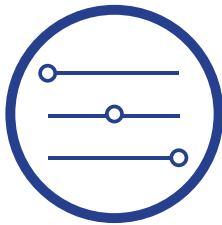


Includes FREE Computational Imaging Software (SDK)



**LSS-2404**  
Light Sequencing Switch



## Product Introduction

A low-cost programmable switch that synchronizes variable lighting and camera exposures to manage multi-shot image capture sequences for Computational Imaging.

## Key Features

- Achieve multiple computational imaging techniques
- Easily trigger camera and variable lighting or optics at the same time
- Flexible trigger input & output to fit every machine (3.3-24V trigger input, switched ground; 5V,12V,24V selectable trigger output)
- Fully programmable with multiple recipe storage
- Flexible lighting options with external Ethernet control
- 4 channels for multiple lights or segments
- Open architecture, works with most imaging software

## Benefits

- Better images that were previously impossible to achieve
- Shorter development time
- No more iterative attempts to perfect optics and lighting
- No more post processing to enhance images in software
- Directly outputs the image your vision algorithm needs
- More reliable MV solutions

## Computational Imaging

### Basic Principles of CI

- Computation inherent in the image formation process
- Combines special lighting and/or optics along with image processing during image capture
- Typically involves a sequence of images with different illumination for each frame
- Covers a wide variety of techniques, all designed to output better images for your specific application
- Ends with the image acquisition process



Computational  
Imaging

### Typical Computational Imaging Functions

- **Photometric Stereo** — Generate edge and texture images using shape from shading
- **Ultra Resolution Color**— Create higher resolution color images with no interpolation artifacts
- **Bright Field + Dark Field** — Combine the advantages of two well-known lighting techniques
- **HDR** — Create images with higher contrast ratios
- **Extended Depth of Field** — Improve depth of field without losing light or reducing magnification
- **Multi Spectral** — Enhance images with maximum contrast from multiple spectral bands
- **360° object capture** — Panoramic imaging with singly triggered, multiple scene acquisition

GET THE  
IMAGE YOU  
NEED™

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### LSS-2404 SPECIFICATIONS

<b>Description</b>	The LSS-2404 Programmable Light Sequencing Switch is designed to switch external +24 VDC power for up to 4 channels of lights. Upon receiving an external system trigger, the LSS-2404 executes a preprogrammed sequence of lighting on the 4 output channels and outputs a correlated camera trigger, automatically timing external camera exposures to the programmed lighting sequence.	
<b>Lighting Channels</b>	4	
<b>Power Supply</b>	24 VDC nominal at 5A (minimum)	
<b>Input Voltage</b>	10.8 – 28.8 VDC (absolute range)	
<b>Power Consumption</b>	5W maximum; Excluding attached lighting and dependent on configuration	
<b>Trigger Input</b>	<b>Voltage mode:</b> Accepts 3.3 – 24 VDC logic level voltage with adjustable trigger level <b>Switched Ground Mode:</b> Supports opto-isolators or closed contacts via direct connection without external components	
<b>Trigger Threshold</b>	Software programmable 1 - 24 VDC trigger level in 100 mV increments Default = 9.6 V threshold to work with 12 V or 24 V trigger logic	
<b>Trigger Out (to camera)</b>	Selectable to 5 V, 12 V, or 24 V via software. Voltage level tolerance +/- 15%. Maximum limited to ~93% Vin	
<b>Trigger Functions</b>	Trigger Event – Selectable: Single trigger all, trigger individual sequences, or trigger every frame Trigger Delay – Selectable 2 μS to 65 sec trigger delay for synchronization with external processes Invert Function – Trigger I/O logic can be inverted by software	
<b>Power + Trigger Connections</b>	Pluggable screw terminal blocks with recessed connections. M3 set screw, 12 - 24 AWG Mating connector: Order DigiKey P/N ED2779-ND (Power), ED2781-ND (I/O)	
<b>Lighting</b>	Output connector: M12-5 female 4 lighting channels; switched ground (sinking) Pinout: Pin1 - +24 Vin Common Pin2 - CH1- Pin3 - CH2- Pin4 - CH3- Pin5 - CH4-	M12-5 Pin Assignment 
<b>Maximum Current Rating</b>	1 A/ch x 4-channels; 4 A maximum all channels	
<b>Channel Output Voltage</b>	Unregulated; >98% of supply voltage	
<b>Channel Output Mode</b>	Current sinking only	
<b>Communication Port</b>	RJ45 connector. 100BaseT Ethernet. TCP/IP protocol. Control via web-based GUI or TCP/IP command set.	
<b>Indicator Functions</b>	Power On Trigger Activity Ethernet – network connection Ethernet – network activity/fault	General Fault Thermal Fault (see manual)
<b>Firmware</b>	User upgradeable via Web-based GUI (included)	
<b>Sequence Timing</b>	User programmable via Web-based GUI (included) and TCP/IP command set Default: Photometric Stereo (PMS) 4 frame sequence 40 fps operation, 25 mS frame, 25 mS strobe width, 15 mS camera trigger	
<b>Timing Resolution</b>	Maximum Trigger rate: 10,000 fps (100 μS) Minimum output signal width: 100 μS Maximum delay trigger to start of first frame: 50 μS Timing resolution: 1 μS Channel skew + jitter: <= 10 μS	

LSS-2404 SPECIFICATIONS	
<b>User Parameters</b>	
- Frame Time	100 $\mu$ S - 2000 S; Time for each frame in a sequence
- Strobe Width	100 $\mu$ S - 2000 S; Independently selectable CH1 - CH4. Must be < frame time.
- Camera Trigger Width	100 $\mu$ S - 2000 S; Must be < frame time.
- Framing Mode	ON / OFF; Framing Mode adds reference frames, with all channels on, at the start and end of a sequence. (2 frames total) ON / OFF; Framing Mode adds reference frames, with all channels on, at the start and end of a sequence. (2 frames total)
- Trigger Type	Triggered One-shot (default), Triggered Continuous, Free-run (continuous non-triggered)
- Trigger Delay	2 $\mu$ S - 65 mS @ 1 $\mu$ S resolution or 2 mS - 16 sec @ 1mS resolution; (optional)
- Program Limits	<ul style="list-style-type: none"> <li>• 1 pre-programmed series</li> <li>• 10 sequences per series</li> <li>• 12 frames per sequence</li> <li>• 2 billion sequence repeats</li> <li>• 4 stored configurations in flash memory</li> <li>• Unlimited configurations (via disk files)</li> </ul>
Additional Software Features	<ul style="list-style-type: none"> <li>• Program configuration via web browser (Firefox version 56 or later recommended)</li> <li>• Firmware field upgradeable</li> </ul>
Operating Temperature Range	0 to 40 °C
Storage Temperature Range	-10 to 50 °C
Operating Humidity	10 to 80% Non-condensing
Cooling	Free air cooling
Package Type	DIN module 1.5X (representative image below)
Dimensions	1.4 x 4.0 x 4.7 inches / 35 x 101 x 119 mm L x W x D
Weight	4.8 oz. / 135 g



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