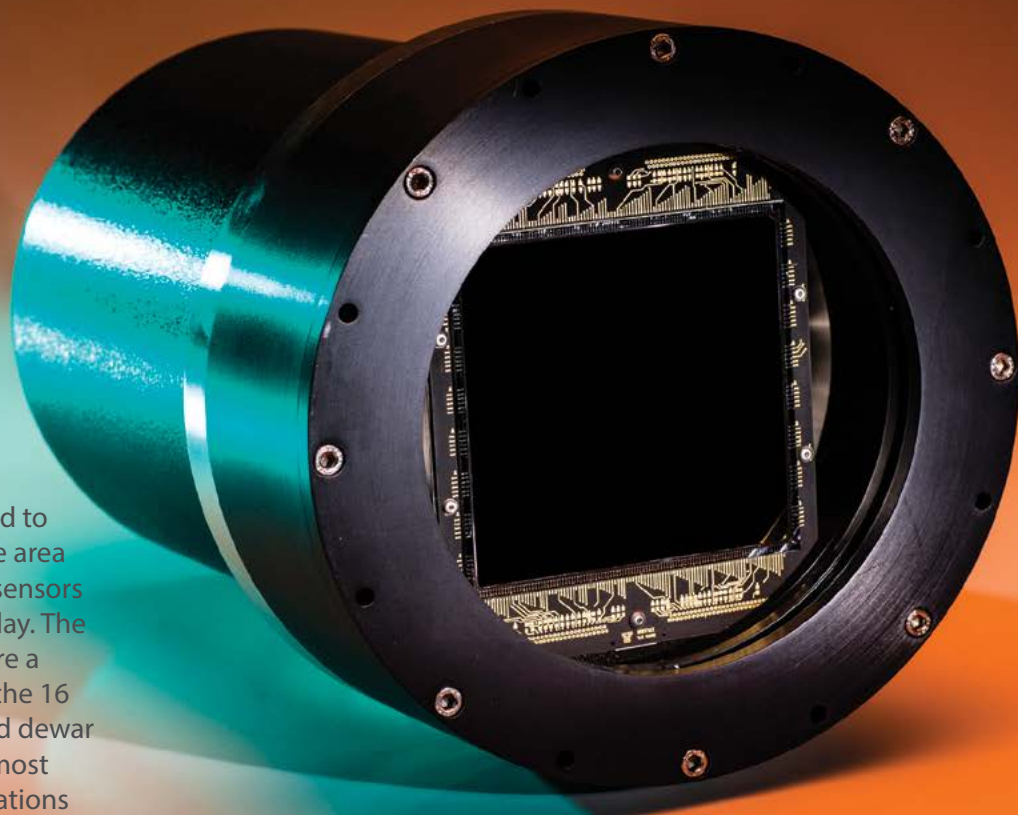


# 1110S CCD Camera

SI's 1110S camera is designed to accommodate the very large area multi-port single-chip CCD sensors coming onto the market today. The 100+ megapixel CCDs require a camera capable of utilizing the 16 output ports in a cryo cooled dewar so the requirements of the most demanding scientific applications can be exceeded. It provides device-limit performance in a very compact configuration.



## Features

- **Cooling:** The 1100 can cool CCDs below  $-100^{\circ}\text{C}$  by cryocooling and is available with thermoelectric cooling as well.
- **Multiple read speeds are available:** Common readout speeds start at 100kHz per port, and can achieve MHz speeds (per port) as well depending on the CCD selection.
- **Low read noise:** sub 5e-RMS noise performance. Low noise and high pixel full-well with 16-bit digitization provides large dynamic range performance.
- **Multi-port readout:** Up to 16 outputs are supported.
- **Sensors available:** The 1100 is designed to accommodate multi-port (>4 ports) CCD which includes the 10k x 10k 16-port  $9\mu\text{m}$  pixel sensor from STA and the 9k x 9k  $10\mu\text{m}$  pixel CCD from e2v.
- **Binned imaging:** Serial and parallel binding, for reduced area and high speed is provided.
- **Shutter:** The camera incorporates an internal flexible shutter drive that can be used with a variety of common shutters. Outputs are also available that can signal an external shutter driver.
- **Trigger:** Dual trigger inputs can be configured for a variety of operations, such as expose and read on trigger or shift line and read for externally paced TDI readout.
- **Fiber optic communication:** Fiber optic cable to a computer through a proprietary PCI or PCIe card is provided.
- **Software:** Included with every camera is our SI Image software suite for camera control, data manipulation and archiving. The native file format is FITS. C++ and LabView SDKs are available upon request.

