



Version 7.0

# Camera Guide: CoolSNAP Color Cameras

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## Introduction

Photometrics® CoolSNAP™ color cameras (CoolSNAP Color, CoolSNAPcf Color, CoolSNAPfx Color) are cooled, high-resolution, digital integrating cameras. The cameras employ an interline CCD (no need for a mechanical shutter), and a Bayer color mask. The full resolution color image (1392 x 1040) is produced using standard interpolation methods that preserve the high resolution nature of the data.

CoolSNAP cameras are controlled by a software interface known as PVCAM® (Photometrics Virtual Camera Access Method). The camera comes with its own PCI controller card and all camera functions (e.g., exposure time) can be controlled by the **MCID™ Elite** imaging system utilizing this PVCAM interface.

This chapter describes the installation, use and adjustment of the CoolSNAP color cameras. Most of the functions and features described here are exclusive to this camera. **MCID Elite**, however, provides many other features related to camera-based image acquisition in general (e.g., frame averaging for noise reduction). These are described in the online *MCID Elite Reference Manual (Chapter 2: Acquiring Images)*.

## Installing the Camera

The basic procedure for installing a CoolSNAP color camera is as follows:

1. Install the appropriate PVCAM driver from the **MCID Elite 7.0** CD-ROM.
2. Install the controller card and connect the camera components.
3. “Install” the camera in **MCID Elite**.

If you purchased your camera from Imaging Research as part of a “turnkey” system (i.e., with a computer), the camera, controller card and driver were installed prior to shipping. You need only connect the camera components together.

**NOTE:** Although PVCAM cameras do not connect to it, the main **MCID Elite** imaging board (Matrox Genesis) must be installed in addition to the camera controller card. The Genesis board is used for a variety of processing operations and provides output to the image monitor. Refer to the *MCID Elite Startup Guide* for installation instructions.

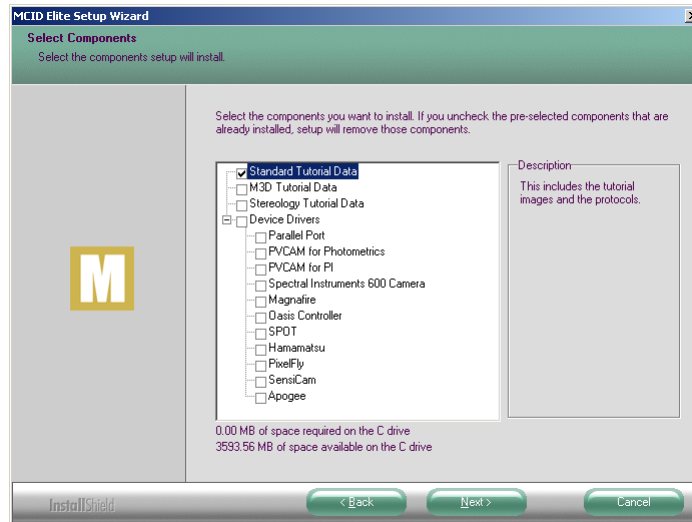
## Installing PVCAM Drivers

The driver for all CoolSNAP color camera models is contained on the **MCID Elite 7.0** installation CD-ROM. If the driver has not been installed, do the following:

**IF YOU ARE INSTALLING MCID ELITE 7.0 FOR THE FIRST TIME:**

1. Log on to Windows® as an *Administrator* or as a User with administrative privileges.
2. Insert the **MCID Elite 7.0** installation CD into the CD-ROM drive.
3. Press [**Install MCID Elite**] and follow the instructions that appear.
4. When the *Select Components* installation dialog box appears (Figure 1), select the **PVCAM for Photometrics** device driver.

