# 1000 Series Camera

## Summary

**The 1000 Series** camera is a compact low temperature camera capable of accepting large scientific CCDs.

The 1000 Series system uses a thermo-electric cooler to optimize the performance of the CCD. Dark current is drastically reduced by cooling as low as -60°C, making the 1000 Series cameras ideal for low light level imaging.

The 1000 Series CCD camera system is a precision, multiport digital camera designed for use with large area scientific CCD arrays in demanding imaging applications. A 1000 Series system is an extremely compact camera head, measuring only 92 x 92 x 168 mm (3.6 x 3.6 x 6.6 inch).

## Key Features

- Compact 92 x 92 x 168 mm (3.6 x 3.6 x 6.6 inch) camera head
- Precision 16-bit digitization from 50kHz up to 1MHz pixel rates
- Low readout noise (<3 e- RMS) over a range of pixel readout rates achieved by correlated double sampling using dual-slope integration
- Low dark current by cooling as low as -60°C
- Accommodates variety of CCDs
- Window with various lens coupling systems and bonded fiber optic bundles available

## Example Applications

- Streak Tubes
- Film Digitization
- Microwell Plate Imaging for High Throughput Screening (HTS)
- X-Ray Detection
- Framing Camera
- Optical Astronomy
- Lab Animal Imaging
- In-Vivo Bioluminescence or Chemiluminescence

# 1000 Series

### ■ CCDs Supported

A variety of large area, multi-phase scientific grade CCDs can be used in the 1000 Series camera. Two, three, and four phase architecture CCDs from Fairchild Imaging, E2V, Kodak, and Atmel can be used.

### ■ Cooling of CCDs

The 1000 Series camera uses a thermoelectric cooling system to accurately control the temperature of the CCD. CCDs can be cooled to temperatures as low as -60°C to minimize dark current.

### ■ Readout Speed, Noise, Precision and Modes

The readout and digitization uses a 16 bit digitizer. The pixel readout rate can be varied from 50kHz to 1MHz. The gain of the analog processor can be modified under computer control to compensate for the gain change of the dual slope integrator at different readout speeds.

To maximize use of the digitizer's dynamic range, the image data offset of the CCD port is adjustable under computer control. The entire analog chain has been optimized to achieve the lowest possible noise, high image fidelity, and low sensitivity to EMI and other environmental conditions.

The 1000 Series system offers fully programmable readout of sub arrays and independent serial and parallel register binning. In addition, specialized readout modes, such as time delay and integration (TDI) using an internal or external time base are possible. These capabilities allow the readout of only the area of the CCD of interest at variable resolution in order to make optimum use of computer resources, to increase image frame rate, and to optimize image signal to noise ratio under low light conditions.

### ■ Size of Camera

The 1000 Series camera can be obtained as small as 92 x 92 mm (3.6 x 3.6 inch) square shape, approximately 168 mm (6.6 inches) in length. The electronics for the camera are housed in the camera head, with only the power supply and water chiller external to the camera head.

### ■ Computer Interface Hardware

The 1000 Series cameras use a Gigabit fiber optic connection to a proprietary direct DMA PCI interface card in the host computer. The camera control and imaging software is written in LabView and runs under any of the current Windows operating system versions. Multi-processor multi-thread environments are fully supported. A simple, intuitive graphical user interface is provided for acquisition, viewing processing and archiving images.

### ■ Software Interface

Spectral Instruments provides our own SI Image SGL camera control software that uses an intuitive graphical user interface for camera control, image acquisition, viewing, processing and archiving. In addition, a TCP/IP server is built into the software allowing another program on the same computer or from another computer to initiate image acquisition and transfer. SI Image SGL is written in LabVIEW and is provided as a Windows application. The LabVIEW source code is available as an option for users who need to extend its functionality or



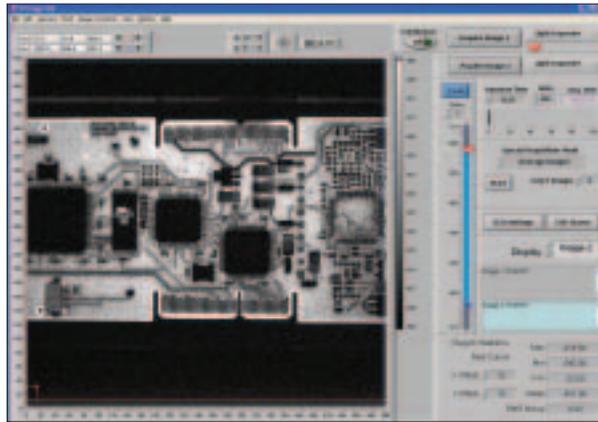*SI Image SGL is an Intuitive GUI for Camera Control*

incorporate controlling other instruments into a single program. While our current software runs on Windows 98, NT, 2000 and XP, Windows 2000 or XP are recommended for the current version and will be required for future versions.

### ■ Options Available

A variety of system options, such as CCD UV enhancement coatings, 1:1 fiber optic inputs, various lens mounts, UV windows and window AR coatings can be provided upon request.

A network appliance option allows for the camera to be operated remotely through TCP/IP with software application on the remote PC, or with a standard web browser. This allows multiple remote cameras to be operated from a single location.

An optional 28-volt input DC-DC converter, in addition to its standard AC to DC power supply, can be used to power the 1000 Series camera.