DATASHEET

ColdBlue™ Cooled Camera Systems

Slow Scan Model FD2114KNU

Features:

- High resolution 16-bit output depth, 8 electrons typical noise
- Precision readout with 6 user-selectable output rates (250 to 500 kHz, non-binned)
- Peltier cooling (-30° C at 25° C ambient) allows for 1000 fold dark current reduction
- USB 2.0 Interface
- Asymmetric binning and programmable sub-array selection
- Hermetically-sealed sensor package (under vacuum) is maintenance free with significantly-reduced risk of sensor contamination
- Easy system integration with included Win32.dll. Drivers included for Win2000 and Windows XP. Example software with source code included
- Integrated camera head and control system eliminates need for rack-mounted, space-intensive control box
- Power supply included

Description

PerkinElmer Optoelectronics ColdBlue™ series of cooled CCD camera systems offer scientific-grade CCD technology integrated with the latest in camera electronics to offer the user an unparalleled solution for advanced imaging applications. Featuring the Eastman Kodak KAF-3200ME imager, the FD2114KNU offers pixel resolutions of 2184 x 1472 (6.8µm x 6.8µm pixel size). The modular sensor head design allows the camera system to be customized with different sensors at a minimum of design time.

To eliminate contamination and moisture within the sensor package, the package that surrounds the sensor has been hermetically-sealed under vacuum. The sensor head has been sealed against light and dust.

The camera system is supplied with an installation disk (Win32 DLL and demonstration program), regulated power supply, and cables necessary for operation.

The FD2114 also features an integrated Thermo-Electric (TE) cooler, which cools the sensor to -30°C. This reduction in temperature allows for almost a 1000X reduction in dark current. Additionally, Area of Interest readout and binning are supported within the camera.

Ideally suited for such applications as Protein Quantification, Fluorescence Microscopy, Luminescence, Spectroscopy, and Semiconductor Imaging, the FD2114 offers users an attractive suite of features, including low noise, high quantum efficiency, multiple operating speeds, all in a small footprint.

PerkinElmer optoelectronics

Table 1. Camera Features Summary

Camera	Array Size (Pixels) (H x W)	Pixel Size (µm)	Active Area (mm)	Bits/ Pixel	Max. Frame Scan Rate (no binning)	Min. Frame Scan Period (no binning)
FD2114KNU	2184 x 1472	6.8 x 6.8	14.85 x 10.26	16 bits	0.143 F/sec	7.02 sec

The Sensor

The FD2114KNU uses the Eastman Kodak KAF-3200ME sensor. The sensor offers a pixel resolution of 2184 x 1472, set on a 6.8 x 6.8 µm structure, for a total active imaging area of 14.85 x 10.26 mm. The sensor maintains 100% fill factor, with a 20µV/electron sensitivity.

Other sensors may be integrated into the ColdBlue-series of cooled CCD camera systems. Contact PerkinElmer for more information on integrating specific CCD sensors into this camera system.

Functional Description

The PerkinElmer ColdBlue series incorporates high performance, high resolution area image sensors. Each pixel within the sensor converts light into discrete charge packets, that are then converted to an analog voltage.

