# User Guide

for Picture Window and Picture Window Pro

**by Kiril Sinkel**

Picture Window Tutorial

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2/24/16

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for Picture Window and Picture Window Pro

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## Images and Documentation

**Readme.txt:** A text file containing the latest information on this version of Picture Window. Some of the information might have become available after this manual has been finalized.

**Sample Images:** A selection of images that were used in the examples in this manual. You can use the images to try the examples for yourself. The images are installed when you install from the Picture Window CD or install the documentation download and are located in the *samples* subdirectory in your Application Data Folder.

**Photo CD Images:** A selection of images n the Photo CD format is available for your use. They are located in the photo_cd subdirectory on the CD and can be opened using the Picture Window **Open Photo CD** command in the File menu. Note that the PhotoCD format is supported by PWP/32 only.

**Documentation Files:** Picture Window includes extensive documentation. The documentation is in Adobe Acrobat format. During installation, you have the option of copying the documentation files to your hard drive or using them directly from the CD. They are located in *docs* subdirectory of your Application Data Folder. See **Using the Picture Window User's Guide** and **White Papers** for overviews of the available documentation.

**Glossary:** The glossary defines many common digital imaging terms. It is in help file format.

# 1. Introduction to Picture Window

Welcome to the Picture Window™ image editing program. Picture Window is designed to help you realize the full potential of your photographs and have a great deal of fun in the process.

## Getting Started

To get started using Picture Window:

1. The easiest way to start using Picture Window is to read through the short tutorial and actually try the exercises. (See **Picture Window Tutorial**.) The tutorial shows you how to edit an image and familiarizes you with Picture Window. It has everything you need, including the sample image used in its examples.
2. After you get the hang of it, play with some other images. A number of images are available with Picture Window. However, the best images are your own. So if you haven't already done so, select some of your best photographs. If they are already digital, open them directly in Picture Window. If the are prints, negatives or slides, get them scanned.
3. Once you have created photos you really like, you can use Picture Window to print the images or to create a slide show.

   **Print them on your own printer:** You can use Picture Window to print out your images on any Windows-compatible printer. Today's ink jet printers can produce prints of striking quality. Picture Window also lets you print an image across several sheets of paper, letting you produce poster-size prints. See **Print**.

   **Create album pages, photo essays, greeting cards, and photo business cards:** Picture Window's Layout

feature lets you combine images, text, textures, and other elements into layouts of all kinds. See **Creating Layouts**.

**Make a slide show.** Picture Window's slide shows can include images, text, and sound. You can copy them to a floppy and send them to anyone with access to Windows computer system. It's a great way to share pictures with family and friends. And its quite inexpensive. See **Making Slide Shows**.

You can also use the images you edit in Picture Window with other applications to create newsletters, brochures, and many other kinds of documents. You can also send images via email and use them on your web site.

We hope you enjoy working with your pictures and using Picture Window.

# Digital Light & Color—Online

To the latest information on Picture Window updates, tips, technical support, as well as information on many interesting digital photography topics and links to other photography web pages, visit the Digital Light & Color web site at **http://www.dl-c.com**.

# Using the Picture Window User's Guide

This guide is designed to help you get started quickly using Picture Window. It provides examples of virtually every Picture Window operation and contains many hints for getting the best results. Use it both as a tutorial and for reference when you need to find out how to use a particular command. Remember, too, that you can click on the ? button in the tool bar to get Help at any time.

Here is a synopsis of this *Guide*.

**Picture Window Tutorial:** A brief step-by-step tutorial shows you how some of the most common image manipulations are performed and gets you started using Picture Window right away.

**Guided Tour to Picture Window:** Provides an introduction to Picture Window's editing features.

**Utility Functions:** Describes the File, Edit and Window menus. It describes the primary image file formats and shows you how to use the Open Photo CD dialog. It discusses setting preferences, using the undo function, getting information on images and using magnification functions.

**Using Geometry Transformations:** Discusses the geometry transformations which allow you to crop images, change their perspective, orientation, and size by adding or deleting pixels.

**Brightness and Contrast:** Describes the transformations for controlling brightness and contrast and discusses HSL, HSV, and RGB color spaces and how they affect image brightness.

**Color:** Describes the transformations for controlling color balance and saturation, using the filter transformation, converting color images to black and white and tinting black and white images.

**Sharpen, Blur and Noise Reduction:** Describes the Blur and Sharpen transformations.

**Freehand Tools:** Describes free-hand tools that let you retouch the image directly, as well as the magnifier, zoom, and readout tools.

**Making and Using Masks:** Describes how you can use masks to apply Picture Window manipulations selectively, to different areas of your image.

**Combining Images:** Describes how you can combine elements from several images to form a new composite image.

**Creating Layouts:** Describes how you can place multiple images and text on a page to make photo montages, album pages, greeting cards or just group images to simplify printing.

**Albums & Multi-Image Printing:** Album can automatically layout and print images in standard sizes and create free-form layouts. Album is an alternative layout. It supports multiple page albums but does not support text.

**Special Effects:** Describes how to use transformations designed to create various graphical effects. These effects let you transform your photographs entirely, and add text to your photographs, as well as extract and combine color channels.

**Using Batch Workflow:** Workflows can be used to process a batch of images automatically. This is useful for many common tasks, such as transferring images from your camera to your computer, making the same adjustment to a set of images, resizing images for posting on the internet or e-mailing.

**Making Slide Shows:** Describes how you can distribute your images as an electronic slide show. Slide shows can include sound, captions, and text descriptions. They can be uploaded to a web site or copied to a floppy disk, for easy sharing with friends and family.

**Converting a Raw Image:** Describes how to get the most out of your raw images.

# White Papers

The Picture Window CD also contains white papers on digital imaging, color, and photography topics. These in-depth discussions help you understand the basic principles underlying many common operations, ranging from scanning images to color rendering and contain a great deal of practical information. Here are the available white papers:

**Image Fundamentals**

- Digital Image Basics
- Digital Imaging Glossary
- Ten Tips for Making Better Prints

**Astrophotography**

- Using Picture Window in Astrophotography

**Scanning, Resampling, and Film Topics**

- Scanners and How to Use Them
- Image Resampling
- Extending the Dynamic Range of Film
- Velvia vs. Provia 100F A Digital Perspective

**Color Techniques**

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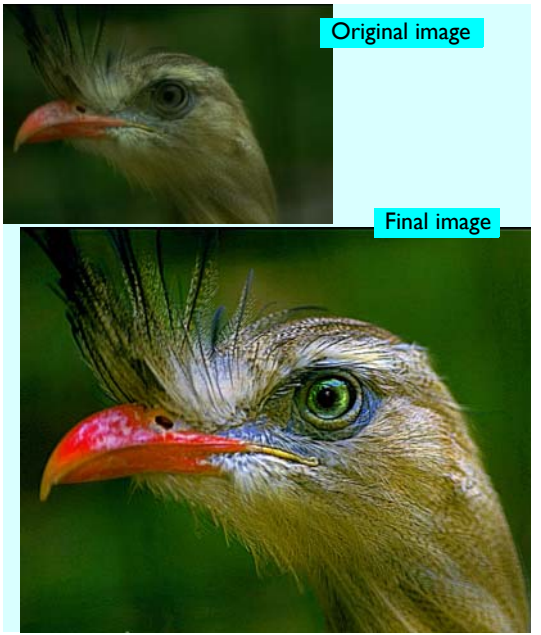
- Color Management
- Color Management Terms

# 2. Picture Window Tutorial






To get you started using Picture Window we present two short tutorials.

**Basic Image Editing**

This tutorial covers basic operations, like cropping, adjusting brightness, color balance, and others that you will use over and over again with your images. These operations are characteristic of Picture Window generally, so learning them will make you comfortable with using all of Picture Window.

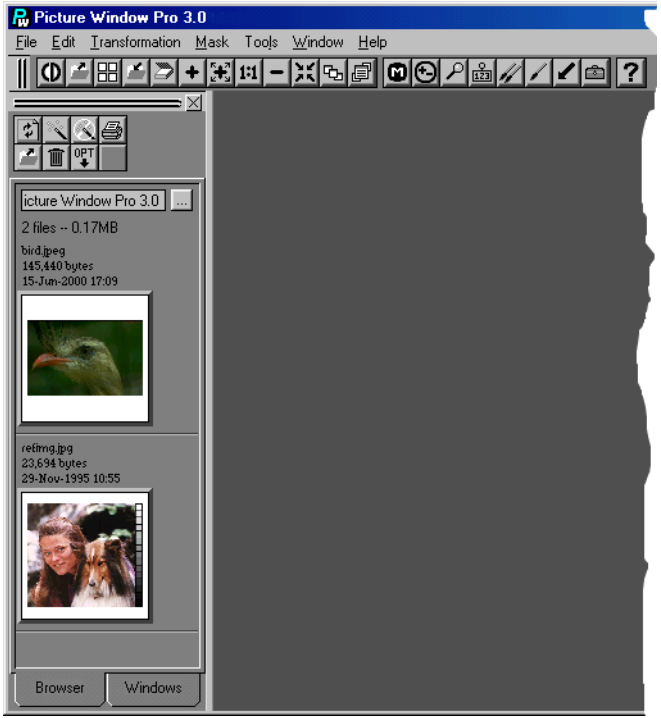
**Applying Edits to Multiple Images**

Once you go through a series of steps to edit an image, you can apply the same workflow automatically to any number of other images by simply dragging and dropping. This tutorial introduces you to workflows and shows you how easy they are to apply.

# Basic Image Editing

This tutorial covers basic image operations. The only thing you need to do before you try this guided tour is install Picture Window—everything else, including a sample image, is provided. So start Picture Window by double-clicking its icon and then load a sample image. The procedure for loading the first sample image is next.

# The Opening Screen




When you first bring up Picture Window, you get a display like that shown at right. The menu and tool bar are displayed at the top of the window. A **Browse** window at the left shows thumbnails of images in any selected directory. (If the Browse window is not displayed, just click the button in the main tool bar.)

## Loading an Image

The first file we want to open is **bird.jpeg** located in the Picture Window installation directory. The extension **jpeg** indicates the file is compressed using the JPEG standard. JPEG is designed specifically for photographs and easily achieves compression factors of 6 to 10 with good quality.

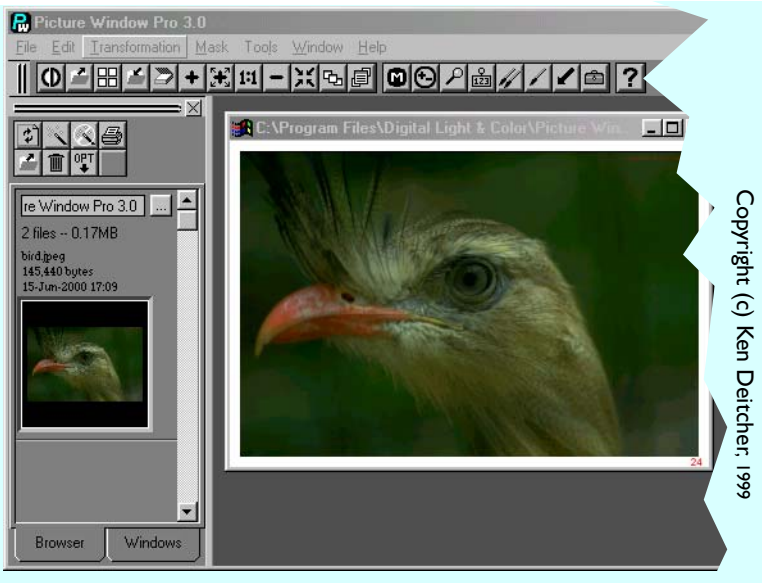
To load the image using the browse window:

4. **Select the Picture Window installation directory.** In the browse window, click the ... button. The Select Folder dialog is displayed. Navigate to the installation directory. Click the **Select** button. All the images in the directory are displayed in the browse window.
5. **Open the bird image.** To open Bird.jpeg, double-click on the image or drag it to the work area. The image is displayed in its own window.

You can also load images using the standard **File | Open** or **File | Open Photo CD** dialogs. (See **Opening Images**.)

## The Image Window

Notice that the image is displayed in its own **image window**. Since the image window is used throughout Picture Window, it is worth noting some of its features.






The title bar of the image window shows the file name of the image. Or, if the image has not yet been stored in a file, the title bar displays an image number. During a session, increasing image numbers are always assigned, so that you can be sure that a greater number means it's a later version.

The title bar also displays the image's magnification. You can change the magnification with the **Zoom** buttons in the tool bar.

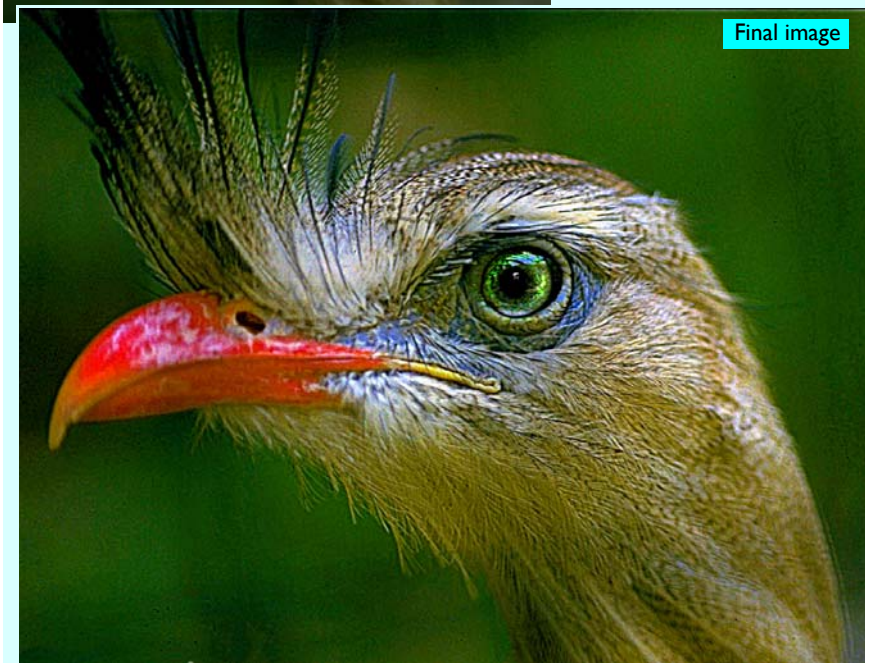
**Zoom in:** Enlarges the image within the image window.

**Zoom in and enlarge window:** Enlarges the image. Also enlarges the image window, if possible.

**Zoom out:** Reduces the size of the image and shrinks the window.

When the image is magnified so that it is larger than the image window, you can drag the image around inside the window by clicking the **Hand** button  in the main toolbar. You can also use conventional scroll bars.

Finally, note the number in the upper left corner of the image's border. It indicates the number of bits per pixel. Full color images have 24 or 48 bits/pixel. Monochrome images have 8 or 16 bits/pixel. 1 bit/pixel images are also possible.


# Evaluating an Image

After you first display an image, evaluate it for a moment. What would you do to improve it? Very few photographs are finished when they come out of the scanner.

Frequently, the photographs we take have all the essential ingredients to be good images once their strengths are brought out and the impact of their defects is reduced.

The image at the top left is a photo of a fabulous bird, as it looks after scanning. By inspecting it critically, you can see a number of things that can be improved. The image contrast is subdued, it has a slight green color cast, and focus is soft.

On the following pages we work on the image in stages, making a series of improvements. Their cumulative effect is the second image shown at left.

To learn the most, load the image and perform the steps yourself as you read.

# Cropping the Image

Since cropping makes the image smaller and thus more manageable for your computer, it's a good idea to crop the image early in the enhancement process. However, if you are not sure whether you want to leave a feature in or out, leave it in. You can always crop it out later.


So let's start by cropping the image. Crop is an image transformation, located in the **Transformation** menu.

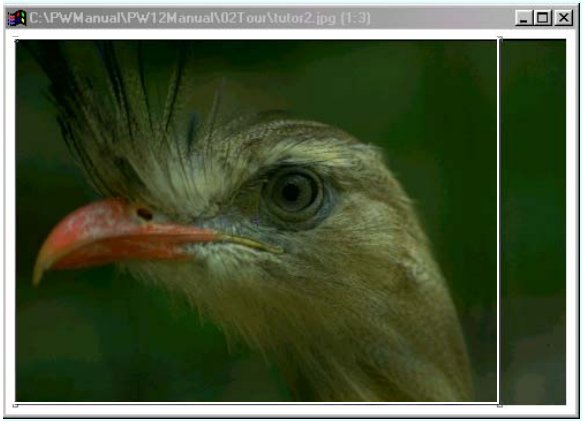
Click on the menu. You will notice that it contains a long list of operations. The three major categories are **Geometry**, **Gray**, and **Color**. Gray contains all the grayscale (i.e. black and white) operations for controlling brightness and contrast. **Color** contains functions for adjusting color balance and color saturation. **Geometry** is the one we want to choose. In addition to cropping, it contains functions for resizing images and for controlling perspective.

## The Crop Procedure

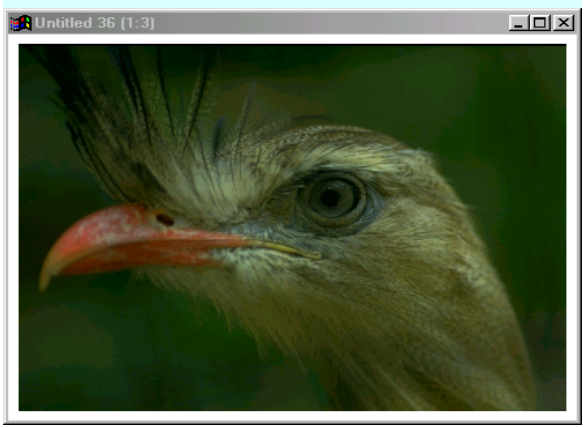
To crop the image:

1. **Click on the image window** to make sure that it is selected. In Picture Window, you select the image window first and then select a transformation for operating on the image.
2. **Display the Crop/Add Border Transformation.** In the **Transformation** menu, select **Geometry** and then select **Crop/Add Border**. The dialog box is displayed. Notice also, that there are little open squares in each corner of the image. These are "handles" that you can drag with the mouse to adjust the cropping rectangle.
3. **Drag the crop rectangle handles** to achieve the crop you desire. You can drag the corners or edges to adjust the size of the rectangle. You can also drag the interior of the rectangle to reposition it without changing its size.

   To make fine adjustments, enlarge the image window by pressing the  tool bar button or selecting the **Zoom In** menu choice in the **Window** menu.
4. **Preview the crop.** To see the effect of the crop, click **Preview**. A small version of the image is displayed in a preview window. You can enlarge the preview window too, by selecting the window and pressing the  tool bar button. You can make further adjustments and preview the image again as necessary.




**Cropping:** In this example, we dragged the right edge of the crop rectangle to the left to cut out the extra space. The result is below.

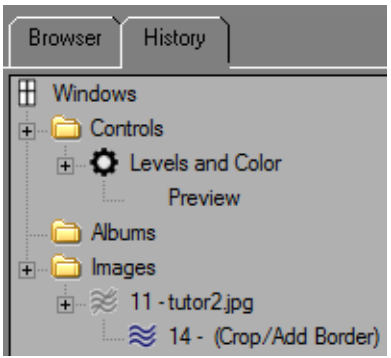


Most dialogs have a **Preview** button. It lets you see the results of your editing without leaving the dialog. The preview image has only as much resolution as is needed for the screen, so your changes can often be applied much faster than to the full image.

5. **Click OK.** When you are satisfied with the changes, click the **OK** button. The cropped image is displayed in a new image window. (Note, if you want to try additional variations, click the **Apply** button instead. Clicking **Apply** leaves the dialog up and allows you to make additional images.)

   **Hint:** Sometimes transformation dialogs get buried under other windows. Just click the  button in the tool bar to bring all transformation dialogs to the top.

## Pipeline Editing

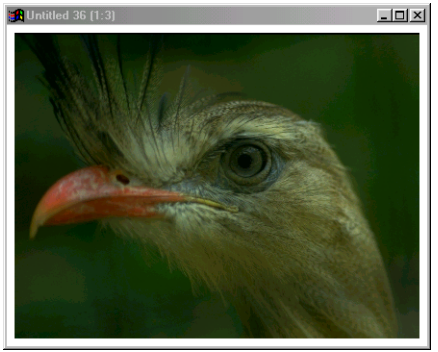



Notice that you now have two image windows—one with the unchanged original image and the other with the changed new image. In Picture Window, most editing operations are not performed in place on the original image, but rather produce a new image. That way you can compare the new version with the previous one and continue from the one you like best. Also, you can easily return to a previous version, even if it's several stages back. This is particularly helpful when you are experimenting. You can save any image to a file at any time. On the other hand, if you don't think you will be returning to a particular intermediate step, you can delete its image window, to conserve memory.

As you continue editing and the number of open windows accumulate, you might have trouble finding the window you need. One way to locate the right window is to use the **History Display** (Click the **History** tab at the top of the Browse display.) It shows a hierarchical list of open windows. To select a window just double-click on its title.

# Adjusting Brightness and Contrast

Usually, brightness and contrast are among the most important adjustments you can make. You can think of brightness as being how light or dark the midtones of the image are. Contrast is the range of tones—from the darkest shadows to the lightest highlights.




Usually your goal is to make the shadows as dark as possible while retaining just a hint of texture and detail in most of the shadow areas. Likewise, you usually want to adjust the highlights so they are as white as possible, but also with a little bit of texture and detail. Finally, you want to adjust the midtones so they look realistic.

### Evaluating the Sample Image

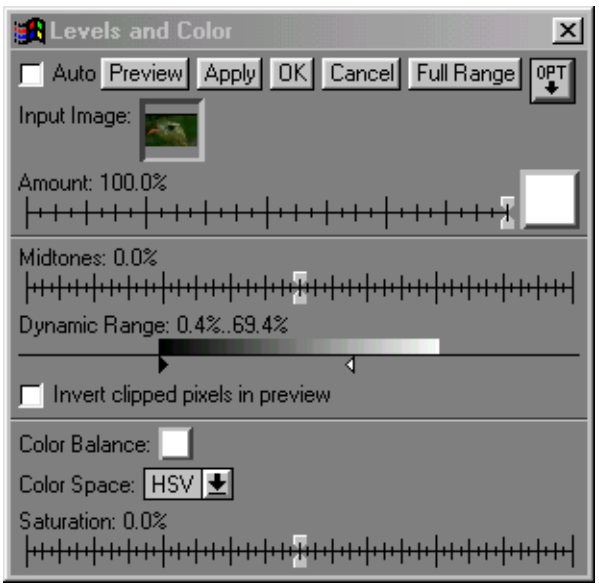
Let's look at the sample image with these criteria in mind. Compare the brightest feathers with the white of the border. They are not nearly as bright. Thus the bright areas of the bird could be made brighter, giving the photo more snap. Similarly, check the blacks. In this example they are satisfactory, but if they were not, we would want to make them darker.

## Using the Levels and Color Transformation

Picture Window has several transformations for adjusting brightness and contrast. We will use a simple and very effective transformation called **Levels and Color**. It gives you independent control of contrast and brightness as well as color balance and saturation. In this example, we will only explore its contrast and brightness features. See **Levels and Color Dialog** for information on its color controls.)

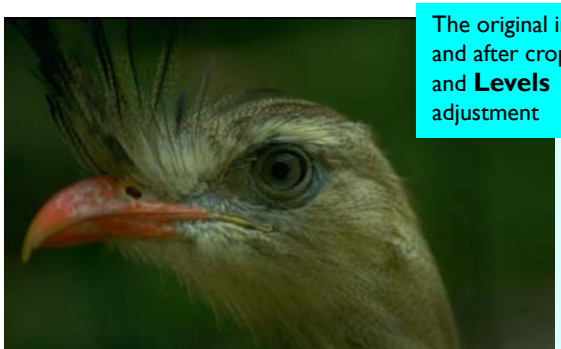
## The Levels and Color Procedure

To use the **Levels and Color** dialog:



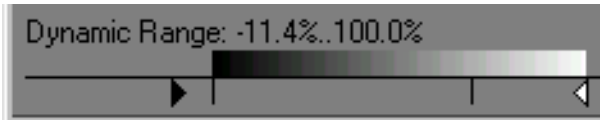

1. **Select the image window** containing the image you want to adjust.
2. **Display the Levels and Color Dialog.** In the **Transformation** menu, select **Gray** and then select **Levels and Color**. The **Levels and Color** dialog box is displayed.

   Notice the position of the shadow and highlight sliders on the Dynamic Range control. Picture Window sets these sliders to the actual brightness level of the shadow and highlight areas of the image. (When you move the sliders, a small scale mark shows their original positions.) For instance, we can see that the brightest area in our image is only about 69% of full possible brightness.



The original image and after cropping and **Levels** adjustment

**3. Adjust the dynamic range.** A good starting point for this adjustment is to simply move the shadow and highlight sliders to maximum black and white, respectively, and preview the image.




The further apart the sliders are, the higher the contrast of the image. For very high contrast, you can actually move them past the maximum white and black points. That has the effect of emphasizing highlights and shadows and increasing the contrast in the rest of the image.

**4. Adjust the Midtones slider**. The Midtones slider affects the mid-range tones most. Adjust it for the most natural brightness level for the subject at hand. We set the brightness to about +25%

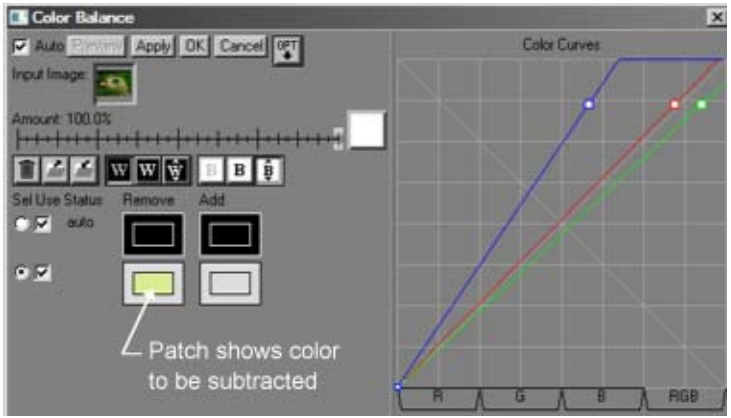
**5. Preview the adjustments.** To see the effect of the adjustments, click **Preview**. A small version of the image is displayed in a preview window. Experiment with different settings and preview again, until you are satisfied with the image.

**6. Click OK** when satisfied with the adjustment. A new image is created in its own window. The dialog box is dismissed.

Note that you can also create a new image by pressing **Apply** instead of **OK**. See **Applying a Transformation** for a discussion of the two buttons.

# Adjusting Color Balance

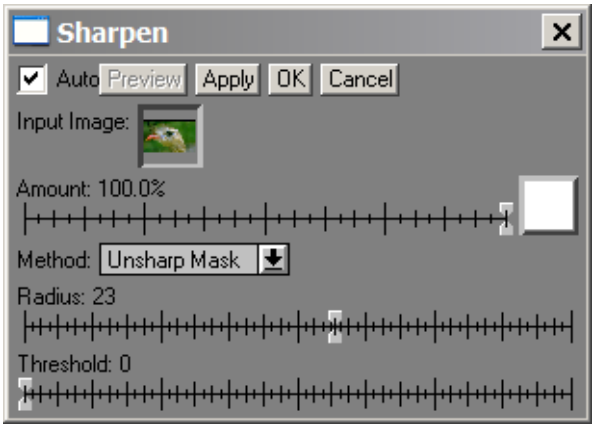
Notice that the whites in the feathers actually have a green tinge. We can remove this tinge by rebalancing the colors of the photograph, using the **Color Balance** transformation.




1. **Select the image window** containing the image you want to adjust.
2. **Display** the **Color Balance** transformation**.** In the **Transformation** menu, select **Color** and then select **Balance**. The **Color Balance** dialog box is displayed.
3. This transformation tries to determine the correction needed to balance the image. Its guess is frequently quite close. Click **Preview** to see the results of auto-correction. If they are satisfactory, click **OK** to create a new image. If you disagree with the auto-correction, click on any area of the image which should be neutral -- for example the highlights in the feathers above the eye would be a good choice. The auto-correction results in our case are shown below.

To bring the image into balance, the **Color Balance** transformation determined that it must subtract green. (Note the **Remove** highlight patch above.) The results are shown at left. Note that the feathers are whiter and the beak is redder. The blue highlights in the feathers are also more prominent.

# Sharpening the Image



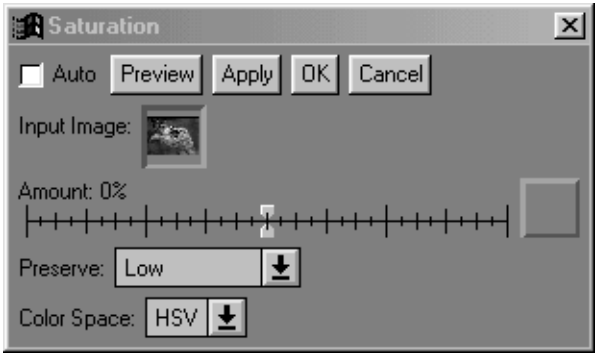

Images in which texture or fine detail are important can frequently be improved by sharpening their focus. In this image, the feather structure is a bit soft, so it is a good candidate for sharpening. To sharpen an image:

1. **Select the image window** containing the image you want to adjust.
2. **Display** the **Sharpen Transformation** transformation**.** In the **Transformation** menu, select **Sharpen**. The **Sharpen** dialog box is displayed.
3. There are several sharpening methods. We chose **Unsharp Mask**, which is a good general-purpose sharpening method. All other settings are simply the defaults.
4. Click **Preview** to see the results of the sharpening. Adjust the radius for best sharpening. When it is satisfactory, click **OK** to create a new image. The original and final images are shown below.

