Photometrics

CoolSNAP™

USER MANUAL CoolSNAP$_{HQ}$ and CoolSNAP$_{K4}$

PHOTOMETRICS®

a division of Roper Scientific, Inc.

User Manual for CoolSNAP™ *HQ* and CoolSNAP™ *K4* Systems

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57-063-001 Rev C0

LIMITED WARRANTY

Photometrics, a division of Roper Scientific, Inc., ("Photometrics," us," "we," "our") makes the following limited warranties. These limited warranties extend to the original purchaser ("You", "you") only and no other purchaser or transferee. We have complete control over all warranties and may alter or terminate any or all warranties at any time we deem necessary.

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Photometrics warrants this product against substantial defects in materials and / or workmanship for a period of up to one (1) year after shipment. During this period, Photometrics will repair the product or, at its sole option, repair or replace any defective part without charge to you. You must deliver the entire product to the Photometrics factory or, at our option, to a factory-authorized service center. You are responsible for the shipping costs to return the product. International customers should contact their local Photometrics authorized representative/distributor for repair information and assistance, or visit our technical support page at www.photomet.com.

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Photometrics warrants, with the exception of the CCD imaging device (which carries NO WARRANTIES EXPRESS OR IMPLIED), this product against defects in materials or workmanship for a period of up to one (1) year after shipment. During this period, Photometrics will repair or replace, at its sole option, any defective parts, without charge to you. You must deliver the entire product to the Photometrics factory or, at our option, a factory-authorized service center. You are responsible for the shipping costs to return the product to Photometrics. International customers should contact their local Photometrics representative/distributor for repair information and assistance or visit our technical support page at www.photomet.com.

Normal Wear Item Disclaimer

Photometrics does not warrant certain items against defect due to normal wear and tear. These items include internal and external shutters, cables, and connectors. *These items carry no warranty, expressed or implied.*

Sealed Chamber Integrity Limited 24 Month Warranty

Photometrics warrants the sealed chamber integrity of all our products for a period of twenty-four (24) months after shipment. If, at anytime within twenty-four (24) months from the date of delivery, the detector should experience a sealed chamber failure, all parts and labor needed to restore the chamber seal will be covered by us. *Open chamber products carry NO WARRANTY TO THE CCD IMAGING DEVICE, EXPRESSED OR IMPLIED.* Responsibility for shipping charges is as described above under our Basic Limited One (1) Year Warranty.

Vacuum Integrity Limited 24 Month Warranty

Photometrics warrants the vacuum integrity of all our products for a period of up to twenty-four (24) months from the date of shipment. We warrant that the detector head will maintain the factory-set operating temperature without the requirement for customer pumping. Should the detector experience a Vacuum Integrity failure at anytime within twenty-four (24) months from the date of delivery all parts and labor needed to restore the vacuum integrity will be covered by us. Responsibility for shipping charges is as described above under our Basic Limited One (1) Year Warranty.

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Photometrics warrants all of our manufactured software discs to be free from substantial defects in materials and / or workmanship under normal use for a period of one (1) year from shipment. Photometrics does not warrant that the function of the software will meet your requirements or that operation will be uninterrupted or error free. You assume responsibility for selecting the software to achieve your intended results and for the use and results obtained from the software. In addition, during the one (1) year limited warranty. The original purchaser is entitled to receive free version upgrades. Version upgrades supplied free of charge will be in the form of a download from the Internet. Those customers who do not have access to the Internet may obtain the version upgrades on a CD-ROM from our factory for an incidental shipping and handling charge. *See Item 12 in the following section of this warranty ("Your Responsibility") for more information.*

Owner's Manual and Troubleshooting

You should read the owner's manual thoroughly before operating this product. In the unlikely event that you should encounter difficulty operating this product, the owner's manual should be consulted before contacting the Photometrics technical support staff or authorized service representative for assistance. If you have consulted the owner's manual and the problem still persists, please contact the Photometrics technical support staff or our authorized service representative. *See Item 12 in the following section of this warranty ("Your Responsibility") for more information.*

Your Responsibility

The above Limited Warranties are subject to the following terms and conditions:

1. You must retain your bill of sale (invoice) and present it upon request for service and repairs or provide other proof of purchase satisfactory to Photometrics.
2. You must notify the Photometrics factory service center within (30) days after you have taken delivery of a product or part that you believe to be defective. With the exception of customers who claim a "technical issue" with the operation of the product or part, all invoices must be paid in full in accordance with the terms of sale. Failure to pay invoices when due may result in the interruption and/or cancellation of your one (1) year limited warranty and/or any other warranty, expressed or implied.
3. All warranty service must be made by the Photometrics factory or, at our option, an authorized service center.
4. Before products or parts can be returned for service you must contact the Photometrics factory and receive a return authorization number (RMA). Products or parts returned for service without a return authorization evidenced by an RMA will be sent back freight collect.
5. These warranties are effective only if purchased from the Photometrics factory or one of our authorized manufacturer's representatives or distributors.
6. Unless specified in the original purchase agreement, Photometrics is not responsible for installation, setup, or disassembly at the customer's location.
7. Warranties extend only to defects in materials or workmanship as limited above and do not extend to any product or part which has:
   - been lost or discarded by you;
   - been damaged as a result of misuse, improper installation, faulty or inadequate maintenance or failure to follow instructions furnished by us;
   - had serial numbers removed, altered, defaced, or rendered illegible;
   - been subjected to improper or unauthorized repair; or
   - been damaged due to fire, flood, radiation, or other "acts of God" or other contingencies beyond the control of Photometrics.
8. After the warranty period has expired, you may contact the Photometrics factory or a Photometrics-authorized representative for repair information and/or extended warranty plans.
9. Physically damaged units or units that have been modified are not acceptable for repair in or out of warranty and will be returned as received.
10. All warranties implied by state law or non-U.S. laws, including the implied warranties of merchantability and fitness for a particular purpose, are expressly limited to the duration of the limited warranties set forth above. With the exception of any warranties implied by state law or non-U.S. laws, as hereby limited, the forgoing warranty is exclusive and in lieu of all other warranties, guarantees, agreements, and similar obligations of manufacturer or seller with respect to the repair or replacement of any parts. In no event shall Photometrics' liability exceed the cost of the repair or replacement of the defective product or part.

11. This limited warranty gives you specific legal rights and you may also have other rights that may vary from state to state and from country to country. Some states and countries do not allow limitations on how long an implied warranty lasts, when an action may be brought, or the exclusion or limitation of incidental or consequential damages, so the above provisions may not apply to you.
12. When contacting us for technical support or service assistance, please refer to the Photometrics factory of purchase, contact your authorized Photometrics representative or reseller, or visit our technical support page at www.photomet.com.

Optional CoolSNAP Camera System Service Contract

The optional CoolSNAP Camera System Service Contract provides extended coverage for the CoolSNAP camera system. All terms and conditions listed in the CoolSNAP Camera System Warranty, including those pertaining to shipping costs and appropriate system use, apply to the CoolSNAP Camera System Service Contract.