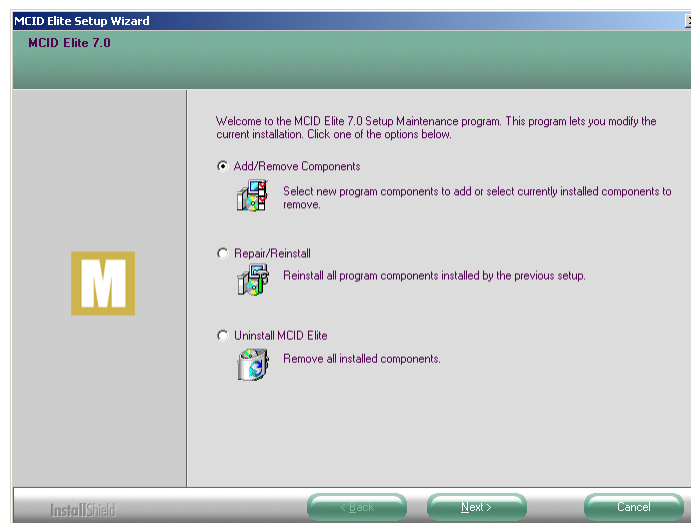
**Figure 1:** Install the 'PVCAM for Photometrics' driver from the Select Components installation dialog box.



**IF MCID ELITE 7.0 IS ALREADY INSTALLED:**

1. Log on to Windows as an *Administrator* or as a User with administrative privileges.
2. Open the Windows *Start* > *Settings* > *Control panel* folder.
3. Open *Add/Remove programs*.
4. Select **MCID Elite 7.0** from the list of applications and press the [**Change/Remove**] button. This launches the *MCID Elite Setup Wizard* (Figure 2).
5. Select the *Add/Remove Components* option.
6. When the *Select Components* installation dialog box appears (Figure 1), elect the **PVCAM for Photometrics** device driver.

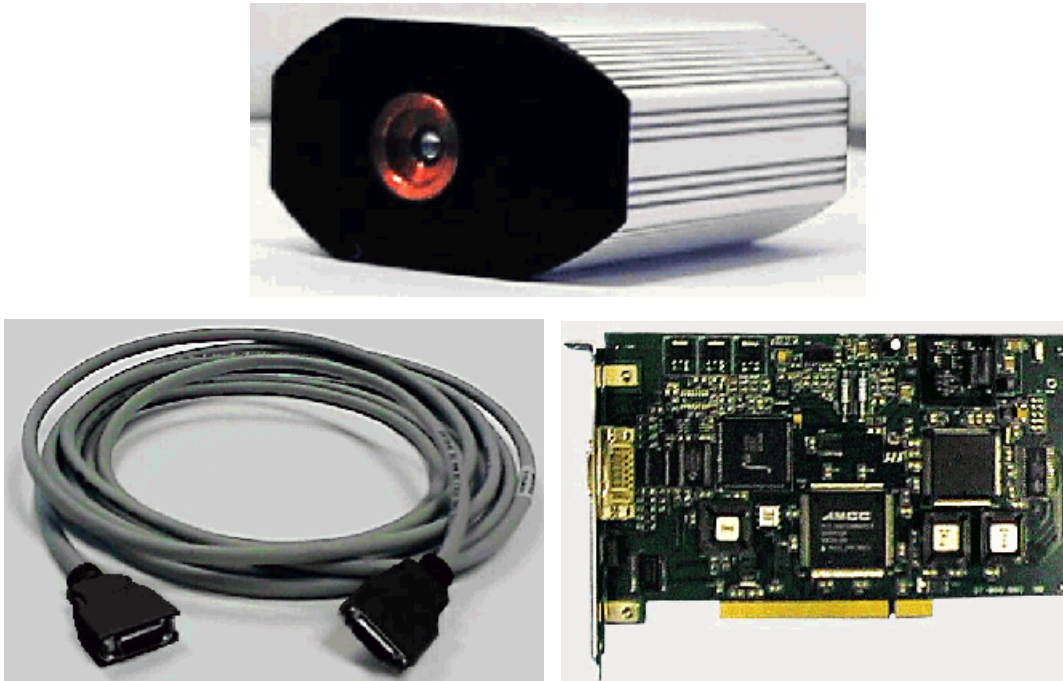
**Figure 2:** The *MCID Elite Setup Wizard*.