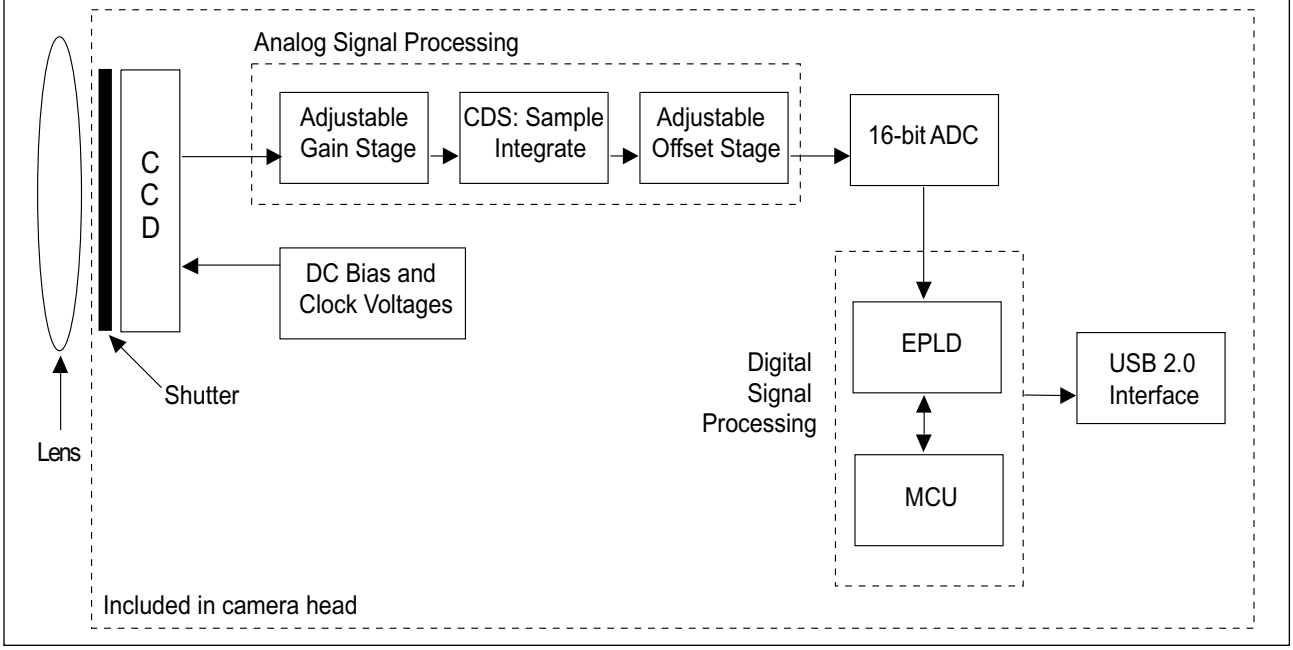
The analog voltage is then processed as a single channel of sampled-and-held, raster order analog video data. Analog processing circuitry provides adjustable gain levels, allowing the accomodation of user's unique lighting and application requirements. Once the signal is processed, it is then digitized to 16-bit depth and formatted for output. Figure 1 is a block diagram illustrating the major camera components.

Camera Read Modes

The PerkinElmer FD2114KNU operates in three different modes: (1) Area of Interest (AOI) Mode, (2) Binning, and (3) Combination Mode.

AOI mode allows the user to select a subsegment of the CCD to be read out. Binning mode allows

Figure 1: Camera Head Block Diagram

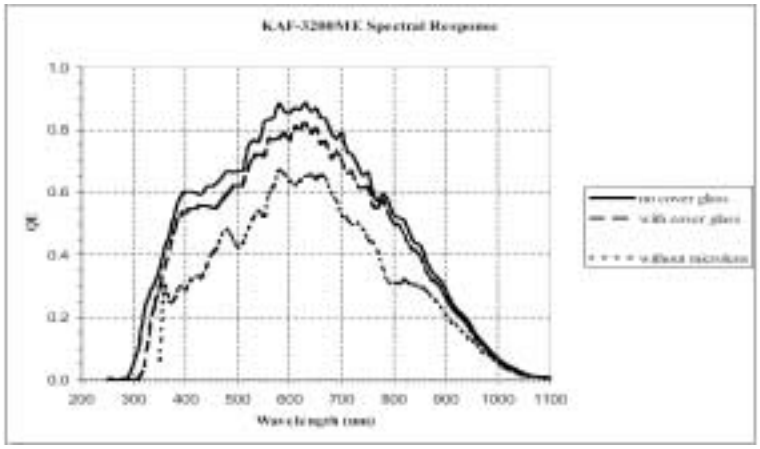


Read Modes (cont)
for up to a 16 pixel region (in both directions) to be combined for faster readout. Binning and AOI modes can be run simulateously with combination mode.

Data Output
The digital video output is identical in all modes of operation. The digital video is presented via the USB 2.0 connection. Figure 1 shows the block diagram for data handling within the ColdBlue camera.

Serial Control
The FD2114 supports serial communications over the rear-mounted USB 2.0 interface. The following parameters of camera operation and function are set via the USB port: clock rate, binning, area of interest, integration time, gain, set black level, image grab, and test pattern generation commands.

