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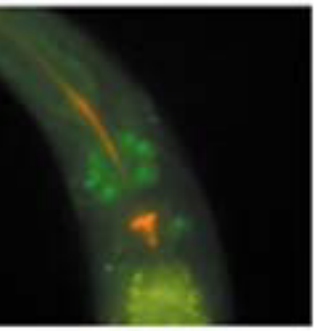
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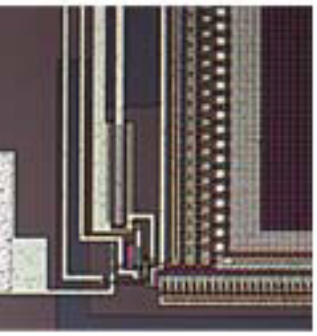
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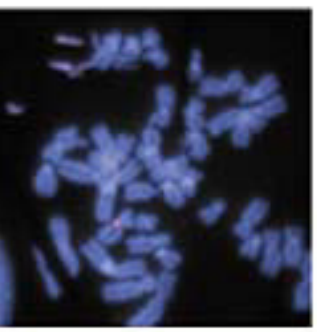
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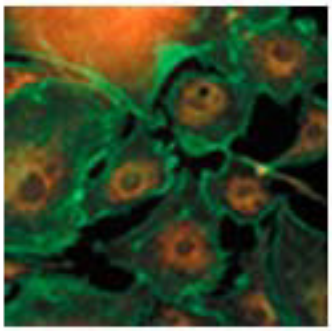














CoolSNAP ES

CoolSNAP cf

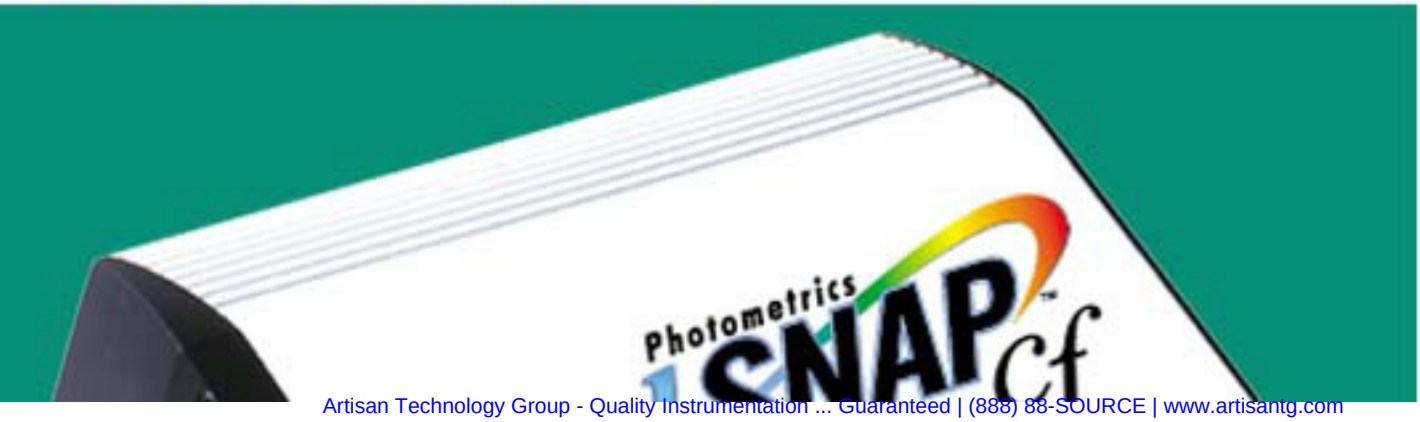


ROPER SCIENTIF
PHOTOMETRICS

User Manual



CoolSNAP
cf and ES



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Photometrics CoolSNAP™

User Manual for CoolSNAP$_{cf}$™ and CoolSNAP$_{ES}$™ Systems

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BEYOND IMAGING

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Basic Limited One (1) Year Warranty

Roper Scientific 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, Roper Scientific 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 Roper Scientific 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 Roper Scientific authorized representative/distributor for repair information and assistance, or visit our technical support page at www.roperscientific.com.