Sharpening brings out the texture of the feathers.

The amount of sharpening you can apply before artifacts start becoming noticeable is different for each image. In this case, a radius of about 23 gave good results.

# Adjusting Color Saturation



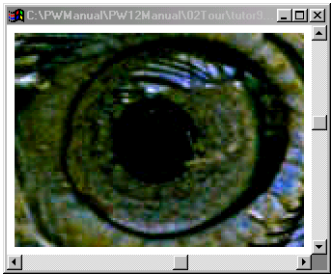

After sharpening the image, we see that the colors look rather bleached. We can bring them out by increasing saturation.

1. **Select the image window** containing the image you want to adjust.
2. **Display** the **Color Saturation** transformation**.** In the **Transformation** menu, select **Color** and then select **Saturation**. The **Saturation** dialog box is displayed.
3. The transformation can be used to either increase or decrease the saturation by moving the slider either to the right or left. Experiment to find the best setting. Click **OK** to create a new image.

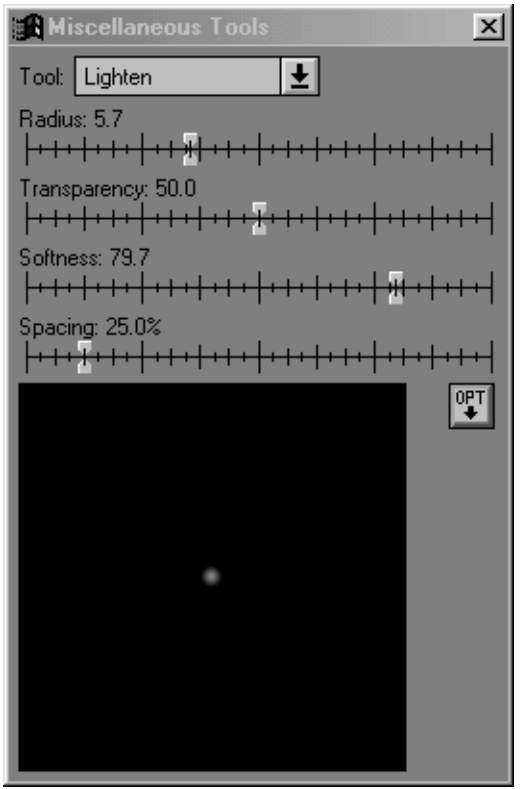
Increasing saturation by about 40% brings out the colors of the beak and the blue around the eye.

Setting the **Preserve** option to **Low** keeps areas of low saturation unaffected.

# Brightening a Small Area



Eyes are frequently very important in drawing us into an image. In this particular case, they are a bit 'dead'. Highlights that can make eyes come alive are not very evident. However, if we look closely (detail, left), we can see that highlights do exist. So all we have to do is make them standout more.




Picture Window has a series of paint brush- like tools for making local changes. In this case, we will use the **Lighten** tool to selectively lighten the iris of the eye.

To use the tool:

1. **Select the image window** containing the image you want to adjust.
2. **Enlarge the image.** Click the  Zoom button in the toolbar. Then place the cursor over the eye and click the left mouse button until the eye fills the image window.
3. **Display** the **Miscellaneous Tools** dialog**.** In the **Tools** menu, select **Miscellaneous Tools.** This dialog offers many tools, any of which can be chosen from the drop-down menu. We will use the **Lighten** tool.
4. You can set the tool's **Transparency** and **Softness**. Set these to high values to reduce the degree of change in each pass of the tool. That makes it easier to control the effect.

5. Move the mouse over the image. A small circle is displayed. It shows the size of the tool. Set the **Radius** slider so that the circle is somewhat smaller than the area you want to change.

6. Hold down the mouse button and go over the area you want to lighten. In our case, we circled around the iris, making a number of irregular passes to brighten it. Notice that the tool works directly on the image. (If you make a mistake or overdo the change, use **Undo** to reverse your action.)

The results are shown below.

We traced several passes around the iris to lighten it and make the eye glisten.

We also added a small highlight to the pupil with the **Paint Tool.**

The result is to bring out the eye's spherical shape and to make it look more alive.

The original and final image are shown at the beginning of the chapter. (See **Evaluating an Image**.)

The final step is to save the image, described next.

## Saving the Image

After you have adjusted the image, save it in a file. Here is the procedure:

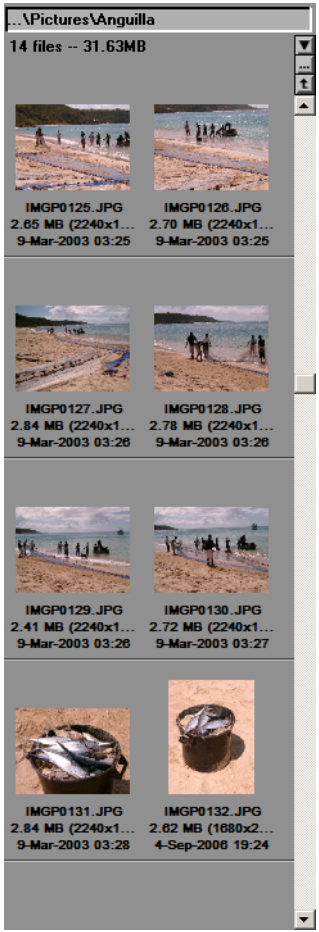
1. **Select the image window** containing the image you want to save.
2. **Display File Save.** In the **File** menu, select **Save As.** The standard Windows **File Save** dialog is displayed.
3. **Set the file type.** If you intend to continue working on the image, select TIFF or one of the other uncompressed formats. If you have completed working with the image, and want to archive it using as little storage space as possible, save it as a JPEG compressed file.
4. **Select the drive and directory** in which you want to store the image and enter a file name for the image.
5. **Press OK to complete the operation.** The image is saved.

## Using Other Transformations

This chapter is only an introduction to the transformations at your disposal. The transformations we performed, cropping, adjusting brightness, contrast, and color balance are required by most images. In addition, images frequently have dust marks and other small imperfections which can be removed with the **Speck Removal** tool. (Also see the **Image Retouching Techniques** white paper for an in-depth discussion.)

However, the manipulations you will want to perform ultimately depend on the image and on your creative purpose. Picture Window provides a very rich set of tools to help you get the most out of your photographs.

In the next chapter, we introduce all of the Picture Window functions and describe procedures that are common to most of the manipulations.




# Applying Edits to Multiple Images

Frequently all the images taken at the same time will require the same editing steps. In this tutorial we will see how we can edit a single picture from such a series and then apply the edits to all the rest of the pictures by simply dragging and dropping.

The screen shot on the left shows thumbnails of a series of pictures of fishermen fishing in the surf. We can see from the thumbnails that the images are all pretty similar. Double-clicking on one of the images (IMGP0130.JPG, see below) we can see there is a decided magenta cast to it. So let's remove the cast, save the modified image. We can then drag and drop the rest of images in the browser on top of the modified image and apply the changes to them automatically.

**Topics**



A sample image

# 1. Correct the Color Balance

The Levels and Color transformation is a kind of swiss army knife which combines a number of operations in one dialog. Here we will use it simply to correct the color balance.

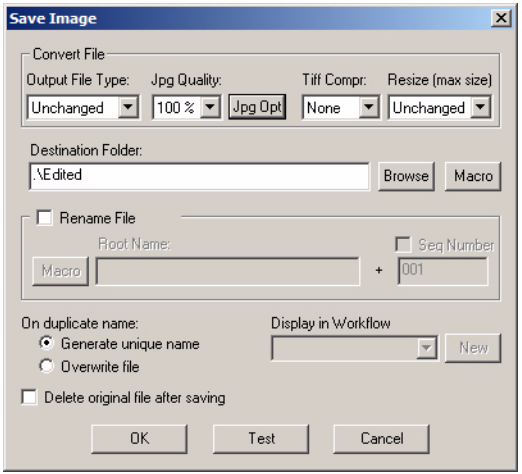
**1.** Click on the Levels and Color button in the toolbar to display the transformation.

**2.** Click on the magenta cast in one of the clouds. (You may want to experiment with a few sample points, since each is a bit different.) The magenta will be subtracted from the image, to produce something like the image at left.

**3.** Click **OK** to complete the transformation.

**Note:** In this example we are only adjusting the color balance. However, you can string together any number of operations So, for example, at this point you could add other changes. All we be applied automatically.

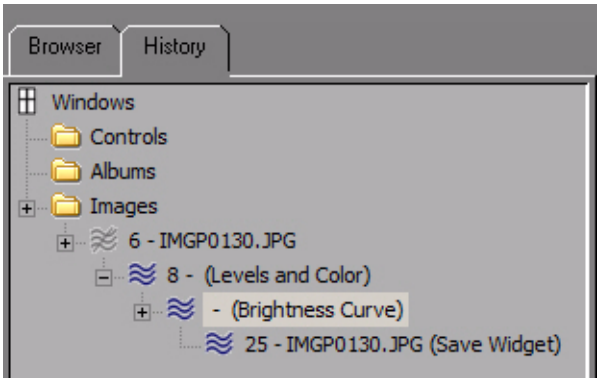
# 2. Save the Image




We will save the image by using the Save As Widget instead of the regular Windows Save As dialog. The Save As widget allows us to specify where the image will be stored as a macro, which can be applied to multiple images.

1. Select **File/Save As Widget** from the main menu to ope the dialog. The dialog lets you specify how files will be saved, including the file type, location, file name and other options. We will fill in the **Destination Folder** and use the defaults for everything else.
2. **Fill in the Destination Folder.** We want to place the images into a subfolder we will call Edited. To create this macro:
   a. Click the **Macro** button next to the **Destination Folder** field and select **Current Folder** from the menu. The .\ path symbol is inserted into the field.
   b. Type in *Edited*. The field should now read .\Edited.
3. Click **OK**. Your current image will be saved under its current name in a subfolder named Edited.

We have now edited and saved our prototype image and are now ready to apply the same workflow steps to the other images in the folder.




## 3. Drag and drop to apply the changes to multiple images

Let's quickly look in the History window to review what we have done. Click the **History** tab in the Browser.

The History tab shows that we opened IMGP0130.JPG and performed several operations on it. Each operation is noted in an indented list. The number associated with the operation refers to the image window. number The whole series of operations is called the *workflow.* If we now drop images onto the last image window, (Window 25), this workflow will be applied to all the dropped images.

Here is the procedure.

1. Display the last image window in the workflow. (Window 25) by double-clicking on its entry in the workflow.
2. Display the browser by clicking the **Browser** tab.
3. In the Browser window, select the images you want to edit.
4. Drag the images to the last image window of the workflow and click the **Apply Workflow** button in the displayed dialog.

The images are processed automatically.

Note that the images are processed in the background. If you are processing a great many images, you can continue working in Picture Window while the background process is running.

**Making Selections in the Browser**

Click on an image to select it.

To select a range of images, click on the first image in the range. **Shift click** on the last image in the range. All images in between will be selected.

To select non contiguous images, **Ctrl click** on each one.

To select all images click the  browser button.

# 3. Guided Tour to Picture Window

This chapter is an introduction to the Picture Window features and user interface. We first look at the many ways you can use Picture Window to enhance your photos. Then we look at how Picture Window works. The topics covered are:

**Enhancing Your Images**: A gallery of image-enhancement techniques.

**Picture Window Main Menu**: Describes how Picture Window's functions are organized

**The Picture Window Display**: Shows how Picture Window's desktop works

**Editing in Picture Window**: Describes the editing process and the common features of Picture Window dialogs.

# Enhancing Your Images

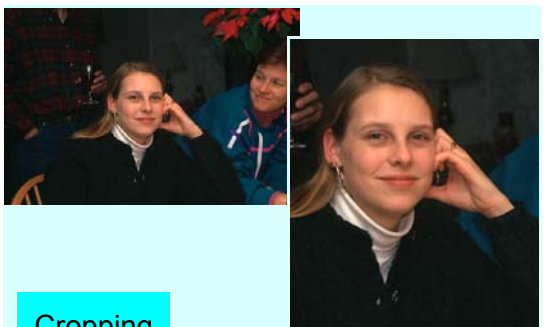
It is seldom that an image emerges from the camera completely ready for printing. In fact, half the fun of photography lies in working with your images again, getting another chance at making them fulfill your original intention as well as possible. And this second time is more leisurely, since you have more time for reflection and for experimentation. You can return to the same images over and over and sometimes even create several quite different photographs from the same exposure.

In the sections below, we give examples of some of the most common manipulations you will want to try. Each is linked to the section that discusses it in greater detail.

### Cropping

Cropping is a simple but powerful technique. Use it to remove extraneous detail to focus the viewers attention on what is most significant in the scene.

You can also crop an image to give it specific proportions, so that it would fit into a particular frame, for instance. (See **Crop/Add Border** for more information.)



Cropping

Perspective

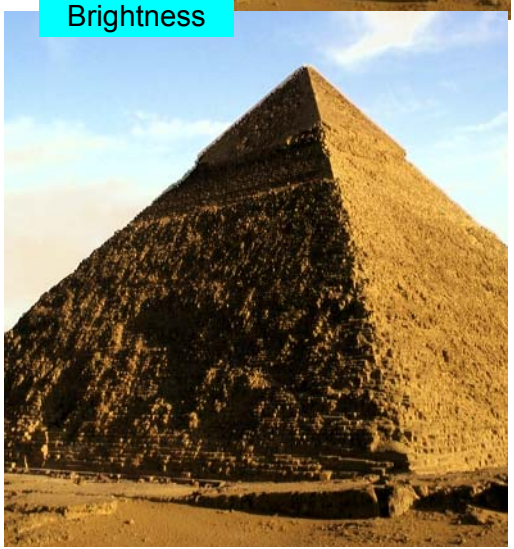
## Straightening a Tilted Image, Correcting Perspective

Sometimes the camera angle may introduce an apparent distortion to an image. An image may be tilted, or appear to be leaning backward, for instance. Such problems can be corrected with the **Warp** transformation. It lets you rotate images, and make perspective corrections. You can also use this transformation to correct many kinds of distortions or even introduce deliberate ones, for creative purposes.

## Adjusting Brightness and Contrast

Properly adjusted brightness and contrast can make a big difference to the impact of a photograph. In most cases, you want to use the full dynamic scale of your print materials. That means adjusting the highlights for maximum brightness and the shadow areas to obtain rich blacks.

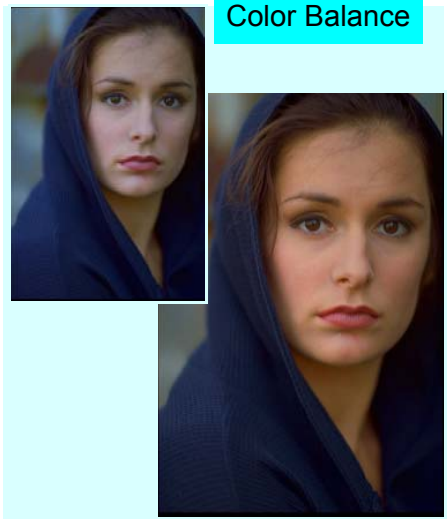
Brightness



Picture window has three transformations for brightness and contrast adjustment—**Levels and Color**, **Brightness**, and **Brightness Curve.**

## Adjusting Color Balance

Frequently a color image will have a cast to it—a particular color will be over-represented in the image. For instance, pictures taken under fluorescent




lights have a definite greenish tinge to them; those taken indoors under incandescent lights may look too red.

Use Picture Window's **Color Balance Transformation** to balance your image. The transformation gives you a great deal of control over the color balance of your image. Frequently it finds the color cast automatically, letting you simply confirm its hunch to bring your image back to balance.


### Controlling Saturation

The 'intensity' of colors—their saturation—can be adjusted a number of ways. You can use either the **Color Saturation** or the more powerful but more complex **Color Curves**. You can also use the **The Filter Dialog**, as in the example at right, to control saturation and to add or remove color casts.

## Removing Defects

Sometimes the easiest way to alter an image is to touch it up directly, with the computer equivalent of a paint brush. Picture window's **Freehand Tools** let you do just that. Various brush-like tools let you touch up dust spots and scratches or even cover up large distracting elements like the traffic light in the example at right.

Freehand Tools

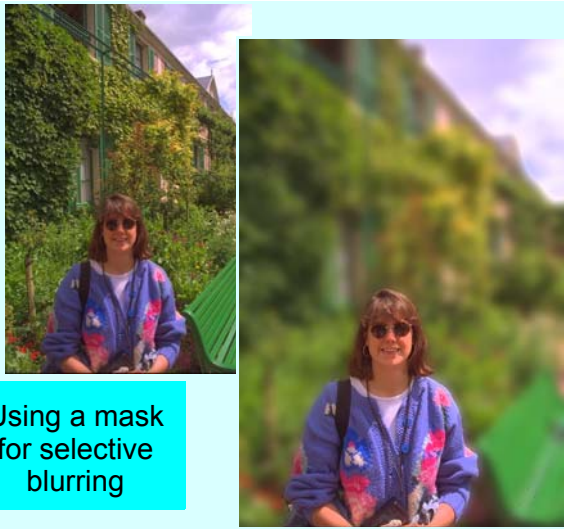
Removing red eye

## Red Eye Removal

Red eye is a frequent problem in indoor flash photos, particularly with compact point and shoot cameras. Picture Window provides a very easy to use **Red Eye Removal** tool which can eliminate the problem completely.

## Masking

Sometimes you want to apply a transformation to only a portion of an image. You might want to lighten a face, darken a sky, or blur a background, but leave the rest of the image unmodified. Masks allow you to do just that. Virtually every transformation can be applied through a mask, allowing you to affect masked and unmasked portions of the image differently. Masks can also be used to protect an area while using a freehand tool. (See **Making and Using Masks**.)

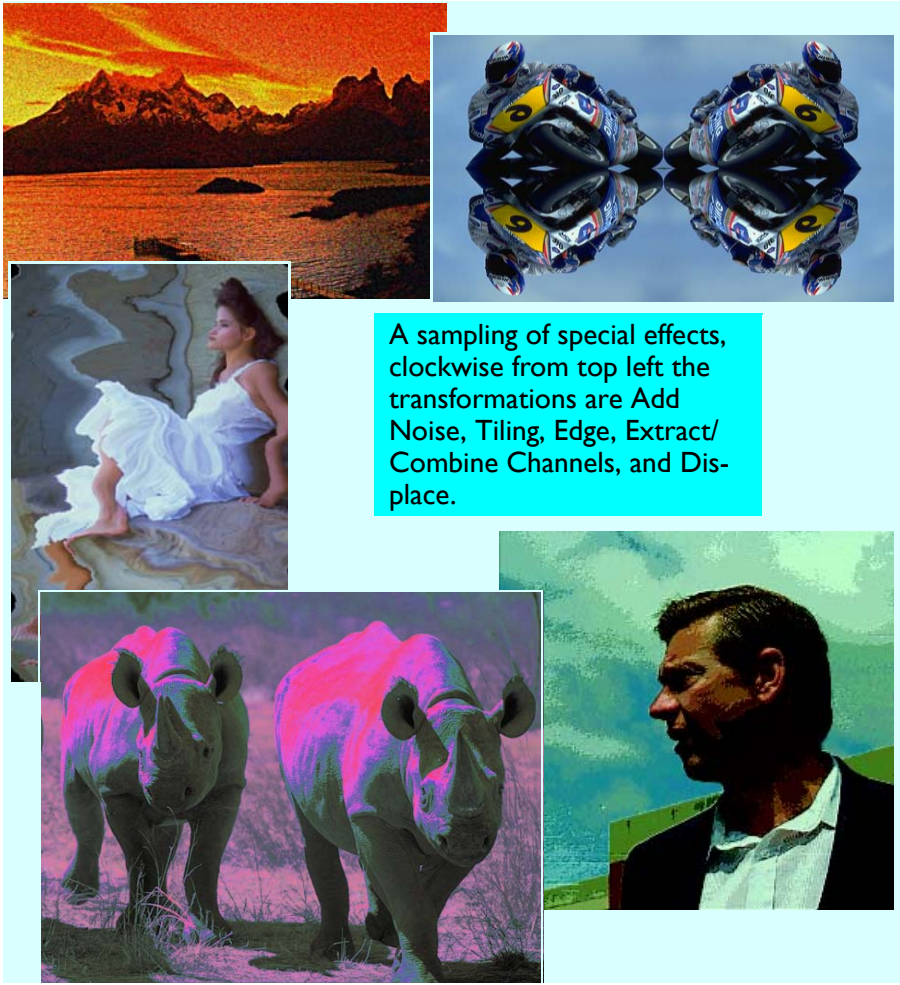


Using a mask for selective blurring

## Composite Images

Picture Window's Composite transformation lets you combine images to form new composite images. It's a powerful transformation which lets you control scaling, placement and even precisely which portions of each of the images are retained in the final photo.

You can use the Composite transformation to add an interesting sky to a picture, to add another person into a group photo, or for any number of effects ranging from serious to playful. (See **Combining Images**.)

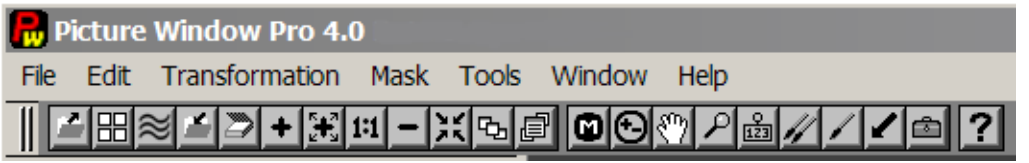


A sampling of special effects, clockwise from top left the transformations are Add Noise, Tiling, Edge, Extract/ Combine Channels, and Displace.

## Special Effects

Picture Window provides a series of transformations specifically designed to create special effects of various kinds. A small sampling of some of the effects that are possible are illustrated at left. See **Special Effects**.

# Picture Window Main Menu




Picture Window's top level menu can be divided into two kinds of functions—the main image editing functions and various utility functions.

### Image Editing Functions

- Transformations
- Masks
- Tools

### Utility Functions

- File Menu
- Edit Menu
- Window Menu

## Transformations

**Transformation** contains functions that act on an entire image. The three most important transformation categories are:

**Geometry** transformations control the image's spatial parameters. This includes cropping the image, adding a border, resizing it, and warping it to correct perspective and other distortions. (See **Using Geometry Transformations**.)

**Gray** transformations adjust the brightness and contrast of the image. Several transformations are provided. You can choose a simple slider-control transformation for uncomplicated situations or a transformation which literally lets you shape the brightness curve for more complex situations and for creating special effects. (See **Brightness and Contrast**.)

**Color** transformations adjust image color balance and saturation. Additional functions let you extract a color channel from the image or create a black and white image from a color image. (See **Color**.)

Other transformations let you blur and sharpen images, overlay images, copy images, and create many kinds of special effects.

## Masks

**Mask** is used to create and edit masks for applying transformations to selected image areas. For example, if you want to darken the background in a photograph but leave the foreground unaffected, you can create a mask that allows the transformation to discriminate between foreground and background. You then apply the **Brightness** transformation through the mask and darken the background only. Masks can be used with most transformations. (See **Making and Using Masks**.)

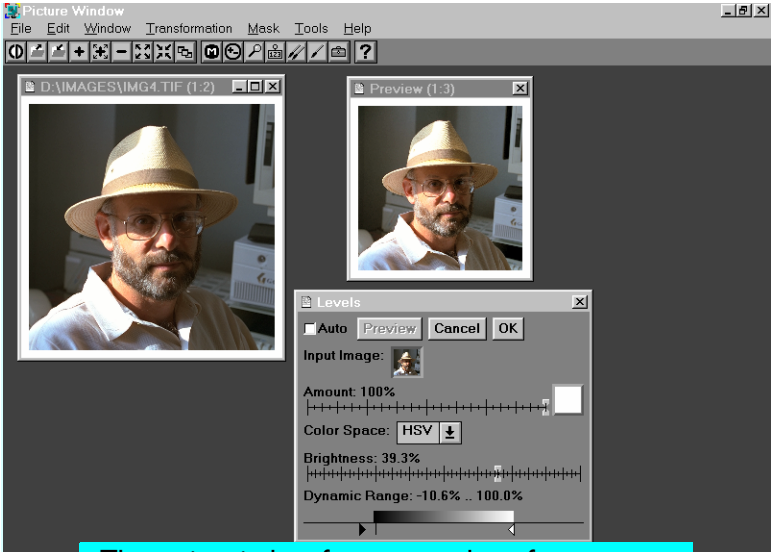
Masks are key to making composite images. You can combine images together using the **Composite** transformation to create a whole range of effects from realistic to surrealistic and beyond. (See **Combining Images**.)

## Tools

**Tools** contains variety of tools for free-hand manipulation of the image. They include **Paint**, **Clone** and **Miscellaneous** tools which let you touch up the image directly, like with a paint brush. A **Speck Removal** tool lets you remove dust spots and scratches quickly and easily. A **Red-Eye Removal** tool lets you get rid of red eye—the bane of flash photography—saving many wonderful images from the trash heap. A **Line and Arrow** tool lets you draw arrows and lines on the image. You can use it with the Text transformation to identify image elements.

The **Tools** menu also has **Zoom** and **Magnifier** tools for enlarging the image. A **Readout** tool lets you find the coordinates and value of the pixel at any point in the image. (See **Freehand Tools**.)

# The Picture Window Display

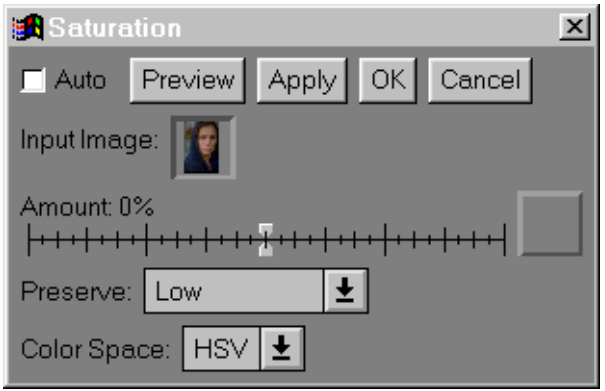



The main window forms a work surface on which you can spread images so you can see your progress as you work.

The main Picture Window display is the work surface on which you edit your images. You can use it like you would a light table—you can spread your images out on it, and compare different images to each other. You can also zoom images to a convenient working size. Depending on the task, you may want to magnify an image so you can see individual pixels, or shrink it so you can view the whole image. Buttons on the tool bar let you resize your images easily.

As you work, the number of open windows seems to multiply and the window you want may get hidden. Picture Window gives you two easy ways to find it and bring it to the surface. One way is to use the **Window** menu. It lists all open windows; so you can pull it down and select the window you want. The other way is to cycle through the windows until the one you want is brought to the top. You can do this easily by clicking on the  **Cycle** tool bar button.

# Using Transformations




Once an image is opened and displayed on your screen, you can use any of Picture Window's transformation dialogs to enhance it. The dialogs all work in the same basic way. Most dialogs have the following common functions:

**Preview:** gives you a quick look at the results of the transformation by applying the dialog at lower resolution and displaying the result in a preview window. For continual feedback, set auto preview by clicking in the **Auto** check box next to the **Preview** button. Auto preview redisplays the preview image each time you make a change.

**Options:** Some dialogs have an **options** menu. The menu lets you set options specific to the transformation. To display the **Options** menu, click the 

button in the dialog.

**Input Image:** A thumbnail of the image that is being edited by the transformation is displayed for confirmation. The image is initially chosen by selecting an image window and then selecting the desired transformation.

However, you can change the input image to any other image currently open in Picture window. To do so, click on the **Input Image** window. A menu pops up showing all the available input images. Click on the image you want to edit next.

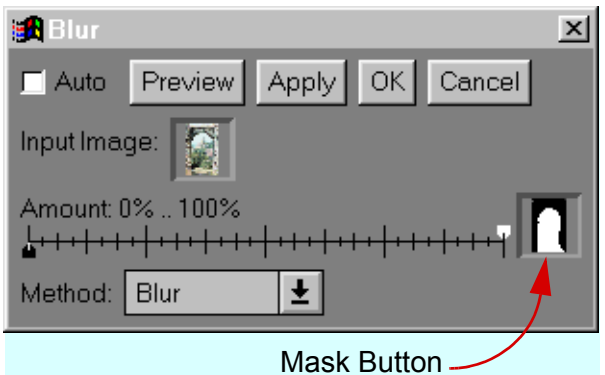
## Amount

The Amount control is a slider which determines the degree to which the transformation settings are applied. Though that sounds very simple, it s actually a very powerful additional control. The Amount control can be used with or without a mask.

