FLI
Finger Lakes Instrumentation

Engineering Excellence
Because Your Image Depends On It

Signa Series Customizable Filter Wheels

User's Guide

WELCOME

Thank you for purchasing an FLI Signa 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 FLI Signa Filter Wheels. Please read it and follow the procedures to ensure trouble-free installation of your hardware. For information on other FLI Products or to discuss your Signa filter wheel, please contact:

sales@flicamera.com

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

CONTACT INFORMATION

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PRODUCT SAFETY

⚠ This FLI Signa Series Filter Wheel is shipped with a 24V DC power supply. Do not use any other power supply with this FLI Signa Series Filter Wheel, or use the power supply in a way other than described in this guide. Doing so may cause damage to the Signa Series Filter Wheel that will not be covered under the warranty.

⚠ If you are concerned about lightning strikes in the area you use your Signa Series Filter Wheel, you may want to take safety precautions as electrical surges can damage electrical equipment. We recommend that when your Signa Series Filter Wheel is not in use that you unplug the Signa Series Filter Wheel from power and any RS-232 cables.

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Signa Filter Wheel Overview

Signa Filter Wheels use high quality stepper motors to provide precision movement and optimal speed. Filter exchange rates as low as 66 milliseconds are possible.

All of the drive and control electronics facilitating the functionality of the Signa models are contained within the filter wheel housing. This convenient solution eliminates the need for an external controller and the associated wiring hassles. It is possible to operate multiple filter wheels through the same serial port by connecting them with RS-232 cables in a linear series, or daisy-chain. Simply connect a computer to the input port and a second wheel to the output port to achieve functionality equivalent to a two-wheel system driven by a central control unit. Up to three filter wheels can be operated from the same serial port in this way.

SIGNA FILTER WHEEL SPECIFICATIONS

	625	632	1025	1032
Voltage	24V DC			
Power	36 W			
PC Connection	RS-232			
Filter Diameter	25±0.4 mm	32±0.4 mm	25±0.4 mm	32±0.4 mm
Adjacent Filter Transition	68 ms	66 ms	92 ms	92 ms
Number of filters	6		10	
Filter Thickness	1 mm to 5 mm			

RS-232 SETTINGS

Baud	9600
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	None

HIGH SPEED FILTER WHEEL CONNECTIONS

Connecting a Signa Series to a Computer
Signa 6xx and 10xx

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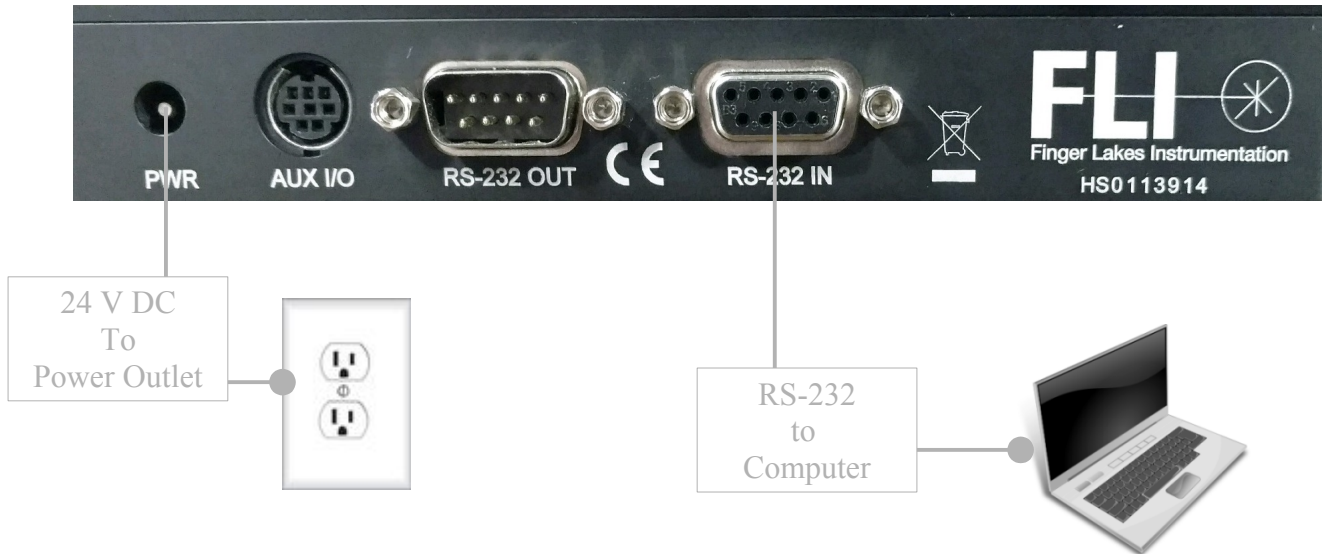
INSTALLING FILTERS FOR SIGNA 6XX AND 10XX