## Installing and Connecting Camera Components

The **CoolSNAP Color** and **CoolSNAPcf Color** cameras are supplied with a camera head, a PCI controller card, and a digital interface cable (Figure 3). There is no independent power supply as the camera is capable of drawing power from the computer via the interface cable.

*Figure 3: CoolSNAP Color hardware components.*



Plug the PCI controller card into a vacant PCI slot in your computer. Connect one end of the digital interface cable into the controller card and the other end into the **Data** socket on the rear of the camera head (Figure 4).

*Figure 4: Rear view of CoolSNAP Color camera body.*



The **CoolSNAPfx Color** camera is supplied with an external power supply in addition to the controller card and camera head. Cables are included to connect the camera to the PCI controller card and the power supply.

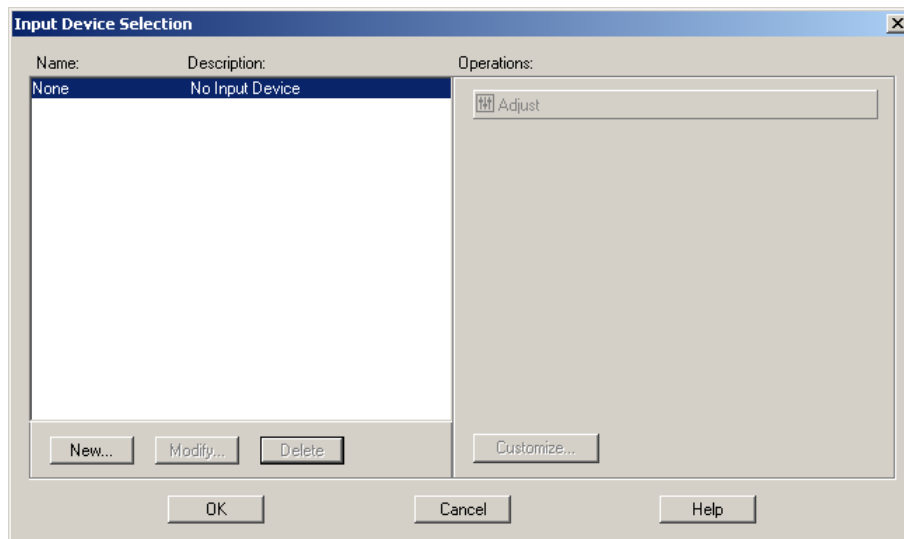
### Installing in MCID Elite

CoolSNAP color cameras should only be installed as a 24-bit input device (8 bits each for red, green and blue).

#### Procedure

The **MCID Elite** imaging system's interface to cameras is controlled through the *Settings > Input select* menu command. The *Input Device Selection* dialog box (Figure 5) contains a list of every camera that you have already installed. You can select, add, or delete any camera input from the list. You can also edit the definition of a specific input, and assign specific operations and settings to it. For details, see *MCID Elite Reference Manual (Chapter 2: Acquiring Images)*.

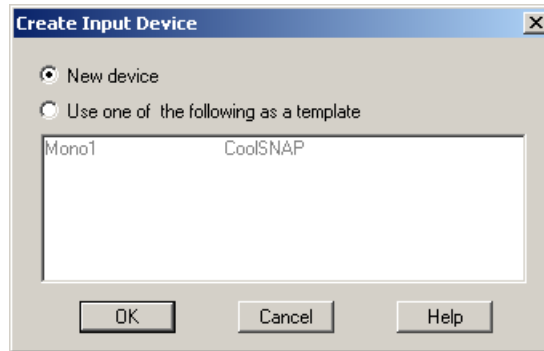
**Figure 5:** The *Input Device Selection* dialog box lists all cameras installed in MCID Elite. It is also used to add new cameras to the list.