The Service Contract also guarantees that Photometrics shall ship a complete replacement CoolSNAP camera system within forty-eight (48) hours of receiving notification of a CoolSNAP camera system defect. All components of the defective CoolSNAP camera system must be returned to Photometrics. Shipment of these components should not be made without prior authorization by Photometrics.

When purchased within two (2) months of the date listed on the packing slip shipped with the original equipment, the Service Contract is valid for a period of twenty-seven (27) months from the packing slip date.

This period comprises the initial CoolSNAP Camera System Warranty period of twelve (12) months, the CoolSNAP Camera System Service Contract period of twelve (12) months, and an additional three (3) months of free coverage.

When purchased prior to the lapse of the CoolSNAP Camera System Warranty or an active CoolSNAP Camera System Service Contract, the CoolSNAP Camera System Service Contract is valid for twelve (12) months beyond the lapse date of the Camera System Warranty or current Service Contract.

The CoolSNAP Camera System Service Contract can be renewed repeatedly. If the renewal occurs outside of a period covered by Warranty or Service Contract, Photometrics may, at its sole discretion, require an inspection of the camera system as a condition of consent to place it under Service Contract.

U. S. Government Restricted Rights

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This license is effective until terminated. It will terminate upon the conditions set forth above or if you fail to comply with any term hereof. Upon termination, you agree that the software and accompanying materials, and all copies thereof, will be destroyed. This agreement is governed by the laws of the State of Arizona. You acknowledge that you have read this agreement, you understand it, you agree to be bound by its terms, and that this is the complete and exclusive statement of the agreement between you and Photometrics regarding the software.

Declaration of Conformity

Roper Scientific, Inc. declares that the equipment described in this document is in conformance with the requirements of the European Council Directives, listed below:

89/336/EEC	EMC Directive & Amendments
93/68/EEC	EMC Directive & Amendments
73/23/EEC	Low Voltage Directive & Amendments

on the approximation of the laws of Member States relating to Electromagnetic Compatibility and Product Safety.

This declaration is based upon compliance of the product to the following standards:

EN 55022, CISPR 22B	RF Emissions Control
EN 50082-1, IEC 801	Immunity to Electromagnetic Disturbances
EN 61010-1	Product Safety

Product Description: CoolSNAP$_{fx}$ and CoolSNAP$_{HQ}$ Camera with CoolSNAP PCI card
Model: CoolSNAP$_{fx}$ and CoolSNAP$_{HQ}$
Test Reports: 983198CELV, 983196C22A, 983197IEC801, 983199EN60950

Authorized Signature: _____
Stephen L. Marcus, Vice President

January 7, 2002

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USA

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Chapter 1. Introduction

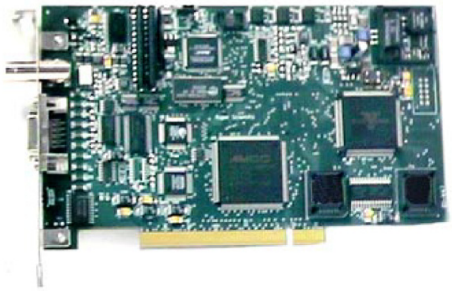
Description

The Photometrics® CoolSNAP$_{HQ}$ and CoolSNAP$_{K4}$, from Roper Scientific, are ideal cameras for low-light scientific and industrial microscopy. These cameras incorporate progressive scan CCDs (charge-coupled devices), a 12-bit digitizer, and low-noise electronics to produce monochrome images at greater than 1k x 1k resolution.

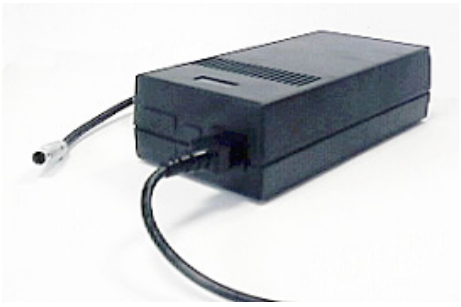
System Components

In addition to the components shown below, the CoolSNAP™ package also includes RS Image™ software.

Camera (with Test Lens) and DATA Cable



PCI Card



Power Supply with Power Cable and Power Cord

About This Manual

The *CoolSNAP User Manual* is divided into five chapters. It is suggested that you read the entire manual before operating the camera in order to ensure proper use. The chapters that follow this introduction are

- **System Installation** — Instructions for connecting your CoolSNAP camera to your computer via the CoolSNAP PCI card.
- **Operating Features** — Discusses CoolSNAP features such as antiblooming, trigger modes, and (for the CoolSNAP$_{HQ}$) the dual-speed ADC.
- **Troubleshooting** — Provides answers to camera system problems.
- **Basic Specifications** — Provides specifications for CoolSNAP system components.

Note: Unless otherwise noted, the CoolSNAP$_{HQ}$ and the CoolSNAP$_{K4}$ cameras are referred to by the name "CoolSNAP".

Precautions

The CCD and other system electronics are extremely sensitive to electrostatic discharge (ESD). To avoid permanently damaging the system, please observe the following precautions:

- If you are using high-voltage equipment (such as an arc lamp) with your camera system, be sure to turn the camera power *on last* and power the camera *off first.*
- Never connect or disconnect any cable while the camera system is powered on.
- Although you should switch off the *camera's* power supply before disconnecting any camera system cable, you do *not* need to power off your computer to detach the cables.
- Use caution when triggering high-current switching devices (such as an arc lamp) near your system. The CCD can be permanently damaged by transient voltage spikes. If electrically noisy devices are present, an isolated, conditioned power line or dedicated isolation transformer is highly recommended.
- Always leave one inch of space around the camera's external cooling fins for air flow.
- Never open the camera. There are no user-serviceable parts inside the CoolSNAP camera. Opening the camera voids the warranty.
- Use only the PCI card, cables, and power supply designated for this camera system. Using non-CoolSNAP$_{HQ}$ /CoolSNAP$_{K4}$ cables, PCI cards, or power supplies may result in permanent damage to your system.
- Do not use a C-mount lens that has optics that extend behind the flange of the lens.

Environmental Requirements

The CoolSNAP camera system should be operated in a clean, dry environment.

The camera system's ambient operating temperature is 0°C to 30°C with 80% relative humidity, noncondensing.

Storage Requirements

Store the CoolSNAP camera system in its original containers. To protect the system from excessive heat, cold, and moisture, store at an ambient temperature between -20°C and 60°C with a relative humidity of 0%-90%, noncondensing.

Microscopes, Lenses, and Tripods

The camera has a standard threaded video mount and can be mounted to any microscope that accepts a standard C-mount adapter. The camera also allows you to install any lens that is compatible with a standard threaded video mount as long as its optics do not extend behind the flange of the lens. The CoolSNAP camera can be mounted to a tripod using the tripod mounting attachment located on the bottom of the camera. See *Additional Measurements* on page 17 for more information.

Note: In microscopy applications, a 1.0x C-mount camera coupler is recommended for proper field of view.