**No Mask:** Sometimes applying a particular transformation fully makes too extreme a change. The Amount control lets you take a middle path and specify a percentage of the change to apply. Use **Preview** to see the effect of various Amount settings. **Shift-click** on the white mask button to toggle the preview to 0%. (**Auto** must be set.)

**Mask:** A mask lets you apply a transformation to selected areas of the image while leaving other areas unchanged. You can use it for effects like vignetting, increasing contrast in the sky to make it more dramatic and many others.

Masks are selected by clicking on the **Mask** button. After the selection is made, a thumbnail of the mask is displayed right on the button face and the **Amount** control slider splits into a white and a black slider. This lets you control how the transform is applied to areas under the white and black parts of the mask separately. See **Getting Started with Masks—A Quick Tutorial.**




When a mask is selected, the Amount slider splits into a white and a black indicator. Each is adjustable independently. The white slider controls areas that are white in the mask; the black slider controls areas that are black in the mask.

## Applying a Transformation

After you are satisfied with the adjustments that you have made, you are ready to create a new, full resolution, image. Picture Window is

unique in that it creates a new image rather than modifying the existing image. This gives you more control. You can compare the old image with the new one and decide to try again, discard the old one, or perhaps keep them both for a time, until you see if the particular approach you are taking is ultimately fruitful.

You can apply the transformation and create a new image in one by clicking either the OK or the Apply button. Here is what each does:

**OK:** This button creates a new image and dismisses the dialog. It allows you to work on a new image. This is the most common way of creating the new image.

**Apply:** This button also creates the new image, but the dialog remains open, with the original image still selected. This option allows you to change the dialog settings and try again. You can then compare the resulting output images at full resolution. Apply is useful when you want to apply the same transformation to several images or the differences you are trying to evaluate are too subtle to see in the preview window.

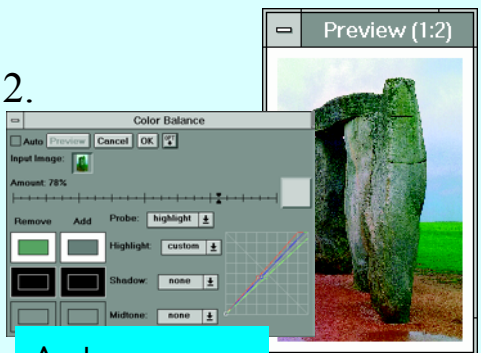
# Editing in Picture Window

In Picture Window, you can have as many images open as your system resources allow. Each image is displayed in its own image window. You can apply a transformation to an image in any image window by simply selecting the window and then choosing the desired transformation from the menu. Once displayed, the transformation is connected with the selected window—any transformation settings you make are applied to the selected image. For confirmation, each transformation dialog has a small window that shows a thumbnail of the selected image. Only one transformation dialog can be active at a time.

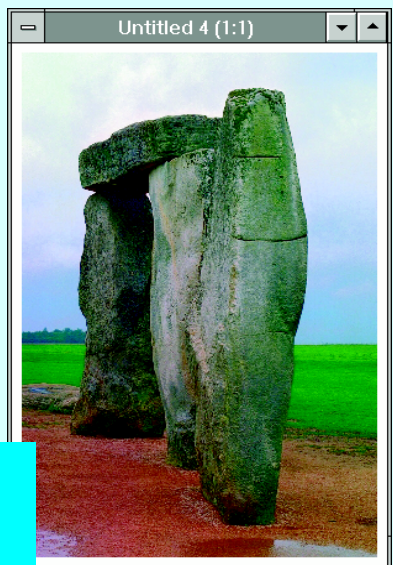
## The editing process

1. Select a window


2. Apply a transformation. In this case, it's Color Balance.




3. New image is displayed. Compare it with the original.



When you apply a transformation to an image, the modified image is placed in a new window while the original image remains unchanged. This lets you compare the results of your transformation with the original image easily and discard the change if you decide to. Also, you can try several alternative changes to the same image and compare them to each other.

## Image Windows

Since you use image windows all the time, let's note some of their features:

An image window

**Title:** Image windows are titled. If the image has been saved in a file, the title is the file name. If the image has not been saved, it is numbered. To help you keep track of your images, numbers are assigned in an increasing sequence.

**Magnification:** The magnification at which the image is displayed on the screen is shown in the title bar. The magnification you select never affects the image itself—only the display, so you can zoom in and out freely as you work.

The magnification is always an integer to avoid introducing artifacts caused by interpolating fractional pixels. If the image is magnified to greater than 1:1, the integrity of its pixels is preserved. In fact as you continue to magnify the image, you can clearly see and manipulate individual pixels.

**Border:** The image is shown inside a border. By default, the border is white to give you a reference in judging the brightness of the image. (You can set border color and width in the **Preferences**.)

# 4. Using Geometry Transformations

Probably the first operations you want to perform on your image have to do with its geometry. Transformations for controlling image size, shape, and orientation are grouped under **Geometry** in the **Transformation** menu. The operations are:

- **Crop/Add Border** is used to crop the image using a rectangular, oval, or diamond shape. You can also tilt the image in the process of cropping, soften the edge to create a vignette effect, and add white or colored border.
- **Resize** is used to change an image's size, resolution, or proportions. Resize resamples the image, replicating or eliminating pixels as necessary.
- **Warp** is used to correct perspective, rotate the image to level the horizon, or stretch portions of the image for creative effect.
- **Level** is used to level the image. You draw a line across a horizontal or vertical feature and the image is adjusted to make that feature level or plumb.
- **Mirror/Rotate** is used to rotate or flip the image.``````````````
- **Copy** creates an independent copy of an open image.
- **Juxtapose** combines two images hrizontally or vertically into a single new image.
- **Fan** bends an image into a fan. You can control the degree of bending and the color of the background.
- **Displace** can be used to displace the image horizontally and vertically or to rotate it. While it can be used to make controlled displacements, it is most frequently used to create various distortion effects by controlling displacement using textures, gradients, checkerboards or other control images.

- **Lens Distortion** corrects barrel and pincushion distortion in the image. It can also be used to add such distortion to create a special effect. In barrel distortion, frequently associated with fisheye lenses, horizontal and vertical lines are bowed outward, making the image look like it is on the surface of a sphere. In pincushion distortion—horizontal and vertical lines are bowed inward.

### Suggested order of operations

Though Picture Window does not impose any order in which you must perform image enhancement operations, you may want to do any needed geometry corrections and crop your image close to its final size early in the process, to save memory. This is also a good time to resize the image if necessary, and rotate it or flip it if it is upside down or backwards.

# Crop/Add Border

The Crop/Add Border transformation lets you crop using a rectangular, oval, or diamond shape. If the image is tilted, you can tilt the cropping rectangle (or oval or diamond) to compensate. The transformation also lets you add a white or colored border to your image. For convenience, you can also resize your image in the same operation.

Cropping is used to remove extraneous peripheral material and thus make a photograph more powerful. When you crop, you can think of yourself as taking the picture again. This time you are faced with the scene as recorded in an existing photograph. As you look at it, you might find that it contains a different and better photograph within it. In fact, it's not unlikely that among your own snapshots there are many new pictures waiting to be discovered.

Cropping also reduces the size of the image, improving performance and making the image more manageable for your computer. So, it pays to crop your image early in the image enhancement process. However, if your image is rotated and needs straightening or perspective correction, perform these operations before cropping or leave extra room when you crop your image.

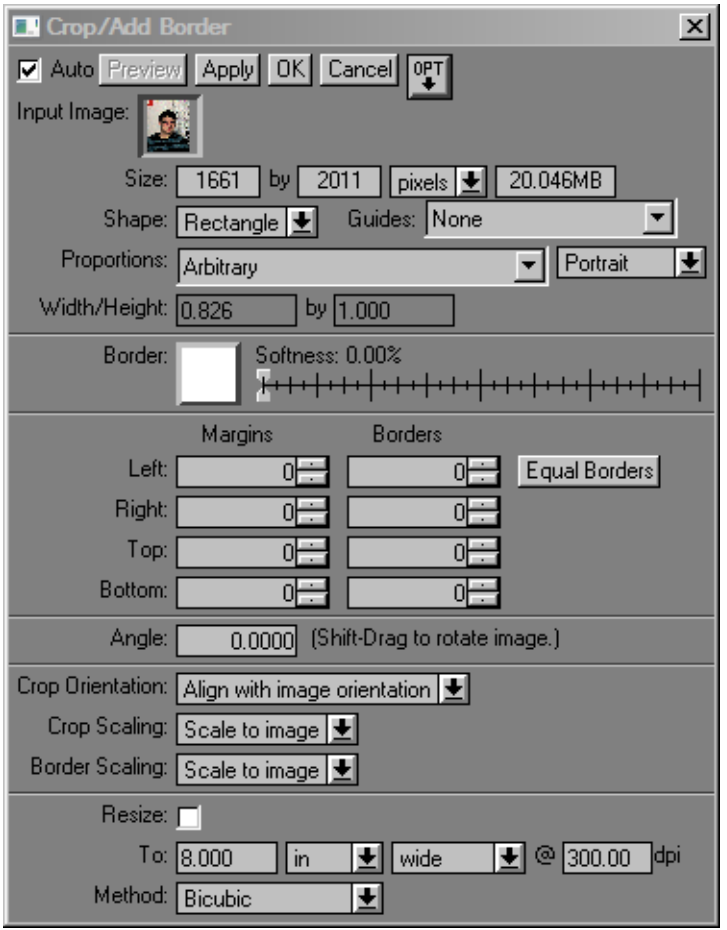
Sometimes one kind of picture 'hides' inside another, like this portrait inside a regular snapshot. Here are two possible crops, one rectangular and one oval with a soft edge.

**The Crop/Add Border Dialog**

## The Crop/Add Border Dialog

To crop an image:

1. **Select an image window** containing the image you want to crop.
2. **Display the Crop/Add Border dialog.** In the Transformation menu, select **Geometry** and then select **Crop/Add Border.** The dialog box is displayed. A crop rectangle is displayed on your image. Initially, it is the full size of the image.
3. **Shape. Choose** rectangle, oval, or diamond.
4. **Guides.** You can choose **None** or one of the **Composition Guides** which help with making cropping decisions.
5. **Proportions.** You can choose Arbitrary, Custom, or one of the specific standard proportions such as 5x7 or 8x10. If you choose a standard proportion, also set the orientation to Portrait or Landscape.
   **Arbitrary** allows you to manipulate the cropping rectangle freely.
   **Custom** allows you to specify your own proportions. Just enter the width and height in the appropriate controls. (Since you are merely specifying



proportions, no units are involved.) The cropping rectangle is locked to the proportions you have chosen as you move and resize it.

6. **Size and position the crop rectangle** to achieve the crop you desire. To adjust the size of the crop rectangle, drag the corners or edges. The readout shows the exact size and file size of the crop rectangle in the units you select. (Alternatively, you can move the rectangle sides by using the **margin** controls. These allow you to control the rectangle in fine, single pixel, increments.)

   To reposition the entire crop rectangle without changing its size, drag it by its center.

   To tilt the crop rectangle, either enter an angle in the **Angle** control or drag one of the corners while holding down the shift key. Positive angles tilt the rectangle clockwise. (The angle control is one way to straighten a tilted image. If you want to precisely align the edge of the image with an image feature, try the **Warp** transformation instead.)

   **Note:** You can enter numbers or arithmetic expressions into any of the numeric fields.

7. **To add a border** to the image, enter the size of the border, in pixels, into the top, bottom, right, and left border controls.

   By default the border is white and the edge of the border is sharp. If you want to change the color of the border or use a texture, click the **Border** button. A menu showing all images and a choice for a solid color is displayed. If you choose the solid color, the **Color Picker** is displayed. Use it to set a color or to choose a color from the image. If you choose an image, it is tiled to cover the entire border. This works particularly well with textures. You can find many textures on the web. You can easily change the color of a texture using the **Tint** transformation.

8. To vignette the image, use the **Softness** slider to adjust the softness of the border.

9. **To resample the cropped image** check the **Resize** checkbox. Set the desired image size and resolution. These settings refer to the final cropped image. For instance to create screen resolution image, set the width to 10 inches and

resolution to 75 dpi. To upsample for printing, set the size to the printed size and resolution to 300 dpi. Finally, set the resampling method. Use one of the Lanczos methods for highest quality. (See **Interpolation Methods**.)

10. To see the effect of the crop, click **Preview**. Click **OK or Apply** when you are satisfied with the adjustment you have made, The cropped image is displayed in a new window, next to the original image.

### Scaling Control

These options are used when the Crop/Add Border transformation is applied to additional images in a workflow. They allow intelligent interpretation of the settings you have made on the prototype image to other images. These images may, of course, have different sizes and orientations.

- **Crop Orientation:** There are two options. **Align with image orientation** turns the crop rectangle when the image has the opposite landscape or portrait orientation from the prototype image. **As is** maintains the original crop orientation. This setting applies only if you have chosen a fixed aspect ratio.
- **Crop Scaling:** The options are **Scale to image** and **Don't scale.**
  The first option scales the crop rectangle to the image. If Aspect ratio is set to **Arbitrary**, each crop boundary is scaled individually. Left and right borders are positioned using the ratio of widths of the prototype and current images. The same is done for the top and bottom borders, using the ratio of heights.

  If Aspect ratio is set to a specific ratio then the entire crop rectangle is scaled using the ratio of either the heights or widths (the larger ratio is chosen) to maintain the prescribed aspect ratio.

  The **Don't scale** option maintains the same absolute crop rectangle size and position.

  In all cases the crop rectangle is always constrained to lie within the image. If it is larger, the rectangle is reduced until it fits. If a specific aspect ratio is selected, the ratio is maintained when the rectangle is resized.

- **Border Scaling:** The options are **Scale to image** and **Don't scale.**
  If **Scale to image** is chosen, the borders are scaled to the ratio of the square roots of the image areas. Thus all four borders are scaled by the same ratio. In the second case, the absolute number of pixels is used.

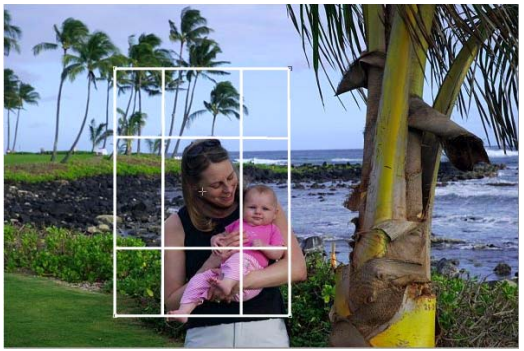
  If **Don't Scale** is chosen, the absolute border widths set in the control are applied to all images, regardless of size.

## Composition Guides

Composition guides project guidelines over the image to help you crop the image. The guidelines are placed proportionally within the crop rectangle and move as you move and resize the rectangle.

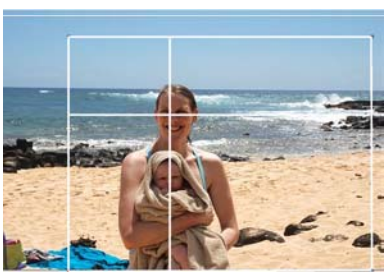
Guides follow a number of classic proportions, such as thirds, the golden ratio and others. You can also add guides by editing the text file which defines them. (See below.)

There are many ways to align the guide lines. The lines can be used to define a subrectangle, as in the top example at right. They can also be used to position a natural focal point in a visually dominate area of the image. Finally, the guides can be used as an aid in rotating the image to straighten it or perhaps align a feature with a diagonal.



**Composition Guides:** A Root 5 grid was projected on the image. The crop rectangle was then adjusted so that the main subject occupied the major rectangle in the lower right.

The guide can also be used as an alignment aid. Here the Rule of Thirds guide is used to position a major feature a third of the way from the top and left side.



### Defining Additional Guides

Books on composition show many different guides. If there is one that you would like to use, you can add it to the available repertoire. The guide lines are not hard coded but rather defined in a text file called PWCompositionGuides.txt. The file is located in the **Application Data Folder**. To add more guides, edit the file in a text editor. Here are some tips:.

- Make sure to backup the file before editing, in case you need to revert to the original version.
- Each guide is defined in an object block, as shown at the right. The block contains an object name and one or more lines. Lines are specified using one of three key words, followed by their coordinates, as follows:

  *line x1 y1 x2 y2*
  *vertical x*
  *horizontal y*

```
begin_object
  name "Asterisk"
  line 0.0 0.0 1.0 1.0
  line 0.0 1.0 1.0 0.0
  vertical 0.5
  horizontal 0.5
end_object
```

- Each coordinate is specified as a number from 0 to 1. For x coordinates, zero is the left side of the crop rectangle, 1 is the right side. Points in between are specified by values between zero and 1. For y coordinates 0 is the top, 1 is the bottom.

# Resize

Sometimes you want to change the proportions of your image. You may also need a lower resolution or a higher resolution version of your image. You can make these changes using the **Resize** transformation.

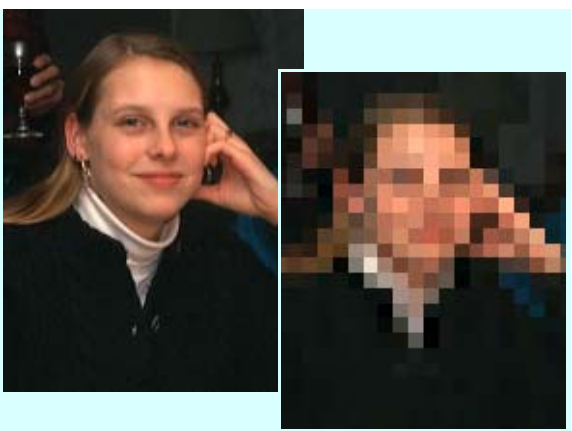
To increase the apparent resolution of an image, **Resize** adds new pixels by interpolating. Since these new pixels are derived from existing pixels, they do not actually add any new detail to the image. However, in many cases, you may be able to increase the apparent resolution of a low resolution image by using resize before printing. See the **Image Resampling** white paper for more information.

To reduce the resolution of the image, **Resize** consolidates pixels, reducing detail. The process is not reversible—the lost detail cannot later be recovered from the resulting lower-resolution image. If you will need the full resolution image later, make sure to save a copy of the original before resizing it.

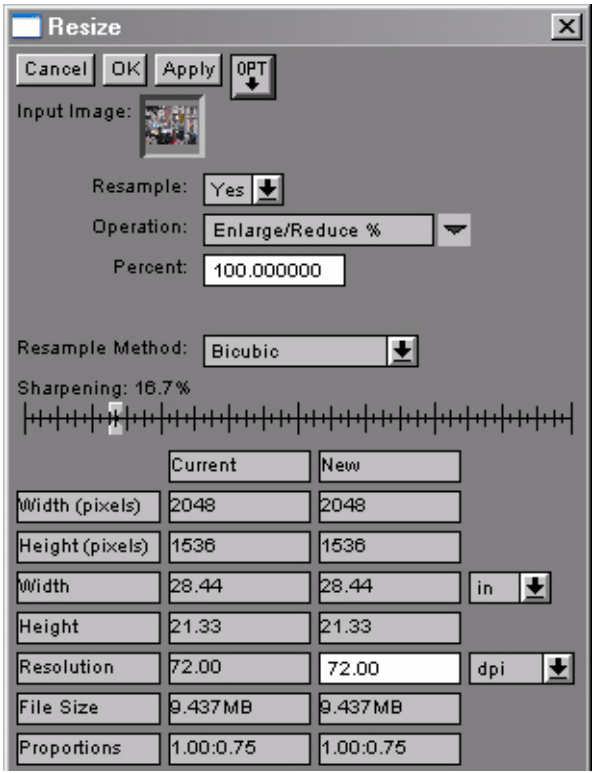
**The Resize Dialog** **Interpolation Methods**

### Creating a blocky, pixillated image

An interesting effect can be obtained by resizing an image to a smaller size using **Bicubic** interpolation and then resizing it larger using **Nearest Neighbor**. This converts the image to a sort of mosaic made up of large blocky pixels as in the example at the right.



## The Resize Dialog




To resize an image:

1. **Select an image window and display the resize dialog.** Select **Transformation->Geometry->Resize**.
2. **Set Resample:** Select **Yes** if you want to enlarge or reduce the image by changing the number of pixels in the image. Select **No** if you want to change the DPI setting only without affecting the number of pixels in the image.
3. **Select the Operation** and enter the operation's parameters. The change in image dimensions is displayed in the New column of the table in the lower portion of the dialog. Available operations are described below:

**Enlarge/Reduce%:** The image width and height, in pixels, is resized by a specified percentage.

**Bounding Rectangle:** The image is enlarged or reduced so that it fits within a specified rectangle. The image's aspect ratio is not changed. This mode is useful for resizing an image so that it can be displayed within an area of a particular size regardless of whether the image is landscape or portrait. The rectangle's dimensions can be specified in pixels*, inches, cm or mm, by setting the Units dropdown control. This control is displayed for all modes which involve width and height.

**Fill Rectangle:** The image is enlarged or reduced so that it fills a specified rectangle. The image's aspect ratio is not changed. The image is not cropped, so one of the dimensions may be larger than that of the rectangle's. This

mode is useful for resizing an image so that it fully fills an area of a particular size. The area's dimensions can be specified in pixels*, inches, cm or mm.

**Fixed Width:** The image is resized to a specified width, in pixels*, inches, cm or mm. The image height is changed proportionally.

**Fixed Height:** The image is resized to a specified height, in pixels*, inches, cm or mm. The image width is changed proportionally.

**Fixed Width/Height*:** The image is resized to a specified width and height, in pixels, inches, cm or mm. Since both width and height are fixed, the image's aspect ratio may change.

**Total Image Size*:** The image is resized to a specific number of pixels, specified in megapixels. Aspect ratio is not changed.

**Reset Resolution:** Lets you relabel the output resolution to a new value. Image dimensions are recalculated at the new resolution. This operation is available in **Relabel DPI** mode only.

4. **Select an interpolation method*.** The best quality for most images is achieved by selecting **Bicubic**, the default choice. See **Interpolation Methods** for more information.
5. **Set the resolution:** This control allows you to relabel the output resolution to a particular value in addition to resampling the image.
6. **Set Sharpening:** When Bicubic interpolation is selected, an additional Sharpen slider is displayed. This slider lets you vary the amount of sharpening by modifying the cubic convolution kernel. This sharpening parameter makes the most difference when you are scaling images up. While a value of 0% yields mathematically correct bicubic resampling, the default value of 16.7% usually produces slightly more visually pleasing results. Higher values produce sharper images but may start to introduce over sharpening artifacts such as halos and jagged edges.
7. **Click OK.** The resized image is displayed.

* Applies only when *Resize Method* is set to **Resample Image**.

### Interpolation Methods

Picture Window supports a number of different algorithms for resizing images.

**Nearest Neighbor** is the simplest method. The color of each pixel in the output image is taken from the color of the nearest pixel in the input image. This interpolation method is extremely fast, but when making an image larger, the individual pixels become visible as little blocks of solid color and when making an image smaller the effect can be coarse and jagged.

**Bicubic** is the default setting and produces very high quality results for most images. Instead of simply choosing the nearest neighbor, pixels values are calculated by interpolating using a bicubic algorithm.

The bicubic algorithm helps enhance image sharpness. You can control the degree of sharpness using the sharpen slider displayed at the bottom of the dialog. Usually the setting of 16.7% is optimum. However, by all means experiment with higher and lower values.

**Bilinear.** This method interpolates linearly between pixels. It is also a high-quality method. It generally results in a somewhat softer image than the default Bicubic method.

**Lanczos.** Lanczos resamples by considering pixels in a 4 by 4, 6 by 6, or 8 by 8 cell. (The weights accorded to pixels in the cell vary, depending on how far away they are from the target pixel location.) The 4X4 method is nearly identical to the bicubic method with no sharpening; the 6X6 and 8X8 methods produce somewhat more accurate results than bicubic at the expense of a slightly longer computation time.

For a comparison and examples of all the methods, see the **Image Resampling** white paper.

## Options

**Save As Default.** Saves the current settings of the dialog box as the default settings. How the default settings are applied depends on Preferences/Remember Settings. If Remember Settings = No, then the default is applied each time the transformation is invoked. If Remember Settings = Yes, then the default is applied the first time the transformation is invoked in a PWP session or if it is invoked while holding down the Shift key.

**Clear Default.** Restores the built-in Picture Window default settings.

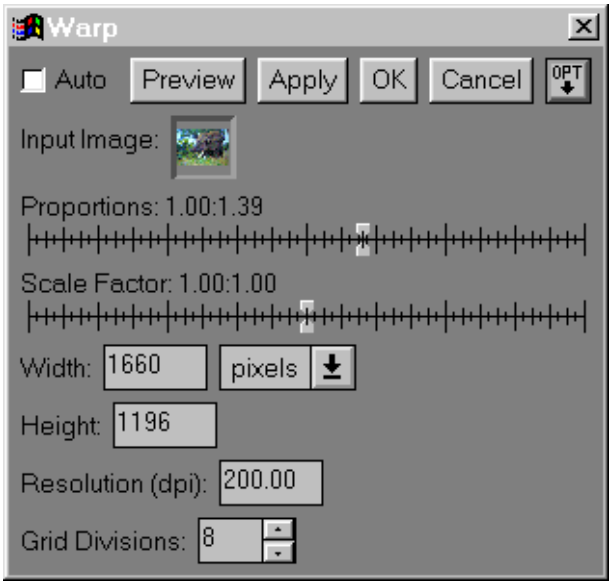
# Warp

Warp is a powerful transformation that lets you make various geometric corrections to an image. Its two most important uses are rotating an image to level the horizon line and correcting perspective distortion. Warp also has a resize dialog built in to it. This allows you to warp, rotate, crop, and resize your image in a single operation. In effect, Warp provides the digital equivalent of view camera tilts and swings or of tilting an easel while printing a negative.

When you use Warp, a grid is projected over your image. You manipulate the grid to warp and rotate the image. (See the next page.) For instance, to level the image, rotate the grid until its vertical (or horizontal) lines are aligned with the verticals (or horizontals) in the image. To correct perspective distortion, adjust the corners of the grid so its verticals are parallel to the verticals in your image.

To help you manipulate the grid easily, the grid has two modes—**rigid** and **free**. Rigid is used for scaling and rotating the grid while free is used to distort it. The mode is selected via the **Warp** dialog option menu.

## Using the Warp Dialog




The Warp transformation is used to correct various geometric distortions. It can change the perspective of an image, level a tilted horizon, and change an image's proportions. To use the warp dialog:

1. **Select an image window.**
2. **Display the Warp dialog.** In the **Transformation** menu, select **Geometry** and then select **Warp**.

   **To rotate the image:** Select **Rigid** from the options menu. Rotate the grid by dragging one of the corners, until it is parallel with the horizontals in your image.

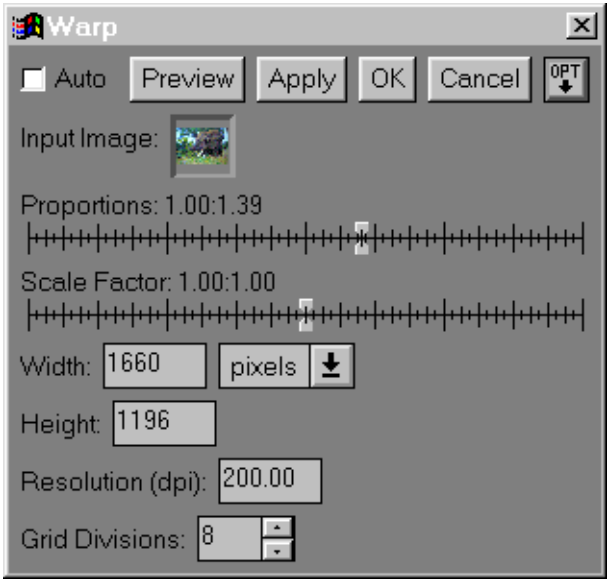
   **To warp the image:** Select **Free** from the **Options** menu. Reshape the grid by dragging its corners or edges. The image will be distorted as necessary to make the grid rectangular.

   **Other options:** Warp also lets you resize the image and change its proportions. For more information on these and other options and controls, see **Warp Controls.**

   **Note:** You can enter numbers or arithmetic expressions into any of the numeric fields.

3. **Click OK or Apply** when you are satisfied. The warped image is displayed. If Warp has degraded your image's sharpness, use **Sharpen Transformation** to restore it.

## Warp Controls




### Proportions

This slider lets you adjust the proportions of the output image. It is initially set to match the proportions of the original image. Altering its setting lets you make the output image taller and narrower or shorter and wider. Any changes you make are reflected in the width and height readouts.

When you apply perspective correction to an image, it is often necessary to adjust its proportions to obtain a natural appearance.

### Size

This slider lets you adjust the ratio of the area of the output image to the area of the warp region. It is initially set to 1:1. Altering this setting lets you set the size of the output image. Any changes you make are reflected in the width and height readouts.

**Hint:** If you are using Warp to reduce the file size of an image, it may introduce artifacts such as moire patterns, especially if the input image contains any kind of repeating pattern. To avoid this problem, use the **Blur Transformation** Transformation on the input image before warping it.