Limited One (1) Year Warranty on Refurbished or Discontinued Products

Roper Scientific 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, Roper Scientific will repair or replace, at its sole option, any defective parts, without charge to you. You must deliver the entire product to the Roper Scientific factory or, at our option, a factory-authorized service center. You are responsible for the shipping costs to return the product to Roper Scientific. International customers should contact their local Roper Scientific representative/distributor for repair information and assistance or visit our technical support page at www.roperscientific.com.

Shutter Limited One Year Warranty

Roper Scientific warrants for a period of up to one (1) year after shipment the standard, factory-installed camera shutter of all our products that incorporate an integrated shutter. This limited warranty applies to the standard shutter installed in the camera system at the time of manufacture. ***Non-standard shutters, special product request (SPR) shutters, and third-party shutter drive equipment carry NO WARRANTIES EXPRESSED OR IMPLIED.*** **Roper Scientific will supply, at no cost to the customer, up to one (1) replacement shutter during the warranty period. Roper Scientific will, at Roper Scientific's option, either ship a ready-to-install shutter to the customer site for installation by the customer according to the instructions in the product User Manual or arrange with the customer to return the camera system (or portion of the camera system) to the factory (or factory-authorized service center) for shutter replacement by us or a Roper Scientific-authorized agent. Responsibility for shipping charges is as described above under our Limited One (1) Year Warranty.**

VersArray (XP) Vacuum Chamber Limited Lifetime Warranty

Roper Scientific warrants that the cooling performance of the system will meet our specifications over the lifetime of the VersArray (XP) detector or Roper Scientific will, at its sole option, repair or replace any vacuum chamber components necessary to restore the cooling performance back to the original specifications at no cost to the original purchaser. ***Any failure to "cool to spec" beyond our Basic (1) year limited warranty from date of shipment, due to a non-vacuum-related component failure (e.g., any components that are electrical/electronic) is NOT covered and carries NO WARRANTIES EXPRESSED OR IMPLIED.*** **Responsibility for shipping charges is as described above under our Basic Limited One (1) Year Warranty.**

Sealed Chamber Integrity Limited 24 Month Warranty

Roper Scientific 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

Roper Scientific 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

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vacuum integrity will be covered by us. Responsibility for shipping charges is as described above under our Basic Limited One (1) Year Warranty.

Image Intensifier Detector Limited One Year Warranty

All image intensifier products are inherently susceptible to Phosphor and/or Photocathode burn (physical damage) when exposed to high intensity light. Roper Scientific warrants, with the exception of image intensifier products that are found to have Phosphor and/or Photocathode burn damage (which carry NO WARRANTIES EXPRESSED OR IMPLIED), all image intensifier products for a period of one (1) year after shipment. ***See additional Limited One (1) year Warranty terms and conditions above, which apply to this warranty.*** **Responsibility for shipping charges is as described above under our Basic Limited One (1) Year Warranty.**

X-Ray Detector Limited One Year Warranty

Roper Scientific warrants, with the exception of CCD imaging device and fiber optic assembly damage due to X-rays (which carry NO WARRANTIES EXPRESSED OR IMPLIED), all X-ray products for one (1) year after shipment. Se*e additional Basic Limited One (1) year Warranty terms and conditions above, which apply to this warranty.* Responsibility for shipping charges is as described above under our Basic Limited One (1) Year Warranty.

Software Limited Warranty

Roper Scientific 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. Roper Scientific 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 Roper Scientific 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 Roper Scientific 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 Roper Scientific.**
2. **You must notify the Roper Scientific 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 Roper Scientific factory or, at our option, an authorized service center.**
4. **Before products or parts can be returned for service you must contact the Roper Scientific 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 Roper Scientific factory or one of our authorized manufacturer's representatives or distributors.**
6. **Unless specified in the original purchase agreement, Roper Scientific is not responsible for installation, setup, or disassembly at the customer's location.**

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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 Roper Scientific.**
8. **After the warranty period has expired, you may contact the Roper Scientific factory or a Roper Scientific-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 Roper Scientific's 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 Roper Scientific factory of purchase, contact your authorized Roper Scientific representative or reseller, or visit our technical support page at www.roperscientific.com.**

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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 Roper Scientific 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 Roper Scientific. Shipment of these components should not be made without prior authorization by Roper Scientific.