Repairs

The CoolSNAP camera system contains no user-serviceable parts. Repairs must be done by Photometrics. Should your camera system need repair, contact Photometrics Customer Service. Please save the original packing materials so you can safely ship the camera system to another location or return it for repairs if necessary.

Note: Do not open the camera. Opening the CoolSNAP camera voids the warranty.

Cleaning

Clean exterior surfaces of the camera with a dry, lint-free cloth. To remove stains, contact Photometrics Customer Service. To clean the camera's imaging window, use only a filtered compressed-air source. Hand-held cans are not recommended, as they may spray propellant onto the window. Do not touch the window.

Photometrics Customer Service

If you have any questions about your camera system, contact Photometrics Customer Service. When you call, please have your Photometrics job number or equipment serial numbers available.

- Tel: 800. 874.9789/ 520.889.9933 between 8:00 a.m. and 5 p.m. MST
- Fax: 520.295.0299
- E-mail: cservice@photomet.com
- Mail: Photometrics
  3440 East Britannia Drive
  Tucson, Arizona 85706

In Europe, you can reach Customer Service at:

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  Japan 261-8501

General product information and answers to some customer service questions can be found on our website: http://www.photomet.com

Chapter 2. System Installation

Carefully review the *Precautions* section on page 2 before performing any of the procedures outlined here. Again, use only a CoolSNAP cable and a CoolSNAP PCI card with your CoolSNAP camera. Using a different cable or PCI card may result in permanent damage to your system.

Introduction

Your CoolSNAP$_{HQ}$ or CoolSNAP$_{K4}$ camera system has the following hardware components:

- PCI card
- Camera and Data cable
- Power supply with Power cable and Powercord.

CoolSNAP system components are linked by the data cable and controlled by your host computer system. All of these hardware components should be included with your shipment. Refer to the information and figures in *System Components* on page 1.

The CCD you selected is installed in your camera.

Keep all the original packing materials so you can safely ship the CoolSNAP system to another location or return it for service if necessary.

If you have any difficulty with any step of the instructions, call Photometrics Customer Service.

Software Compatibility Requirements

The CoolSNAP package includes the RS Image capture software program designed for use with your CoolSNAP camera.

All other imaging software must also be PVCAM®-compatible. For full access to imaging software functions, PVCAM must be version 2.6.9 or higher

Host Computer Requirements

The host computer for your CoolSNAP camera must have the following:

- Windows® 2000 or Windows® XP operating system
- 1 GHz Pentium® 4 (or greater)
- 256 MB RAM (or greater)
- CD-ROM drive
- At least one unused PCI card slot
- 16-bit color display (or greater)

If you are a Mac® user, the host computer for your CoolSNAP camera must have the following:

- Macintosh® OS X
- 256 MB RAM (or greater)
- CD-ROM drive
- At least one unused PCI card slot
- Video adapter that supports 24-bit color (millions of colors)

Multiple Cameras

PVCAM supports multiple open cameras. In order to use this function, it must also be supported by your imaging software. The RS Image capture software program included with your system supports multiple cameras, as do many other imaging packages.

If your imaging software supports multiple cameras, there must be a separate PCI card for each camera.

Software Installation

An Installation Guide appropriate to your system is included as an insert in the CD-ROM case. This guide provides step-by-step instructions for installing the camera interface software and the application software for Windows-based and Macintosh-based PCs. Additional instructions are included for installing a PCI card in your computer and capturing images.

The CD-ROM contains the following files.

- **Readme text files —** these files contain the latest information on the software installations and should be read before you run the PVCAMSetup program.
- **PVCAMSetup software program —** this software installs the camera interface software.
- **RSImageSetup software program —** this software installs the RS Image application program.
- **MacOS directory —** this directory contains the files required for installing on a Macintosh computer.
- **Acrobat directory —** this directory contains subdirectories containing installation programs for Acrobat® Reader®.
- **Manuals directory —** this directory contains user manuals in PDF format.

Installing the PCI Card

You will be using a CoolSNAP PCI card to allow the camera to communicate with your computer.

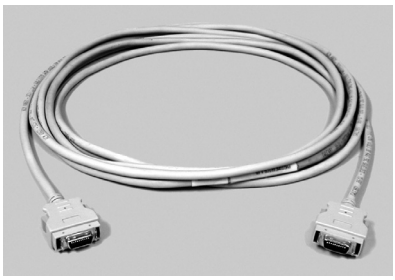
Refer to the Readme text files on the CD-ROM and to the Software Installation insert supplied with the CD-ROM before installing the PCI card. Depending on your system, you will have received one of two different PCI cards available for CoolSNAP cameras: Video or Non-Video. Please follow the instructions appropriate to the card you have received with your system.

This PCI card accepts a standard BNC connector for video output.

After installing the PCI card, go to *Connecting Your CoolSNAP Camera*.

Connecting Your CoolSNAP Camera

The DATA cable connects your CoolSNAP camera to the CoolSNAP PCI card. This cable is identifiable by its 20-pin connectors. It is designed to serve as a conduit for data.



To connect your CoolSNAP camera:

1. Connect either end of the DATA cable to the CoolSNAP PCI card that you have installed in the host computer.
2. Connect the other end of the DATA cable to the DATA connector located on the back of the camera (shown below).

The following connectors are located on the back of the CoolSNAP camera:

- ***DATA connector:*** 20-pin, high-density connector for data transfer.
- ***POWER connector:*** 5-pin, LEMO connector for camera power (see *POWER Connector Pinout* on page 19 for details).
- ***I/O connector:*** DB26, high-density connector for input/output control signals (see *I/O Connector Pinout* on page 20 for details).

Note: CoolSNAP cameras draw power from the PCI bus via the PCI card. Therefore, the computer must be powered on for the CoolSNAP camera to operate.

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Chapter 3 Operating Features

Dual-Mode Operation (CoolSNAP$_{HQ}$ Only)

A unique feature of CoolSNAP$_{HQ}$ is that it allows two different CCD clocking modes that allow you choose between speed and NIR sensitivity. In the PVCAM implementation, the clocking modes are referred to as "normal" and "alternate normal".

Normal mode

In "Normal" mode, the CCD is optimized for maximum anti-blooming protection and frame rate. In this mode, the CCD can be clocked so that exposure and readout happen simultaneously as shown in the example below.

Example: Consider a situation where the full frame readout time is 96 msec (at 20 MHz) and the exposure time is 200 msec. The readout of a frame will occur during the exposure of the next frame. This is possible because the CCD has alternate columns of sensitive and masked areas. While charge is integrating in the sensor area, the previous frame, which is in the masked area, can be read out (Figure 1). In this example, the time required to acquire the three-image sequence is 696 ms (3 x 200 + 96) and the frame rate is approximately 4.3 fps.