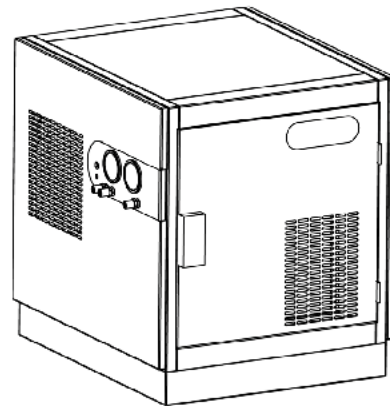
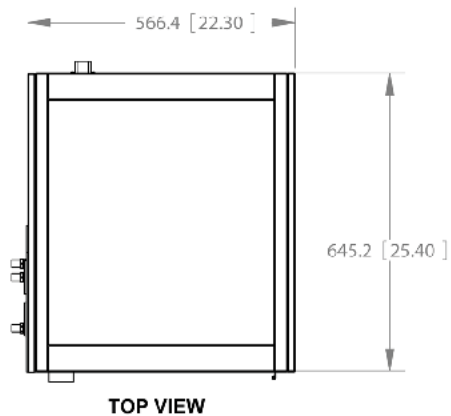
## Camera Details

Cryo cooling	One compressor housed in supplied cabinet with braided stainless steel lines running to camera head, up to 100'
Window details	Many AR coatings are available by custom order. Typical Broadband specs: <1% Reflectivity per surface, 450- 800nm
CCD to mounting surface	~20mm, depends on CCD and optio
Read speeds	Software selectable, customizable
Camera weight	About 25lbs, depending on options
Read ports	16 max, 8 minimum depending on CCD
Shutters	Camera can trigger a shutter controller

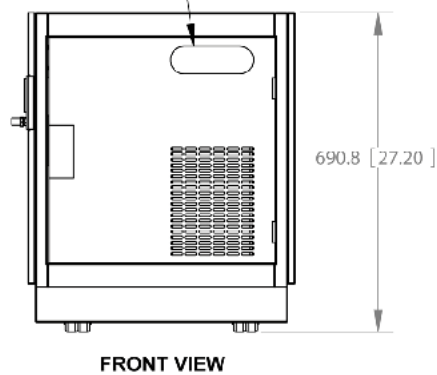


All camera specifications are subject to change. Contact SI for details on configuring a camera specific to your application.

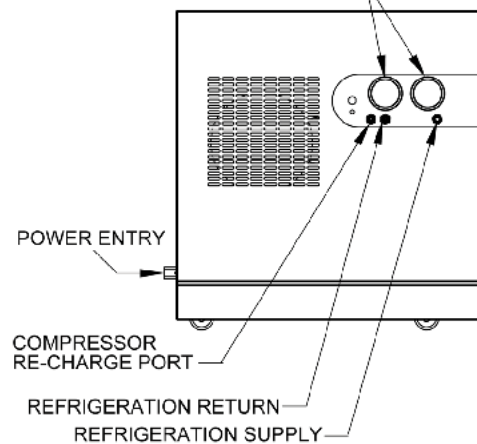
## Cabinet Details



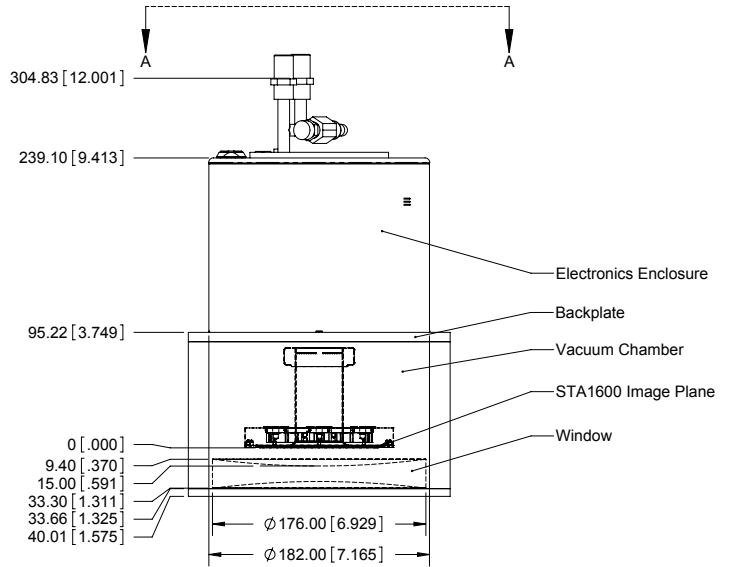
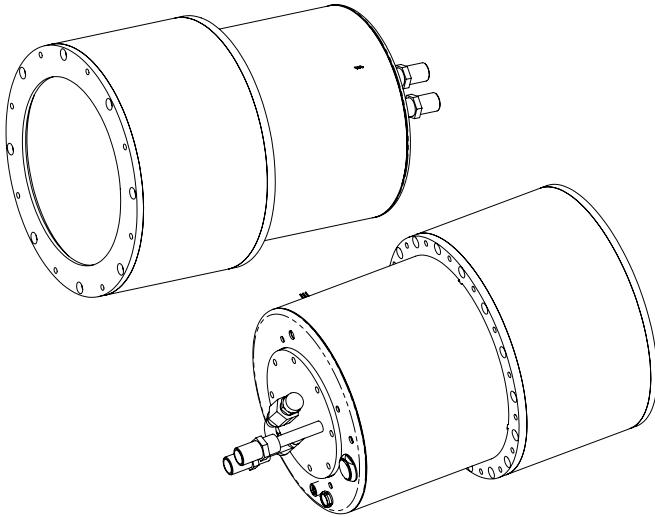
POWER SUPPLY WINDOW  
(ALLOWS VIEW OF INDICATOR LIGHTS)