### Width and Height

These readouts display the current dimensions of the output image in the units you choose. You can also edit them directly. If you change one dimension without changing the other proportionally, the image is stretched or compressed in that dimension. The Proportions and Size sliders are also adjusted.

### Resolution

Indicates the number of pixels to the inch. It is only used to calculate absolute dimensions (in inches or millimeters), when those units are chosen for the width and height readouts.

### Grid Divisions

This control lets you make the grid overlay on the input image finer or coarser.

## Options


Click the **Opt** button to display the options menu.

### Reset

Resets the grid but does not change slider settings.

### Rigid/RotateOnly/Free

**Rigid** causes the warp region to scale and rotate about its center as you move any of its four corners. Use this option to rotate or scale part of the input image while preserving its proportions. When this setting is in effect, dragging a side of the warp region is disabled.

**Rotate only:** The warp grid can only be rotate. This insures that the scale is not changed and that no warping is introduced.

**Free** lets you adjust the four corners of the warp region independently. Use this option to skew, perspective correct, or warp part of the input image.

### Bilinear/Perspective

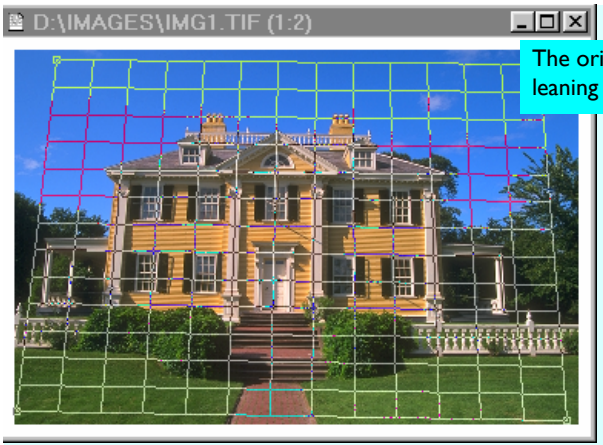
**Bilinear** warping is faster than a true perspective warp and, for small amounts of perspective correction produces nearly identical results. Bilinear warping is identical to perspective warping when you are only cropping, rotating, scaling, or shearing images.

**Perspective** warping is slower than bilinear warping but more accurate, especially when making large perspective corrections.

## Example: Correcting Perspective

The house above appears to be leaning backward and running downhill toward the right—not exactly in keeping with the ideals of symmetry and balance so important to its early nineteenth century architecture. (To try this example, use image file **samples\house.jpg** located in your Application Data Folder.)

Use the Warp transformation to fix these problems. To correct the apparent "leaning backward" look to this house, drag the corners of the grid. 100% correction occurs when the grid lines converge exactly like the verticals in the image. However, you may want to under-correct slightly. Since other cues in the image suggest the camera is looking up, some convergence is expected.




The original image, leaning and tilted

The final corrected image

Likewise, to correct the tilting of the house, line up the horizontal grid lines with the horizontals of the house.

We increased the number of grid lines to 13. Then we lined up vertical grid lines with the columns at the sides of the house and a horizontal grid line with the tops of the first floor windows.

After you correct the keystoning, you will notice that the house is also slightly foreshortened—it's a little squatter than expected. Correct it using the **Proportions** slider. a setting of 1.16:1 seemed about right.

Work carefully and slowly. You can zoom the image to a larger size and increase the number of grid lines so you can work accurately. Finally, remember that warping an image causes some loss in sharpness. You can compensate for it by running the **Sharpen Transformation** transformation.

## Using Warp for Deliberate Distortion

Warp can also be used for non-realistic, creative effects. Sometimes you may want to use warp's ability to tilt and stretch an image to exaggerate a visual tendency that already exists in a picture.

The pair of shots at left only begins to skim the surface of the possibilities. Here the top image (**samples\mtrcycle.jpg** located in your Application Data Folder) is stretched out to the right as if the extreme centrifugal forces of the turn had distorted the rider and motorcycle.

This effect was achieved by adjusting the grid to exaggerate the size of the rider and front wheel compared to the rest of the motorcycle, making the rider appear to be lunging over the bike. The **Proportions** slider was adjusted to elongate the entire image horizontally, giving the lean a more dynamic look. Finally, the image was sharpened to counteract the resulting blurring.

Another technique for introducing deliberate distortions is the **Displace** Transformation.

# Level

This transformation is a quick and convenient way to rotate an image to make a horizontal element such as the horizon perfectly horizontal or a vertical element such as a building perfectly plumb. To rotate the image, you simply outline a horizontal or vertical feature. The image is rotated to make the feature exactly horizontal or vertical.


Alternately, you can specify rotation in degrees. Positive angles produce CCW rotation while negative angles produce CW rotation.

To reset the transformation to 0 rotation, click the **Reset** button.

### Cropping Tool Bar

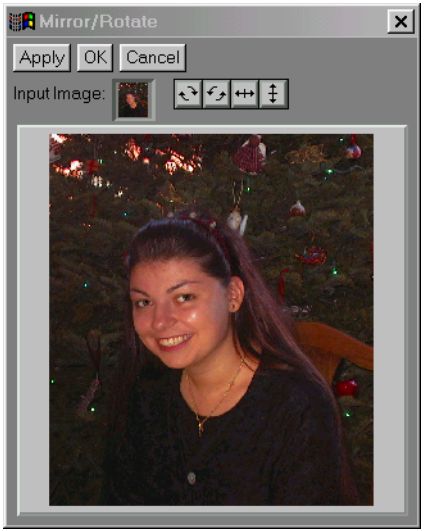
The cropping tool bar provides three cropping options:

**Crop to Trim Border** - this crops the rotated image to the largest rectangle that lies entirely within the original image. The corners of the original image are cropped away. This is the default option.

**Crop to Original Size** - this makes the rotated image the same dimensions as the input image and will generally show some black border. The corners of the original image are cropped away.

**Crop to Include Entire Image** - this adds sufficient black border to guarantee no part of the original image is lost.

# Mirror/Rotate




Use this dialog to reorient your image. This may be necessary if the image is upside down, for instance, or if you want to create a mirror-image version of it.

To rotate or flip your image:

1. **Select an image window.**
2. **Display the mirror/rotate dialog.** In the **Transformation** menu, select **Geometry** and then select **Mirror/Rotate**. The dialog has four buttons for controlling orientation of the image.
3. **Set the orientation** you want. Click on the appropriate button to set the orientation you want. Here is what each button does:

    Rotates the image ninety degrees clockwise. (To turn the image upside down click this button twice.)

    Rotates the image ninety degrees counter-clockwise.

    Flips the image to a left-right mirror image.

    Flips the image to a top-bottom mirror image.
4. Click **Apply** or **OK** to complete the dialog and create a new image window.

**Note:** To rotate an image through an arbitrary angle, use the **Crop/Add Border**, **Warp** or **Displace** transformations. (In Displace, set the method to **Circular**.)

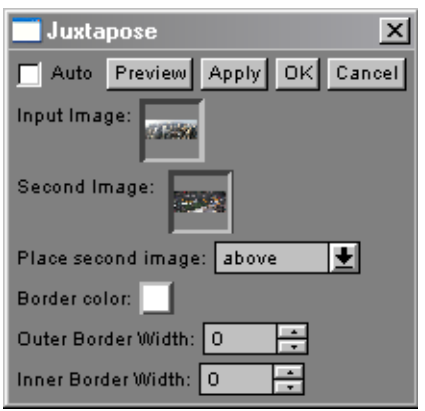
# Copy

The **Copy** command lets you make another independent copy of an image.

You may want to copy an image before trying one of the **Tools** on the image, so you can back out if you don't like the results. To copy an image:

1. **Select an image window.**
2. **Select Copy.** In the **Transformation** menu, select **Geometry** and then select **Copy.** The image is copied to a new image window.

# Juxtapose



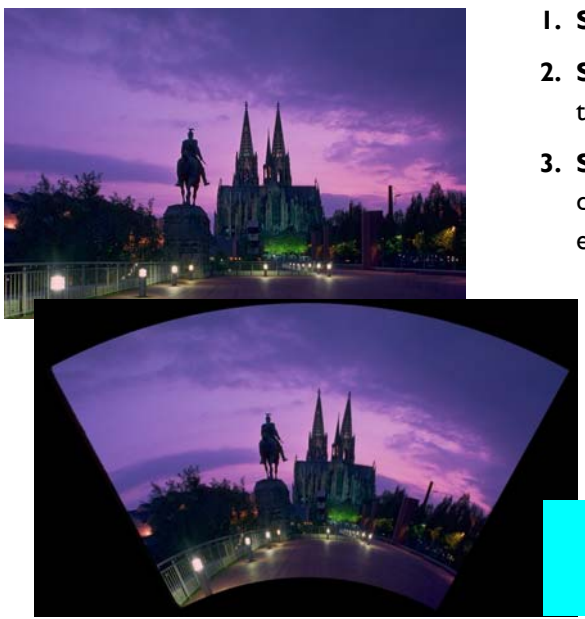

This transformation combines two images side by side or one above the other into a new image. The operation can be repeated to combine additional images. To juxtapose two images:

1. Make sure that both images are opened in Picture Window. Select the image window of one of the images.
2. **Select Juxtapose.** In the **Transformation** menu, select **Geometry** and then select **Juxtapose.**
3. Click on the **Second Image** window and select the second image from the menu. Select the position of the second image with respect to the first.
4. Optionally, set a border color and widths for an overall border and border between images.
5. Click **OK** or **Apply** to complete the operation.

# Fan

The **Fan** command lets you curve your image into a fan shape. You can actually print the image and create a paper fan from it. The arch shape of the image may also be interesting in layouts.


To create a fan-shaped image:



1. **Select an image window.**
2. **Select Fan.** In the **Transformation** menu, select **Geometry** and then select **Fan.**
3. **Set the Curvature.** Adjust the Curvature control until you get the desired fan shape. You can enlarge the preview window to see the entire image.
4. Click **OK** or **Apply** to create a new image.

**In the example at left,** we used a curvature of 70%. We picked a background color from the sky and then darkened it further with the color picker brightness control. The image is **samples\fan.tif.**



# Lens Distortion

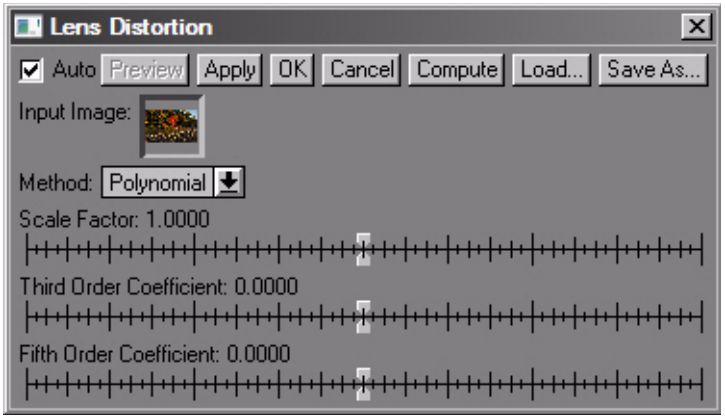
Lenses don't necessarily produce rectilinear images. The distortion may be spherical or may have a more complex shape. Both types are handled by the lens distortion transformation.

**Spherical Distortion:** In spherical distortion, straight lines in the scene are rendered as curved in the image. Perhaps the most extreme example of such distortion is exhibited by fisheye lenses. But normal lenses may also have residual amounts of it.

A spherically-distorted image may appear convex (lines bowed out from the center) or concave (lines bowed in toward the center.) Convex distortion is called *barrel* distortion; concave distortion is called *pincushion* distortion. The lens distortion transformation lets you straighten out either kind of distortion. You can also use the transformation to create such distortion deliberately—for instance to convert a normal image to one that looks like it had been taken with a fisheye lens.

**Complex Distortion:** Complex distortion can arise in lenses with many elements some of which may have different amounts of simpler distortions. The net result is that distortion is a complex composite of individual contributions. Picture Window models such distortion using what are known as 3rd and 5th order polynomials.

## Using the Lens Distortion Dialog




To correct (or introduce) lens distortion to an image:

1. **Select an image window.**
2. **Select Lens Distortion.** In the **Transformation** menu, select **Geometry** and then select **Lens Distortion.**
3. **Center the crosshairs** to the apparent center of the distortion, if necessary. Note that a crosshairs cursor is displayed in the center of the image. If your image has been cropped, that may not be the center of the barrel or pincushion. If so, drag the crosshairs to the apparent center of the distortion.

   **Note:** It is best to adjust distortion before cropping.
4. **Adjust the control points.** Notice that a broken line connecting five control points is displayed as an overlay near the top edge of the input image window. Distortion is corrected by dragging the five control points into alignment with a curved element in the original image that should be a straight line (such as the horizon, part of a building, or a line on a target designed for correcting distortion.) For greater accuracy in setting the control points, enlarge the image.
5. **Click the Compute button.** Picture Window automatically determines the best method and distortion coefficients to make the control points you have selected lie on a straight line. For the most accurate results, place the control points on a line near one of the longer edges of the frame, since this is the part of the image which exhibits the most pronounced curvature. Having determined the distortion coefficients for a given lens you can then apply them to other images taken with the same lens. Note that for zoom lenses, distortion varies with focal length.

6. **Manual Adjustment.** Alternately, you can pick your method (Curvature or Polynomial) and adjust the controls to calculated values or manually while observing the image. For fisheye images, curvature is likely the best method. Since there is only one parameter to adjust, manual adjust may work quite well.
7. **Adjust the Scale Factor** to include as much of the image as you desire.
8. Use the **Save As...** button to save the settings for later reuse. Use the **Load...** button to retrieve previously saved settings.
9. Click **OK** or **Apply** when you are satisfied. A new, corrected image is created.

## Measuring Distortion

Since distortion for a given lens and, for zoom lenses, focal length is repeatable, you can use this transformation to create a series of corrections for each lens you use. To do so, you can photograph a simple target of ruled lines. Make sure to level you target and camera and to align the camera so the back is parallel to the target. Then photograph the target at a series of focal lengths. (You may find that corrections are only needed at the extreme focal lengths of a particular lens.) Create a correction for each focal length and save it using the **Save as ...** function. You can then apply the nearest saved setting to image shot with that lens.

# Example: Correcting Fisheye Distortion


In this example, we corrected an image (**samples\fisheye.tif**. located in your Application Data Folder) exhibiting extreme barrel distortion using the curvature method. The result is shown at top right. Note however that there are still a number of defects that must be fixed. Among them is the top and bottom edges which are now curved in, as well as softness in the image. Also, in this particular case, the image looks like it's leaning back.


**Final image:** After distortion correction, we corrected perspective using the Warp transformation. Then we sharpened and cropped the image. The result is a photograph showing normal head-on perspective at left.

# 5. Brightness and Contrast

Proper adjustment of brightness and contrast is one of the key operations in producing a high-quality print and is equally important for color and black and white images. In most cases, the goal is to adjust the brightness and contrast to produce a full-scale print, one that takes full advantage of the full tonal range of the paper. This usually means that the highlights are printed very light and the shadows very dark, so detail is just barely discernible in each. In some cases, you may even want to expand or compress the contrast in certain regions of the overall tonal scale, to bring out a texture, for instance.

The image of the pyramid on this page illustrates how important proper contrast and brightness adjustments can be. By brightening areas hit by the sun, the whole scene looks hotter, capturing the sense of the desert. The increase in contrast also brings out the textures of the rocks.

**Basic Adjustments:** Picture Window gives you a number of ways to adjust brightness and contrast. See **Brightness and Contrast Transformations** for the details.

**Special Effects:** You can also manipulate brightness and contrast using transformations such as **High Contrast**, **Posterization**, and **Solarization**.

# Brightness and Contrast Transformations

Picture Window gives you a choice of three transformations for controlling brightness and contrast:

- **Levels and Color** is a convenient transformation for adjusting a number of key image properties in a single transformations. It lets you adjust both brightness and contrast (a.k.a. dynamic range) using sliders. It also controls color balance and saturation.
- **Brightness** is semi-automatic and easy to use. It's a good choice for images that simply need overall brightening or darkening. It is also convenient for use with masks because you can set two different brightness levels in a single operation. For instance, you might darken the masked area while lightening the unmasked area.
- **Brightness Curve** gives you very precise control. Its curve and histogram help you visualize your image's brightness and contrast and to shape the curves to control exactly how each tone in the original is reproduced.
- **Two-Zone & Three-Zone Adjustment** break up the image into two or three tonality zones and allow you to manipulate each zone individually. They are a good way to give your image more punch and vibrancy.
- **Tint** lets you add color to a black and white image. The effect is similar to that achieved by hand-tinting a black and white photograph. (Tint can be used with color images. It automatically converts them to black and white.)
- **Light Falloff Correction** compensates for some lenses' tendencies to under expose image edges and corners. This can be a problem particularly with wide angle and aggressive zoom lenses.
- **Gamma Adjust** is a simple transformation for adjusting the gamma of an image to that used by the display. See **Digital Image Basics** white paper for a clear discussion of this frequently-misunderstood parameter.
- **Negative** Inverts the image by converting each pixel into its complement. Dark pixels are converted to light pixels and colors are converted to their complementary colors. There is no dialog associated with Negative. To convert an image, simply select the image and then click on Transformation/Gray/Negative and the image is converted.

  **Inverting color negatives:** To invert scanned color negatives use Transformation/Color/**Negative**. This transformation gives you much more control and allows you to neutralize the orange mask.

# Levels and Color

The Levels and Color Transformation combines most of the key brightness and color adjustments into a single dialog. It adjusts:

- Brightness
- Contrast
- Color Saturation
- Color Balance

**Adjusting Brightness and Contrast**

**Adjusting Color Balance and Saturation**

**Levels and Color Dialog**

**Brightness Levels Example**

## Adjusting Brightness and Contrast

Usually, brightness and contrast are among the most important adjustments you can make. You can think of brightness as being how light or dark the midtones of the image are. Dynamic Range is the range of tones—from the darkest shadows to the lightest highlights. When the range is compressed, the image has low contrast and may look drab and lifeless. If the range is too great it may look harsh, lacking detail in the shadows or highlights.

The **Levels and Color** transformation provides separate sliders for adjusting midtone brightness and the brightness levels of the shadow and highlight areas. For most pictures your goal is to make the shadows as dark as possible while retaining just a hint of texture and detail in most of the shadow areas. Likewise, you usually want to adjust the highlights so they are as white as possible, but also with a just little bit of texture and detail. Finally, you want to adjust the midtones so they look realistic.

**See Also:**

**Brightness**

**Brightness Curve**

## Adjusting Color Balance and Saturation

Usually, the goal in adjusting color balance is to make colors appear more natural by removing any color casts in the image. Color casts are most easily detected in areas that should be neutral—that is white or gray. The **Levels and Color** transformation gives you two ways to restore balance.

You can select an area in the photo which should be neutral—such as the white of an eye, teeth, or other details which you know should be a neutral gray. The transformation determines the color compensation needed to make the area neutral. It applies the compensation to the entire image, thereby removing the cast.

Alternatively, you can work in terms of adding color. For instance, you might feel that an image has weak reds, or greens. By double-clicking on the Color Balance button, you bring up the color picker. From the color picker you can select the color that should be added to the image.

Saturation refers to the 'intensity' of a color and ranges all the way from neutral (no color at all) through the pastels to fully saturated colors. An image may be in balance yet still have unsatisfactory colors. They may either be too weak and washed out (saturation is too low) or overdone and garish (saturation is too high). The **Levels and Color** transformation provides a slider which increases or decreases saturation.

**See Also:**

**Color Balance Transformation**

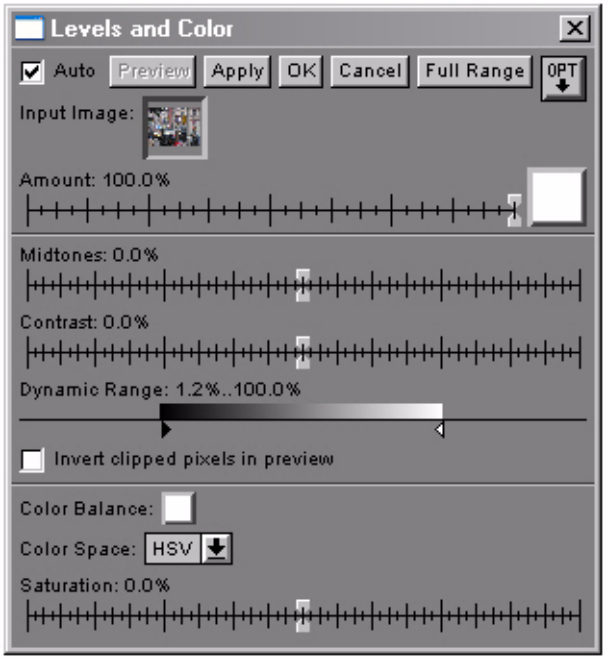
**Color Saturation**

## Levels and Color Dialog

To use the **Levels and Color** dialog:

1. **Select the image window** containing the image you want to adjust.
2. **Display the Levels and Color dialog.** In the **Transformation** menu, select **Gray** and then select **Levels and Color**. The dialog box is displayed.

   Notice the position of the shadow and highlight sliders on the Dynamic Range control. Picture Window sets these sliders to the actual brightness level of the shadow and highlight areas of the image. (When you move the sliders, a small scale mark shows their original positions.) For instance, the brightest area in our image is at about 92% of full possible brightness. Similarly the darkest areas are not black (0% brightness) but are actually at about 10% brightness.



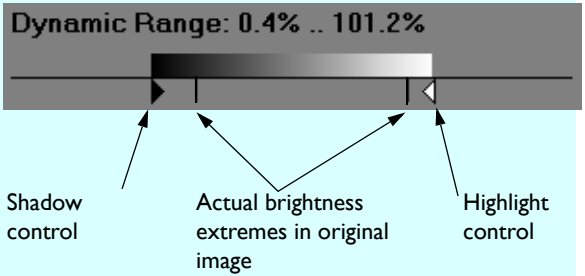

**Note:** To reset the controls to their original auto detected values, click the **OPT** button and select **Reset**. All controls are reset.

3. **Adjust the midtones slider**. The slider affects the mid-range tones most. Adjust it for the most natural brightness level for the subject at hand.
4. **Adjust the contrast slider.** The slider controls the contrast of the image. Generally you want to adjust contrast so you can just see detail in the highlights and shadows of your image. If you make changes to the dynamic range control, recheck your contrast setting.

## Dynamic Range

The dynamic range control shows you the actual brightness of the shadow and highlight areas of your image along the brightness scale. You can control the contrast of the image by resetting one or both of these levels.

In most cases, the controls should be set near their extremes. This makes the lightest and darkest areas in the image print as pure white and black, respectively.




5. **Adjust the dynamic range.** The further apart the sliders are, the higher the contrast of the image. A good starting point for this adjustment is to simply click the **Full Range** button to move the shadow and highlight sliders to maximum black and white, respectively, and preview the image.

   For very high contrast, you can actually move them past the maximum white and black points. That has the effect of blocking highlights and shadows but increasing the contrast in the rest of the image. This may actually improve the image, as long as having detail in the blocked areas are not visually important. You can see which areas of the image are affected by checking the **Invert Clipped Pixels** check box.

**Hint:** To display clipped pixels as you are adjusting the curve, select **Window/Show Clipped Pixels** from the main menu or click the  .button in the main toolbar.

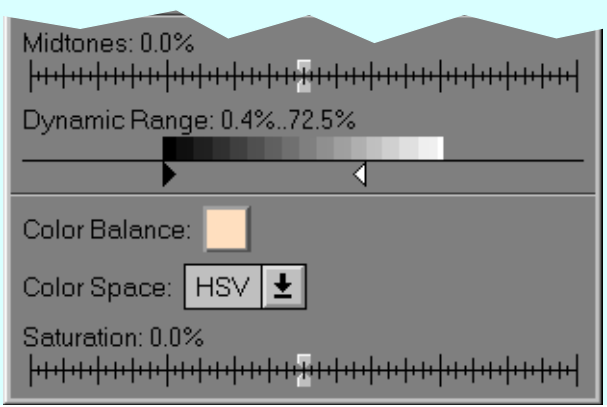
6. **Adjust the color balance** of your image. You can adjust the balance in either one of two ways:

   **Technique 1:** Move the cursor to a detail in the image which should be white or a neutral gray and click on it. The color which must be added to make the detail neutral is displayed in the **Color Balance** button. (Enlarge the area if necessary. Frequently there will be some variation in the colors within the detail, so experiment by picking different points and previewing the results.)

   **Technique 2:** Manually pick a color to add to the image to make it balanced. To pick the color, click on the **Color Balance** button. The **Color Picker** is displayed. Pick the color you want to add from the color picker.

**Color balance example:** The image on the far left has a bluish cast. We clicked on the white of the eye to find the exact color to add—in this case it was pink or the opposite of blue. (Note the compensating color displayed in the Color Balance button.)

The correction resulted in the output image, left.



7. **Adjust the Saturation slider.** If the colors are in balance but are either too weak or strong, use the saturation adjustment. Move the saturation slider to the right to increase the saturation or to the left to decrease it.

   **Note:** Color Saturation and balance adjustments are affected by the Color Space control (see **HSV, HSL, and RGB Color Spaces)**. In most cases you will want to work in the default **HSV** space. However you may want to choose **HSL** in special cases.

8. **Preview the adjustments.** To see the effect of the adjustments, click **Preview**. A small version of the image is displayed in a preview window. Experiment with different settings and preview again, until you are satisfied with the image. Use the **Amount** control to vary the degree of the change.

9. **Click Apply** or **OK** when satisfied with the adjustment. A new image is created in its own window.

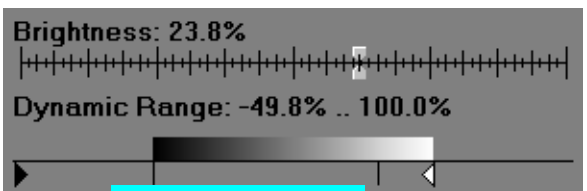
## Brightness Levels Example

In this example, the photo of the skyline was made more dramatic by simultaneous darkening the shadows and increasing overall brightness. (To try this example, load file samples\skyline.jpg located in your Application Data Folder)

Notice that the shadow control has been moved far beyond black. This has the effect of blocking the shadows—that is making all the darker tones, from the dark grays on, solid black. You can see which areas are blocked by checking the Invert clipped pixels checkbox. In this particular image these tones are found mostly in the buildings along the waterline, making them appear more massive and the skyline more prominent.

At the same time, the brightness and the highlight controls have been increased moderately, brightening the midtones and highlights in the sky and water, making these areas almost luminous.


Preview image with **Invert clipped pixels** checked.




Brightness and dynamic range settings used.

## Color and Brightness Adjustments Example

The 'burned out' look of this photo was created by combining three manipulations.

First the image was given a green color cast. We clicked on the Color Balance button and picked a suitably sickening green from the color picker.

Then the saturation was set far above normal.

Finally, the brightness level was increased.

# Brightness

The **Brightness** transformation lets you adjust the overall brightness of the image by moving a slider. Preserve options allow you to choose which portions of the brightness curve will be held constant. It is the simplest of the three transformations for adjusting the image's brightness.

**The Brightness Dialog**

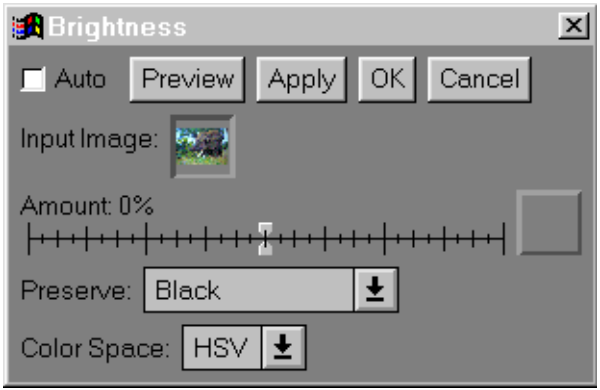
**Preserve Options**

## See Also:

**Levels and Color**

**Brightness Curve**

## The Brightness Dialog



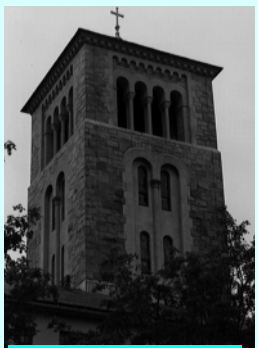

To use the brightness transformation:

1. **Select an image window.**
2. **Display the Brightness dialog.** Pull down the **Transformation** menu; choose **Gray** and then **Brightness**.
3. **Options.** Choose one of the **Preserve Options.** In rare cases, you may also want to experiment with a different **Color Space**. (See **Color Space, Pixels, and Digital Images.**)
4. **Adjust brightness.** Move the slider to increase or decrease the brightness.