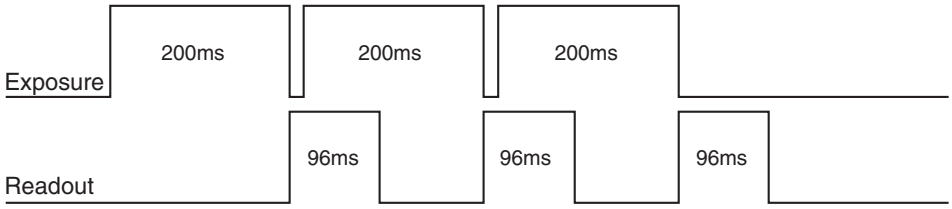


Figure 1. Normal Mode, Overlapped

If the exposure time is 50 ms, which is less than the readout time, the camera operates in "nonoverlapped" mode (see Figure 2). The effective frame rate for this is 6.84 fps (1/[0.05+0.096]). While in normal mode, the camera firmware automatically calculates the readout times, taking into account binning and/or subregion, and carries out the exposure-readout sequence to maximize the frame rate.

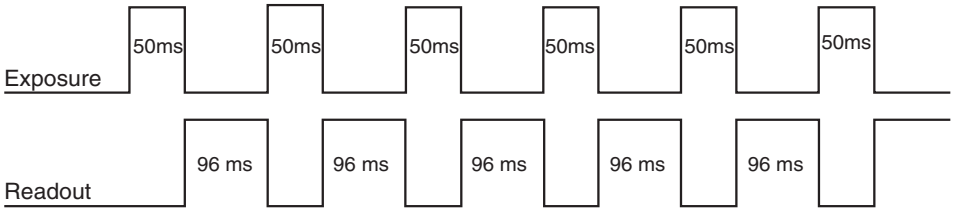


Figure 2. Normal Mode, Nonoverlapped

Alternate Normal mode

In "Alt-Normal", it is possible to achieve higher QE in the NIR (peak QE of approximately 65%) by manipulating the CCD clock voltages. Also, in this high-sensitivity mode, the preamplifier is switched off during the exposure to eliminate the background generated by preamplifier glow. In this clocking mode, irrespective of what the exposure time is, the camera operates in "nonoverlapped" or "sequential" mode.

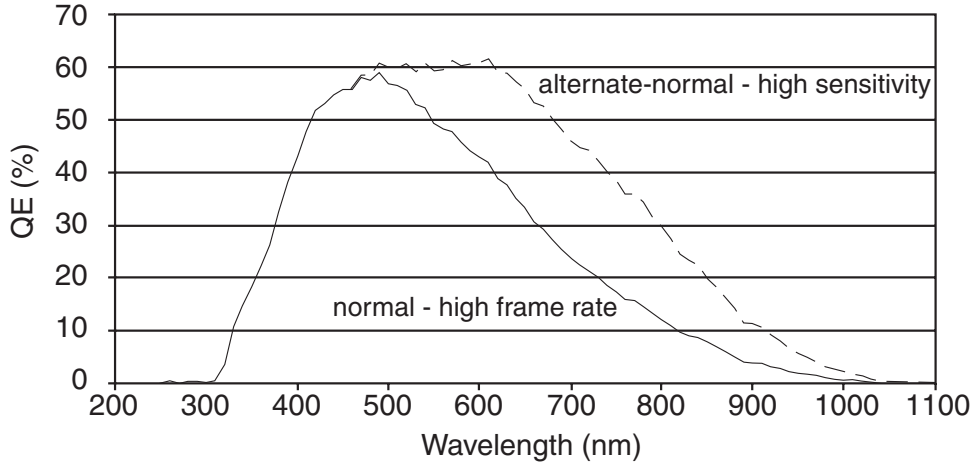


Figure 3. QE for Normal and Alternate Normal Modes

Antiblooming

Typically, interline CCD devices are designed with antiblooming capabilities. To prevent excess electronic charge from migrating to adjacent pixels, "drains" are built into the CCD. These drains remove any excessive charge generated from an overexposed pixel. Sony interline CCDs will prevent blooming for optical signals greater than 1000 times the full-well capacity of a single pixel. However, the extended QE capabilities of the Sony ICX285 in the CoolSNAP$_{HQ}$ reduce the antiblooming suppression for certain modes. In normal mode, the CCD operates with typical antiblooming suppression. But in alternate normal mode, the enhanced sensitivity causes a reduction in antiblooming to greater than 100 times single-pixel full-well capacity.

Triggered Operation

CoolSNAP$_{HQ}$ and CoolSNAP$_{K4}$ offer several methods of integration with external trigger sources, such as delay generators or laser pre-triggers. Each camera has a 26-pin, high-density I/O connector (pinout functions are described on page 20) on the back for trigger-in/out and various TTL input and output operations. A special cable is available to access primary signals such as "Trigger-in," "Trigger-invert," "Expose out," "End of frame," and "Interline shift." In the default mode, the camera triggers on the rising edge of a TTL signal. To invert the triggering polarity, the "Trigger-invert" must be grounded, which can be done with a 50-ohm terminator. The CoolSNAP cameras support the trigger modes described on the following page (Note that all of these modes are operated in "nonoverlapped" mode).

Trigger-first mode In this mode, the camera requires only one trigger to acquire a sequence of frames. Each frame is exposed for a length of time entered into the software and read out. Once the trigger is received, the camera is inhibited from taking any further triggers until the entire sequence is completed (see Figure 4).

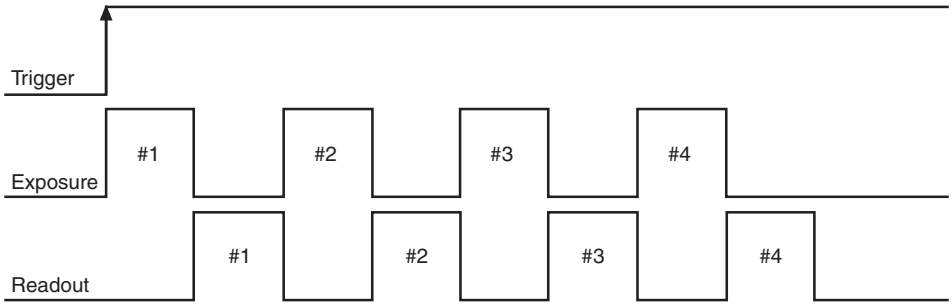


Figure 4. Trigger-First Mode Timing Diagram

Strobe mode In this mode, each frame in a sequence requires a trigger. Each frame is exposed for a length of time entered into the software and is then read out. If the trigger arrives during the exposure-readout of the previous frame, it is ignored (see Figure 5). For a sequence of one frame, strobe mode and trigger-first mode are the same.