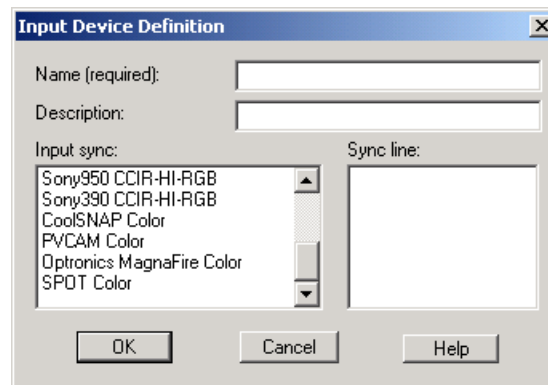
#### **TO DEFINE THE COOLSNAP COLOR CAMERA:**

1. Open the *Settings* menu and select *Display format*. Set the *Image Type* to 24 bits.
2. Open the *Settings* menu again and select *Input select*. The *Input Device Selection* dialog box appears, which lists every camera that is currently installed in **MCID Elite**.
3. Click the **[New]** button.
4. If another camera has been installed already, a *Create Input Device* dialog box will appear (Figure 6). Select the *New device* option and click **[OK]**. If no other cameras have been installed, the *Input Device Definition* dialog box appears (Figure 7).

**Figure 6:** The Create Input Device dialog allows you to install a new camera from scratch, or to copy the all of the settings associated with an existing device.

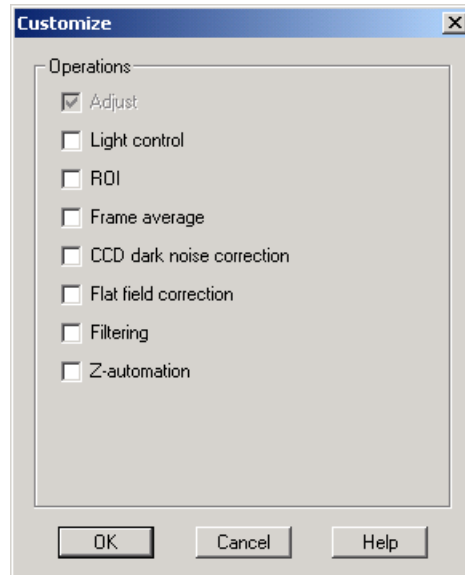


**Figure 7:** The Input Device Definition dialog box is used to describe a camera and its Input sync.



5. Select **CoolSNAP Color** as the input sync.
6. Enter a unique **Name** and **Description** in the appropriate entry fields (e.g., “CoolSNAP Color Camera”).
7. Press **[OK]** to exit the dialog box.

**Figure 8:** The *Customize* dialog box is used to link controls for various camera operations to the camera.



8. A *Customize* dialog box appears next (Figure 8), which allows you to assign various input device operations to this camera (e.g., frame averaging controls). You can select them now or assign them later (see *Chapter 2: Acquiring Images for details*).
9. Click **[OK]** to exit the dialog.

The camera is now installed in the list of input devices. When you exit the *Input Device Selection* dialog box, the camera (and all of the settings and operations associated with it) becomes the default, input device.

## Acquiring Images

The basic procedure for acquiring images with a CoolSNAP color camera is as follows:

### TO DIGITIZE AN IMAGE:

1. Select the desired *Display format* (24 bits).
2. Select the camera from the list of input devices, if necessary.
3. Press the **Digitize** (camera) icon to display a “live” image.
4. Make any necessary adjustments to the live image (e.g., focus or exposure time).
5. Click **[OK]** to complete digitization.

The image is now “frozen”, and any **MCID Elite** function can be applied to it (e.g., the image can be processed, calibrated, sampled, or saved to disk as an image file).

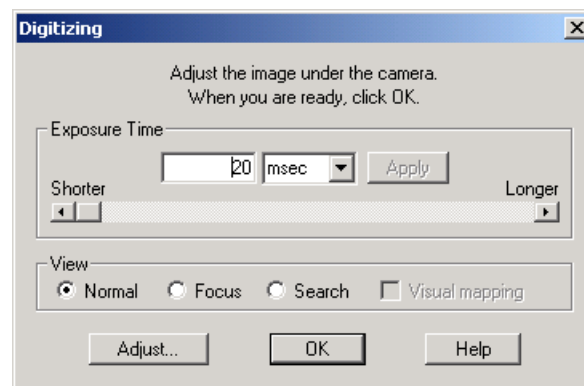
## Digitizing



Click the **Digitize** icon to initiate digitization or press <Ctrl - D>. A dialog box appears to indicate that **MCID Elite** is digitizing continuously and a live image appears on the image monitor.