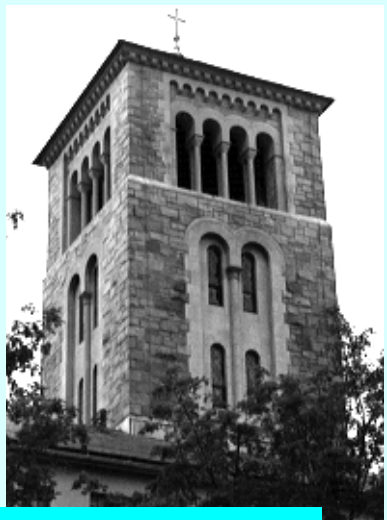
   **Hint:** To display clipped pixels as you are adjusting the curve, select **Window/Show Clipped Pixels** from the main menu or click the  .button in the main toolbar.
5. **Click Preview** to see the results of the adjustment. When it is satisfactory, click **OK** or **Apply**. Picture Window applies the settings you specified and displays the new image.

## Preserve Options

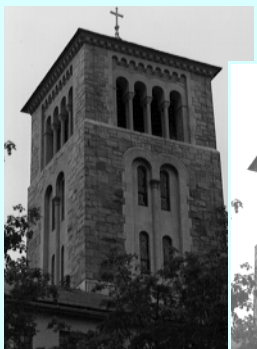
Preserve options let you decide which portions of the brightness range should be maintained constant. Choose the Preserve setting by inspecting the image and determining which portion of the brightness scale needs change. For instance, the blacks in the example image are satisfactory while the midtones and whites are far too dark. Therefore the best setting is Preserve Black. The other settings are shown for comparison.

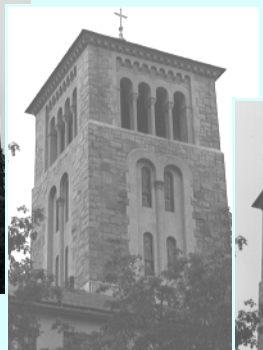


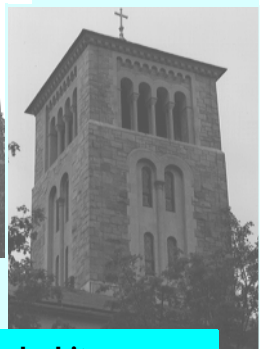
Original image



**Preserve black.** Affects highlights. Best setting for most images.







From l to r. **Preserve black and white.** Affects midtones only
**Preserve neither.** Affects entire range equally.
**Preserve white.** Affects shadows only.

# Brightness Curve

The most powerful way to control image brightness and contrast in Picture Window is the **Brightness Curve** transformation. It displays image tonalities as two graphs—a brightness histogram and a brightness curve. These graphs help you visualize the tonalities in your image and give you precise control over brightness and contrast. The transformation allows you to optimize image contrast throughout the brightness range and to precisely position highlights and shadows within the overall tonality range. The brightness curve transformation can also be used to create special effects such as posterization, solarization, negative images, and very high contrast images.

## Show Clipped Pixels

To display clipped pixels as you are adjusting the curve, select **Window/Show Clipped Pixels** from the main menu or click the  .button in the main toolbar. See **Show Clipped Pixels** for details.

**Brightness Curve Dialog**
**Brightness Curve Controls**
**Brightness Curve and Histogram**
**Example: Using Histograms to Control Contrast Selectively**
**Brightness Curve Examples**

## Other Brightness Transformations:

**Levels and Color**
**Brightness**

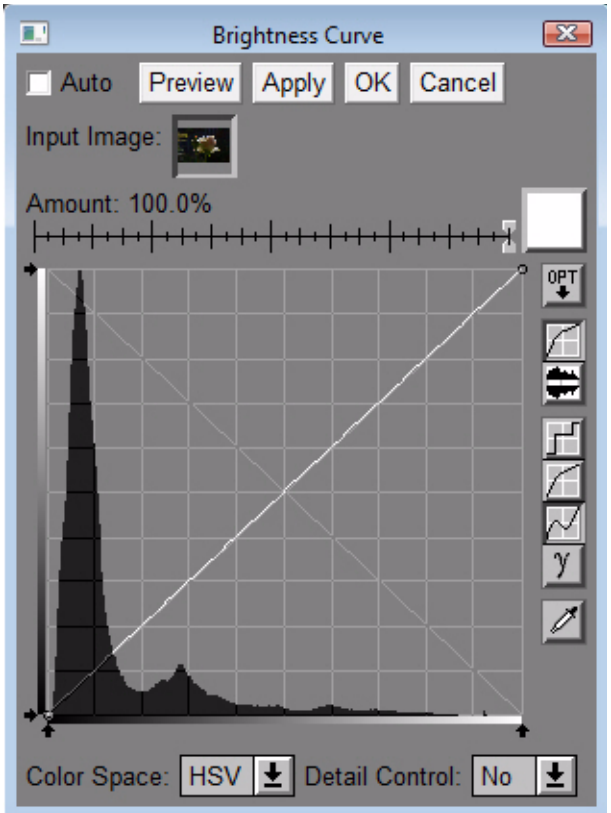
## In-depth White Paper:

**Using Curves and Histograms**

## Brightness Curve Dialog

The Brightness Curve transformation lets you control the brightness and contrast of your image. It displays brightness information in two forms—as a curve or as a histogram (See **Brightness Curve and Histogram**.) To use the dialog:

1. **Select an image window.**
2. **Display the Brightness Curve dialog.** In the **Transformation** menu, select **Gray** and then select **Brightness Curve**. The **Brightness Curve** dialog box is displayed.
3. Click on the  **Histogram** or  **Curve** buttons to toggle between the two types of display. Set other **Brightness Curve Controls** as required
4. **Adjust the curve** by dragging control points. (To create additional control points **Shift Click** on the curve or below the histogram. To delete a point, **Control Click** on it. See **Creating and Deleting Control Points**)
   To see the effect of your changes, click **Preview**. Use the **Amount** control to vary the degree of the change. To display clipped pixels as you are adjusting the curve, click the  .**Show Clipped Pixels** button in the main toolbar.
5. **Click OK** or **Apply** when you are satisfied with the adjustment you have made. The transformed image is displayed in a new window.



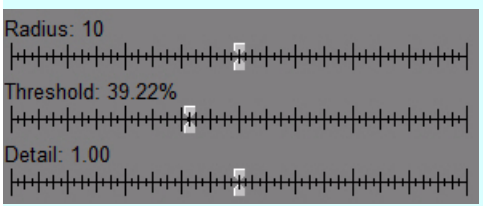

The brightness curve (diagonal line) with the histogram in the background.

# Brightness Curve Controls

## The Probe

The probe lets you match features in the image with its points on the brightness curve or histogram. That way you can determine the portions of the curve which control particular areas of the image. To use the probe, click the  **eye dropper** button. Move the mouse over the input image holding down the left button. The brightness value at the cursor is indicated by a red line in the curve.

You can also use the probe to add control points to the curve or histogram. To do so, click the  **eye dropper** button. Move the mouse to a point in the input image whose brightness you want to control. Shift-click the left mouse button. (i.e., hold down the shift key and click the left mouse button.) A new control point is created at the brightness value you have chosen in the image.


## Curve Shapes

Curve shapes let you control how the curve is drawn between control points. Smooth, the default is used most frequently. Stepped and line are used to achieve special effects. (See **Controlling How the Curve is Drawn**.)

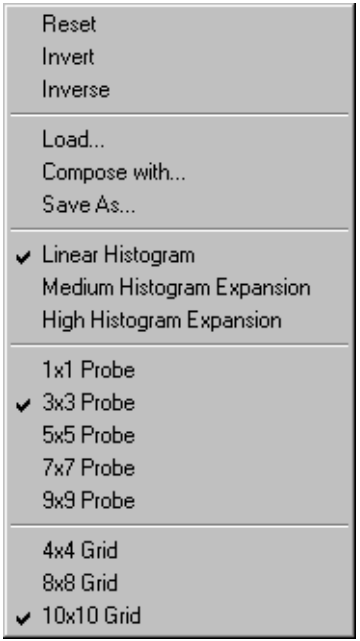
## Detail Control

This control let's you preserve detail contrast even as you reduce average contrast. To apply, set **Detail Control** to **Yes**. High frequency information will now be rendered at the contrast set by the **Detail** slider. You can tweak the low/high frequency boundary with the **Radius** and **Threshold** sliders. The Preview window may contain artifacts; use the **Apply** button to judge results.

## Options Menu

Click the 

**Opt** button to display the options menu.




**Reset** returns the curve control to its initial state.

**Invert** inverts the curve, replacing each output value by its negative.

**Inverse** reflects the curve about one of the diagonals. (Rising curves are reflected around the rising diagonal and vice versa for falling curves.) When a curve and its inverse are applied serially, the result is no change. Thus the inverse of a calibration curve is the correction curve.

**Load** lets you reload a previously saved curve from a disk file.

**Compose With** lets you combine stored curves. For instance you can combine a curve which increases shadow brightness with one that rolls off highlights. To combine curves choose **Compose With** to load one or more additional curves. Additional curves are combined with the current curve and have the same effect as if the curves were applied to the image sequentially, in the order they have been loaded. (The order of application does make a difference.)

**Save As** lets you save a curve in a disk file for future use.

**Linear Histogram** displays histograms using linear scaling. Linear scaling provides the most visually- accurate representation of the histogram.

**Medium/High Histogram Expansion** displays histograms with a non-linear scale, amplifying low values with respect to high ones. When using linear scaling, if the histogram has a very strong spike it can cause the lower values to be scaled down so much that they are hard to read. Expanded scaling compresses the dynamic range of the dis-

play by exaggerating smaller values and making large spikes less dominant.

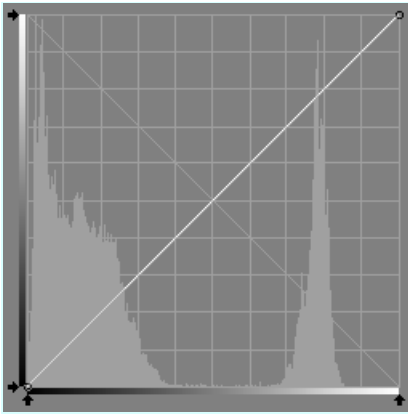
**Probe Size** Lets you control the area in pixels over which the probe averages its reading. Smaller probe sizes let you get a precise reading of a very small area. Larger probe sizes are useful for obtaining an average reading, say in a textured area of an image where the values for a small area will vary erratically. The currently selected probe size is checked.

## Brightness Curve and Histogram

The brightness curve and histogram are two complementary ways to view the same information.

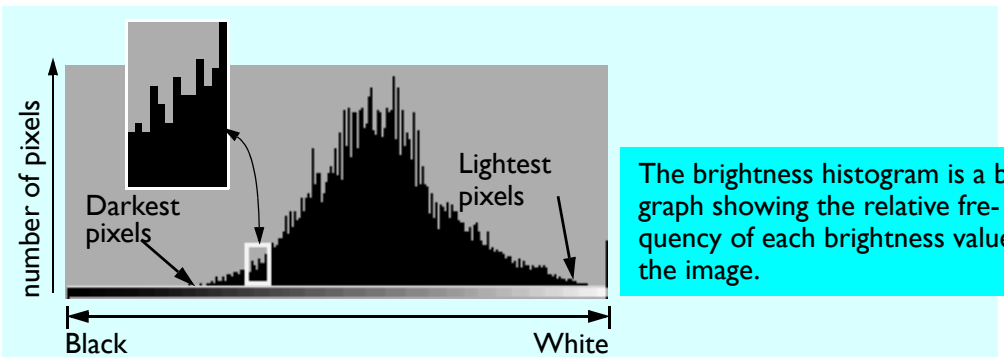
The brightness **curve** shows how each brightness value in the input image (horizontal axis) is represented in the output image (vertical axis). (A similar curve and histogram are used to adjust color saturation. In that case the curves represent saturation rather than brightness values.)

The brightness **histogram** is a tightly packed bar graph computed from the brightness of each point in the image. Each bar represents a particular brightness value from the darkest at the left to the lightest at the right. The height of the bar is an indication of the number of pixels in the image with that particular brightness value.



Create a control point and drag it to reshape the curve.

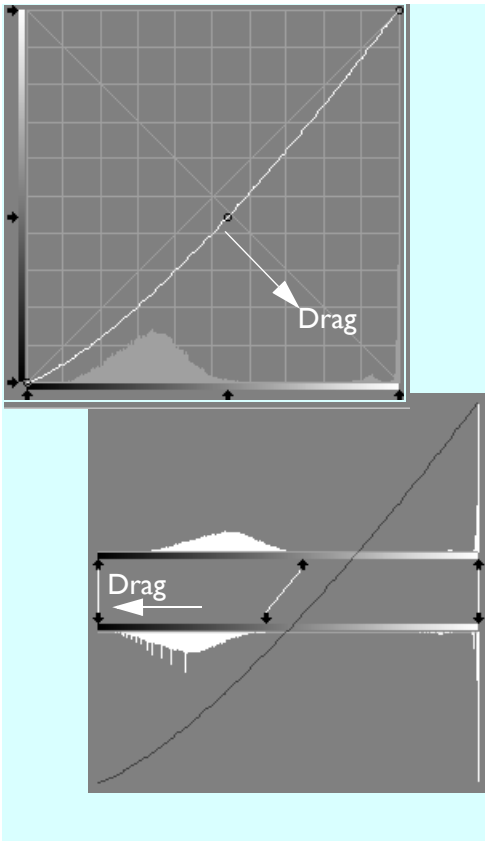
You shape the curve and hence control brightness and contrast by moving control points. You can shape either the histogram or the curve. Since the two graphs are different views of the same information, any changes you make in one are reflected in the other.




The brightness histogram is a bar graph showing the relative frequency of each brightness value in the image.

## Controlling Curve Shape

You can control the shape of the brightness curve by creating control points and dragging them to shape the curve. For example, to 'bow' the curve downward, you create a control point in the middle of the curve and drag it down. (Alternately, you can achieve the same effect by creating a control point in the middle of histogram and dragging it to the left. The two actions are equivalent.)




## Creating and Deleting Control Points

**To create a control point**:

1. Position the cursor to the point of the curve at which you want to create a new control point. You can create the point either in the brightness curve or in the histogram.
2. Hold down the shift key and click the left mouse button. The control point is created.
3. Drag the control point to reshape the curve.

You can create as many control points as necessary to create the shape you need.

To delete a control point:

1. Position the cursor to the control point.
2. Hold down the Ctrl key and click the left mouse button. The control point is deleted and the curve is redrawn using the remaining points. The first and last points cannot be deleted.

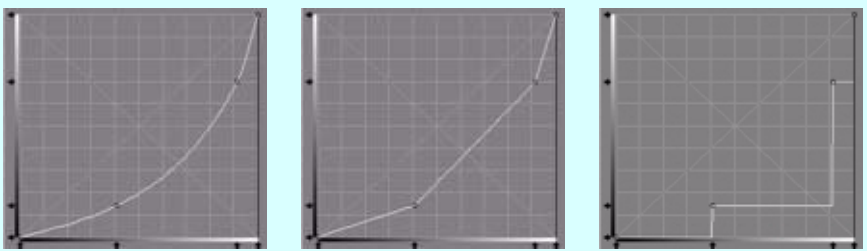
### Controlling How the Curve is Drawn

In addition to dragging control points, you can also control how the curve connects the control points, by clicking on the appropriate button in the curve dialog. Here are the options:

**Smooth:** The curve is fitted smoothly through all the control points. This is the most common option.

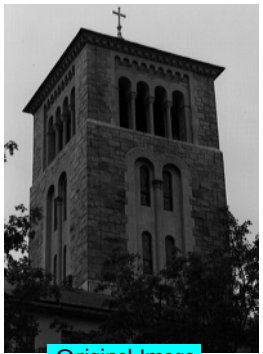
**Line segment or Broken:** The control points are connected by straight lines. This choice can be used to create curves which reverse direction abruptly (i.e. change from a positive slope to a negative slope or vice versa). Using line segments avoids having a section of the curve which has zero slope and therefore zero change. (For an example, see **Solarization**.)

**Stepped:** The curve is drawn as a series of steps with vertical transitions from one control point to the next. This creates a series of discrete levels rather than a gradual change from one level to another. (See **Posterization** for an example.)



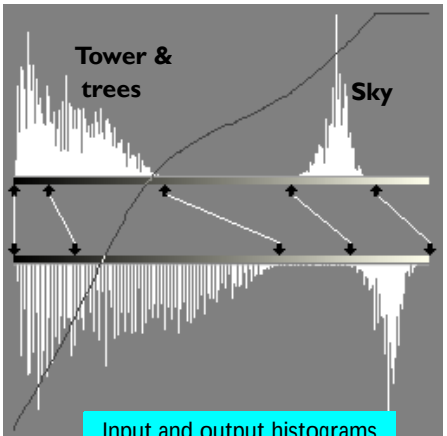
**Comparison of Curve Shapes:** The three curves above have the same control points and differ only in shape, The shapes are (l. to r.) Smooth, Broken and Stepped.

Final Image



Original Image

## Example: Using Histograms to Control Contrast Selectively




Input and output histograms

The histogram display is particularly useful to selectively control contrast in different areas of the tonality scale. In this example, we will adjust the tonality of the image at the left using the **Brightness** histogram.

Start by displaying the image and the Brightness histogram:

1. Open the tower image(**samples\tower.jpg**) and display the **Brightness Curve** dialog. (Transformation->Gray->Brightness Curve). Click on the **Auto Preview** check box.
2. Click on the  **Histogram** button. The brightness histogram is displayed. It shows that brightness values are clustered into two ranges.
3. Let's relate the histogram ranges to the image. Click on the  **Probe** button. Put the cursor into the image and hold down the left mouse button. Notice that the cursor changes to a cross. The brightness of the point in the image is indicated by a red line in the histogram. Move the cursor around the image. You will notice that the bright-

ness values in the tower fall mostly into the left cluster in the histogram while the brightnesses in the sky fall mostly into the right cluster. You can use the probe in the brightness curve as well.

4. The first step in improving the image is to spread out the tones of the tower to increase the local contrast in that part of the tone scale. Shift-click just below the upper histogram to add a new control point at the right end of the first region in the histogram. (See **Creating and Deleting Control Points**.)

   Drag the lower arrow right, toward lighter values. Use the **Preview** window for feedback. Dragging the arrow spreads out the tones in the tower, revealing more texture and detail in the tower's stonework.

5. However, as we lighten the tower, the blacks tend to move toward lighter values as well. To control this tendency, add another control point at the dark end, just after the initial peaks in the histogram. This gives independent control of the blacks.

6. Finally, bracket the 'sky' region of the histogram with two more control points. This allows you to shift the entire region toward pure white and still maintain its contrast. If the sky had more texture in it, you might use these control points to expand the sky's contrast range as well.

7. Click **OK** when you are satisfied with your adjustments. A new image is created.

The Brightness curve transformation is a little bit more complicated than either of the other two brightness transformations, However, its advantage is that it gives you more information and more control over your image. For more information, see **Using Curves and Histograms**.

Original Image

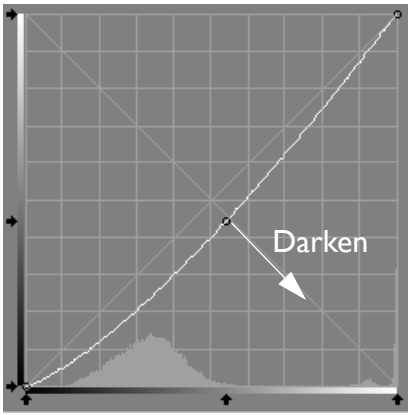
## Brightness Curve Examples

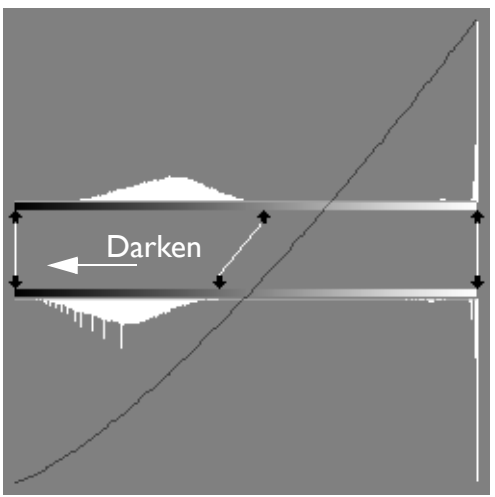
This shows how some standard effects can be achieved using the brightness curve or histogram. Remember, you can work with whichever one is more convenient. All examples use the same image—**samples\castle.jpg** located in your Application Data Folder. They show how the curve and the histogram are controlled to achieve various effects. The effects shown are:

**Darken**
**Increase midtone contrast**
**Posterization**
**Lighten**
**Negative image**
**Solarization**

## Darken

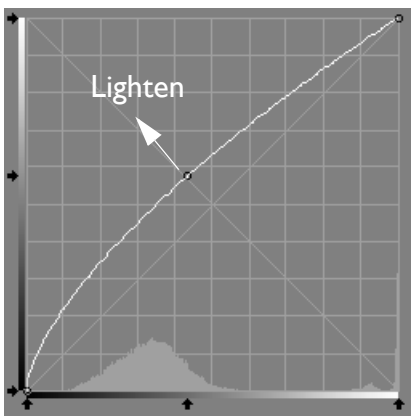
To darken an image without affecting the lightest and darkest values, add a control point in the middle and drag it to darken the middle tones of the image. The effect on the histogram is to shift it toward the darks, crowding the very dark areas and expanding the scale in the light areas.

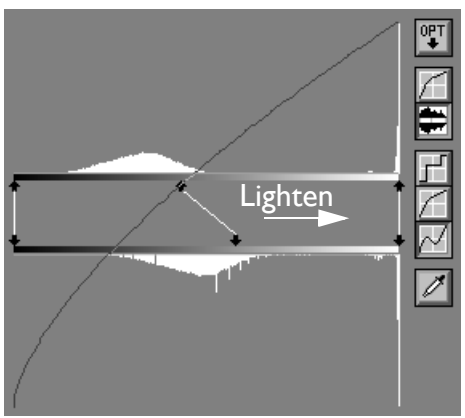


## Lighten

To lighten an image's middle tones, add a control point near the center of the curve. Drag it toward the upper left corner of the dialog. The effect on the histogram is to shift it all points, including the shadows, toward lighter values. This increases detail in the shadows.

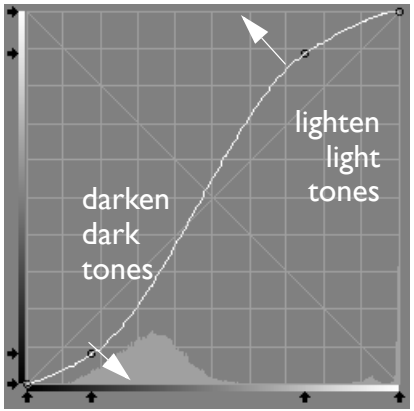


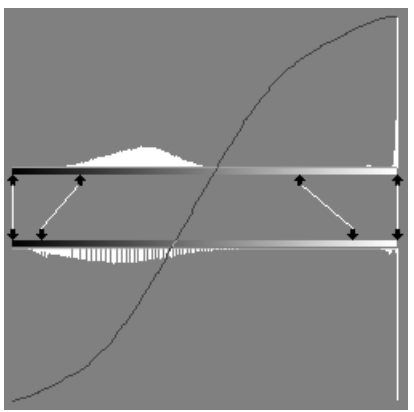



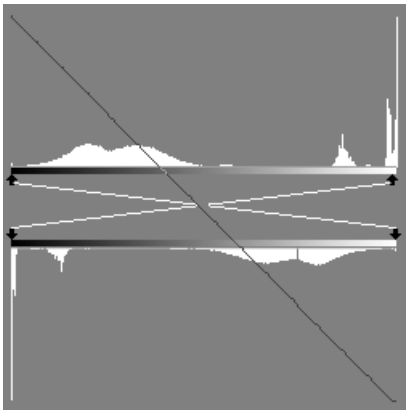
## Increase midtone contrast

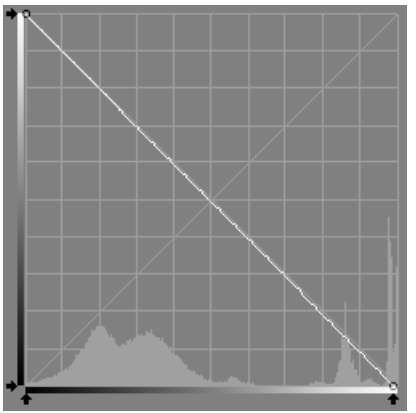
To expand mid-range contrast, add two control points and spread them apart. this steepens the middle of the curve while making the shadow and highlight regions less steep. The effect on the histogram is to expand its central area while crowding its end regions. The resulting curve approximates the S-curve of photographic paper and film.

Since most picture features are in the midtones, this frequently results in the best contrast.







## Negative image

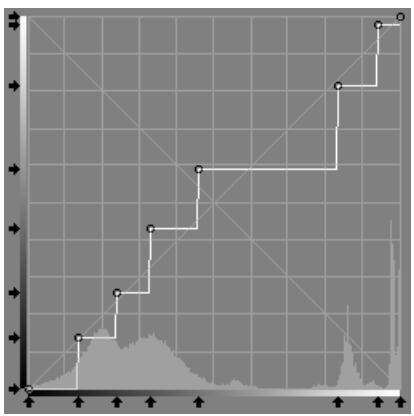
A negative image is one where each color is converted into its complement. For example, a dark red would be converted to a light green.

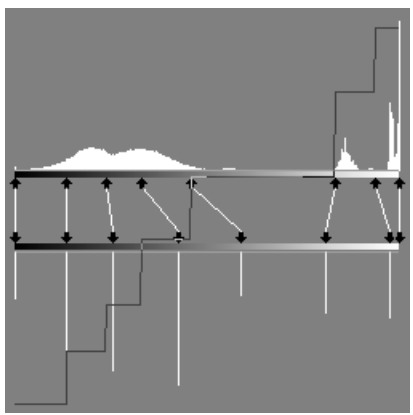
To produce a negative image, set the **Color Space** option to **RGB** and give the curve an opposite slope by dragging the bottom left control to the top left and the top right control to the bottom right.

## Posterization

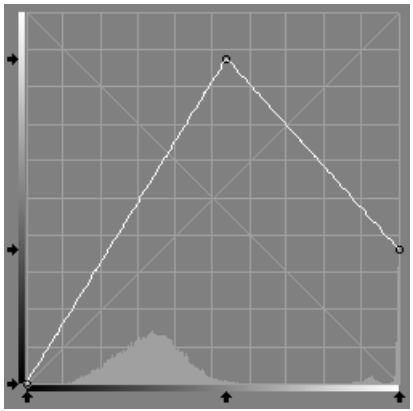
In a normal image, brightness varies continuously from dark to light. Instead, in a posterized image only a few discrete brightness levels are used.

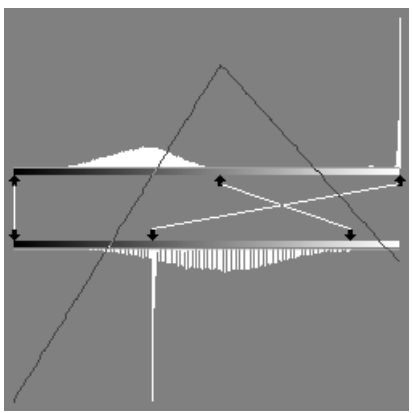
To posterize an image, set the **Color Space** to **RGB**. Add several new control points along the curve. Click the **Step** **Curve Shapes** icon to break the image up into a series of steps of flat tonality. Notice that the histogram becomes a series of spikes, since all brightness values in a particular range are bunched to a single step.





Images can also be posterized using the **Posterize Transformation**. This transformation gives you a number of additional controls, including the ability to remap colors for interesting false color effects.





## Solarization

A solarized image is one in which the brightest areas of the image have so much exposure that they have turned negative. In other words, after a certain point, the brighter an area is the darker it becomes. At the same time areas that are darker than this threshold behave normally. The effect can be a weird "X-ray" look. It is called solarization because it was sometimes caused by exposing photographic material to the sun.

To solarize an image, set the **Color Space** to **RGB**, add a third control point and create a negative curve that changes to positive. Click the broken line **Curve Shapes** button to make the transition abrupt to avoid having a section of low contrast.

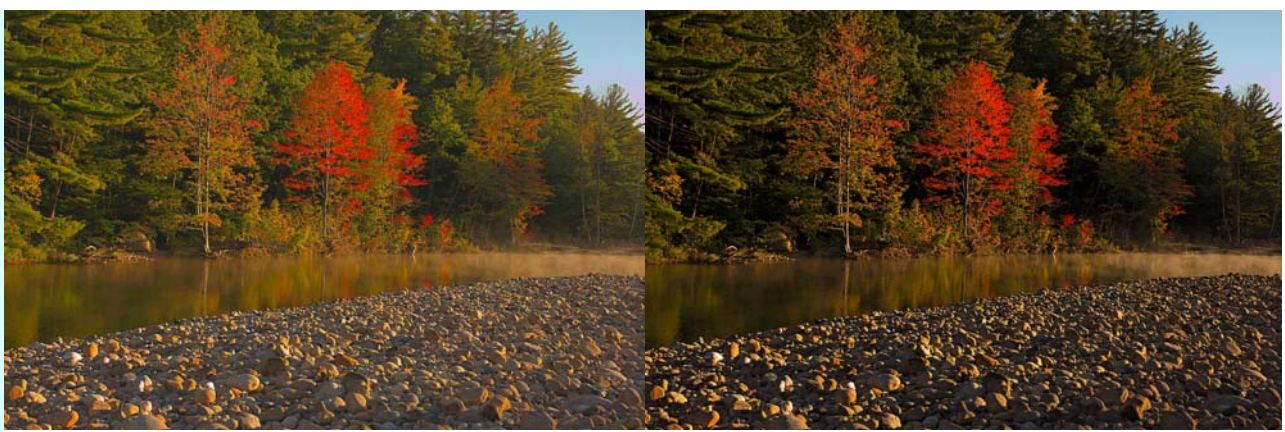
# Two-Zone & Three-Zone Adjustment

The Two-Zone and Three-Zone transformations divide the image into tonality zones and allow you to adjust the brightness, contrast and saturation of each zone independently. Because you can work on the tonality zones separately, you can achieve results not possible by simply manipulating the brightness curve. For instance it is possible to make the contrast curves of different zones overlap, for increased local contrast and vibrancy.