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, Roper Scientific may, at its sole discretion, require an inspection of the camera system as a condition of consent to place it under Service Contract.

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Declaration of Conformity

Roper Scientific, Inc. declares that the equipment described in this document is a CLASS A DEVICE 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	**Product Safety with Amendments**

on the application 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	**RF Emissions Control**
EN 61000-3 Series	**Harmonics & Flicker**
EN 55024	**Immunity from Electromagnetic Disturbances**
EN 60950	**Product Safety**

Product Description:	**Video Camera**
Model:	**CoolSNAP$_{cf}$ / CoolSNAP$_{ES}$**
Test Reports:	**EMC Rpt 2K01-0122-003B- EN55022**
	EMC Rpt 2K00-0122-003C- EN55024
	EMC Rpt 2K01-0122-003D-EN61000-3 Series
	SAFETY Rpt 2K01-0122-003E-EN60950

Authorized Signature: _____
Stephen L. Marcus, Vice President

Roper Scientific, Inc.
3440 East Britannica Drive
Tucson, AZ, 85706
USA

CE

Manufacturer: **ROPER SCIENTIFIC**

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Chapter 1. Introduction

Description

CoolSNAP$_{cf}$ and CoolSNAP$_{ES}$, from Roper Scientific, are ideal cameras for digital microscopy and many other biological applications. The simple, compact CoolSNAP$_{cf}$ incorporate a high-quality CCD (charge-coupled device), a 12-bit scientific digitizer, and low-noise electronics to produce high-quality 12-bit monochrome or 36-bit digital color images at greater than 1k x 1k resolution. The CoolSNAP$_{ES}$ offers higher sensitivity (especially in the red region) and lower read noise to produce high quality 12-bit monochrome images.

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

System Components

Components for the CoolSNAP camera system are listed as follows:

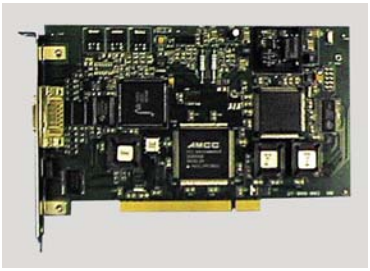
- **Camera**
- **Interface hardware (PCI card installation covered in the *Installation Guide* insert packaged with the CD-ROM)**
- **Data cable (connects camera and PCI card)**
- **Software (PVCAM® and RS Image™) and**
- **Manual (PDF on the CD-ROM).**



CoolSNAP Camera with Test Lens



CoolSNAP Cable



CoolSNAP PCI Card

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About This Manual

The *CoolSNAP User Manual* is divided into four 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 installing the camera system's hardware and software.
- Troubleshooting — Answers to camera system problems.
- Basic Specifications — Specifications for CoolSNAP components.

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:

- This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take adequate measures.
- 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 before disconnecting the CoolSNAP cable from the DATA connector or the PCI card, you do *not* need to power off your computer to detach the cable.
- 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 1/2 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 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.
- Do not use a screw longer than 1/4 inch (.63 cm) in the camera's tripod mounting hole.
- Do not use a C-mount lens having optics that extend farther than .47 inches (11.9 mm) behind the flange of the lens.

Environmental Requirements

The CoolSNAP camera system should be operated in a clean, non-condensing environment.

The camera system's ambient operating temperature is 15°C to 30°C.

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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 0°C and 70°C with a relative humidity of 0%-80% 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 farther than .47 inches (11.9 mm) behind the flange of the lens. The CoolSNAP camera can be mounted to a tripod using the tripod-mounting hole located on the bottom of the camera. See *Additional Measurements* on page 16 for more information.

Note: In microscopy applications, a 0.5x C-mount camera coupler is recommended for an expanded field of view.

Repairs

The CoolSNAP camera system contains no user-serviceable parts. Repairs must be done by Roper Scientific. Should your camera system need repair, contact Roper Scientific 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 Roper Scientific Customer Service.

To clean the camera's imaging window, use only a filtered compressed-air source. Do not touch the window.