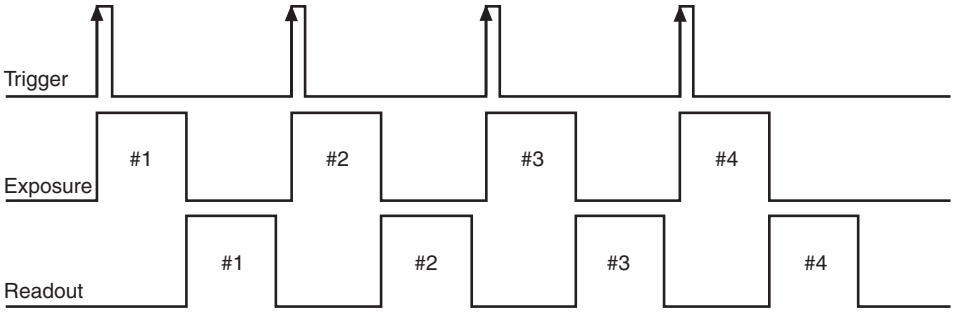


Figure 5. Strobe Mode Timing Diagram

Bulb mode In this mode, exposure time for each frame is determined by the trigger pulse width. Exposure time entered into the software is not used in this mode (see Figure 6).

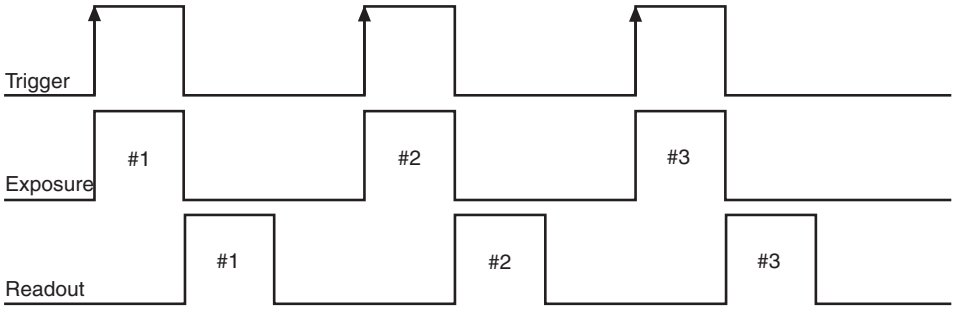


Figure 6. Bulb Mode Timing Diagram

RS170/PAL Operation

The CoolSNAP$_{HQ}$ offers monochrome video output on the back of the PCI card, selectable between NTSC and PAL. The video signal is derived from the digital data being transferred from the camera through the PCI interface card. Thus, simultaneous video output and data transfer is accomplished. If the image resolution is greater than the video format (640x480 for RS170) then the 0,0 to 640,480 region is displayed. For image sizes less than the video format, the entire region is displayed. Finally, since video output comes from raw data, the signal is monochrome only.

Note: The CoolSNAP$_{K4}$ does not support video.

CoolSNAP$_{HQ}$ Application Examples

Example 1

"I have a CoolSNAP$_{HQ}$ and want to operate the camera in the most sensitive setting for taking high-resolution, single images."

For this application, the camera should be operated in "alternate normal" mode to provide the best quantum efficiency. Furthermore, the readout speed of the camera should be set to 10 MHz to reduce the read noise. Finally, the camera gain should be set to 2. These settings will operate the camera in its most sensitive mode.

Example 2

"I would like to acquire sequences of images with a CoolSNAP$_{HQ}$ to study time-correlated phenomena. My light level is fairly high and I want to optimize the acquisition rate of the camera."

First, the camera speed should be set to 20 MHz. In addition, the camera should be put into "normal" mode to take advantage of the overlapping of the readout with the integration time. Finally, the "clearing" mode of the camera should be set to "clear pre-sequence" to remove the clearing overhead between frames. Of course, reducing the region of interest and increasing binning will always increase the frame rate further.

Example 3

"I would like to use a CoolSNAP$_{HQ}$ to study the immediate response of a specimen to an electrical stimulus."

The camera should be set up as in Example 2 for optimum time resolution. Furthermore, the camera should be set to "Trigger-first" mode. The same TTL signal that is providing the electrical stimulus should be sent to pin number 1 on the I/O port on the back of the camera.

Chapter 4. Troubleshooting

If you have any difficulty while troubleshooting, or do not see your camera system's symptoms listed here, contact Photometrics *Customer Service.*

System Does Not Boot Normally

If your operating system does not boot normally after you have installed a PCI card, try installing the new card in another open PCI slot. If this does not work:

1. *Turn off your computer* and remove the newly installed PCI card.
2. Turn your computer back on. If your system boots normally, there is probably an interrupt conflict between a previously installed expansion card and the PCI card that you are installing.
3. If you need assistance resolving the interrupt conflict, contact Photometrics Customer Service.

New Hardware Found Dialog Box Does Not Appear (Windows 2000/XP)

If the New Hardware Found dialog box does not appear after installing a new PCI card to your computer and booting Windows 2000/XP:

- Check to make sure that the new PCI card is inserted in a PCI slot according to your computer manufacturer's instructions and that the CoolSNAP system's HCK disc is in the host computer's CD drive.
- It is possible that there is a conflict between the new PCI card and a previously installed expansion card. *With the computer's power turned off,* remove any previously installed expansion cards that your system does not need to function. (If you are unsure which cards can be safely removed, call Photometrics Customer Service.) Then turn your computer back on and boot Windows 2000/XP again.
- If the New Hardware Found dialog box still does not appear, contact Photometrics Customer Service.

Images Not Displayed

If no images appear:

- Confirm that the switch on the power supply is set to "|".
- Confirm that the correct CoolSNAP camera is selected in your imaging software application.
- Power off the camera and the host computer and check all system connections (particularly the DATA and power cables). Restart.
- Confirm that operating system is set for at least 64k colors (16 bits).
- Confirm that the camera is operational by taking an image with a standard C-mount lens attached to your CoolSNAP. Using normal room lighting, place the camera on a table about 3 meters away from an object and acquire an image.

If the problem persists, contact Photometrics Customer Service.

Bright Spots in Image / Increased Background Noise

If you notice bright spots (hot pixels) in the image or an increase in background noise, take another calibration image and then re-acquire the original image.

Camera Running Too Warm

It is normal for the camera to be slightly warm to the touch while in operation. However, if the camera is more than slightly warm to the touch (and at least 1/2 inch of space has been left around the external cooling fins for air flow), switch off the camera immediately and contact Photometrics Customer Service.

PVCAM Error Message Appears

If a PVCAM error message appears, note the message's number code and contact Photometrics Customer Service.

Lengthy Pauses During Imaging

If you notice lengthy pauses marked by a lot of disk activity while imaging:

- Close any other programs that may be running.
- Install more physical memory to your computer system.

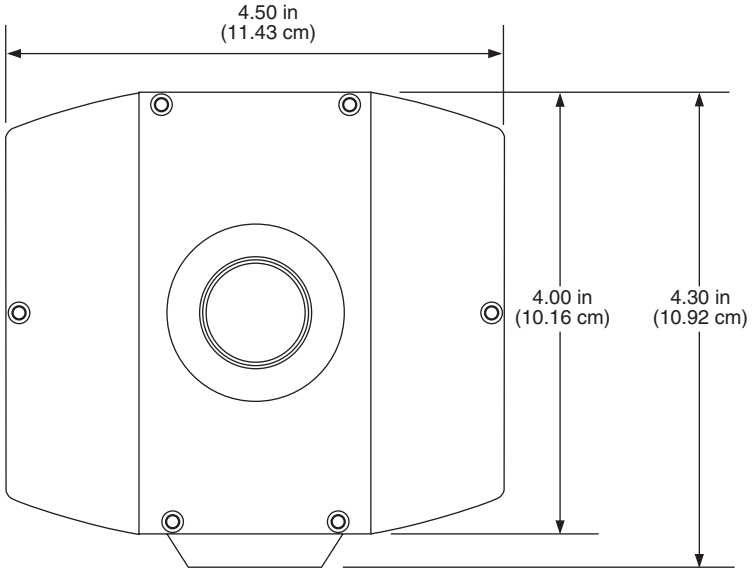
Video Output Not Displayed on Monitor

Refer to the Installation Guide (included as an insert in the CD-ROM case) for instructions on setting the PCI card jumpers for the proper video format.