1. Remove power from the Signa Filter Wheel and remove the Signa Filter Wheel's RS-232 cable from the computer.

2. Carefully remove the Signa Filter Wheels filter port cover from the housing.

3. Rotate the internal filter wheel to the position of the filter pocket to be populated.

   Note: On the Signa 1025 and 1032, the filter pocket index is visible through the slot above the filter port.

Signa 10xx
Filter Pocket Index

Signa 10xx
Filter Port
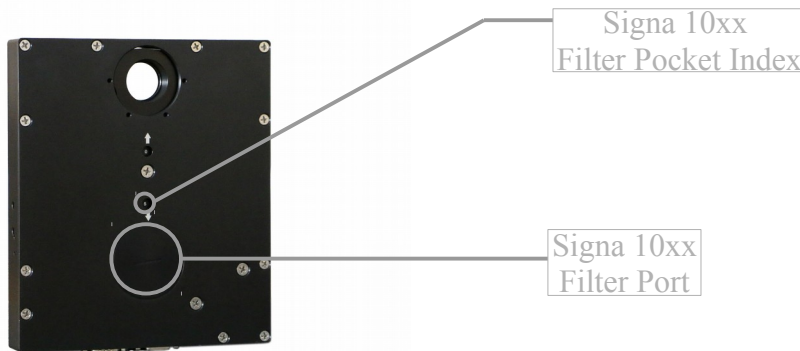
Note: On the Signa-625 model, the filter pocket index is visible through the filter port.

Signa 6xx Filter Port

Signa 625   Signa 632

Signa Series 6xx & 10xx
                                                                                           June 2018
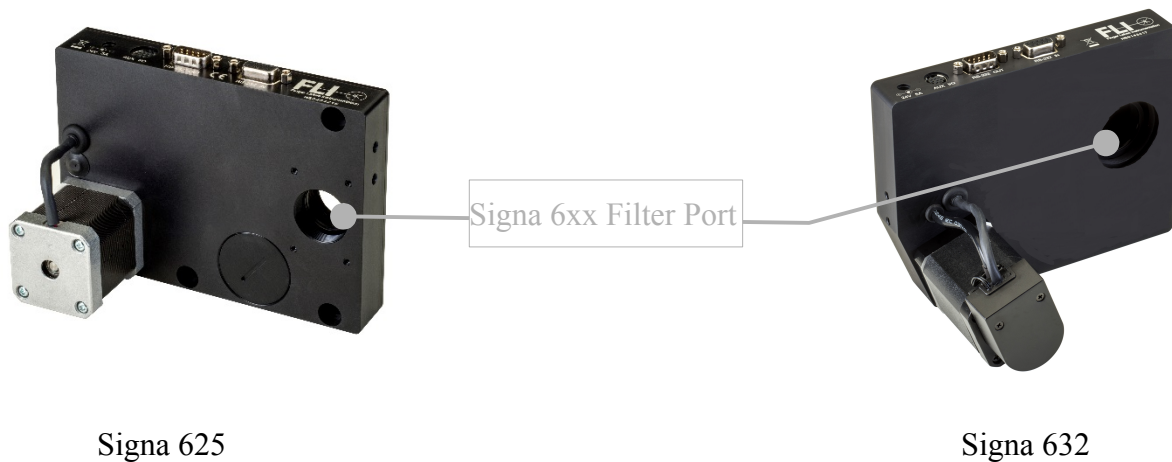
4. Remove the retainer ring from the filter pocket.