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Roper Scientific Customer Service

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

- **Tel:** 800. 874.9789 and 520.889.9933 between 8:00 am and 5:00 pm MST
- **Fax:** 520.295.0299
- **E-mail:** cservice@roperscientific.com
- **Mail:** Roper Scientific
  3440 East Britannia Drive
  Tucson, Arizona 85706

In Europe, you can reach Customer Service at:

BENELUX

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- **Fax:** 31.347.324979
- **E-mail:** mailto@roperscientific.com
- **Mail:** Roper Scientific, BV
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In Japan, you can reach Customer Service at:

- **Phone:** 81.43.274.8022
- **Fax:** 81.43.274.8023
- **E-mail:** sales@roper.co.jp
- **Mail:** Nipon Roper, K.K.
  D-10E 1-3 Nakase,
  Mihama-ku, Chiba-shi
  Japan 261-8501

General product information and answers to some customer service questions can be found on our website:

http://www.roperscientific.com

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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$_{cf}$ or CoolSNAP$_{ES}$ camera system has the following hardware components:

- **PCI card**
- **Camera and Data cable**

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 Roper Scientific 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 2.6.5 or higher.

Host Computer Requirements

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

- **Windows® 98SE, Windows® ME, Windows® 2000, or Windows® XP operating system**
- **500 MHz Pentium® III (or greater)**
- **256 MB RAM (or greater)**
- **CD-ROM drive**
- **At least one unused PCI card slot**
- **16-bit color display (or greater)**

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

Macintosh® OS 8.X or OS 9.X

- 64 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.
- MacOS8_OS9 directory — this directory contains the files required for installing to 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.

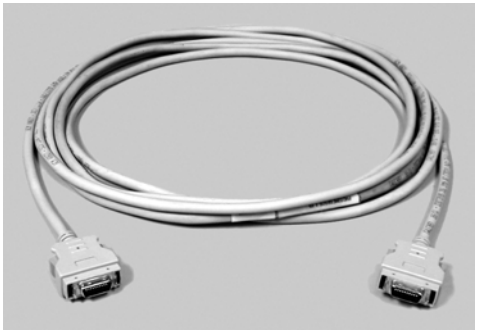
Note: The Video-capable PCI card accepts a standard BNC connector for video output.

After installing the PCI card, proceed to *Connecting your CoolSNAP Camera* on page 7.

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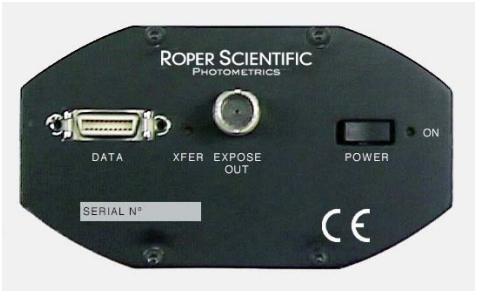
Connecting Your CoolSNAP Camera

The CoolSNAP cable connects your CoolSNAP camera to the PCI card. This cable is designed to serve as a conduit both for data and power.



To connect your CoolSNAP camera:

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



The following connectors and display lights, as well as the power switch, are located on the back of the CoolSNAP camera.

- ***DATA connector:*** **20-pin, high-density connector for data transfer and power.**
- ***EXPOSE OUT connector:*** **standard BNC connector (not video); the signal at the BNC connector will go to a TTL high level when the exposure begins; useful for synchronizing an external shutter in the illumination pathway; will not power the shutter.**
- ***XFER display light:*** **amber LED illuminates during data transfer.**
- ***ON display light:*** **green LED illuminates when camera is powered on.**
- ***POWER switch:*** **momentary on/off rocker switch (CoolSNAP$_{cf}$) or toggle switch (CoolSNAP$_{ES}$).**

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

Common Features

The features described in this section are identical in the CoolSNAP$_{cf}$ and CoolSNAP$_{ES}$ cameras. Features that are specific to the CoolSNAP$_{ES}$ camera are described separately in the "CoolSNAP$_{ES}$" section.

Readout Speed

The CoolSNAP$_{cf}$ and CoolSNAP$_{ES}$ cameras operate at 20 MHz digitization and offer greater than 10 full frames per second.

Binning

Both cameras support 1x, 2x, 3x, 4x, and 8x binning in the serial (horizontal) direction and flexible binning in the parallel (vertical) direction. Binning increases the frame rate and sensitivity but at the expense of resolution. Choosing a smaller region of interest (ROI) further increases the frame rate.