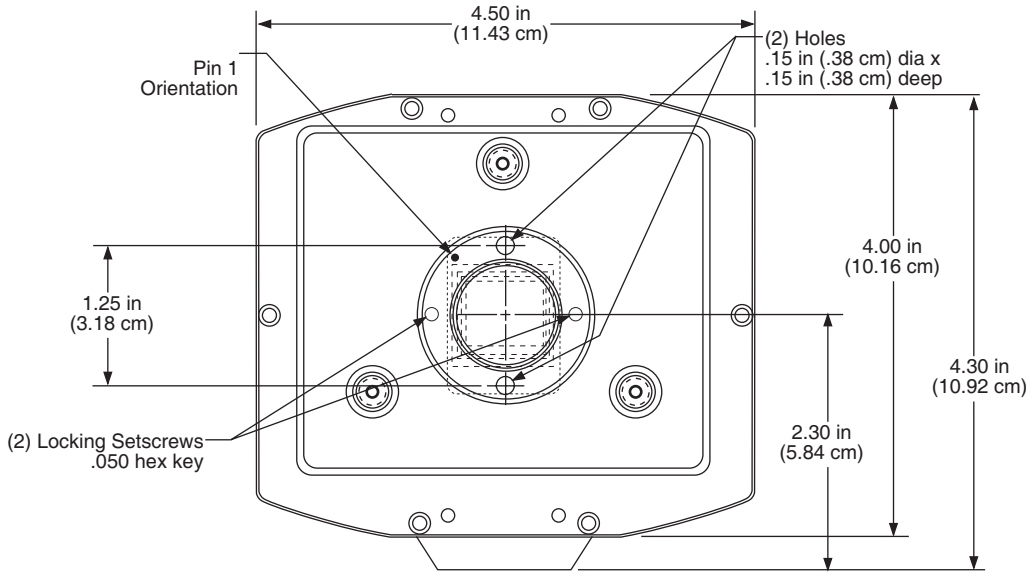
Note: The CoolSNAP$_{K4}$ does not support video.

Chapter 5. Basic Specifications

Camera Dimensions (Front)