5. Place a circular filter into the filter pocket.

6. Replace the retainer ring, make sure not to over tighten the retainer ring.

7. Repeat steps 3 through 6 to install filters in remaining pockets.

8. Replace the filter replacement port cover and screw in housing.

CUSTOM OPTIONS (NRE MAY APPLY)

1. Number of filter pockets

2. Size of filters

3. Shape and size of housing

4. Communication interface

5. Filter exchange rate

6. Firmware

7. Mounting Features

8. Tell us what you would like your filter wheel to do. Our engineers can modify an existing filter wheel or design a completely new product to meet your requirements.

COMMANDS

Get Device Status

Byte 1: 0xCC							
7	6	5	4	3	2	1	0
1	1	0	0	1	1	0	0

Response: The device responds with the received command (CC hexadecimal) immediately and requests configuration information from a daisy chained device.

Byte 0-10										
0	1	2	3	4	5	6	7	8	9	10
0xCC	WAST	WBST	-	WCST	SAST	SBST	SAMOD	-	SBMOD	0x0D

Byte 0: 0xCC								
Bit	7	6	5	4	3	2	1	0
Name	1	1	0	0	1	1	0	0

Byte 1: WAST (Device A Speed and Position)								
Bit	7	6	5	4	3	2	1	0	
Name	0	SPD2	SPD1	SPD0	POS3	POS2	POS1	POS0	
Filter Change Speed				Filter Position (0-9)				
000 (0) Speed = 0				0000 (0) Position = 0				
001 (1) Speed = 1				0001 (1) Position = 1				
010 (2) Speed = 2				0010 (2) Position = 2				
011 (3) Speed = 3				0011 (3) Position = 3				
100 (4) Speed = 4				0100 (4) Position = 4				
101 (5) Speed = 5				0101 (5) Position = 5				
110 (6) Speed = 6				0110 (6) Position = 6				
111 (7) Speed = 7				0111 (7) Position = 7				
				1000 (8) Position = 8				
				1001 (9) Position = 9				

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Byte 2: WBST (Device B Speed and Position) – Daisy chaining								
Bit	7	6	5	4	3	2	1	0
Name	1	SPD2	SPD1	SPD0	POS3	POS2	POS1	POS0
	Filter Change Speed				Filter Position (0-9)			
	000 (0) Speed = 0				0000 (0) Position = 0			
	001 (1) Speed = 1				0001 (1) Position = 1			
	010 (2) Speed = 2				0010 (2) Position = 2			
	011 (3) Speed = 3				0011 (3) Position = 3			
	100 (4) Speed = 4				0100 (4) Position = 4			
	101 (5) Speed = 5				0101 (5) Position = 5			
	110 (6) Speed = 6				0110 (6) Position = 6			
	111 (7) Speed = 7				0111 (7) Position = 7			
					1000 (8) Position = 8			
					1001 (9) Position = 9			

Byte 4: WCST (Device C Speed and Position) – Daisy chaining								
Bit	7	6	5	4	3	2	1	0
Name	1	SPD2	SPD1	SPD0	POS3	POS2	POS1	POS0
	Filter Change Speed				Filter Position (0-9)			
	000 (0) Speed = 0				0000 (0) Position = 0			
	001 (1) Speed = 1				0001 (1) Position = 1			
	010 (2) Speed = 2				0010 (2) Position = 2			
	011 (3) Speed = 3				0011 (3) Position = 3			
	100 (4) Speed = 4				0100 (4) Position = 4			
	101 (5) Speed = 5				0101 (5) Position = 5			
	110 (6) Speed = 6				0110 (6) Position = 6			
	111 (7) Speed = 7				0111 (7) Position = 7			
					1000 (8) Position = 8			
					1001 (9) Position = 9			

Byte 5: SAST (Shutter A State)								
Bit	7	6	5	4	3	2	1	0
Name	1	0	1	0	1	SHST2	SHST1	SHST0
						Shutter State		
						010 (1) Open		
						011 (2) Open on ext. trigger		
						100 (3) Closed		