Figure 2. Spectral Sensitivity, FD2114KNU



NOTE: Data comes directly from sensor manufacturer.

Table 2. Full Camera Specifications

Operating speeds	250, 278, 312, 357, 412, 500 kHz (user-selectable)
Quantum Efficiency	85% at 600 nm (based on sensor spec)
Dynamic range	76 dB min, unbinned (based on sensor spec)
Digitzation depth	16 bit
Sub-array readout	Up to full CCD, user-programmable
Binning	1 x 1 to 16 x 16 asymmetrical
Spectral range	300 – 1000nm (based on sensor spec)
Lens mounts	C mount
Cooling	TEC air cooled to -30C
Shutter	Fast acting dual blade
Window	AR coated sapphire
Gains	1 - 9x adjustable (9 selections)
Software	Win32.dll
Exposure time	32 ms to 1.9 hrs

Table 3. CCD Characteristics

CCD Characteristics	KAF 3200ME
Pixel Architecture	Full frame readout
Pixel array format	2184 (h) x 1472 (v)
Sensitive area (mm)	14.85 x 10.26
Pixel size (microns)	6.8 x 6.8
Full well capacity (e-) single pixel/binned	55,000/110,000
Typical read noise (e-) at 250 kHz	8
Typical dark signal (e-/pixel/second)	0.015 @ -35C
Horizontal charge transfer efficiency (HCTE) (%)	0.99997