The transformations work by creating a mask for each zone and another mask for the transition areas between zones. Adjustments to each zone are made only to the masked areas for that zone. Finally the adjusted images are blended with the original image based on the masks to produce the final result.

In this two-zone example, we broke the image up into a shadow and a highlights zone. This allowed us to manipulate each of the zones independently. We darkened the shadow zone to get nice solid shadows. On the other hand, we brightened and increased the contrast of the highlight zone to get more vibrancy. The result is the right image below.

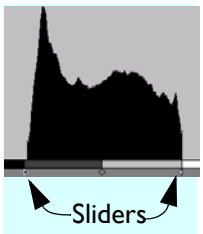
Before and after images.



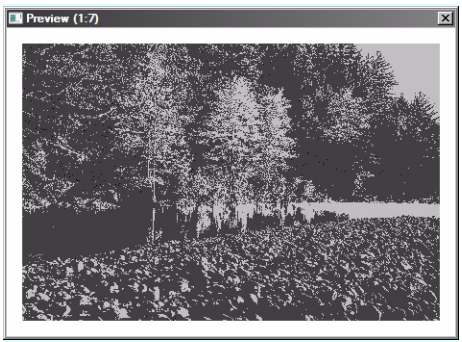
### Preview Display


To help you understand what the transformations are doing, the preview display has four modes selected by buttons in the dialog. The modes are:

**Zone display (Z):** Zone display shows how the image is divided among the zones. (The two zone version of the display is shown at right.) This display is useful when setting zone markers (see below). It reduces each zone to an area of solid color based on which zone in the input image the pixels fall into. Thus you can quickly see what parts of the image are in what zone.



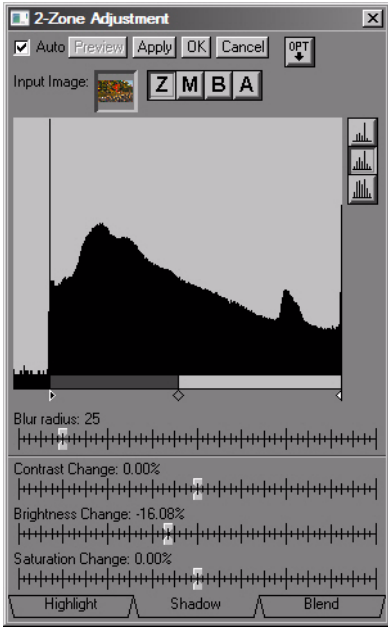

**Mask display (M):** Mask display displays the highlight, shadow, or blend masks depending on which tab is selected. This lets you see the masks the transformation is using and is helpful when setting the mask blur radius.




Zone display showing the features contained in each zone.

**Before (B) and After (A):** Toggling between before and after modes shows the input image in the preview window before and after adjustment. This makes it easy to see the effects of your adjustments.

## Two-Zone & Three-Zone Dialogs




To use the Two or Three Zone transformation, select the image you want to use. Then launch the transformation by choosing it from the **Transformation->Gray** menu. The transformation dialog and preview are displayed.

### Using the Dialog

To Apply the Two-Zone adjustment:

1. **Adjust the contrast range.** Make sure the image occupies the full available brightness range. Adjust the left and right sliders under the histogram to the left and right edges of the histogram. as shown at left.
2. **Set a brightness level(s)** that divide the zones from each other. Select the Z zone display preview mode button so that the preview image shows which features are included in each of the zones. Adjust the zone slider under the histogram as you observe the preview. You can also adjust the blur radius to control the transition between the zones.
3. **Adjust each zone.** Select the **A** after preview mode button and the Highlight or Shadow tab. Adjust the brightness, contrast and saturation to get the effect you want. Repeat the adjustment for the other tab. To display clipped pixels as you are adjusting the curve, select **Window/Show Clipped Pixels** from the main menu or click the  .button in the main toolbar.
4. **Click the Blend tab.** If necessary, you can adjust the degree of contribution from each of the zones.
5. **Click OK** when you are satisfied with the adjustments. The dialog is dismissed and a new image is created.

For an in-depth discussion of 2-Zone and 3-Zone Adjustment, please see the **Multi-Zone Adjustment** white paper.

# Light Falloff Correction

This transformation lets you correct the tendency of images to get darker from their center compared to their corners. This transformation lets you determine the actual light falloff associated with your camera and lenses and to apply the necessary corrections to subsequent images from the same camera and lenses.

There are three steps to applying the transformation. The first two steps, making the test images and calculating the corrections, only need to be done once. The last step, correcting images, is performed on a per image basis.

## 1. Make The Test Images

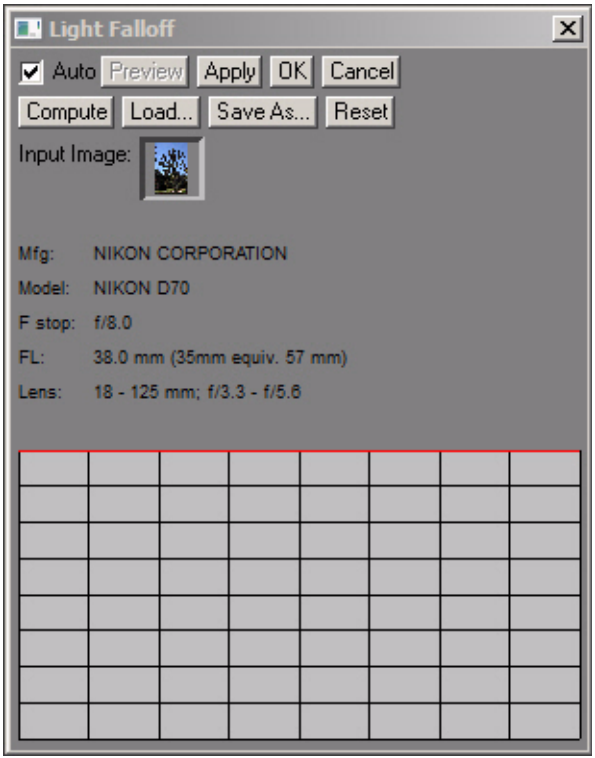
To use the transformation, the first step is to photograph a uniform white field using the camera and lens for which you want to compute corrections. One way to do this is to photograph a sheet of white paper taped to a vertical wall that is uniformly illuminated by sunlight or an overcast sky. Another way is to purchase a sheet of opal glass (available through www.edmundoptics.com) or other good diffuser and photograph a light box or a white monitor screen with the opal glass placed about halfway between the camera lens and the light source. Make sure the entire field of view is covered by the uniform white illumination.

In general, falloff varies with lens, f/stop, and for zoom lenses, the focal length. Thus to characterize it, you need to take a series of images varying these parameters.

## 2. Calculate the Correction

For each test image:

1. **Open a test image in Picture Window.** The image should be uncropped and unmanipulated. Open the Light Falloff transformation (**Transformation->Gray->Light Falloff**).
2. **Click the Compute button.** The transformation measures the light falloff and attempts to model the observed data mathematically using progressively higher order polynomials until it achieves a satisfactory fit. Once a good fit is achieved, Picture Window displays the order of the fit and shows a graphical of the light falloff curve.
3. **Save the correction.** Click the Save As button to save the light falloff curve for future use. Use the filename to specify the lens, f/stop and focal length so you can identify the correction later.



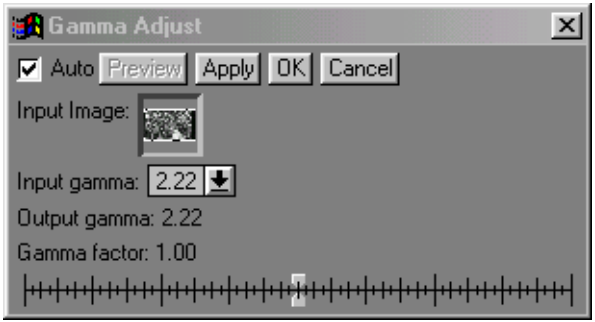

## 3. Apply the Correction

1. **Open an image** you want to correct. The image should be uncropped. Open the Light Falloff transformation (**Transformation->Gray->Light Falloff**).
2. **Load the correction file.** Click Load and select the correction file for the lens and closest to the aperture and focal length used to make the image.

3. **Click OK of Apply** to apply the correction.

You can use the transformation in a workflow to apply it to multiple images.

# Gamma Adjust



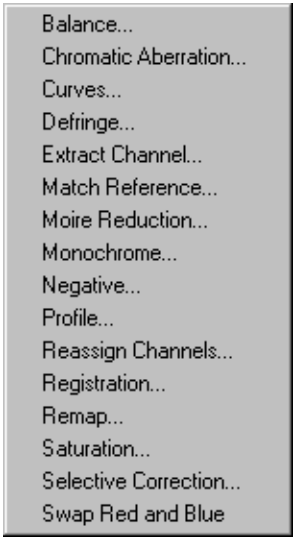

Gamma is a measure of dynamic range. PC monitors are typically set to a gamma of 2.2, the gamma standard used by the television industry. Other common standards are 1.4 (Macintosh) and 1.8 (the printing industry). An image will look darker and more saturated when displayed at a higher gamma and lighter and less saturated when displayed at a lower gamma than the gamma at which it was recorded. Adjusting the gamma of an image mostly affects its midtones.

The Gamma transformation converts an image from one gamma to another. To use it:

1. **Select an image** whose gamma you want to change.
2. **Display the Gamma Dialog.** Choose **Gray** from the **Transformations** menu. Click on **Gamma**. The Gamma dialog is displayed.
3. Set the **Convert From Gamma** to the value of the original image.
4. Set the output gamma by adjusting the **Gamma Factor** slider. You can set the slider either to a particular factor or to a particular value of the output gamma.
5. Click **OK** or **Apply** to create an image of the desired gamma.

See **Digital Image Basics** white paper for a clear discussion of gamma.

# 6. Color




Picture Window allows you to control color rendition in many ways. You can control color balance and saturation, change colors selectively, adjust colors using standard filters, and adjust colors using a reference target, among other options. You can also separate the image into its component color channels, combine color channels, and tint the image. Finally, you can correct two common color-related problems—chromatic aberration and mis-registration of scanner color sensors—using special transformations.

This chapter discusses the **Common Controls** used across Picture Window to control color, as well as **Color Concepts.**

## Transformations

**Color Balance** lets you remove (or add) color casts to restore color balance.

**Color Saturation** lets you increase or decrease the intensity of colors. Picture Window has two color saturation dialogs. The **Saturation Dialog** simply increases or decreases saturation uniformly; the **Color Curves** dialog displays a saturation histogram and lets you control saturation in different saturation ranges independently.

**Color Curves** allows you to adjust the response of each component color directly by shaping the curve or histogram of the color channel. You can work in RGB, HSV, or HSL color space.

**Color Correction** allows you to control a narrow range of selected colors without affecting other colors in the image. Selection is by hue and saturation -- all areas of a particular hue and saturation regardless of their brightness can

be changed to a different hue/saturation. You can use this transformation to bring out a particular color, say a flesh tone or the green of foliage. (Picture Window Pro only.)

**Color Remap** is another transformation that works on narrowly selected colors. However it discriminates colors based on hue, saturation and brightness. You can select colors based on this criteria and remap them to any other colors you choose. (Picture Window Pro only.)

**Defringe:** The Defringe transformation removes or reduces purple fringe artifacts which can be frequently seen near over-exposed pixels. Fringing can often be seen around backlit detail such as tree branches against a bright sky or when the image has specular highlights like the railroad tracks in the before and after images shown above. Cleaning up fringing, even when it is not particularly noticeable, produces a cleaner, crisper image.

**Negative:** Converts color negatives to positive color images. Color negative includes controls for setting black and white points in the image and making individual red, green, and blue gamma adjustments to neutralize the orange mask used in many color negative materials. (Picture Window Pro only.)

**Match Reference** allows you to color correct an image by using a color reference target. You can include the reference target in the image itself, or use a target from another image photographed under the same conditions. This transformation can be used with film and digital cameras as well as scanners. (Picture Window Pro only.)

**Monochrome** lets you convert a color image to black and white. You have the option of specifying a filter of a selected color (like taking a black and white photograph through a colored filter) or using a channel mixer control.

**Profile** lets you reset the input or output color profile of an image and recalculate its colors.

**Tint** lets you do the opposite—add color to a black and white image. The effect is similar to that achieved by hand-tinting a black and white photograph.

**Filter** simulates taking a color photograph through a filter.

**Extract Channel** lets you extract one of the color channels as a black and white image. For instance, you can compose an image that contains only the red channel. Similarly, you can choose green, blue, hue, saturation, or brightness. (Use the **Combine Channels** transformation to recombine individual monochrome images into a color image.)

**Reassign Channels** lets you reorder the three R, G and B channels in an image. One application for this transformation is to swap the red and blue channels in color infrared images to create bluer, more believable skies.

**Swap Red and Blue:** Swaps the red and blue channels to create a B-G-R image from an R-B-G image, for compatibility with software that expects the channels in the B-G-R order.

**Convert Transformation**: The Convert transformation allows you to convert between the principal image structures—24 and 48 bit color, 8 and 16 bit monochrome (black and white), and 1 bit binary. (48 and 16 bit formats are supported by Picture Window Pro only.)

**Channel Registration**: Corrects a scanning defect caused by scanners whose red, green, and blue sensors are somewhat displaced from each other. Misregistration appears as color fringing that is constant across the whole image.

**Chromatic Aberration**: Corrects an image flaw that is caused by lenses whose magnification is not constant across the color spectrum. It is noticeable in images as color fringing the gets progressively worse as one moves away from the center of the image.

**Moire Reduction:** Moire patterns arise when two repeating patterns are superimposed on each other. Since the sensor chip in digital cameras is itself a pattern, when a repeating pattern occurs in the image, an annoying interference or moire pattern can result as the image pattern alternately reinforces and interferes with the pattern of sensors on the chip. This transformation lets you make its effects far less noticeable. (Picture Window Pro only.)

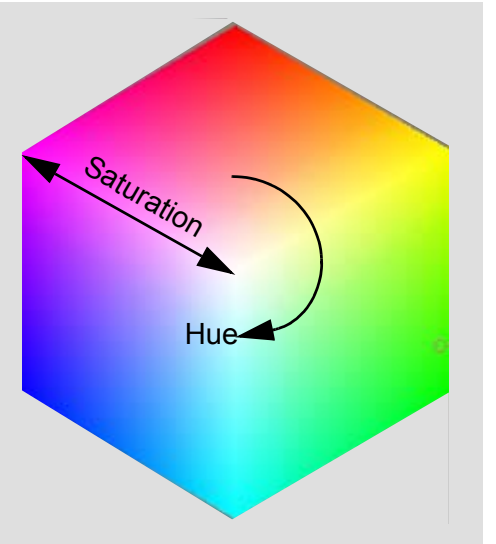
## Common Controls

## Color Concepts

# Hue and Saturation Concepts

Color has two aspects, or dimensions—hue and saturation. These properties can be visualized with the help of the color wheel. Hue changes as we move around the wheel—as colors blend from red to orange, green, blue, etc. Saturation changes along the radius. As we move from the edge toward the center, colors change from full "intensity", becoming paler and increasingly pastel, until finally they become completely neutral or "colorless" in the center.

These transformations are discussed in the sections below.




Visualizing hue and saturation

# Color Balance

Usually, the goal in adjusting color balance is to make colors appear more natural by removing any color casts introduced by lighting and camera settings. Color casts are most evident in the whites. For instance, whites of photographs made in incandescent light frequently have an easily-noticed orange cast. Of course, other areas of the photograph then also have an excess of orange—it's just less obvious.

However, achieving a neutral color balance is not always the goal. For instance, you may want to under-correct an orange cast in a photograph taken in early morning light to retain some of the atmosphere the light gives. Or sometimes, for creative purposes, you might want to add a color cast. For instance, you may want to add a little bit of red to warm up the flesh tones in a portrait or add blue to deepen a sky.

**Color shifts:** A color shift, as in the example above, can be visualized as a misalignment between the colors in the scene and those of the image. Color is said to be "unbalanced" because one of the colors is overemphasized with respect to the others.

In this example, the shift can be corrected by deemphasizing the blue in the input image.

## Color Balance Transformation

The Picture Window color balance transformation gives you considerable control over the color rendition of your image. To make it easier to work with color casts, it divides the color balance operation into two parts—removing color casts and adding them. So you first create a neutral image and then, if you want, re-introduce a color cast back into it. The transformation also gives separate control over color casts in the highlights and dark areas of the image.

The first step in color correction is determining the color cast you want to remove from your image. You choose from three techniques:

**Automatic:** Picture Window determines the color cast in the lightest and darkest areas of the image. Frequently simply removing this cast results in a balanced image. See **Using the Color Balance Dialog.**

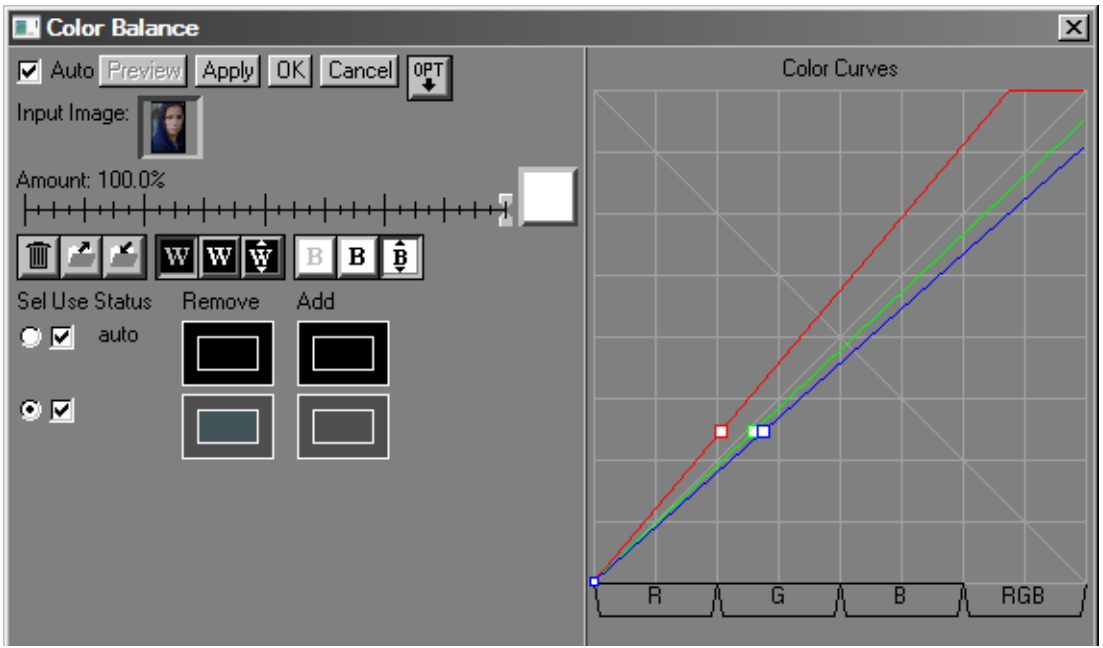
**Probe:** You can click on a point in the image which you want to make neutral. An image feature that you know should be neutral, like the white of an eye or a cloud, is a good choice. Picture Window then adjusts the color balance of the image to make this color a neutral gray. (See **Using the Probe**)

**Color Picker:** You can use your judgement (or your fancy) to select any arbitrary color to be added or removed. (See **Picking A Color Directly**)

After you have chosen a **Remove** color cast, preview the image. You may decide the color balance is satisfactory, or you may want to introduce an additional color cast. Use the probe to match a color in the image or use the color picker to introduce an arbitrary color.

## Using the Color Balance Dialog

1. **Select an image window.**
2. **Display the Color Balance Dialog.** (Transformation->Color->Balance.) Picture Window calculates the color casts in the shadow and highlight areas of the image and displays the dialog. The color casts found in these areas are shown in the corresponding **Remove** squares. A gray of the same brightness is shown in the **Add** squares. The color curves at the right of the dialog show how each of the primary colors will be adjusted to remove or add the casts shown.




3. **Automatic/Manual Correction** is selected using this toolbar:  Select the middle or last W button for automatic white balance. In automatic balance, PW tries to determine the color cast by examining highlights in the image. Click **Preview** to see the results of the corrections. Use the **Amount** control to vary the degree of the

change. If automatic balance is successful, you are done. Click **OK or Apply**. Picture Window applies the dialog at full resolution and displays the new image.

Other techniques for correcting color are discussed below.

## Using the Probe

You can use the probe to choose a point on the image whose color cast you want to remove. In this example (**samples\womanblu.jpg** located in your Application Data Folder), we corrected the image's color balance by using the white of the eye as the reference point. Here is the procedure:

1. Display the Color Balance dialog (Transformation->Color->Balance.)
2. Magnify the portion of the image you want to use.
3. Set the radio button next to the row you want to use. (The light gray row controlling highlights has the greatest effect since the brightest colors are the most noticeable.)
4. Click on the point in the image you want to use. Notice that the cursor changes to a cross and the color cast is shown in the **Remove** square.

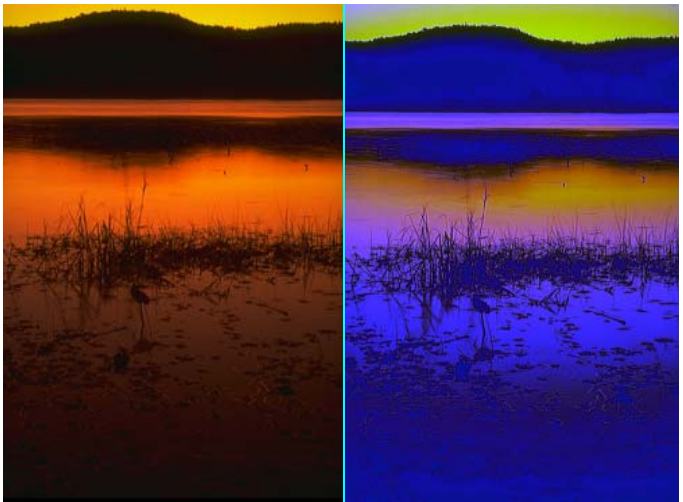
5. Click **Preview** to see the effect. Try experimenting with sightly different positions of the probe and different settings of the **Amount** control.
6. When you are satisfied, click **OK**. A new image is created.

## Picking A Color Directly

You can pick a color cast to add or to remove directly, using the color picker. The color picker can insert a color into any of the **Add** or **Remove** squares. This technique gives you the maximum discretion over the color correction process. You can use this technique, for instance, to create wild false color effects.

To use the color picker:

1. Click on one of the **Remove** or **Add** squares. The **Color Picker** is displayed.
2. Choose the color you want to add or remove. You can choose colors for more than one square.
3. Experiment by trying different colors and brightness levels. Complete the dialog by clicking **OK** to create a new image.



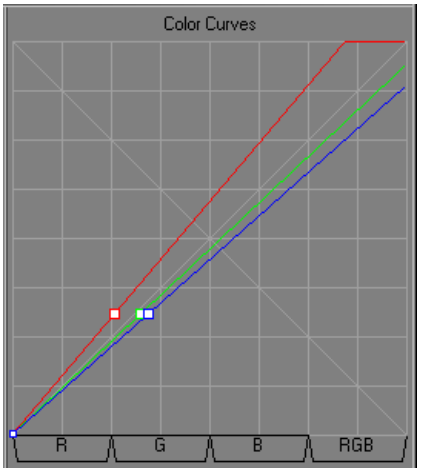
To achieve the effect shown (the image is **sample\landscap.jpg**), we set the **Remove Highlight** square to an orange. (Removing orange is equivalent to adding blue—its complementary color.)

## Using Color Balance with a Gray Scale

For very accurate color correction, include a gray scale target when you photograph your image. You can use up to seven gray scale levels for color balance. Simply shift click on each gray scale value. This will create an additional row of Remove/Add squares in the Color Balance dialog.

To remove a row, select the row you want to remove and click the Trash Can button.

## Color Correction Curves




The color balance transformation works by applying three curves to the input image—one for the red channel, one for green channel, and one for the blue channel. These curves are displayed on the right side of the dialog box.

Initially each curve is defined by points corresponding to the current highlight and shadow color selections. However you can adjust the curves by dragging the control points to refine the color balance adjustment. R, G and B tabs under the curves let you display each curve and its histogram individually.

## Using a Mask

You can apply the color balance dialog through a mask. You may want to do that if different areas of your image require different corrections. An example might be a scene which includes indoor and outdoor elements. In that case make a mask that isolates the indoor elements, for instance, and apply corrections separately to the indoor and outdoor portions. See **Making and Using Masks**.

### Color Balance Options

Click the **Opt** button to set any of the following options:

**Probe Size:** You can control the size of the probe in the color correction dialog. Set it to 1 x 1 pixel for very detailed work or enlarge it up to 9 x 9 pixels to get more of an average value over a small area.

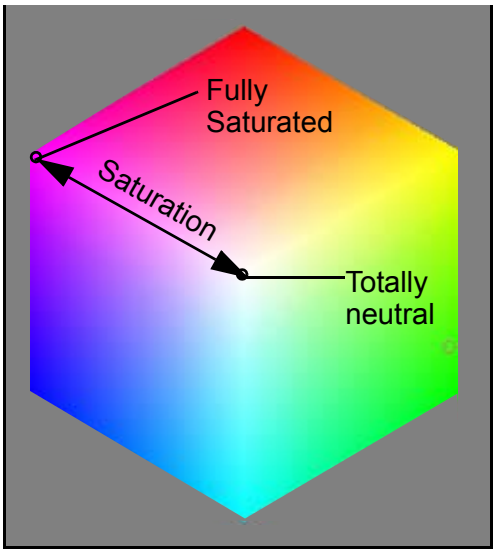
**Reset:** Resets the Color Balance dialog to its original auto-detected values.

## Saving and Loading Settings

 You can save the current settings for use later. To save settings, click the Save Current Settings button and assign the settings a file name. You can later reuse the settings with another image by clicking the Load Settings button and retrieving the file.

# Color Saturation

Saturation refers to the depth or richness of a color. Primary colors, for instance, are fully saturated. You can reduce their saturation by mixing them with white. The greater the proportion of white, the less saturated the color. In the limit, a fully desaturated color is totally neutral.



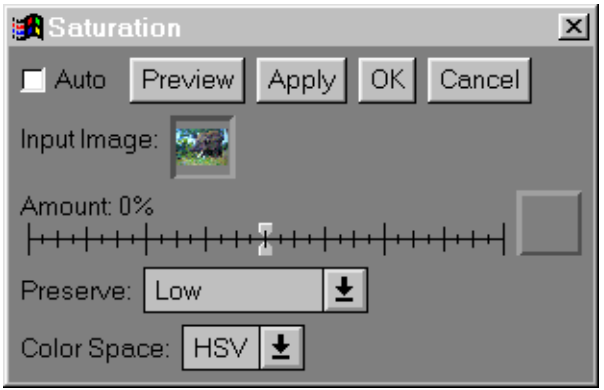

Picture Window allows you to control saturation. You can emphasize color by exaggerating saturation or mute the colors by reducing it. Picture Window gives you a choice of two transformations for adjusting saturation.

**Saturation** is the simpler one. (See **Saturation Dialog**.) It provides a single control for increasing or decreasing saturation over the entire saturation range. Options allow you to maintain the saturation in low and/or high saturation areas constant, while you control areas of medium saturation. This transformation is convenient for images that need small changes in overall saturation but it does not provide as much control as the **Color Curves** transformation. (See **Color Curves**.)

## Saturation Dialog

The **Saturation** dialog is the simpler of the two available dialogs. To use the dialog:

1. **Select an image window.**
2. **Display the Saturation dialog.** Pull down the **Transformation** menu; choose **Color** and then **Saturation**.
3. **Adjust saturation.** Move the slider to increase or decrease saturation.
4. **Click Preview** to see the results of the adjustment. When it is satisfactory, click **OK or Apply**. The saturation adjustment is complete—Picture Window applies the transformation and displays the new image.




### Color Space

The Color Space option lets you work in the HSV or HSL color system. In **HSV**, saturation changes are more pronounced in the highlights. In **HSL**, saturation changes are more pronounced in the midtones.