Byte 6: SBST (Shutter B State)								
Bit	7	6	5	4	3	2	1	0
Name	1	0	1	1	1	SHST2	SHST1	SHST0

Shutter State
010 (1) Open
011 (2) Open on ext. trigger
100 (3) Closed

Byte 7: SAMOD (Shutter A Mode)								
Bit	7	6	5	4	3	2	1	0
Name	1	1	0	1	1	SHMOD2	SHMOD1	SHMOD0

Byte 9: SBMOD (Shutter B Mode)								
Bit	7	6	5	4	3	2	1	0
Name	1	1	0	1	1	SHMOD2	SHMOD1	SHMOD0

Shutter Mode
011 (3) Not Connected
100 (4) Normal Operation

Shutter Mode
011 (3) Not Connected
100 (4) Normal Operation

Get Device Configuration

Byte 1: 0xFD								
7	6	5	4	3	2	1	0	
1	1	1	1	1	1	0	1	

Response: When requesting the device configuration, the device responds with the received command (FD hexadecimal) immediately and requests configuration information from a daisy-chained device.

Bytes 0-4						
0	1	2	3	4		
0xFD	'1'		'0'		'-'	'3'

Bytes 5-9					
5	6	7	8	9	
'W'	'A'	':'	WHLACFG		

Device A Configuration
'NC' Not Connected
'ER' Error
'25' 25 mm
'32' 32 mm

Bytes 10-14 – Daisy chaining				
10	11	12	13	14
'W'	'B'	':'	WHLBCFG	

Bytes 15-19 – Daisy chaining				
15	16	17	18	19
'W'	'C'	':'	WHLCCFG	

Device B Configuration
'NC' Not Connected
'ER' Error
'25' 25 mm
'32' 32 mm

Device C Configuration
'NC' Not Connected
'ER' Error
'25' 25 mm
'32' 32 mm

Bytes 20-24				
20	21	22	23	24
'S'	'A'	':'	SHATYP	

Shutter A Type
'VS' Vincent Shutter

Bytes 25-29				
25	26	27	28	29
'S'	'B'	':'	SHBTYP	

Shutter B Type
'VS' Vincent Shutter

Byte 30
30
FRM
Firmware Revision

Set Filter Position

Byte 1: 0xFC – Daisy chaining							
7	6	5	4	3	2	1	0
1	1	1	1	1	1	0	0

Note: Byte 1 only present for Device C configuration, omitted if Device A or B selected.

Byte 2							
Bit	7	6	5	4	3	2	1	0
Name	WHL	SPD2	SPD1	SPD0	POS3	POS2	POS1	POS0
Filter Change Speed				Filter Position (0-9)			
000 (0) Speed = 0				0000 (0) Position = 0			
001 (1) Speed = 1				0001 (1) Position = 1			
010 (2) Speed = 2				0010 (2) Position = 2			
011 (3) Speed = 3				0011 (3) Position = 3			
100 (4) Speed = 4				0100 (4) Position = 4			
101 (5) Speed = 5				0101 (5) Position = 5			
110 (6) Speed = 6				0110 (6) Position = 6			
111 (7) Speed = 7				0111 (7) Position = 7			
				1000 (8) Position = 8			
				1001 (9) Position = 9			

WHL: 0: Command for directly connected device 1: Command for daisy chained device
Response: Byte 1: Command byte as received, returned immediately.
                        Byte 2: 0x0D after task completion.

Reset

Byte 1: 0xFB								
7	6	5	4	3	2	1	0	
1	1	1	1	1	0	1	1	

Response: 0x0D

Examples

Binary	Hexadecimal	Decimal	Functionality
00000000	00	0	Filter carriages move to position '0'at maximum speed
00110100	34	52	Filter carriages move to position '4' at speed 3
11111100	FC	252	Wheel C moves to position '0' at maximum speed
	00	0	
00110110	36	54	Wheel A moves to position '6' at speed 3
10101010	AA	170	Shutter A opens
10101100	AC	172	Shutter A closes
10111010	BC	186	Shutter B opens

APPENDIX A – 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 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 BYLAW.

➢ 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 B – 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 you 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.

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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.