RS170/PAL Operation

Both CoolSNAP$_{cf}$ and CoolSNAP$_{ES}$ offer 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: RS170/PAL is NOT available in CoolSNAP$_{cf}$ color systems.

CoolSNAP$_{ES}$ Features

The following subsections describe features that are specific to CoolSNAP$_{ES}$ camera systems.

Dual Mode Operation

A unique feature of CoolSNAP$_{ES}$ 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 90 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 690 ms (3 x 200 + 90) and the frame rate is approximately 4.3 fps.

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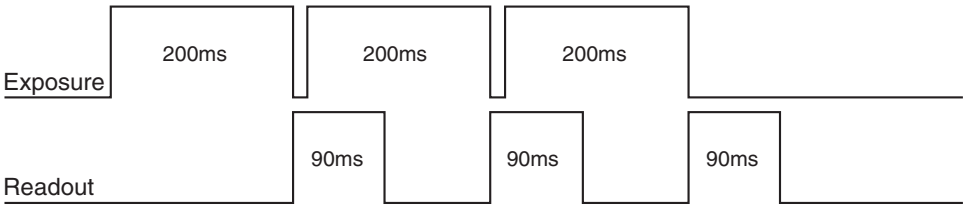


Figure 1. Normal Mode, Overlapped

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 7.14 fps (1/[0.05+0.090]). 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.

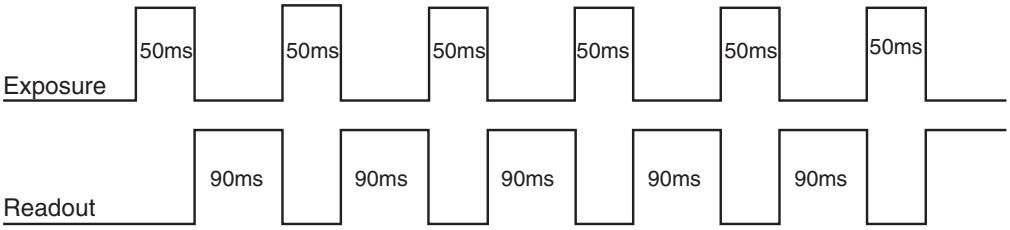


Figure 2. Normal Mode, Nonoverlapped

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.

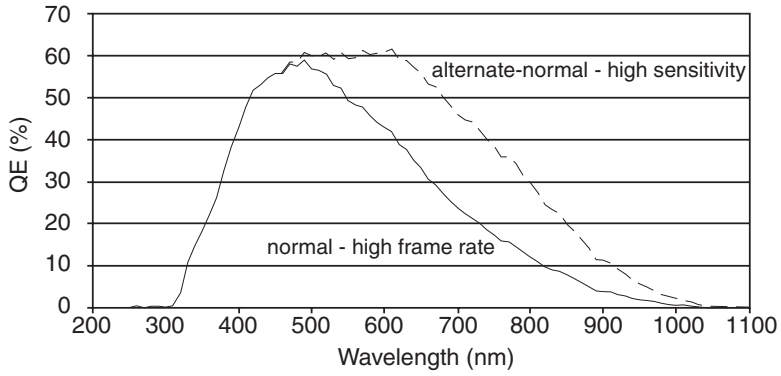


Figure 3. QE for Normal and Alternate Normal Modes

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$_{ES}$ 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.

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Application Examples

Example 1

"I have a CoolSNAP$_{ES}$ 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 and 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$_{ES}$ 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.