Figure 3. Example Screen Shot of Provided Demonstration Software

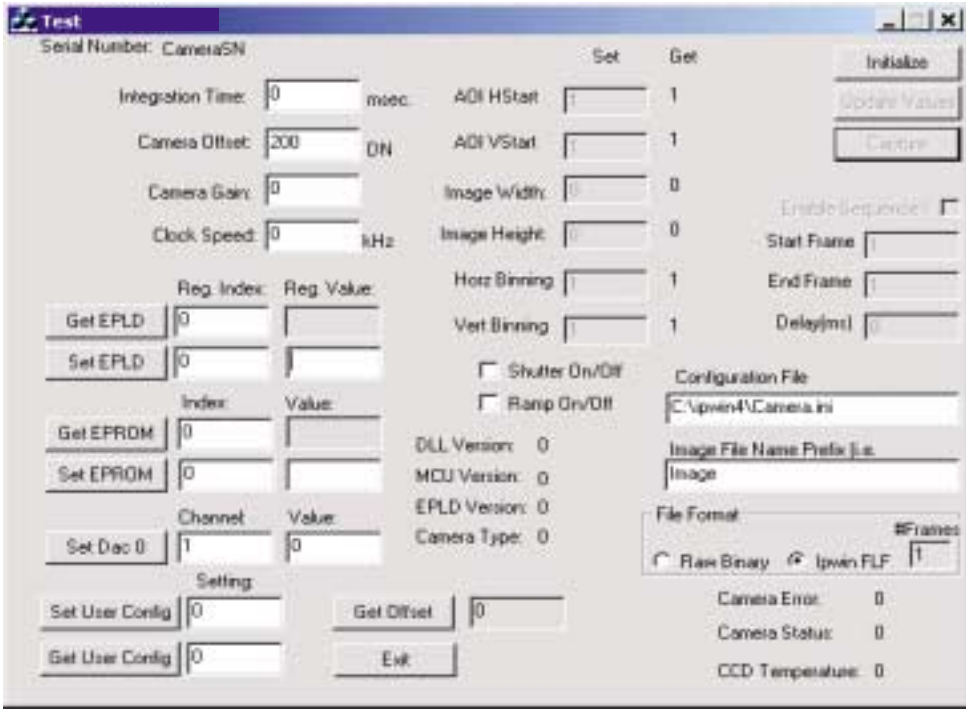


Figure 4. Outline Drawings

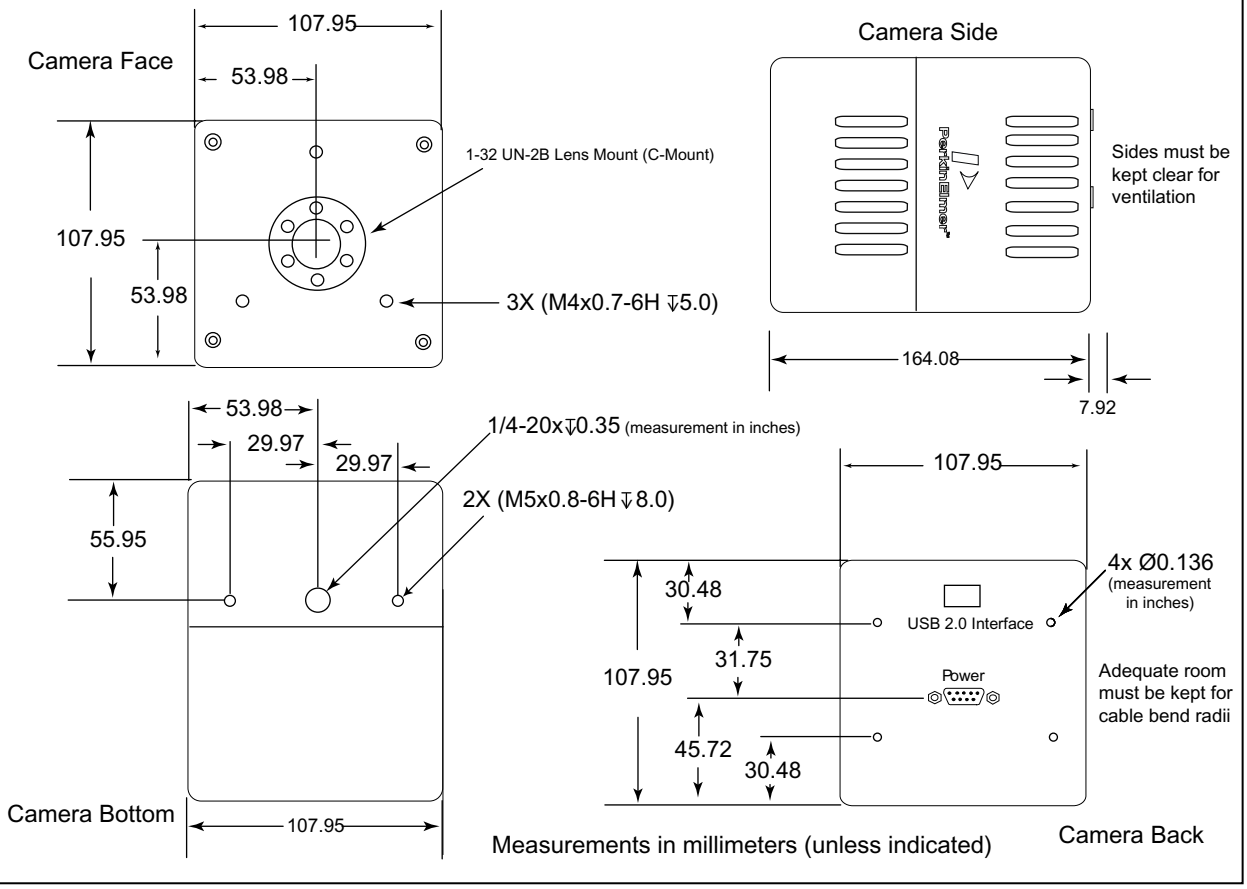
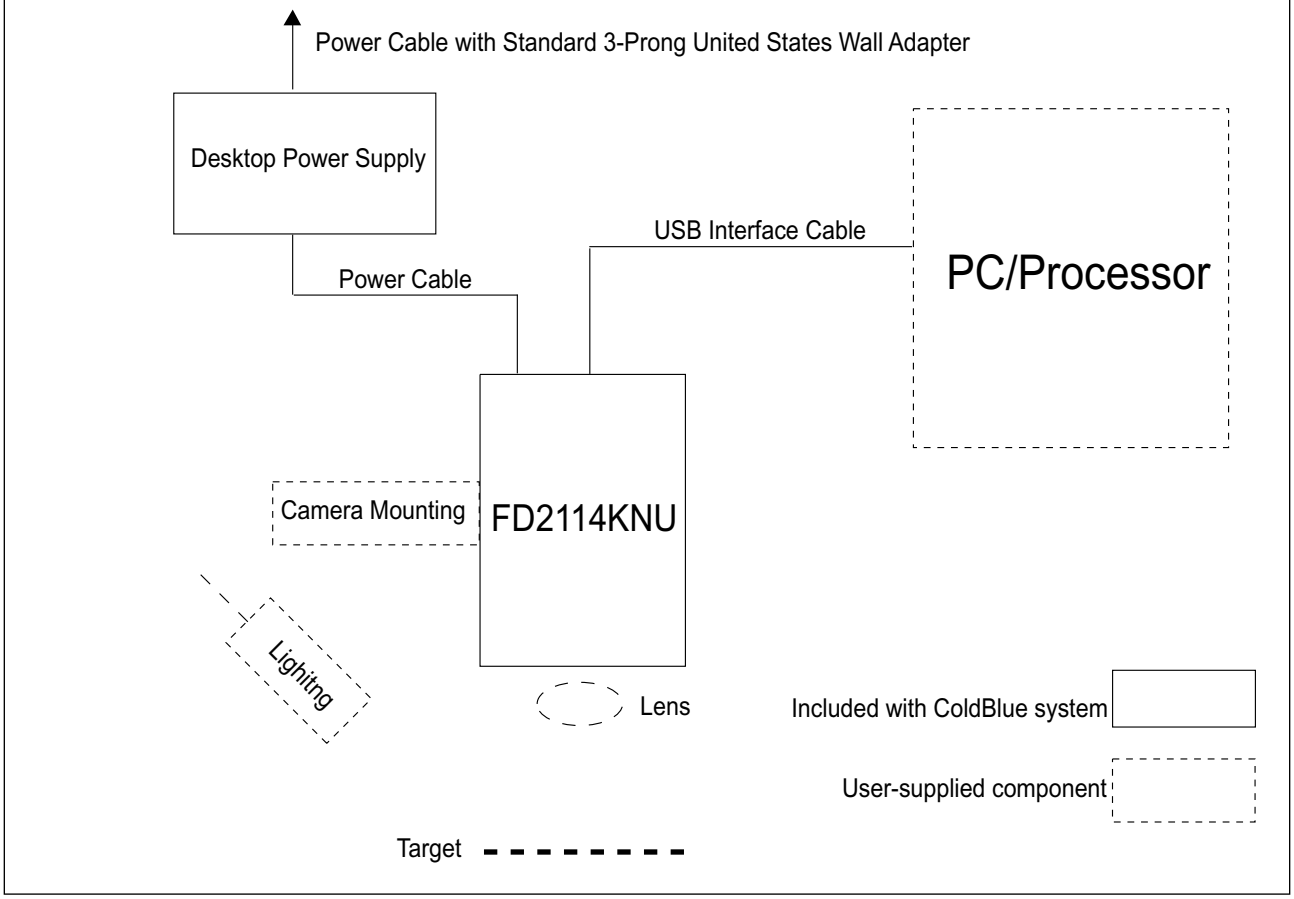