### Preserve Options

There are many different ways to saturate or desaturate an image. This Popup Menu control lets you select what parts of the saturation scale of the input image are most affected and what parts of the scale remain unchanged.

**Low** keeps areas of low saturation relatively unaffected, applying increasing correction to areas that are already saturated. This tends to keep highlights, shadows, and, in fact, all neutral areas neutral. This setting is usually the best one.

**High** has the least effect on highly saturated areas and the strongest effect on the least saturated areas. This setting should normally be avoided, since it exaggerates color in neutral areas—areas that contain little or no color information to begin with. By arbitrary convention the hue of a perfectly neutral gray is zero which corresponds to red. Increasing the saturation of a neutral gray region therefore makes it redder.

**Low and High** holds unsaturated and highly saturated areas relatively unchanged. It has its strongest effect on the regions of midlevel saturation.

**Neither** changes areas across the entire saturation scale by the same amount. Like **High**, this setting exaggerates color in neutral areas and should normally be avoided.

# Color Correction

The Color Correction transformation provides another way to change colors. While transformations like Color Balance or Filter smoothly affect all colors, **Color Correction** is almost surgical in radically changing one color while scarcely affecting neighboring colors. For instance in the example at left, we made the dusty greens of the scrub much greener without affecting the very similarly colored ground. You can also use this transformation to adjust flesh tones, or deepen the color of the sky, for example.

The correction settings can be saved and later applied to other images. Thus you can use this transformation to adjust the response of your printer, for instance.

**Note: The** Color Correction transformation is only available in the Pro version of Picture Window.

**Color Correction Dialog**

**Using the Color Correction Dialog**

**Color Correction Example**

## Color Correction Dialog

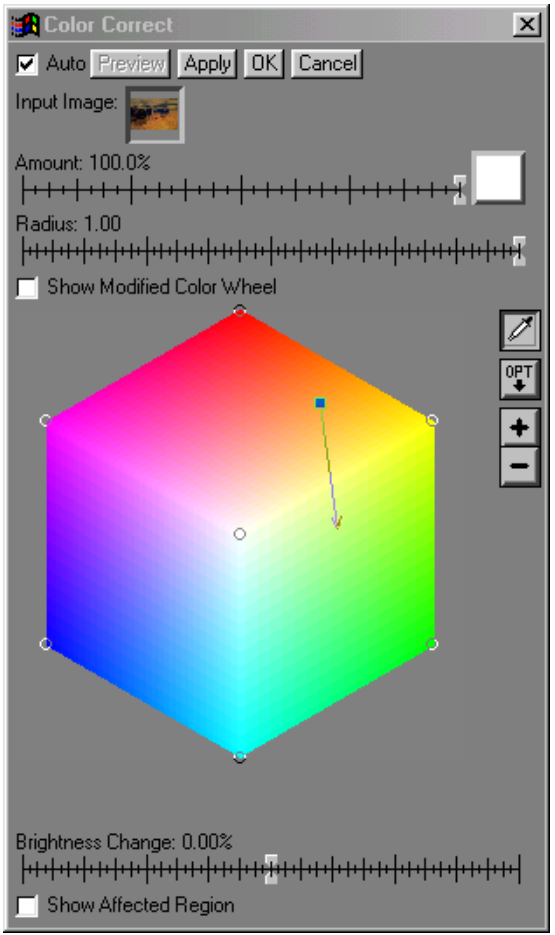
The Color Correction dialog displays HSV color space. It lets you alter colors by moving control points on the color space diagram.

Initially, seven control points (shown as small circles) are displayed. A point is positioned at each of the primary colors and their complements. A seventh point is positioned in the center, on white. Typically, these seven points serve as anchors, mapping the cardinal colors and white to themselves, while you create and manipulate new control points at colors you want to adjust. However, you can drag the original control points or delete them.

To change a color, you drag its control point to the color you want it to have. For instance, to change the whites in an image to a different color, drag the white control point to a new color. When you drag a control point, an arrow is displayed. The tail of the arrow shows the original color. The head shows its new value. (At right, we created an orange point and dragged it to green.)

To zoom in on the current point, click the  plus button.

You can also change the brightness of the color of the selected point. To change the brightness of the color, use the slider at the bottom of the dialog. Note that as you move the mouse cursor over the color wheel, a readout just below the color wheel displays the hue and saturation values corresponding to the cursor location.



## Color Correction Controls

**Radius:** Controls how large a color neighborhood is affected by a control point. Larger radius values affect more of the neighboring colors, and vice versa.

**Show Corrected Color Wheel:** Shows how the color wheel has been affected by moving the control points.

**Options:** Pops up an option menu consisting of the following items:

**Reset** returns all of the color correction settings to their initial values.

**Load** lets you restore a previously saved set of color correction settings for application to the same or to a different image.

**Save As** lets you save the current color correction settings in a file for later use.

**Probe Size** These options let you control the number of pixels the probe samples. Larger probe sizes are useful for obtaining an average reading of an area of the image that does not have a smooth texture; smaller probe sizes let you get precise readings of very small areas. The currently selected probe size is checked.

**Probe:** The probe is used to select a color from an image. Click the button to activate the probe (note the button depresses) and then click on a color in any image window. A new control point matching the selected color is created in the color wheel.

**Plus/Minus:** These buttons zoom (and unzoom) the color wheel to allow for more precise adjustment.

**Brightness Scale:** The brightness scale is used to increase or decrease the brightness of the selected point.

**Show Affected Region:** Check this box to show the region affected by the currently selected control point.

## Using the Color Correction Dialog

1. **Select an image window.**
2. **Display the Color Correction Dialog.** Pull down the **Transformation** menu; choose **Color** and then **Color Correction**.
3. **Create control points** corresponding to the colors you want to affect. To create a new point, you can pick a color from the image or directly from the color wheel.

   To pick a color from the image, click the probe  button in the dialog. Then click on the desired color in the image. A new point is created in the color wheel.

   To pick a color from the dialog, hold down the Shift key and click directly on the color wheel.

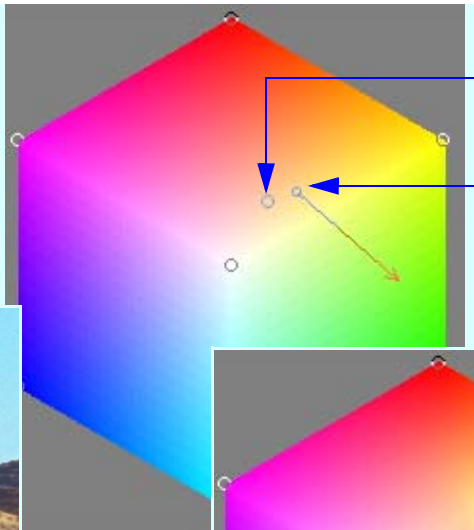
   To delete an existing point, hold down the Ctrl key and click on the point.

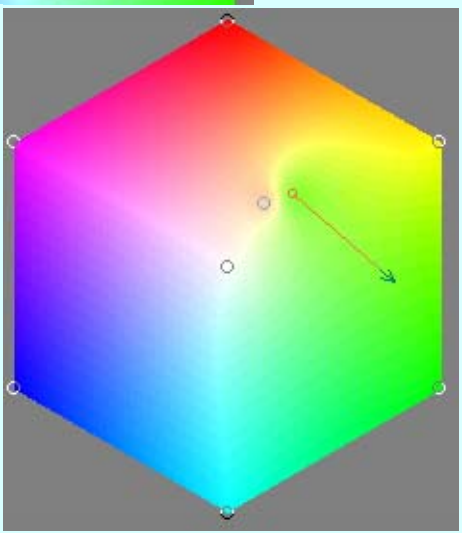
4. **Drag the point to the color you want it to assume.** Click **Preview** to see the results of the corrections. Use the **Amount** control to vary the degree of the change.

   Create and adjust additional points, as necessary. If the transformation is changing a color close to one you selected and you want it to remain unchanged, you can either reduce the **Radius** setting or create an additional control point and let it remain fixed.

5. Check the **Show Corrected Color Wheel to display the effect of the changes on the color wheel.**
6. When the correction is satisfactory, click **OK or Apply**. Picture Window applies the transformation at full resolution and displays the new image.

# Color Correction Example



In this example, we created two control points. One for the sagebrush and the other for the ground. (Note how similar the colors are.) We then dragged the sagebrush point toward to green, to bring it out. We left the ground point unchanged to anchor the color.

The top color wheel shows the original color space; the bottom color wheel shows the effect of the change on the color space.

The glare along the tops of the track causes overexposure and purple fringing, as shown in the top image. It can be corrected with the Defringe transformation.

# Defringe

The Defringe transformation removes or reduces purple fringe artifacts which can be frequently seen near over-exposed pixels. Fringing can often be seen around backlit detail such as tree branches against a bright sky or when the image has specular highlights like the railroad tracks in the before and after images shown at left. Cleaning up fringing, even when it is not particularly noticeable, produces a cleaner, crisper image.

Purple fringing is sometimes confused with chromatic aberration. However it has a different cause and structure and so requires a customized tool. Fringing can be distinguished from chromatic aberration because the latter is most extreme near the edges of the image while fringing is not affected by its location in the image.

The idea behind the defringe transformation is simple—first locate purple fringe pixels and then desaturate them, i.e. replace the purple color with a neutral gray. To be considered a purple fringe pixel, a pixel must satisfy two criteria:

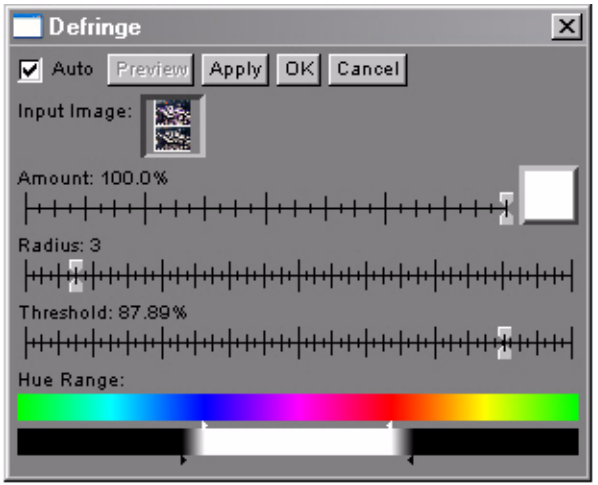
- It must be purple as defined by its hue being in a specific range.
- It must be within a given distance of a pixel brighter than a given threshold value.

In other words, defringe makes every purple pixel near a bright pixel gray.

**Defringe Dialog** **Defringe Transformation Notes**

## Defringe Dialog

To launch the Defringe dialog, select an image window. Pull down the **Transformation** menu; choose **Color** and then **Defringe.**




### Radius

The Radius slider sets the maximum distance a pixel can be from a bright pixel and still be considered a purple fringe pixel. This should be set to roughly the fringe width in pixels or perhaps a bit larger since the effect falls off gradually as you reach the full radius value. Try to use the smallest value that removes all the fringe so as to minimize the impact on other parts of the image.

### Threshold

The Threshold slider defines how bright a pixel must be to qualify pixels within the radius setting as purple fringe pixels. Set the threshold as high as possible while still maintaining the desired effect as this will minimize collateral damage to other parts of the image.

### Hue Range

The Hue Range slider defines the range of hues you want to consider as purple. If the selected range is too narrow, the transformation will not remove all the fringe. If the range is too wide it may start affecting other parts of the image.

At the top of the hue range is a color strip that shows you the full range of possible hues with magenta in the center. There is also a gray bar and four sliders - two white ones above the bar and two black ones below it. Moving the white sliders moves the corresponding black slider at the same time. The range of hues between the white sliders is fully selected as indicated by the gray bar between them being white. Moving the black sliders extends the hue range, causing its effect to fall off

gradually for pixels whose color is adjacent to the fully selected range. These partially selected hues between the black and white sliders are affected but to a lesser extent than pixels with fully selected hues. Pixels with hues outside the range defined by the black sliders will not be affected by the transformation at all. This range feathering reduces artifacts due to the effect of the transformation suddenly cutting off.

# Color Remap

Color Remap is another transformation that works on narrowly selected colors, leaving unselected colors unchanged. It discriminates colors based on hue, saturation and brightness. You can select a color and then remap it to any other colors you choose. You can also control how narrowly or broadly the selection is applied. You can select up to a maximum of eight different colors at once.

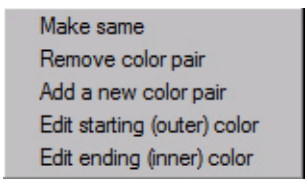
Usually you would adjust the brightness, contrast and color balance of your overall image first. Then you can use this transformation to enhance important colors without affecting the rest of the image, like in the example below. Of course you also make much larger changes, such as turn a red to a blue, for example.

**Note:** Remap is more selective than **Color Correction**. Color correction discriminates based on hue and saturation only and applies to all brightnesses of the color. Remap discriminates on hue, saturation and brightness.

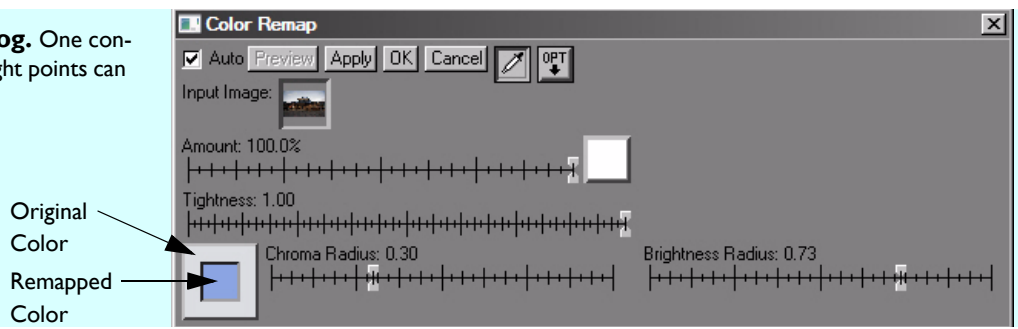
In this example colors in two areas are remapped - the sky and the logs of the house. The sky color was made more intense while the logs were made more vibrant. See **Color Remap Example** for details.

## Using the Remap Dialog

1. **Select an image window.**
2. **Display the Color Remap Dialog.** Select **Transformation->Color->Remap.**
3. **Select a color** that you want to remap. **Shift-click** on the color in the original image. A color patch and controls for the chosen color are created in the dialog.
4. **Set the remap color.** Click on the center color square in the dialog to display the **Color Picker**. Select the color you want to remap to.
5. **Adjust the selectivity of each color** using the Chroma and Brightness Radii controls. Moving the controls to the left increases selectivity. Moving them to the right makes the selection more inclusive. In addition, the tightness control affects the overall selectivity of all selected colors.
6. **Select additional control points**, as needed. You can add, remove and edit control points by right-clicking on the color patch and selecting an operation from the menu.
7. **Click OK** to complete the dialog and create a new image.




**The Color Remap dialog.** One control point is shown. Up to eight points can be created.

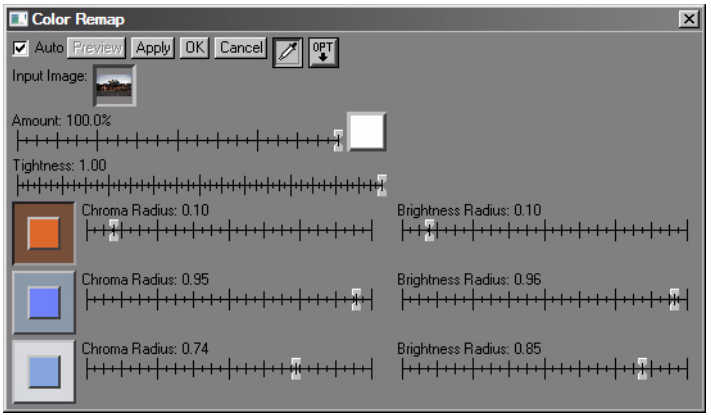


## Color Remap Example

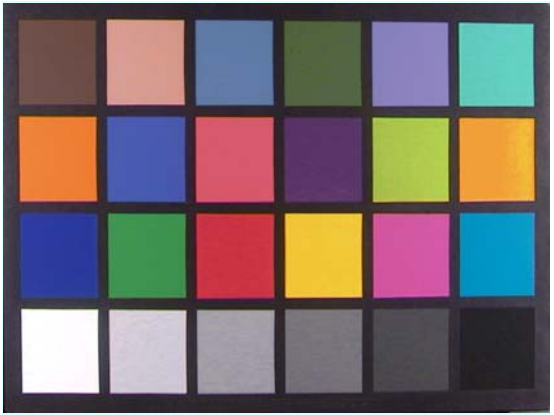
In this example we deepened the color of the sky and made the clouds more prominent. We also made the logs of the building brighter and more saturated.

A single selection (pt. 1) was enough to cover the logs.

However the sky with its greater range of colors required two points (pts 2 & 3). We selected nearly the same color as the remap color for both sky points and also set the Chroma and Brightness Radii to high values for low selectivity. The result is shown in the image at the right. The image is in samples\remapexample.jpg.




# Match Reference



Macbeth Color Reference Target

The Match Reference transformation *(available in Picture Window Pro only)* lets you color correct an image by using a reference target that you scan or photograph under the same conditions as the image you are correcting. (For more information, see the **Color Management** white paper.)

Here are several examples of when you may want to use this technique:

- **Achieve accurate color matching.** Sometimes you want your photograph to represent colors accurately. Examples include photographs of paintings, fabrics, and clothing. To match colors accurately, include the Macbeth target in your photograph (or in a separate photograph taken under the same conditions). You can then adjust your image to represent colors accurately. Three Macbeth targets using a selection of color profiles are available from the *samples* subdirectory in the Application Data Folder.
- **Create your own scanner film profiles.** You can create your own color compensation profiles for the film you shoot and scan. Simply photograph and scan the Macbeth color target. Use the resulting image in the Match Reference transformation to compensate for the film type. The transformation can correct for the orange mask found in many negative films and even reverse the colors to create positives from negatives. The advantage is that you can use films for which your scanner does not offer a profile or which have been processed in a non-standard way.
- **Compensate for automatic corrections.** Digital cameras and scanners are now often designed to make automatic color corrections. These may not always have the intended positive result. By including a target in the scene or scan, you can later compensate for any automatic adjustments the device makes.

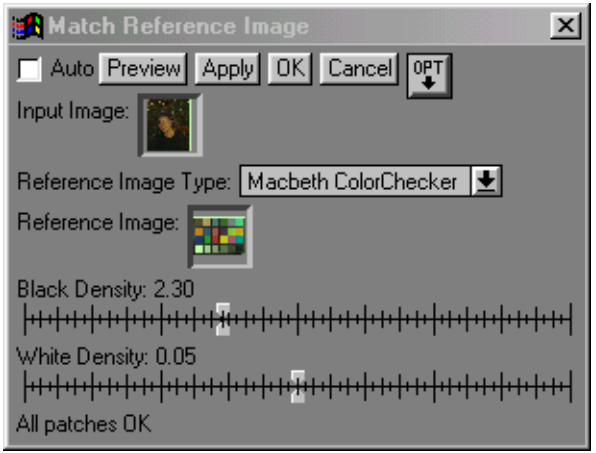
The original image and corresponding target (at left) were used in the **Match Reference** transformation to produce the photo at right.

Two standard targets are supported—the Macbeth color reference target (shown above) and the Kodak Q-13 Grayscale card. Use the Macbeth target for color correction and the Kodak target if you are primarily concerned with grayscale calibration. The targets are available commercially in various sizes, including small cards that can be conveniently carried in your camera bag.

**Saving correction information.** The match reference transformation allows you to save color correction information and apply to other images. Thus you can create a correction files for your scanner, or for typical lighting conditions that you encounter and apply them to images created under the same conditions. See **Saving and Reusing Reference Information**.

## Match Reference Dialog

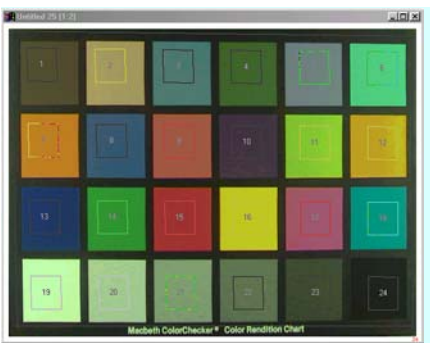
To use the Match Reference transformation, you need an image of either the Macbeth ColorChecker or Kodak grayscale target in addition to the image you are correcting.




To correct an image:

1. **Select an image window.**
2. **Display the Match Reference Dialog.** Pull down the **Transformation** menu; choose **Color** and then **Match Reference**.
3. **Set the Reference Image Type** to match the type of the target you are using.
4. **Select the Reference Image.** Make sure the image that contains the target is open in an image window. (The target must be oriented so that the neutral gray patches are along the bottom row, as shown in the figure.) The reference may be a separate image or included in the image you are correcting. Double-click on the small reference image window and select the image from the popup menu. A series of rectangles is projected over the reference image.

   **Note:** Instead of selecting a reference image, you can load a reference file that you saved previously. To load the file, click the **OPT**  button and select **Load**. Choose the desired file from the **File Open** dialog.



**The reference image** showing all rectangles positioned correctly.

5. **Adjust the projected rectangles.** The rectangles locate the color or gray scale patches in the reference image. Position them by dragging the four corner handles, as needed, until each of the small rectangles is placed inside its respective patch on the image. The dialog checks to make sure the correction data is reasonable and displays the message *All patches are OK* at the bottom of the dialog when all rectangles are properly positioned.
6. **Set the White and Black density sliders.** These sliders compensate for the fact that the whites and blacks of the target are slightly toned down from ideal white and black values. Setting the black density lower or the white density higher effectively expands the contrast range of the correction. Making opposite adjustments compresses it. Thus you can adjust these sliders for best contrast, as judged by inspecting the Preview image. (See Help for additional information on the sliders.)
7. **Adjust the degree of correction, if necessary.** On rare occasions you may want to reduce the degree of correction. See **Controlling the degree of correction** for more information.
8. **Complete the transformation.** When all adjustments are satisfactory click **OK** or **Apply**. The corrections are applied and a new image is created.

# Match Reference Options

## Controlling the degree of correction

When you apply the Match Reference transformation using the Macbeth color target, you can specify one of three degrees of adjustment. (Only the first option is available with the Q-13 target.) The options are:

- **Apply Curves Only:** limits the correction to achieving the neutral balance only. The correction is based on the gray patches of the target only. In the case of the Macbeth target, the color patches in the target are ignored.
- **Apply Curves & Color Correction:** first corrects for neutral balance and then adjusts hue and saturation. Brightness is left unchanged.
- **Apply Curves & Color/Brightness Correction:** performs all three corrections—neutral balance, hue/saturation, and brightness.

For most images best results are achieved with full correction using the last option. However, the second option produces better results in a minority of cases, so if you are unhappy with full correction, you can try to scale correction back using the second or first options.

To select the degree of adjustment click the **OPT** 

button and select the desired option.

### Saving and Reusing Reference Information

You can save the characteristics of a particular correction and reuse it later without having to reopen the target image. This feature make it more convenient for you to create and apply a library color correction profiles for various situations.

To save the reference information for later reuse:

1. **Set up the Match Reference Transformation.** In the Match Reference transformation, select the reference target you want to use and adjust the projected rectangles as described in steps 4 and 5, above.
2. **Save the reference information.** Click the **OPT** 

button and select **Save Reference Settings**. The Save File dialog is displayed. Name the file and click **OK**. You can now cancel or complete the Match Reference transformation as desired.

To apply the saved reference information to another image:

1. **Select the image.**
2. **Display the Match Reference transformation.** Pull down the **Transformation** menu; choose **Color** and then **Match Reference**. The Match Reference transformation is displayed.
3. **Load the saved reference information.** Click the **OPT** 

button and select **Load Reference Settings**. The Open File dialog is displayed. Select the file you saved earlier and click **OK**.
4. **Complete the transformation.** Set the black and white density sliders as required. When all adjustments are satisfactory click **OK** or **Apply**. The corrections are applied and a new image is created.

### Using Reference Information with other color transformations

You can also save reference information in a form that can be used with the **Color Curves** and **Color Correction** transformations.

### Color Curves Transformation

To save and reuse the reference information in these transformations:

1. **Set up the Match Reference Transformation.** In the Match Reference transformation, select the reference target you want to use and adjust the projected rectangles as described in steps 4 and 5, above.
2. **Save Curves.** Click the **OPT**  button and select **Save Curves**. The Save File dialog is displayed. Name the file and click **OK**. You can now cancel or complete the Match Reference transformation as desired.
3. **Save Correction.** Click the **OPT**  button and select **Save Correction**. The Save File dialog is displayed. Name the file and click **OK**. You can now cancel or complete the Match Reference transformation as desired. (This step is unnecessary if you only intend to use the Color Curves transformation.)
4. **Display the Color Curves transformation.** Pull down the **Transformation** menu; choose **Color** and then **Curves**. The Color Curves transformation is displayed.
5. **Load the saved reference information.** Click the top **OPT**  button and select **Load Curves**. The Open File dialog is displayed. Select the file you saved earlier and click **OK**. (Note that the Color Curves Transformation has two OPT buttons. Use the upper button. This button is related to the transformation in general. The lower OPT button is used for options related to the active curve only.)
6. **Preview the results.** You can make further changes by adjusting the curves further. Click OK when you are satisfied with the results.

7. **Display the Color Correction transformation.** Select the new image you have created with the Curves transformation. Pull down the **Transformation** menu; choose **Color** and then **Correction**. The Color Correction transformation is displayed.
8. **Load the saved reference information.** Click the **OPT** 

button and select **Load Correction**. The Open File dialog is displayed. Select the file you saved earlier and click **OK**.
9. **Preview the results.** You can make further changes by adjusting the points further. Click OK when you are satisfied with the results.

# Profile

This transformation associates a new profile with an image and transforms the image's colors from its current to its new profile. You can operate either on the input profile or the output profile or both and can recalculate the image's colors or simply change the assigned profile without changing the image itself. There are circumstances under which each option is appropriate.

Here is what each of the controls do:

### Input color profile

**Retain current:** Leaves the input color profile at its original setting. This is the most common setting.

**Set to custom:** Resets the input color profile to the profile you select. The preview image is recalculated to show how an image of the selected input profile looks in the default display color space. This setting is used when the originally assigned input profile is actually not correct. For instance if the image originates from a device (scanner or camera) that has been calibrated, you can use this function to assign the calibration profile to the image.

### Output color profile

Sets the profile of the output image. The image will be tagged with this profile when it is saved. (The image may or may not be recalculated, depending on the setting of the **Change** control, described below.) If you have reset the input profile and want to retain it in the output image, set Output color profile to the same setting as the input profile.

The most common profile is **sRGB IEC61966-2.1**. Note that you cannot change the profile to **None** or to a scanner profile unless you are just retagging the image with the new profile by setting the **Change** control to **Profile Setting Only**.

### Rendering intent

Usually the default rendering intent, **Maintain Full Gamut**, is most appropriate. However you can choose any one of the following:

**Maintain Full Gamut:** Expands or contracts the source image to fill the full color gamut (range of displayable colors) of the monitor. This is usually the best choice for photographic images.

**Preserve Saturation:** Preserves color saturation at the risk of inaccuracy in other color parameters. This is usually the best choice for business graphics where vivid colors are more important than color accuracy.

**Preserve Identical Colors:** Provides the best color accuracy possible. This choice is typically used for displaying color swatches in which accuracy is the most important quality.

**Preserve Identical Colors and White Point:** Similar to the previous choice with the added condition that the white point is also preserved.

**Preserve Identical Colors and Black Point:** Similar to Preserve Identical Colors with the added condition that the black point is also preserved. This choice provides can sometimes provide the match when using printing services.

### Change

Determines how the output profile is applied. Choices are:

**Image Data and Profile Setting:** translates the input image to the output color space and associates the new profile with the output image. Use this option to translate an image from one color space to another.

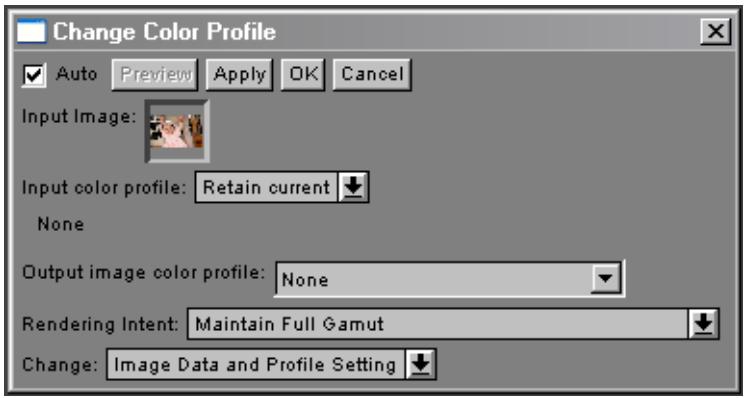
**Image Data Only:** translates the input image to the output color space but associates the original color profile with the output image.

**Profile Setting Only:** copies the input image data to the output image without any modification but associates the new color profile with the output image. Use this option if the original color profile tag was incorrect. This may happen if the image originated from an untagged source and was assigned a default profile that was not correct.