Light is accumulated as long as the electronic shutter is open. Longer exposure yields higher sensitivity. Exposure is controlled by moving the *Exposure Time* slider (Figure 9). For most purposes, an exposure of about 100 to 200 msec is fine. Adjust lighting to give proper illumination. In low light situations, the exposure time can be increased to periods of up to about 5 sec with a gradual increase in background. Exposures longer than this result in sufficient background noise to impair image quality. We have used the CoolSNAP to acquire moderately bright fluorescence images with low backgrounds. Very dim fluorescence starts to become submerged within background noise.

**Figure 9:** Clicking the *Digitize* icon initiates the digitization procedure and displays a dialog box. Move the slider along the *Exposure Time* bar to control the length of time the electronic shutter remains open.



Unlike video cameras, which show a “live” digitizing image, digital cameras tend to have a slower frame rate and the image will appear jerky. With longer exposure times it may take a few seconds before the new frame is displayed. The **View** section of the *Digitizing* dialog box offers some options to help in positioning and focusing of images being acquired with digital cameras.

### Normal

The **Normal** view will allow you to see the whole image during the digitizing process, as it will appear when you finish digitizing. Notice that the frame rate has slowed down to reflect the exposure time combined with the appropriate camera readout time.

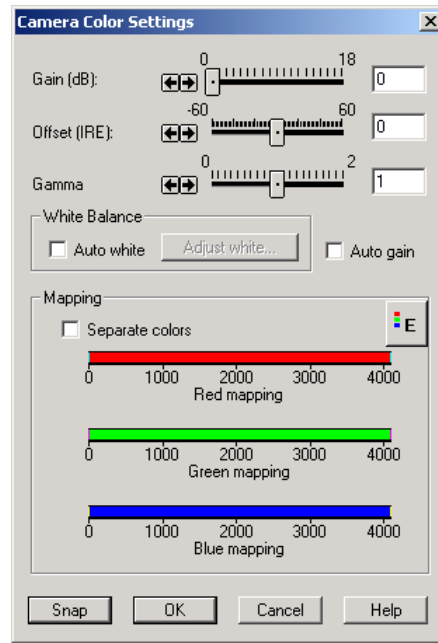
### Focus

**Focus** view displays the central portion of the field at full resolution. As there are fewer pixels to read out, the refresh rate is much faster than would occur if the entire field of view was displayed. This helps with focusing the image during longer exposures. The image is displayed in full resolution when digitization is terminated.

## Adjusting the Camera Response

MCID Elite allows digital control over a number of CoolSNAP settings. To access these controls, press the **[Adjust]** button while digitization is occurring. MCID Elite will display a dialog box for camera adjustment (Figure 10).

*Figure 10: Various options for the CoolSNAP color camera.*



### Gain

Increases or decreases the overall image gain relative to the level of input illumination. Move the slider controls to adjust.

### Offset

Move sliders to adjust the size of the no-light (black level) signal.

### Gamma

A gamma setting of 1.0 sets a linear camera response to input illumination. Numbers greater than 1.0 make the camera less sensitive to low illumination levels and gamma settings less than 1.0 makes the camera more sensitive to low illumination levels.

### Auto gain

Placing a check mark in the *Auto gain* box will have the effect of carrying out an automatic gain adjustment each time an image is acquired.

### Auto white

Allows automatic white balance adjustment (see instructions below). If disabled, white balance can be achieved by manually adjusting the *Red*, *Green* and *Blue* mapping controls.

## Adjust white

Perform automatic white balance adjustment. The procedure is as follows:

### TO ADJUST AUTO WHITE BALANCE:

1. Place a checkmark in the **Auto white** checkbox.
2. Click on the [**Adjust white**] button.
3. A message box appears asking you to block all light to the camera. Press [**OK**] when this has been done.
4. Next, place a white object in front of the camera. If the camera is attached to a microscope, move to a blank field of view. Press [**OK**] when done.

