you can easily rename them. Simply right-click on the button to bring up the renaming window and apply the moniker of your choice.

Other wheels with different size holes and different hole patterns will be available on special order. Note that 2" filters are mounted slightly offset from the optical axis. This is normal and allows for the very compact size of the CFW-1

Installation and Removal of Filters

The color filter wheel must be removed from the telescope system. Work on a clean flat surface. Use a 5/64" hex key wrench to remove the 9 flat headed socket screws securing the cover. Set the cover aside. Remove and set aside the white nylon washer at the center of the wheel. Each filter is held in place with a plastic retainer band, two washers, and two button head socket screws. The button head screws require a .050" hex key wrench. Installation and removal is obvious and straightforward, however care should be taken not to let the plastic band spring suddenly, scratching the filter surface. If doing this for the first time, practice installing and removing the plastic strip with no filters in place before trying it with expensive coated filters! Remove and install one filter at a time. It is not necessary to remove the wheel itself from the unit, and care should be taken not to damage the exposed teeth.

Filters of different thickness may be installed, however different width plastic bands may be required, and very thick filters will not have enough clearance for the retaining screws. These filters must be secured with an adhesive on the edges- contact FLI for assistance and suitable materials.

When service is complete, replace the white nylon washer and resecure the cover with the 9 screws. Do not over tighten the screws!

Cautions & Notes

1. The external power supply is rated at 12VDC/1A. The connector is a standard DC power connector of 2.1 mmx5.5 mm, with positive polarity on the center pin. It is unregulated, with a no load voltage of 17VDC, dropping to about 12VDC under full load. Damage caused by using any power supply other than the supplied unit, or one outside the above specs, will not be covered under warranty.
2. The color filter wheel is designed for use with late model FLI IMG series cameras having a retaining groove around the perimeter of the nosepiece. If used with earlier cameras, the nosepiece should be drilled very slightly at the screw contact points to eliminate any possibility of the camera coming loose. ALWAYS USE A CAMERA SAFETY STRAP REGARDLESS OF THE MOUNTING METHOD EMPLOYED!
3. Use a standard short arm hex key wrench to remove the cover. The longer style with handles tends to wind up then suddenly snap free.
4. If you desire to change the communication settings, right-click the program title bar to bring up the appropriate menu.
5. Note that the PC communication port may have to be set to 1200 baud manually via the Windows control panel.
6. Use caution when dismounting a cold filter wheel assembly, as condensation may form on the filters.
7. A second home operation involves a reversal of the wheel, thus generates more vibration than other filter changes. This is normal and not cause for concern.
8. It is OK to rotate the wheel manually if desired. Note that motor power is removed after a filter change, and the wheel will rotate with minimal effort.

Specifications (typical)

Major diameter	6.500"	165 mm
Radius of small end	1.000"	25.4 mm
Longest dimension	7.990"	203 mm
Body thickness (w/o motor)	.810"	20.6 mm
Camera coupling pocket dia.	2.930"	74.42 mm
Telescope coupling	2.005" -24UNS-2B thread	
Path increase (IMG series cameras)	.540"	13.7 mm
Weight (with RGBC filters, w/o tube)	1.72 lb.	780 g
Filter positions (standard wheel)	5	5
Maximum filter diameter	2.000"	50.8 mm
Maximum filter thickness (glued)	.250"	6.35 mm
Maximum filter thickness (retainer screws)	.175"	4.45 mm
Filter offset from optical axis	.145"	3.68 mm
Rotational speed	.3 RPS (.65 seconds between adjacent filters)	
Direction (viewed from 'scope/cover)	CCW (software dependent)	
Motor	stepper, 12V, 24Ω/coil, 75mH/coil @ 120 Hz	
Power supply	12V, 1A, unregulated	
Power connector	2.1 mm x 5.5 mm standard DC power plug/jack	
Polarity	center pin positive	
Interface	proprietary RS-232 dongle & software	
Interface cable	20'	6m
Operating environment	semi-protected observatory conditions	

Wiring

This information is provided for installations where the user provides a suitable stepper motor controller and the FLI interface is not used. Note that to prevent ground loops there is no chassis connection, as this will be provided by physical connection to the camera. Provide a separate chassis ground connection if the CFW-1 is used in other applications.

Pin	Color	Function
1	violet	motor winding A(1)
2	white	motor winding A(2)
3	orange	motor winding B(1)
4	black	motor winding B(2)
5	red	+5VDC to Hall effect sensor
6	green	signal from Hall effect sensor (OC, use 5 kΩ pullup), home=low
7	yellow	ground return for Hall effect sensor
8	blue	n/c
9	brown	n/c
10	gray	n/c

Service & Adjustment

The CFW-1 requires almost no periodic maintenance. Its moving parts are self-lubricating, and no other oils or lubricants should ever be applied. The covers can be wiped off with a damp cloth to remove dust and dirt, and the internal components can be dusted with filtered low-pressure air or “canned air”.

Adjustment is rarely necessary, but instructions are given here in the event that a different wheel is installed or the filter mass changes greatly.

The internal wheel is timed to the motor step positions for best centering of the filters and correct home position sensing. If the wheel is to be removed, mark both the wheel and drive sprocket tooth positions so it can be replaced in the same orientation. If the orientation is lost, or for a replacement wheel, check the home operation. The wheel should stop with the filter centered in the aperture (ignoring the radial offset). If home is clicked again, the wheel should move several positions away, then back. Failure to center, or moving less than several positions indicates a need for adjustment.

During this process, remember that it is the stepper motor that determines the discrete locations where the wheel is permitted to stop, not the home sensor. The home sensor simply tells the interface that a certain point has been reached. Normal adjustment of the home sensor is such that the small circuit board points directly at the center of the wheel, or just a few degrees towards the aperture. It is secured by a single screw.

The chain is fitted to the larger wheel, then placed over the drive sprocket before the wheel is gently slipped onto the pivot. Since there are 48 motor steps vs. 30 teeth on the drive wheel, the wheel will be in a slightly different relationship to the motor for 5 tooth positions. After that, the pattern repeats. If the centering and home function aren't accurate, change the chain position by one tooth on the drive sprocket and retest. Satisfactory operation should occur within 5 adjustments- there is no need to test beyond that. If centering is satisfactory but the home operation isn't consistent, change the sensor position slightly and retest.

The adjustment process is neither fussy nor difficult. If satisfactory operation can't be obtained in a few minutes, it may indicate some other problem. Contact FLI at the engineering number below for assistance.

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