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Chapter 4. Troubleshooting

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

New Hardware Found Dialog Box Does Not Appear (Windows 95/98/2000/ME/XP)

If the New Hardware Found dialog box does not appear after installing a new PCI card to your computer and booting Windows 95/98/2000/ME/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 Roper Scientific Customer Service.) Then turn your computer back on and boot Windows 95/98/2000/ME/XP again.**
- **If the New Hardware Found dialog box still does not appear, contact Roper Scientific Customer Service.**

Green LED Does Not Illuminate (Camera Has No Power)

If the green LED on the back of the camera does not illuminate when the power switch is pressed to the ON position:

Check to make sure that the host computer has power:

- **If it does not, power the computer on and then switch on the camera.**
- **If it does, power off the computer, check all system connections (particularly both ends of the CoolSNAP cable), power the computer back on, and then switch on the camera again.**
- **If the camera still does not have power, contact Roper Scientific Customer Service.**

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Images Not Displayed Properly

If the amber LED on the back of the camera does not illuminate while images are being acquired and no images appear:

- **Confirm that the green LED on the back of the camera is illuminated, indicating that the camera is powered on. See *Green LED Does Not Illuminate (Camera Has No Power)* on page 13.**
- **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 both ends of the CoolSNAP cable). Restart. If the amber LED on the back of the camera does illuminate while images are being taken, but no images appear:**
  - **Confirm that Windows is set for at least 16-bit colors.**
  - **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 using your system's Brightfield settings.**

If the problem persists, contact Roper Scientific 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 Roper Scientific Customer Service.

PVCAM Error Message Appears

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

Lengthy Pauses During Imaging

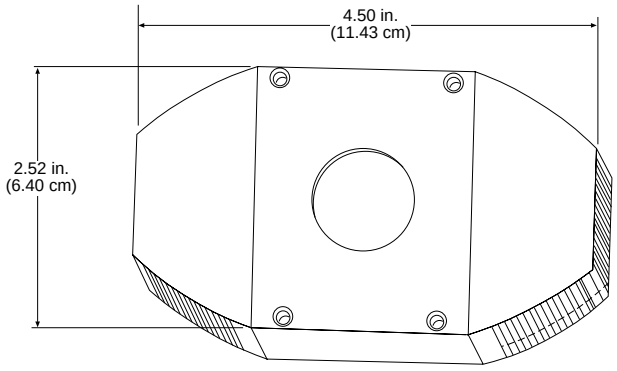
If you notice lengthy pauses marked by a lot of disk activity while imaging:

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

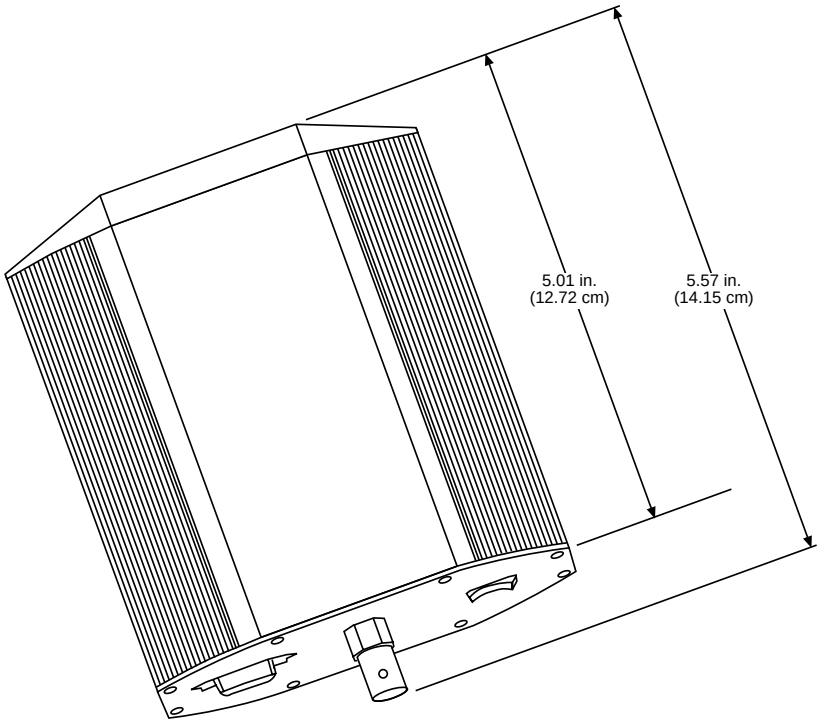
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Chapter 5. Basic Specifications