The camera will automatically adjust the *Red* and *Blue* mapping levels relative to the *Green* level to set the white balance. When completed, a “*White Balance is complete*” message is displayed.

## Mapping

The CoolSNAP is inherently a single chip 12 bit monochrome camera with a Bayer color mask over the chip. To create a color image an interpolation algorithm is applied to the image data obtained from this single chip. In effect three 12 bit images are created, one for each of the three (red, green and blue) color components. The camera is thus capable of creating a 36 bit color image. Unfortunately, **MCID Elite** is unable to handle or display 36 bit color images so this 36 bit color image has to be mapped in some way to fit into a 24 bit color image. The mapping adjustments allow the user to have some control over how this mapping is to be carried out. By setting each of the sliders to their maximum range, the 12 bit red, green and blue image data (4096 levels for each color) are mapped to their corresponding 8 bits. The full 4096 levels are squashed into 256 levels. For dim fluorescent specimens the mapping can be set to the lower 8 bits (256 levels) for each color. This makes the camera more sensitive as there is a one to one relationship when mapping the actual levels.

## Separate colors

Placing a check mark in this box allows the user to adjust each mapping color independently.

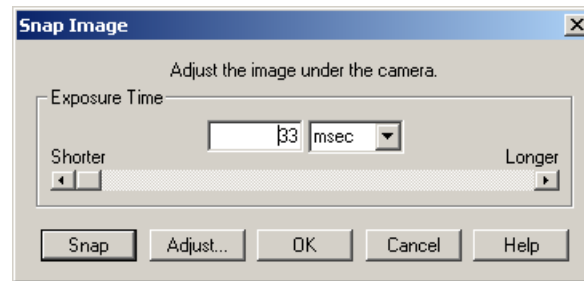
## Snap Shots



In the previous section, clicking on the **Digitize** icon displayed a dialog box where you could make various adjustments to the live image before actually capturing it and displaying the result. The **Snap Shot** icon skips the display of the dialog box and simply snaps and captures a new image. This function can be very useful if you are working with dim specimens and you have already chosen the correct exposure time. Clicking the **Snap Shot** icon will automatically snap a fresh image.

Holding down the <Ctrl> key while clicking on the **Snap Shot** icon will allow you to access an additional set of controls for the **Snap Shot** icon.

*Figure 11: The Snap Image dialog box.*



The *Snap Image* dialog box allows you to adjust the camera exposure time as well as access the **[Adjust]** functions. The only difference between this and the *Digitize* dialog box is that there is no display of a live image during any of these procedures. To see the effects of any adjustments you must click on the **[Snap]** button.

## Maintenance and Troubleshooting

### Cleaning the Camera

The CoolSNAP camera contains a solid state sensing element (a chip) covered by a thin glass window. The glass window attracts dirt like a magnet. Dirt will appear as dark blots on the image. To determine if dirt is on the chip window, move the camera a bit, while looking at an actively digitizing image. Dirt that does not move is on the chip. To avoid gathering dirt, we recommend that you remove the lens or microscope video adapter as little as possible.

The first step in cleaning is to try blowing off dust with clean compressed air, of the type sold for cleaning camera lenses. Use canned air, not air from a lab tap, which often contains oil. Reassemble the camera and digitize an image to see if the dust is gone. If it is not, moisten a cotton swab or piece of lens paper with a glass or lens cleaner. Do not use alcohol or other solvents on optical surfaces (the optical coating and cements can be damaged by such solvents). Remove the lens and gently wipe the glass with the swab or paper. Make sure that the swab or paper has not become dry. Then blow the chip dry with compressed air. Replace the lens and digitize an image to inspect for dust. You may have to repeat the cleaning process a few times to remove all dust.

You may also clean the chip window with “Prophot” cleaners, available from many camera stores. Do not use tissue paper, which often contains impurities. Do not use dry lens paper or swabs to clean the glass over the chip, either. Dry rubbing may produce static charges.

Cleaning the camera is one of those unpleasant and thankless tasks that everyone detests. The best way to avoid cleaning is to keep the camera sealed, so that dust does not enter.

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