

# 800 Series Camera



## Summary

The **800 Series** CCD camera system is a precision, multiport digital camera designed for use with large area scientific CCD arrays in demanding imaging applications. A 800 Series system can be configured with one, two, or four analog processors/digitizers to accommodate CCDs with multiple output ports. Using multiple ports permits higher image frame rates in applications where the absolute low noise and high precision are necessary.

The 800 Series system uses a thermoelectric cooler to optimize the performance of the CCD. Dark current is drastically reduced by cooling to as low as  $-60^{\circ}\text{C}$ , making the 800 Series cameras ideal for low light level imaging.



## Key Features

- Simultaneous readout/digitization from 1, 2, or 4 CCD ports
- Precision 16-bit digitization at up to 1MHz pixel rates
- Very low readout noise ( $3\text{ e}^{-}$  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  $-60^{\circ}\text{C}$
- Accommodates wide variety of CCDs
- 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

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# 800 Series

## ■ **CCDs Supported**

A variety of large area, multi-phase scientific grade CCDs can be used in the 800 Series camera. Two, three, and four phase architecture CCDs from Fairchild Imaging, E2V, Kodak, and Atmel can be used.

## ■ **Cooling of CCDs**

The 800 Series camera uses a thermoelectric cooling system to accurately control the temperature of the CCD. Additionally, an integral vacuum sensor monitors the pressure within the CCD chamber. CCDs can be cooled to temperatures as low as  $-60^{\circ}\text{C}$  to minimize dark current.

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

The readout and digitization uses a separate analog processor for every port, followed by a 14 bit or 16 bit digitizer. The 14 bit digitizer allows pixel readout rates set from 1 to 5 MHz. Using the 16 bit digitizer, the pixel readout rate can be varied from 50 kHz to 1MHz. The 16 bit digitizer allows the gain of the analog processor to 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 each 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 800 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. Readout of any one or of multiple CCD ports is also dynamically selectable under computer control.

## ■ **Size of Camera**

The 800 Series camera are typically 125 mm (5 inches) in diameter, but can be obtained as small as 90 x 90 mm (3.5 x 3.5 inches) square shape, approximately 242 mm (9.5 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.

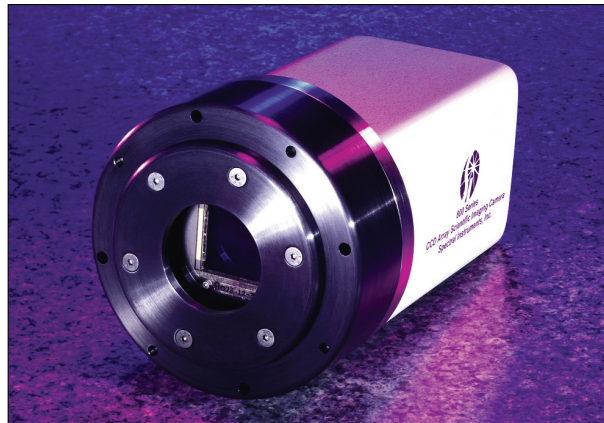
## ■ **Computer Interface Hardware**

Two computer interface options are available, ATA style parallel or fiber optic data connection. The ATA style parallel data interface works for distances up to 20 meters. The fiber optic data link can be used for longer distances. Both options connect the to a PCI bus interface card in a PC.

## ■ **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 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.



*800 Series Camera in Rugged Metal Housing*

## ■ **Options Available**

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

Analog processor/digitizer options include 5 MHz correlated double sampling with 14-bit precision.

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.