Dimensions



CoolSNAP Camera: Front View

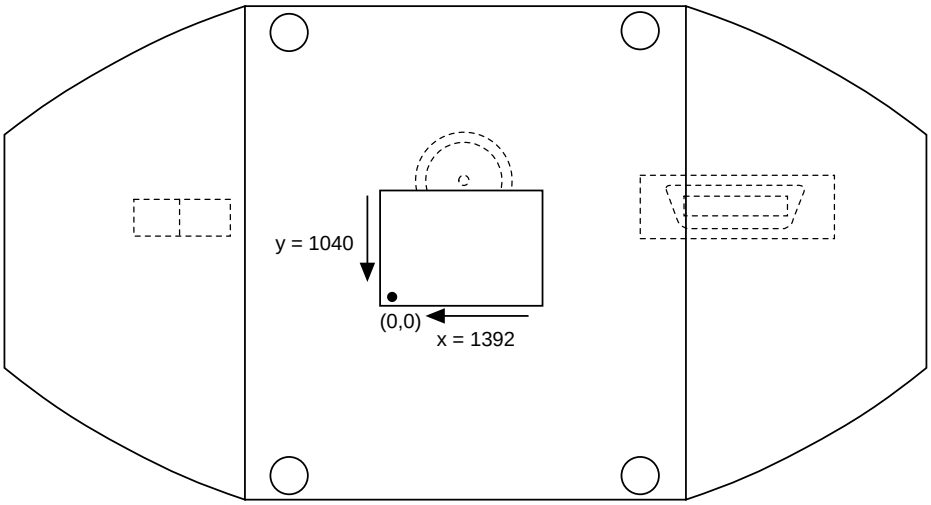


CoolSNAP Camera: Side View

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CCD Specifications and Orientations

	CoolSNAP$_{cf}$	*CoolSNAP$_{ES}$*
Image Type	Color and Mono	Mono
Array	Sony ICX205AK (color) Sony ICX205AL (mono)	Sony ICX285AL
Resolution	1392 x 1040	1392 x 1040
Pixel Size	4.65 µm x 4.65 µm	6.45 µm x 6.45 µm
Digitization Rate	20 MHz	20 MHz
Readout Noise	15 e- rms @ 20 MHz	8 e- rms at 20 MHz
Cooling	Thermoelectric, 5°C below ambient temperature	Thermoelectric, 5°C below ambient temperature



CCD Orientation

Additional Measurements

Camera weight: **1.9 lb. (863 g)**

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

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

Safe C-mount depth: **.47 in. (11.9 mm)**

Flange focal distance: **.69 in. (17.5 mm)**

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Detector

Connectors, Display Lights, and Power Switch

The following connectors and display lights, as well as the power switch, are located on the back of the camera (pictured below).

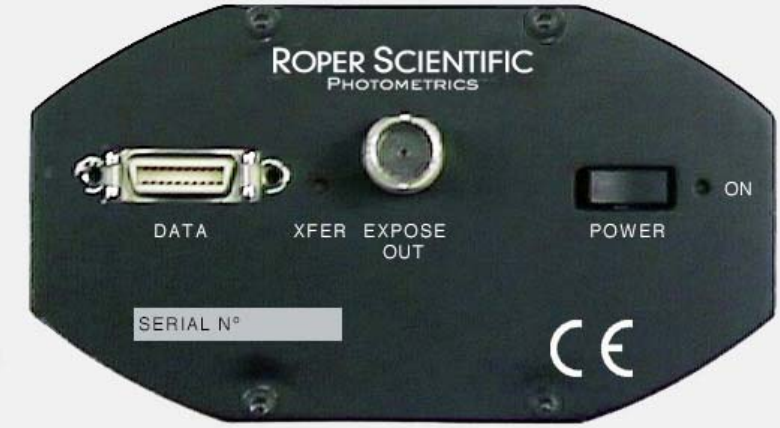
DATA connector: **20-pin, high-density connector for data transfer and power**

EXPOSE OUT connector: **standard BNC connector (not video); the signal at the BNC connector will go to a TTL high level (+ 5 V) when the exposure begins; useful for synchronizing an external shutter in the illumination pathway; will not power the shutter**

XFER display light: **amber LED illuminates during data transfer**

ON display light: **green LED illuminates when camera is powered on**

POWER switch: POWER switch: **momentary on/off rocker switch (CoolSNAP$_{cf}$) or toggle switch (CoolSNAP$_{ES}$).**



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