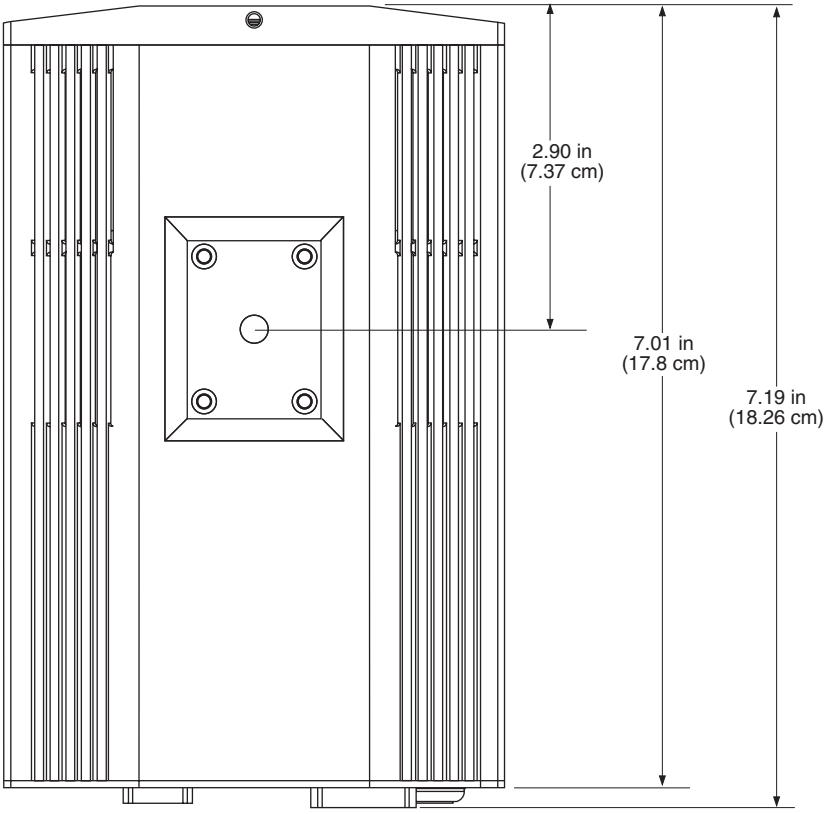


CoolSNAP$_{HQ}$ Camera: Front View

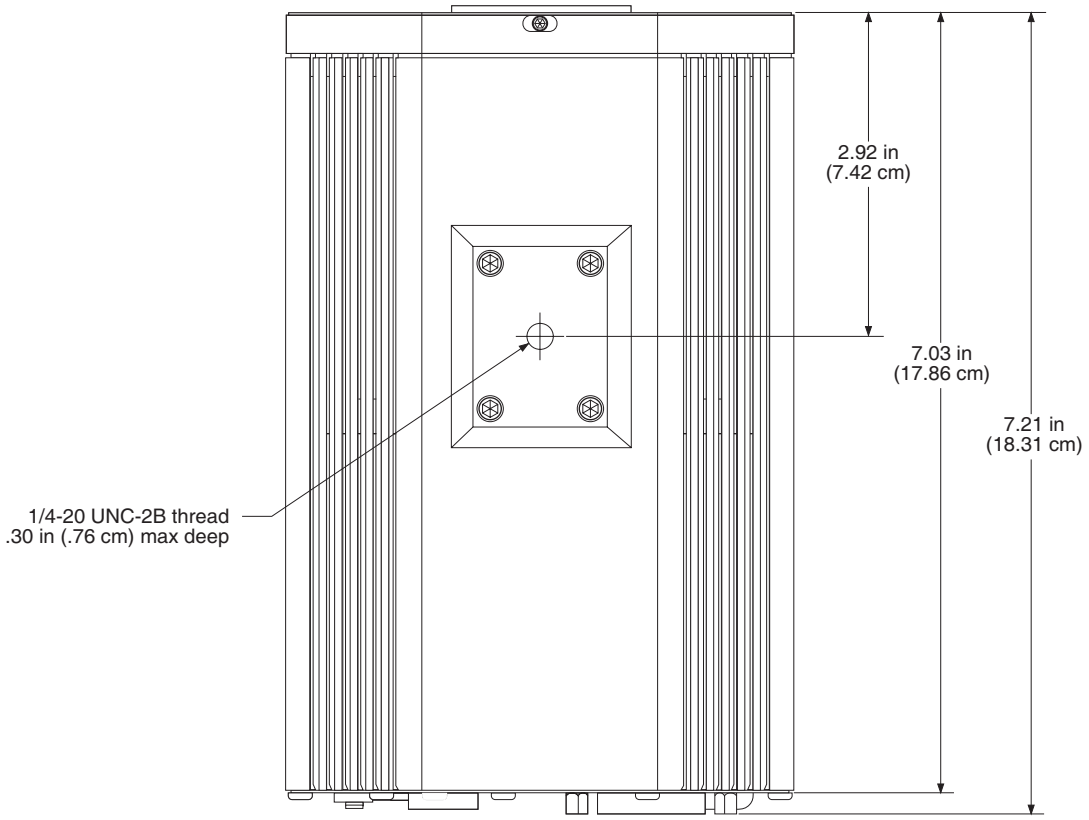


CoolSNAP$_{K4}$ Camera: Front View

Camera Dimensions (Bottom)

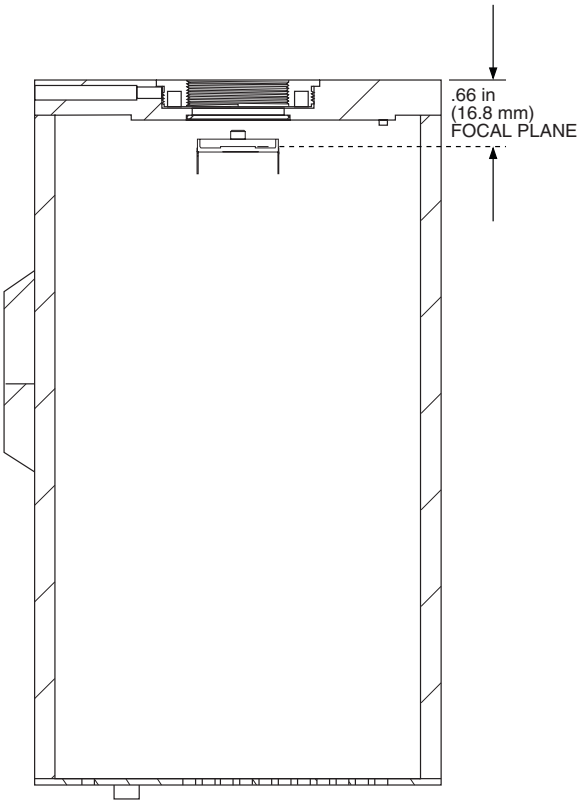


CoolSNAP$_{HQ}$ Camera: Bottom View

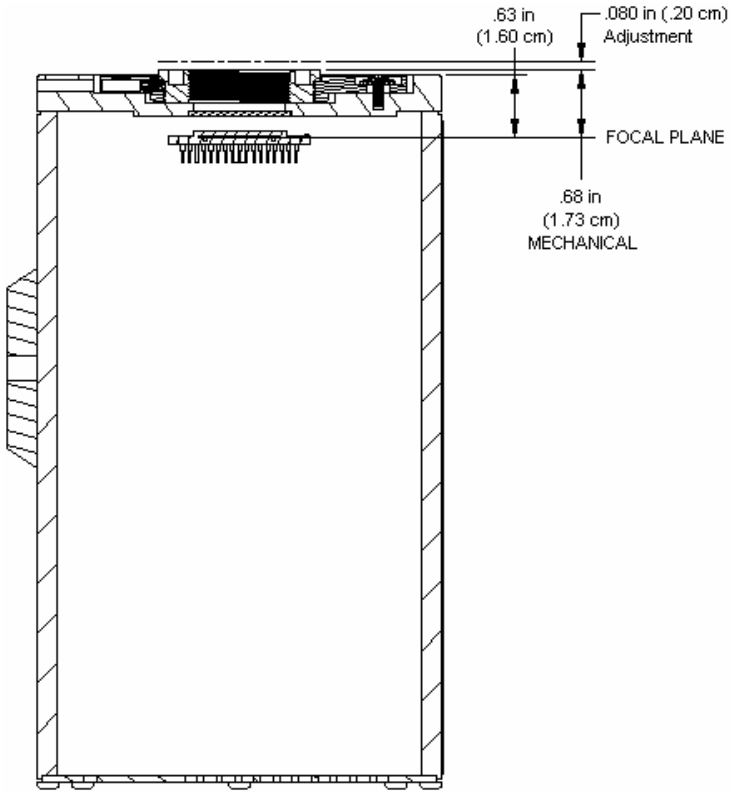


CoolSNAP$_{K4}$ Camera: Bottom View

Focal Plane Measurement



CoolSNAP$_{HQ}$ Camera: Focal Plane



CoolSNAP$_{K4}$ Camera: Focal Plane

Additional Measurements

Camera weight: 6.5 lb. (2.9 kg)

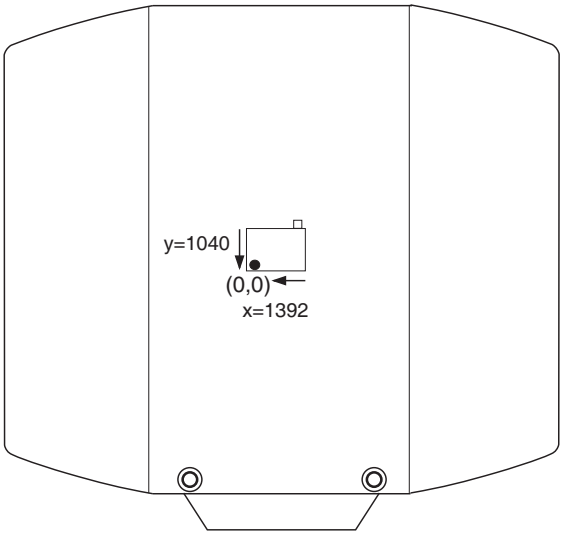
Tripod mounting hole (bottom of camera): .25 in.-20 UNC-2B

Safe tripod mounting screw length: .25 in. (.63 cm)

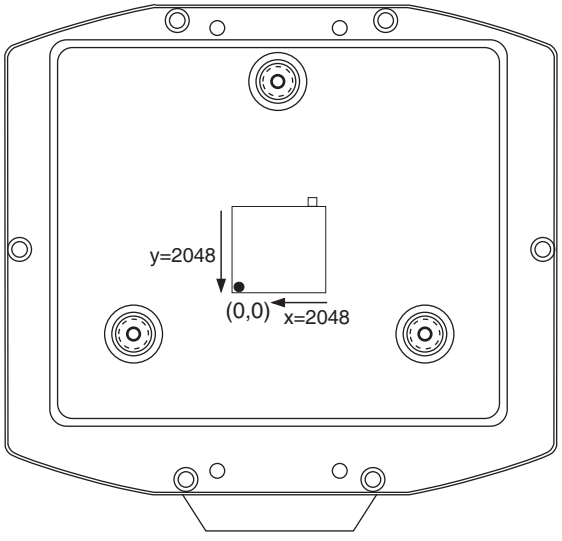
Flange focal distance: .66 in (16.8 mm)