Figure 5: Typical System Block Diagram



Camera System

The ColdBlue system ships complete with the following items:

* FD2114KNU cooled CCD camera
* Desktop power supply (120-230V AC, 50/60 Hz) with 9 pin cable
* USB 2.0 Cable
* CD-ROM containing instruction manual, software drivers, and test program

Table 6. Device Specifications

Camera dimensions	4 x 4 x 6.5" (107.9 x 107.9 x 164mm)
Camera weight	4.5 lbs. (72 oz)
Power supply dimensions	7 x 11 x 2" (177.8 x 279.4 x 50.8mm)
Power supply weight	3 lbs. (48 oz)
Power consumption	65 W
Operating environment	0 to + 30C non-condensing; 70% humidity max.
Regulatory	CE pending

Ordering Information

While the information provided in this datasheet is intended to describe the form, fit and function for this product, PerkinElmer reserves the right to make changes without notice.

Purchase of an FD2114KNU system includes camera, power supply, software drivers, and power cables.

Table 5. Ordering Information

FD2114KNU-011	2184 x 1472 pixels, (KAF3200ME sensor)

For more information, e-mail us at opto@perkinelmer.com, or visit our web-site at http://www.perkinelmer.com/opto.

All values are nominal; specifications are subject to change at any time without notice

Table 6. Sales Offices

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