

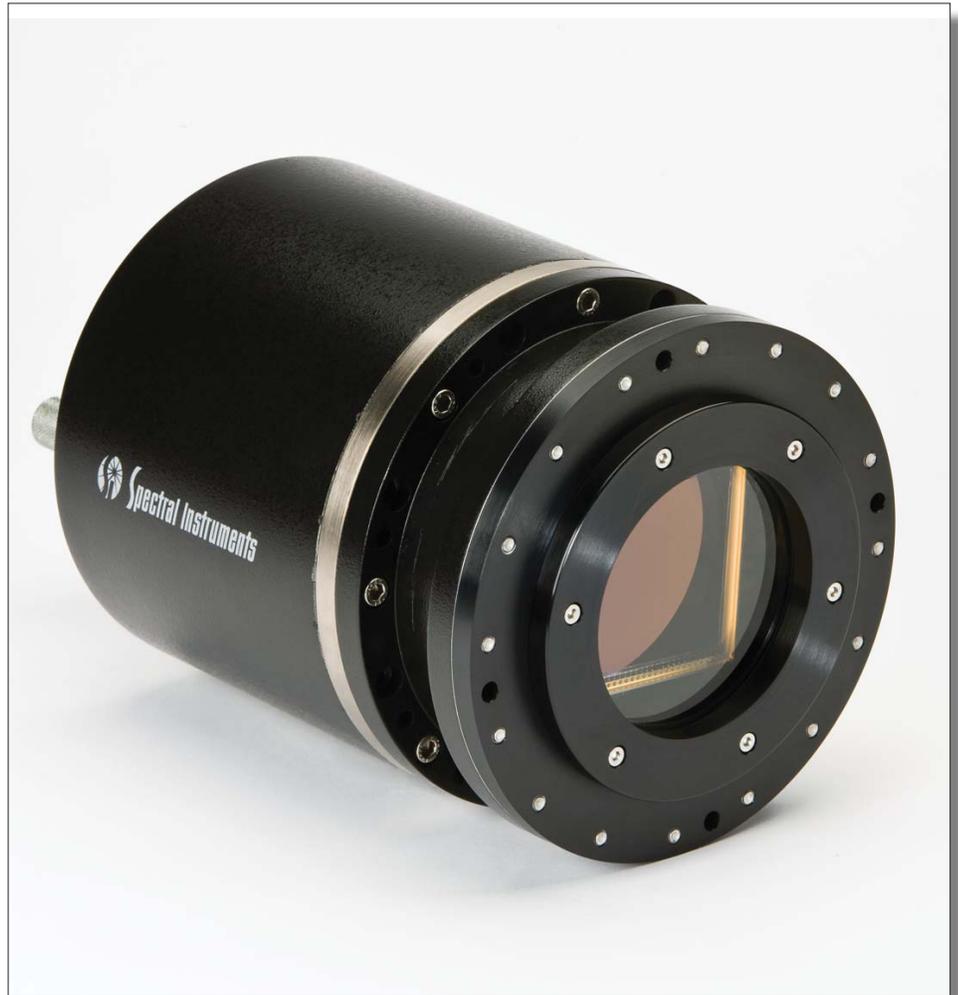
1100 Series Camera



Overview

The 1100 Series CCD camera system is a 16-bit, multi-port camera designed for use with large area scientific CCD arrays in demanding imaging applications. The 1100 series platform is designed to minimize noise for the lowest light level applications. At temperatures less than -100°C , the camera reaches readout noise levels lower than $3e^{-}$ RMS, while dark current is as low as $1 \times 10^{-4} e^{-}$ per pixel per second.

The 1100 Series cameras can accommodate CCDs with multiple readout ports to optimize imaging speeds. Extreme low noise performance and 16-bit analog sampling combined with simultaneous four port readout create a camera capable of performing in the most demanding imaging applications at the leading edge of scientific capability.



Key Features

- Simultaneous readout/digitization from 1, 2, or 4 CCD ports
- 16-bit digitization using multiple converters per port at low noise speeds of 50kHz to several MHz
- 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
- Available with a wide variety of CCDs
- Available with either mechanical cryo-cooling or thermoelectric Peltier cooler
- Optional fiber optic input with 1:1 or taper reducer with up to 200mm input
- Gigabit fiber optic, AIA cable, and Camera Link[®] are all available for computer communication

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

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1100 Series

CCDs Supported

A variety of large area, multi-phase scientific grade CCDs can be used in the 1100 Series camera. Two, three, and four phase architecture CCDs from E2V, Fairchild Imaging, and Kodak can be used.

Cooling of CCDs

The 1100 Series cameras are available cooled by a thermoelectric (TE) Peltier device or by a closed cycle refrigeration unit. With the refrigeration option, the CCD temperature is computer controlled to a user adjusted set point to temperatures below -100°C to minimize dark current. TE cooled cameras operate at somewhat warmer temperatures but require only water cooling from an external source. With either, the camera internal pressure is monitored continuously.

Readout Speed, Noise, Precision and Modes

The readout and digitization uses a separate analog processor for each port, each utilizing a dual slope integrator followed by an ultra linear 16 bit digitizer. This readout rate is user adjustable from 50kHz to several megahertz (depending on CCD).

User selectable CCD output gains are provided so that the typical image signal range is optimized to the 16-bit analog processor. To maximize the dynamic range of the digitizer, the bias offset for each port can be set by the user via a computer interface. The entire analog chain has been optimized to achieve the lowest possible noise, high image fidelity, linearity and low sensitivity to EMI and other environmental conditions.

The 1100 Series system offers fully programmable readout of sub arrays and independent serial and parallel register binning. In addition, specialized readout modes such as time delayed integration (TDI) using internal or external triggers are possible. These capabilities allow the readout of the region of interest (ROI) on the CCD at variable resolutions in order to optimize computer resources, image frame rate, and 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 1100 Series camera head contains all of the electronics for CCD sampling and A/D processing. The camera is a cylinder of 180mm (7 inches) diameter and 250mm (10 inches) in height. The power supply and cooler unit can be contained in their own housing many meters away from the device.

Computer Interface Hardware

Several options are available to interface the 1100 series camera to the computer controller. Parallel AIA, gigabit fiber optic, and Camera Link[®] interfaces can control the camera at distances from 20 meters (maximum of serial) to many kilometers if the fiber optic option is chosen. Proprietary PCI or PCI express cards are used for all interfaces except the Camera Link[®] which can use off the shelf hardware and software.

Software Interface

Spectral Instruments provides control software (SI Image SGL) utilizing an intuitive graphical user interface for camera control,



1100 Series Camera with a Fiber Optic bonded to the CCD

image acquisition, viewing, processing and archiving. All of the above functions can be remotely controlled and initiated from another program or computer due to the integration of TCP/IP protocols in the SI Image software. LabVIEW[®] is used to write the code for SI Image which is included as a stand-alone

Windows based application. Software developer kits (SDK) are available for those customers wishing to program their own software in LabVIEW[®] or C++. SI Image is compatible with Windows 2000 and XP.

Options Available

Spectral Instruments is in the business of delivering customized CCD camera solutions for the most demanding imaging applications. 1100 series cameras can be coupled to a variety of fiber optic bundles: 1:1 fiber faceplates, 2.7:1 with 165mm input, and 3.3:1 with 200mm input. Custom fiber bonding, lens mounts, and optical coatings for QE modification are all available upon request. Please contact us for details of any specification your application requires, we are a custom solution company.