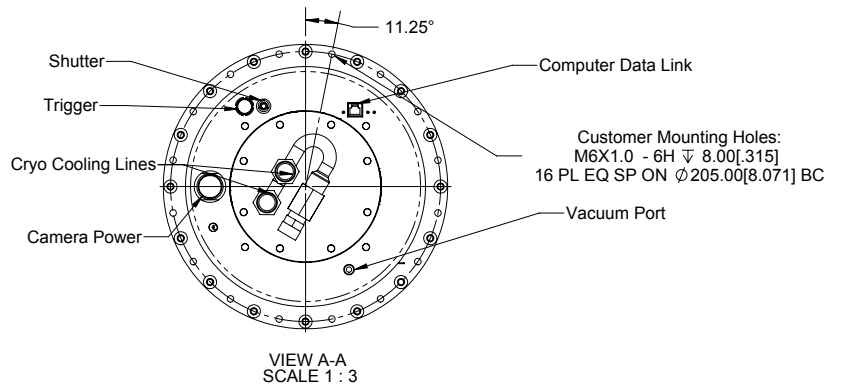
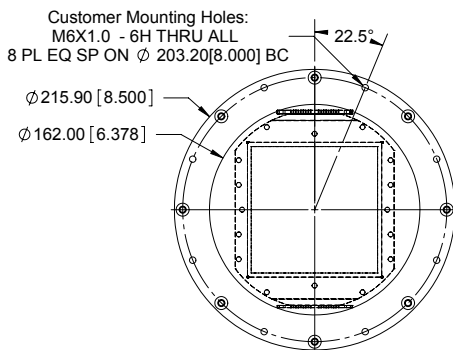
COMPRESSOR GAUGES



# 1110S CCD Camera



## Shutterless Optical 1110S



## Astronomy

The demanding requirements of Astronomical observations, high sensitivity, low read noise, low dark current are all satisfied by the performance of an 1110S camera. Astronomers around the world have utilized SI's renowned skills to exceed the imaging requirements of their applications.

Refer to the CCD manufacturer's website for updated QE data, but just a small example of the different backside AR coatings available from two potential manufacturers is shown below:

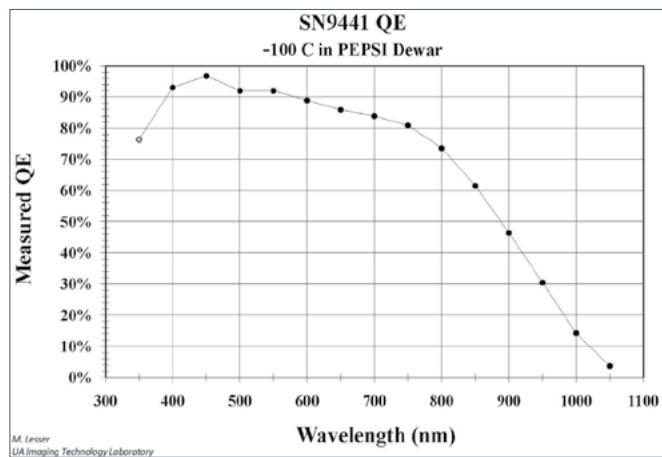
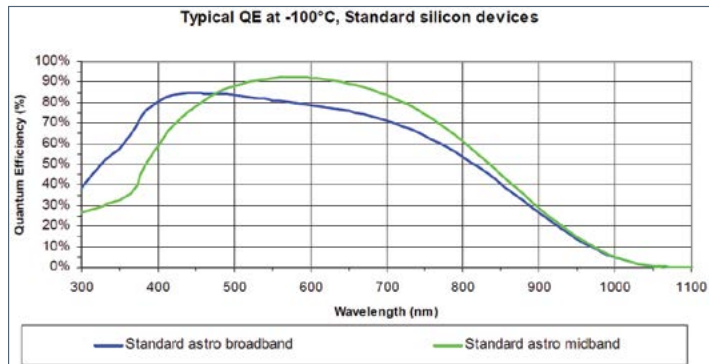


Photo credit: Daniel López, IAC  
Imagd with a 2k x 2k Spectral Instruments CCD Camera



### Typical Camera Performance With An e2v 9k CCD

Typical read noise 100kHz	3.5e-
Typical read noise 1MHz	9.8e-
Typical dark current -100°C	0.001e-/pixel/sec
Non-linearity	<1%, 200e- to 100ke-
CCD size	Approximately 90 x 90mm
CCD pixel size	10.0 μm
CCD pixel dimension	9k x 9k
AR coatings available	e2v standard coatings

### Typical Camera Performance With An STA 1600 CCD

Typical read noise 100kHz	4.5e-
Typical read noise 800kHz	9.8e-
Dark Current	0.001e-/pixel/sec
Non-linearity	<1%, 200e- to 100ke-
CCD size	95.04mm x 95.04mm
CCD pixel size	9.0 μm
CCD pixel dimension	10560 x 10560
AR coatings available	Blue and Broadband