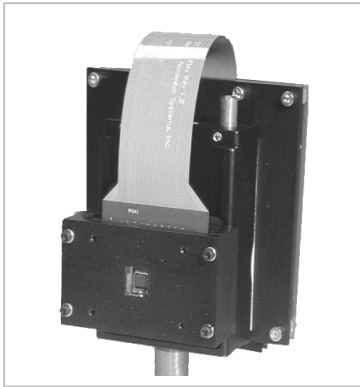




512x512 Multi-level/Analog Liquid Crystal Spatial Light Modulator



The 512x512 multi-level/analog Liquid Crystal Spatial Light Modulator (LC-SLM) is a very high frame rate device that can modulate light in pure amplitude, pure phase, or coupled amplitude and phase. To achieve the desired optical response the device can be filled with either a Ferroelectric Liquid Crystal (FLC) or a Nematic Liquid Crystal (NLC). The FLC is best used for applications requiring very fast modulation along the real-axis or for pure phase modulation of $\pi/2$ or less. The NLC is best used for pure phase modulation of 2π or for applications not requiring pure real-axis modulation. All of our devices are custom gapped to yield the maximum modulation response at the desired wavelength.

The standard 512x512 SLM has been tested to new-image frame rates of 1015-Hz using FLC with a refresh rate exceeding 6-kHz. An optional 2-kHz image rate device can also be purchased.

The drive electronics support frame rates of 1015-Hz, or 2-kHz with the high speed option, and can be interfaced to a multitude of data sources. The simplest is the computer PCI-bus interface for loading data from the computer memory or disk. The driver can also be interfaced to off-the-shelf image processing boards or to custom data drivers using a high-speed data port that supports the full 1015-Hz new-image frame rate.



Dragon - Image of a dragon on a FLC 512x512 analog SLM modulating along the positive real-axis.



Apollo 17 - Image from the Apollo 17 mission on a FLC 512x512 analog SLM modulating along the positive real-axis.



Escher - Escher drawing on a FLC 512x512 analog SLM modulating along the positive real-axis.

Device Specifications

15 μ m-Pitch SLM

Number of Pixels:	262,144 (512 x 512)
Array Size:	7.68-mm x 7.68-mm
Pixel Pitch:	15- μ m
Fill Factor:	83%
Zero-order Diffraction Efficiency:	65%
Contrast:	200:1 zero-order monochromatic light
Optical Flatness:	$\lambda/4$ or better
Optical Modulation:	FLC: variable polarization rotation NLC: variable retardation change
Full frame Loading:	164.16- μ s
Optical Response (10-90%):	FLC: \leq 450- μ s NLC: 1-20-ms rise, 2-30-ms fall Depends on phase stroke, wavelength, and temperature
Maximum Usable Frame Rate:	FLC: 1015-Hz NLC: 30-150-Hz, Depends on phase stroke, wavelength, and temperature
Electrical Addressing:	FLC: 8-bit DACs NLC: 7-bit DACs
Device Configuration:	Reflective
Driver Memory:	1024 frames of SDRAM
Driver Interfaces:	PCI-bus computer slot 128-bit high-speed data port loads full frame in 164.16- μ s Laser modulation signal Detector synchronization signal

LC-SLM Optical Head includes:

1	512F15- $\lambda\lambda\lambda\lambda$	512 x 512 x 15- μ m FLC-SLM at wavelength $\lambda\lambda\lambda\lambda$ nm or
1	512N15- $\lambda\lambda\lambda\lambda$	512 x 512 x 15- μ m NLC-SLM at wavelength $\lambda\lambda\lambda\lambda$ nm or
1	512SA-BO	Remote Op-Amp board to interface to LC-SLM
1	512SA-CF	Flex cable assembly to connect Op-Amp board to LC-SLM
1	512SA-HM	Anodized aluminum mount with integrated tip/tilt/rotation stage to hold Op-Amp board and LC-SLM, includes standard $\frac{1}{4}$ " post for easy interface to existing optical bench systems

LC-SLM Drive Kit includes:

1	512SA-BI	PCI-bus interface board
1	512SA-BD	External Driver board
1	512SA-CID	Cable from Interface board to Driver board
1	512SA-CP	Cable for Power from Interface board to Driver board
1	512SA-CDO	Cable from Driver board to Op-Amp board
1	512SA-S	Software executable and C source code
1	512SA-M	Manual for LC-SLM operation

Options:

- High-speed option for 2-kHz new-image rate (FLC only)
- Custom V-coated anti-reflection cover-glass (standard cover-glass uses a broad-band AR coating yielding < 1% average reflectivity for 450-850-nm or 850-1600-nm)
- Two driver boards can be synchronized to operate two SLMs
- Software for operating two SLM systems in an optical correlator configuration with a frame grabber, peak detection, and laser modulation
- Software modifications for application-specific implementations