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600 Series Camera



Summary

The 600 Series CCD camera system is a precision, multiport digital camera designed for use with large area scientific CCD arrays in demanding imaging applications. A 600 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 lowest noise and highest precision is necessary.

The 600 Series system uses either a unique mechanical cryocooler or liquid nitrogen to optimize the performance of the CCD. Dark current is practically eliminated by cryocooling to below -100°C, making the 600 Series cameras ideal for very low light level imaging.

Key Features

- Simultaneous readout/digitization from 1, 2, or 4 CCD ports
- 16-bit digitization using ultra linear converters at 50kHz to 900kHz pixel rates
- Very low readout noise (<3 e- RMS) over a range of pixel readout rates achieved by correlated double sampling using dual-slope integration
- Near zero dark current by cryocooling to below -100°C
- Accommodates wide variety of CCDs
- Optional fiber optic input with 1:1 or taper reducer with up to 200mm input

Example Applications

- Microwell Plate Imaging for High Throughput Screening (HTS)
- X-Ray Crystallography
- X-Ray Nondestructive Testing (NDT)
- Laboratory Animal Imaging
- Electron Microscopy
- Contact Plate Measurement
- In-Vivo Bioluminescence and Chemiluminescence
- Optical Astronomy
- Film Digitization

Continued other side.

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600 Series

CCDs Supported

A variety of large area, multi-phase scientific grade CCDs can be used in the 600 Series camera. Two, three, and four phase architecture CCDs from Fairchild Imaging, E2V, Kodak, and Atmel can be used.

Cooling of CCDs

The 600 Series system can include a traditional liquid nitrogen dewar, or a unique mechanical cryogenic cooler. With both options, the CCD temperature will be computer controlled to a set point which may be adjusted by the user. Additionally, an integral vacuum sensor monitors the pressure within the CCD chamber. CCDs can be cooled to temperatures below -100°C to minimize dark current.

Readout Speed, Noise, Precision and Modes

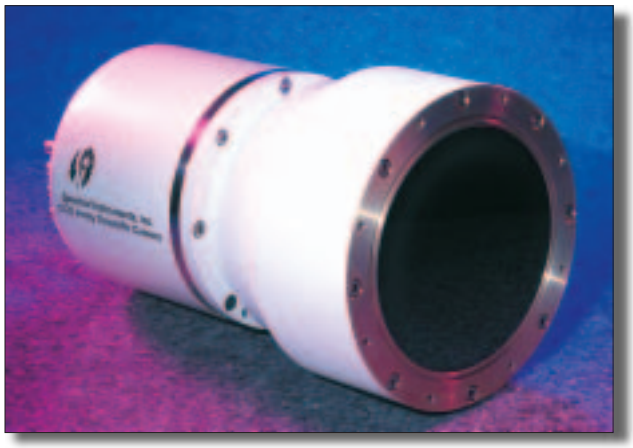
The readout and digitization uses a separate analog processor for every port, each using a dual slope integrator followed by an ultra linear 16 bit digitizer. The pixel readout rate can be varied from 50 kHz to 900 kHz.

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 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 600 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 600 Series camera head is a 178mm (7 inch) cylindrical shape, approximately 250mm (10 inches) in length. The electronics and power supply for the camera are housed in a standard 3U 19-inch rack mount chassis. The mechanical refrigeration unit is housed externally. Connecting lines and cables can be made in various lengths, depending on the application.



600 Series Camera with 165mm Fiber Optic Taper

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.

Options Available

The 600 Series cameras are available with fiber optic bundles bonded to the CCD, or a standard window to enclose the vacuum chamber. Lens mounts can be added to either design. A variety of options are available for the bonded fiber optic bundle. Available options including 1:1 fiber faceplates, a standard 2.7:1 165mm fiber taper, or up to 3.3:1 fiber taper with 200mm diameter input. Fibers can be bonded to CCDs up to 61.20 x 61.21 mm (4096 x 4097 array of 15 micron pixels). Other fiber bonding options are available on request.

600 Series cameras is available with UV enhancement coated or AR coated CCDs.

Custom designs are available.

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