CCD Specifications and Orientation

	CoolSNAP$_{HQ}$	***CoolSNAP$_{K4}$***
Image Type	Mono	Mono
Resolution	1392 x 1040	2048 x 2048
Pixel Size	6.45 µm x 6.45 µm	7.4 µm x 7.4 µm
Digitization Rate	10 MHz and 20 MHz	10 MHz and 20 MHz



CoolSNAP$_{HQ}$ CCD Orientation



CoolSNAP$_{K4}$ CCD Orientation

Connectors

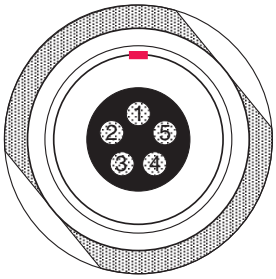
The following connectors are located on the back of the camera.

DATA connector: 20-pin, high-density connector for data transfer and power.

POWER connector: 5-pin, LEMO connector for camera power.

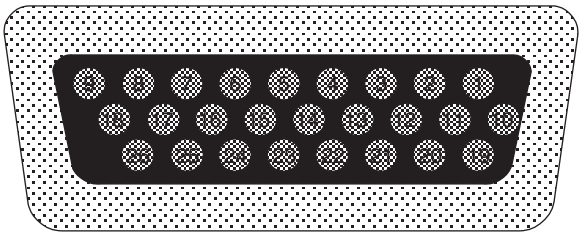
I/O connector: DB26, high-density connector for input/output control signals.

POWER Connector Pinout



1. +12V
2. +12V
3. GND
4. GND
5. GND

I/O Connector Pinout



The I/O (Input/Output Status) connector provides information about trigger function, DAC, and TTL signals. Inputs must be at least 3.15 V for a high and less than 0.9 V for a low.

The numbers on the I/O connector diagram correspond to the numbers given to the definition of each of the pins. The I/O connector is a female, DB26, high-density connector. An I/O cable (Part #: 37-107-002) to access Trigger Input (Pin 1), Trigger Invert Input (Pin 2), Frame Readout (Pin 7), Camera exposing output (Pin 8), and Shutter Output (Pin 23) is available from Photometrics.

1 ***Trigger Input:*** This input is internally tied high through a 4.7kΩ resistor. With Trigger Invert Input open or tied high, a rising edge of the Trigger Input signal initiates the trigger. The trigger source would normally hold this input low, then drive it high to initiate the trigger. To change the state of this input see Trigger Invert Input.

2 ***Trigger Invert Input:*** This input is internally tied high through a 4.7kΩ resistor. With this input open or tied high, a rising edge on Trigger Input will initiate the trigger. With this input pulled low, a falling edge on Trigger Input will initiate the trigger. It can be pulled low by grounding it via a 50Ω terminator.

3 ***GND:*** System digital ground. Any external circuitry intended to interface with the trigger control signals must reference this ground connection.

Port 4

4 ***DAC 1:*** 8-bit programmable output (0-5 V)

Port 5

5 ***DAC 2:*** 8-bit programmable output (0-5 V)

6 ***GND:*** System digital ground. Any external circuitry intended to interface with the trigger control signals must reference this ground connection.

7 ***Frame Readout:*** Active high. A high level on this output indicates that data is being transferred.

8 ***Camera Exposing Output:*** Active high. A high level on this output indicates that the camera is exposing (integrating).

9 ***Interline Shift:*** Active high. A high level on this output indicates that shifting under the interline mask is in progress.

Port 0

10 ***TTL I/O data bit 0:*** TTL level programmable input or output

11 ***TTL I/O data bit 1:*** TTL level programmable input or output

Port 1	***12 TTL I/O data bit 0:*** TTL level programmable input or output ***13 TTL I/O data bit 1:*** TTL level programmable input or output
Port 2	***14 TTL I/O data bit 0:*** TTL level programmable input or output ***15 TTL I/O data bit 1:*** TTL level programmable input or output
Port 3	***16 TTL I/O data bit 0:*** TTL level programmable input or output ***17 TTL I/O data bit 1:*** TTL level programmable input or output

18 GND: System digital ground. Any external circuitry intended to interface with the trigger control signals must reference this ground connection.

19 Power Status: A high level on this output indicates that the camera power is switched on (+5 V = on, 0 V = off).

20 GND: System digital ground. Any external circuitry intended to interface with the trigger control signals must reference this ground connection.

21 (not used)

22 (not used)

23 Shutter Output: TTL output for timing of external shutter driver. Signal is high during Shutter Open Delay and exposure time. The pin does not provide power to drive the shutter directly, so an external shutter drive controller is required.

24 (not used)

25 GND: System digital ground. Any external circuitry intended to interface with the trigger control signals must reference this ground connection.

26 GND: System digital ground. Any external circuitry intended to interface with the trigger control signals must reference this ground connection.

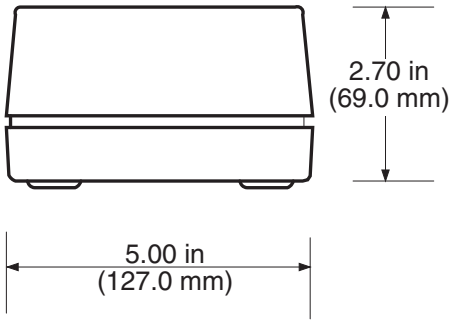
Power Supply Specifications and Dimensions

Voltage Output: +12 Vdc

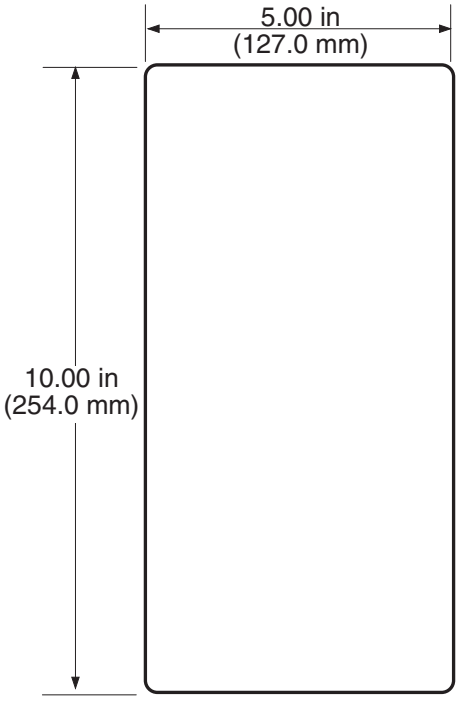
Voltage Input: 100-240 V~ @ 47-63 Hz

Maximum Power Output: 110 W

Power Supply Weight: 4.5 lb (2.0 kg)



Power Supply: Front View



Power Supply: Top View

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