## Using the Profile Dialog

To operate on the input and/or output color profile of an image:

1. **Select an image window.**
2. **Display the Change Color Dialog.** Pull down the **Transformation** menu; choose **Color** and then **Change Color Profile**.
3. **Make settings** following the descriptions above.
4. Click **OK** to apply the change.

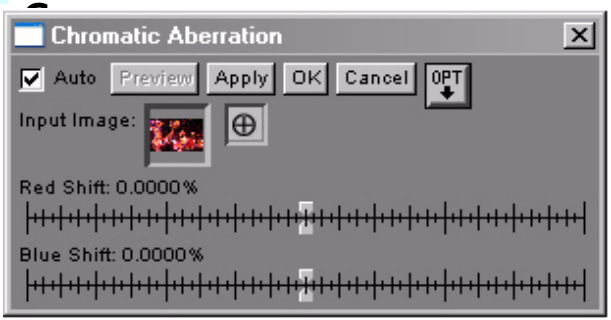


**Chromatic aberration** typically shows up most in highlights and edges.
(The effect was simulated for this illustration.)

The example image is **samples\aberration.tif** in the Application Data Folder.

# Chromatic Aberration

Chromatic aberration arises in lens that exhibit slightly different magnification for light of different colors. You can see it in your images as color fringes, most noticeable around the edges of objects. The fringes get more pronounced the further the object is from the center of the image.




## hromatic Aberration Transformation

1. **Select an image window.**
2. **Display the Chromatic Aberration dialog.** Pull down the **Transformation** menu and select **Color** and then **Chromatic Aberration.**
3. **Adjust the center crosshairs.** Chromatic aberration is typically symmetric about the center. Thus if the image has been cropped, drag the center crosshairs to the original center of the image.
4. **Adjust the Red and Blue Shift sliders to cancel** the aberration. (Select the Preview window and enlarge it by clicking the **Zoom In** button so you can see the aberration.) Use the ⊕ button to toggle the preview between a before and after display of the adjustment.
5. **Click OK** or **Apply** when you are satisfied with the adjustment. A corrected image is displayed in a new window.

## Options

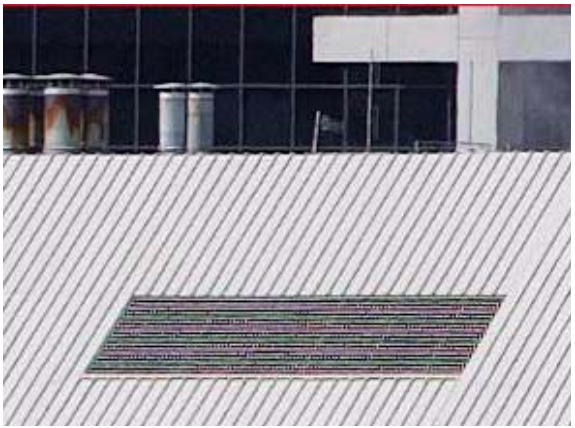
The following options are available by clicking the 

button:

**Reset All:** Resets the dialog to its original default values.

**Load:** Loads settings stored earlier.

**Save As:** Stores current settings:



# Moire Reduction

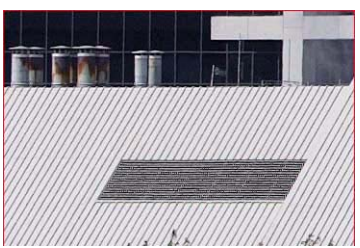
When the dimensions of a pattern in an image are comparable to the spacing of sensor elements in a digital camera's chip, annoying color fringes can result, like the grate in image detail at left. These colors are unrelated to image colors. The Moire Reduction transformation ignores color information, letting you apply tints instead.

Usually only a small part of the image is affected. Thus this transformation is usually applied through a mask which isolates the affected area.

**Note: Only a**vailable in the Pro version of Picture Window.

## Example

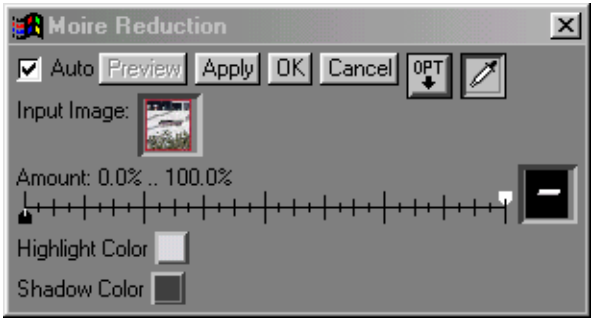
To remove the pattern from the grate in the image above, we created a mask. (In this case we used the polygon tool, aligning the corners with the corners of the grate.) We then used the mask in the Moire Reduction transformation. Since the image is fairly neutral, we assigned dark gray to the shadow color and a light gray to the highlight color. However we could have assigned any other colors or picked suitable colors from the image itself.



The mask and resulting image are shown at left and the dialog settings are shown on the next page.

Note that your computer's display screen may create a new set of interference patterns.(After all, it also consists of a grid of regularly spaced elements.) You can minimize the effect of this by zooming in on the image.

## Moire Reduction Dialog




1. **Select an image window.**
2. **Display the Moire Reduction dialog.** Pull down the **Transformation** menu and select **Color** and then **Moire Reduction.**
3. **Select a mask.** To use a mask (optional), click on the white button to the right of the **Amount** control and choose a mask from the menu. (The mask must be open on the screen.) Set the white and black amount sliders.
4. **Set the highlight and shadow colors.** To pick colors from the image, click the probe button. Then click the image color you want to assign to the highlight. Repeat for the shadow color.

   You can also set the colors using the **Color Picker**. To do so, click the highlight or shadow button and choose the color.
5. Click **OK** to dismiss the dialog and create a new image.

### Options

Click the **OPT** button to set the size of the probe for selecting highlight and shadow colors. The probe size can be set from 1x1 to 9x9 pixels.

# Negative

The color negative transformation is used to convert color negatives to positives. It can compensate for the mask typically applied to color negatives and allows you to make color and dynamic range adjustments.

**Note:** To invert black and white negatives, it is simpler to use **Transformation/Gray/Negative** instead of this transformation.

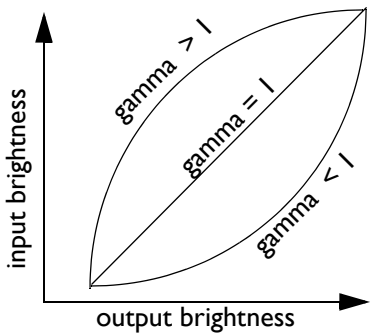
The Color Negative transformation bases is adjustment on the following:

• **Black Point:** This is a region of the negative that should result in blacks in the final image. Since the image is inverted, it corresponds to the clearest portion of the negative, such as the boundary between frames. Usually the color is a dirty orange.

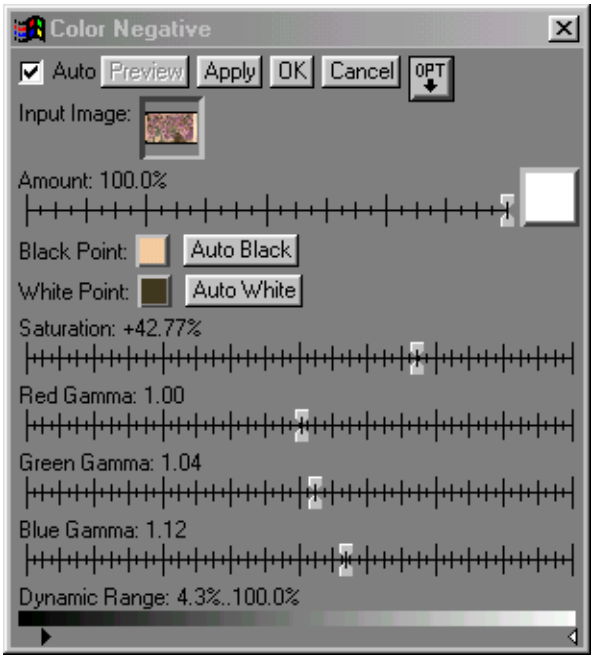
• **White Point:** This is an area that should print as white in the final image. It corresponds to the densest region of the negative.

• **Saturation** controls the intensity of the colors in the image.

- **Red, green and blue gamma** control the color balance of the image. Gamma characterizes the shape of the curves of these colors. A gamma of 1 is a straight diagonal line. Higher gammas are increasingly bowed upward while fractional gammas are bowed downwards.
- **Dynamic range** controls the overall contrast of the image. It actually sets the start and end point of the RGB curves shaped by the gamma controls.



## Color Negative Dialog




Scan the negative. Try to include an unexposed area of the negative such as the frame divider. To convert the scan to a positive:

1. **Select an image window.**
2. **Display the Negative dialog.** Pull down the **Transformation** menu; choose **Color** and then **Negative**.
3. **Set the black point.** Click **Auto Black** or select the black point manually. To select manually, click on the Black Point button to display the **Color Picker**. Use the Color Picker's probe to select a clear area of the negative.
4. **Set the white point.** Click **Auto White** or select the white point manually. To select manually, use the **Color Picker** to choose the densest area of the image.
5. **Set the saturation** for best color intensity.
6. **Set the Gamma controls** for good color balance.
7. **Set the Dynamic Range** so that the white areas are nearly as white as the border and the black areas are as dense as possible without blocking the shadows.
8. **Click OK** or **Apply** when you are satisfied with the settings. A new image is created.

**Hint:** To apply this transformation to a series of images, open the images. Select the first image, make your settings and click Apply. Select each subsequent image by clicking on the image thumbnail next to the Amount control and selecting it from the pop-up menu.

# Extract Channel

Extract Channel extracts one of the channels from a color image and creates a black and white image from it. You can choose to extract:

- the luminance channel (luminance is a measure of perceived brightness),
- one of the three primary (red, green, blue) channels,
- one of the three HSL channels,
- or one of the three HSV channels.

You can use the extract channel function to create a black and white image as your end product. For instance, to convert a color photograph to black and white, try extracting its luminance channel. You can also use Extract Channel to help gain insight into how a particular parameter varies in an image. For example, you can compare the notion of **lightness** in HSL space with that of **value** in HSV space by extracting these channels and comparing the resulting images. (See **HSV, HSL, and RGB Color Spaces**.)

The extracted channel is output as a black and white image based only on the content of the chosen channel in the original color image. For instance, if you choose the red channel, the new image is a black and white image whose intensity is proportional to the amount of red in the original. The new image is black in areas where the original image has no red content and white in areas where red intensity is maximum. It is some shade of gray in areas with intermediate amounts of red.

**The Extract Channel Dialog**

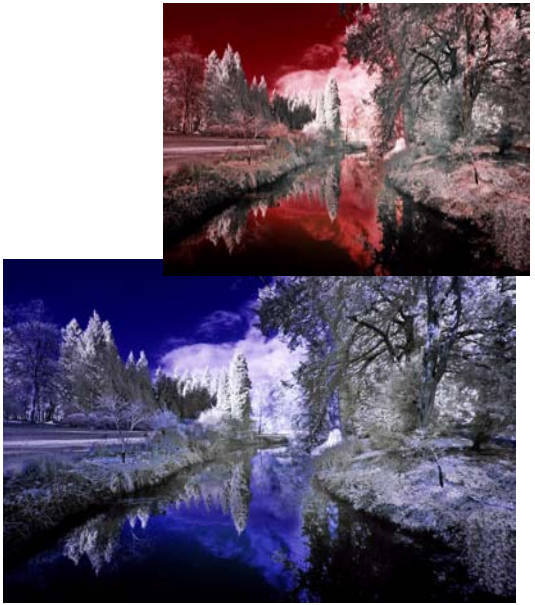
**See Also:** **Extract and Combine Channels** **Monochrome**

## The Extract Channel Dialog

To use the Extract Channel dialog:


1. **Select an image window.**
2. **Display the Extract Channel dialog.** Pull down the **Transformation** menu and select **Color** and then **Extract Channel.**
3. **Choose a channel.** Click on the **Channel** drop down menu and highlight one of the choices.
4. **Click Preview** to get a quick idea of what the image will look like.
5. **Click OK** or **Apply** when you are satisfied with the choice of channel. A black and white image of the channel is built and displayed in a new window.

# Reassign Channels



Reassign Channels lets you change the order of the red, blue and green channels in an image. The primary motivation for this transformation is to make it easy to swap the red and blue channels in color infrared photographs, to make skies look more natural as shown in the example at left. However, the transformation is not restricted to this situation and can be used to place the three channels into any order.

## Using the Transformation

1. **Select an image window.**
2. **Display the Reassign Channels dialog.** Pull down the **Transformation** menu and select **Color** and then **Reassign Channels.**
3. **Set the channels as desired.**
4. **Click OK** or **Apply** when you are satisfied with the choice of channel. A black and white image of the channel is built and displayed in a new window.

# Swap Red and Blue

This transformation swaps the red and blue channels to create a B-G-R image from an R-B-G image, for compatibility with software that expects the channels in the B-G-R order. To use the transformation, select an image and then pull down the **Transformation** menu and select **Color** and then **Swap Red and Blue.** This transformation requires no parameters and has no dialog.

# Monochrome

**Monochrome** converts a color image to black and white. The new black and white image is based on the intensities of the three color primaries. You can control the how the intensities are proportioned in the final image by using a filter or using a channel mixer.

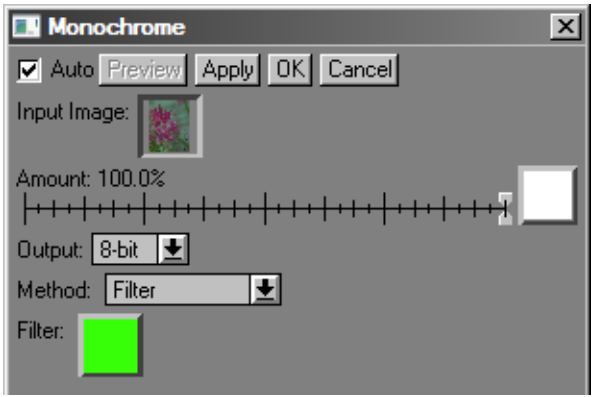
**Filter Method:** By using the Color Picker, you can choose any constant color for the filter. (You can also choose the Color Picker's Filter Bank option to select a Wratten filter.) For example, if you choose a red filter, reds will look lighter while cyans will look dark. Colors in between will yield intermediate shades of gray. The saturation of the color chosen also plays a role in the output. At one extreme, if you choose white, no color is favored. On the other hand, if you choose a fully saturated color, that color is favored and is lightest in the output image. Alternately, you can use another image to create a filter whose color varies from one area to another.

**Channel Mixer Method:** The Channel Mixer method achieves the same thing as the filter method, except that it uses sliders to set red, green and blue sensitivities. Sliders are a bit more powerful than a filter because they allow you to set the sensitivity of a channel to greater than 100%, something that is not possible with a filter. However one has to be careful not to set sensitivity so high as to overexpose highlights. The channel mixer dialog has a highlight warning to help avoid this problem.

**Blending Color & B+W:** The monochrome transformation allows you to blend the output image with the input image in any ratio from 100% output image down. However, if you blend any of the input image into the output image, the resulting image will have at least a little bit of color in it and is stored as a color image rather than as a black and white image.Therefore, if your goal is to produce a black and white image, you must set the **Amount** control to 100%.

**Monochrome Dialog - Filter Method**
**Example - Filter Method**
**Monochrome Dialog - Channel Mixer Method**
**Example - Channel Mixer Method**

## Monochrome Dialog - Filter Method



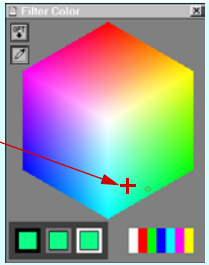

To use the Monochrome dialog:

1. **Select an image window.**
2. **Display the Monochrome dialog.**
   Choose **Transformation->Color->Monochrome**.
   Set method to **Filter**.
3. **Choose a filter color.** A thumbnail of the filter is shown in the filter button. The default is a yellow-green solid color filter. (Essentially, yellow-green filters for luminance.) To select a different color or to select a filter image, click on the **Filter** button.

   Choose **Solid Color** to use the **Color Picker**. Then select a color from the color picker or use the color picker probe to match a color from the image itself.

   Alternately, you can choose an image in one of the open windows as a filter. The filter image must be exactly the same pixel size as the original. If you are converting a color negative to b+w, try using the negative as the filter.
4. **Set Output.** For 24 bit color images, you can create either an 8-bit or 16-bit per pixel monochrome image. The 16-bit option is recommended if you will be making additional brightness adjustments. *(Picture Window Pro only)*
5. **Click Preview** to get a quick idea of what the image will look like. Use the **Amount** control to vary the degree of the change. (However, the **Amount** control must be set to 100%, to create a black and white image. At any other setting, the image contains some amount of color information and is thus still a color image.)
6. **Click OK** when you are satisfied with the filter. A new image is displayed. (See **Example - Filter Method**.)

Original Color Image




Filter color chosen to match back-ground.

Flower and background are well separated.

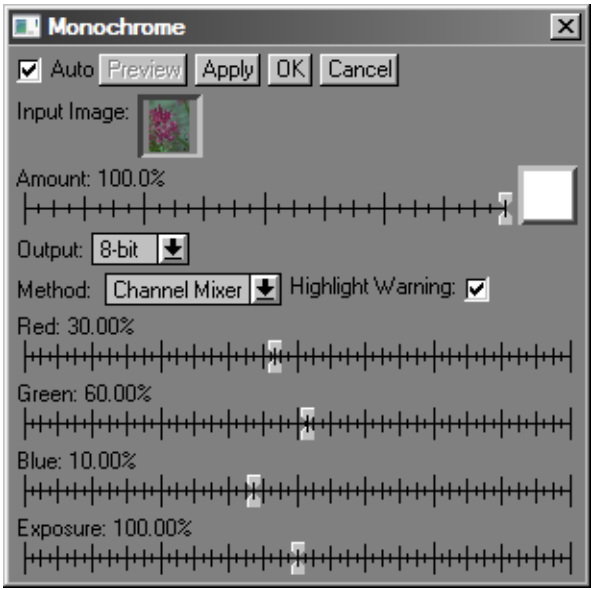
A different filter color results in muddy print.

## Example - Filter Method

In the color image (**samples \prplflwr.jpg** located in your Application Data Folder), the flowers stand out from the back-ground because of the color differences. In black and white, these color distinctions are gone and we have to make the flowers stand out by using tonality only.

To increase the tonal separation between the background and foreground, the filter color was matched to the hue of the background. In general, hues that are close to the hue of the filter are lightened while hues that are opposite the filter hue are darkened. Since the violet of the flower is well separated from the green of the background, choosing the green as the filter color further lightens the background and enhances the separation between foreground and background. Finally, the black and white image's contrast was further enhanced using the **Levels** transformation.

## Monochrome Dialog - Channel Mixer Method

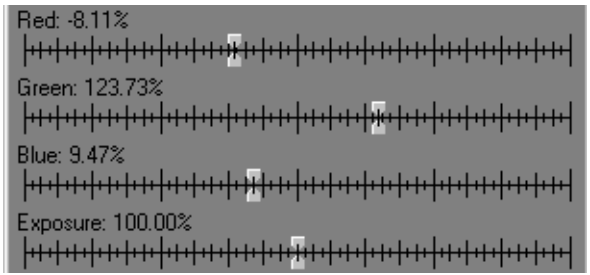



To use the Monochrome dialog:

1. **Select an image window.**
2. **Display the Monochrome dialog.**
   Choose **Transformation->Color->Monochrome**.
   Set method to **Channel Mixer**.
3. **Set Method** to **Channel Mixer**. Sliders for setting Red, Green and Blue sensitivities and a fourth slider for controlling the overall exposure are displayed. Initially the values of the sliders are set to simulate the default green filter used in the filter method.
4. Adjust the sliders for the best image appearance. If a slider is set to too high a value, it is possible to get blown highlights. When **Highlight Warning** is set, blown highlights are displayed as black. To avoid blown highlights, back off on the color slider which is causing them or reduce overall exposure.
5. **Set Output.** For 24 bit color images, you can create either an 8-bit or 16-bit per pixel monochrome image. The 16-bit option is recommended if you will be making additional brightness adjustments. *(Picture Window Pro only)*
6. **Click OK** when you are satisfied with the adjustments. A new image is displayed. (See **Example - Channel Mixer Method**.)

## Example - Channel Mixer Method

The basic idea in using the channel mixer controls is to brighten colors of one hue while darkening the colors of an opposite hue to get the greatest contrast and separation of image elements. Using the same example image, we lightened the background by selecting high values on the green slider. We also darkened the flower areas by setting the red slider to darker values. The settings and the resultant image are shown below.




Controls are set to lighten the green background and darken the reddish foreground.

Original Color Image

Flower and background are well separated.

# Filter

Applying the Filter transformation is similar to taking a color picture through a filter. A filter transmits colors close to itself best and transmits complementary colors least. Thus pick a filter close to the color you want to emphasize.

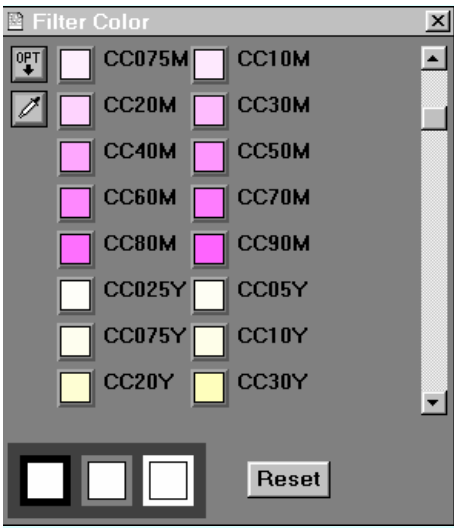
However, there is a subtle difference between the Picture Window **Filter** transformation and conventional filters. In Picture Window, the filter is placed in the image plane rather than on the lens. So it's like sandwiching two transparencies. This allows for some new possibilities. The filter is not restricted to being a uniform color. An image can also be used as a filter. The filter might be a gradient, another image, or even the same image. The filter dialog gives you the following controls:

**Filter:** a constant color, a standard filter, or an image to be used as a filter. If an image is used it must have exactly the same width and height, in pixels, as the input image.

**Exposure compensation:** compensates for the darkening a filter can cause.

**Amount control:** blends the input and output image.

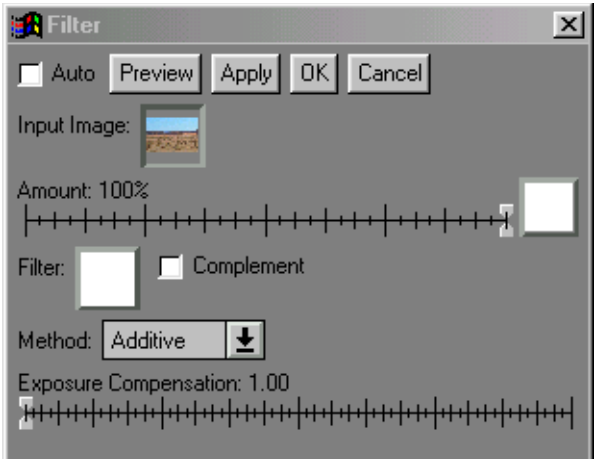
[The Filter Dialog](#) [Filter Example](#)




The Color Picker lets you select filters by standard filter number.

## The Filter Dialog

To use the Filter dialog:




1. **Select an image window.**
2. **Display the Filter dialog.** In the **Transformation** menu, select **Filter**. The **Filter** dialog box is displayed.
3. **Choose a color or an image for the filter.** Click on the **Filter** button. Choose an image or **Constant Color** from the popup menu. If you choose constant color, the **Color Picker** is displayed. Select the hue and saturation from the color cube and the brightness from the scale to the right of the cube. You can also select a standard color correction or Wratten filter or use the **Probe** in the color picker to match a color in an open image. Finally, you can select the color by its complement—i.e. select the color you want to remove rather than emphasize.
4. **Choose a method.** The choices are additive and subtractive. **Additive** is the normal filter operation, and is the same as using a filter on the camera or sandwiching the filter with a transparency. **Subtractive** is like using a filter while printing a negative. It is the *negative* of sandwiching the negative of the filter with a negative.
5. **Click Preview** to see the effect of the settings you have made. If the image is too dark, adjust the **Exposure Compensation** slider to lighten it. If the effect is too extreme, reduce the setting of the **Amount** slider.
6. **Click OK** or **Apply** when you are satisfied. The new image is displayed.

## Filter Example

In this example, an image (**samples\prplflwr.jpg** located in your Application Data Folder) is displayed through two different filters.

In one case, a magenta filter whose color was picked from the flowers was used. The filter has the greatest effect on its complementary colors, like the greens in the background of the original image.

In the second case, the image itself is used as the filter. The effect is to increase color saturation particularly in areas that are already saturated. It makes the colors much more intense.

Original

Filtered with a magenta filter

Filtered by the image itself

Original Image

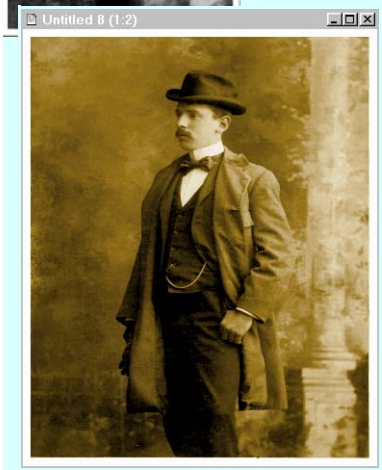



Image after tinting

# Tint

The Tint transformation lets you convert the scale of grays in a black and white photograph to a range of colors. For instance, you can give a black and white photograph a sepia tone by substituting a range of dark to light browns for the dark to light grays in the original image. In fact, by using a series of masks, you can "colorize" a black and white photograph, creating an effect similar to hand-tinting.

The basic mechanism for specifying a color range is assignment of colors (using the color picker) to the end points of the gray scale. This results in a smooth color gradation (see figure) and is all you need in most cases. However, to create various special effects, you may want more control. The Tint dialog is quite powerful. It lets you pick intermediate points along the grayscale and assign other colors to them. In addition you can set the color space (RGB, HSL or HSV) to be used in calculating the intermediate colors as well as control how the colors change—abruptly in a single transition, linearly or sinusoidally. The dialog is described on the next page.

**Tint Dialog**

**Tint Options**

**Tint Example: Creating a Sepia Effect**

**Tint Example: Coloring a Photograph**

## Tint Dialog


Tint is generally used on black and white images. If you use tint on a color image, it is converted to black and white internally and then tinted. To use the Tint dialog:

1. **Select an image window.**
2. **Display the Tint dialog.** In the **Transformation** menu, select **Gray** and then select **Tint**. The **Tint** dialog box is displayed.
3. **Choose a color for one or more points.** The points are indicated by number. Double click on the number identifying the point whose color you want to set. The **Color Picker** is displayed. Select the hue and saturation from the color cube and the brightness from the scale to the right of the cube. You can also use the probe in the color picker to match a color in any other image open on the screen.
4. **Create additional points**, if desired. To create an additional point, place the mouse cursor just above the scale, hold down the shift key and click the left mouse button. A new point is created. Drag the point to the desired position. Double click on the point to assign it a color using the color picker.
5. **Change the color space** and other settings, if desired. Click on the button under the scale to display an auxiliary menu of options. You can work in RGB, HSV and HSL color spaces.
6. **Click Preview** to see the effect of the settings. Use the **Amount** slider to control the degree of tinting.
7. **Click OK** or **Apply** when you are satisfied. The new image is displayed.

## Tint Options

*Click anywhere along the bottom of the scale between any pair of control points to display an options menu.*


**Step** choices create an abrupt transition between the colors at the two control points at the left, center or right in the scale.

**Line** selects a smooth, linear transition.

**Sine** selects a sinusoidal transition. It starts and ends gradually and has its steepest section in the center.

**RGB**, **HSV** and **HSL** are color space choices. Usually **RGB** yields best results. If you choose **HSL** or **HSV**, you can also choose a clockwise *(***CW***)* or counterclockwise *(***CCW***)* path to connect the colors at the ends of the scale. Use the scale display to determine which direction best matches your intention. The **HSL** and **HSV** settings are useful for creating rainbow gradients.

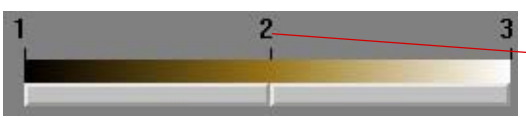
## Tint Example: Creating a Sepia Effect

Creating a sepia effect is quite simple.

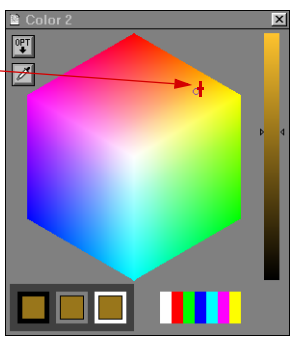
1. Select the black and white image you want to convert to sepia. (The example image is **samples\oldphoto.jpg** located in your Application Data Folder.)
2. Select the Tint dialog (Transformations->Gray->Tint).
3. The tonality scale in a sepia photograph goes from black to a sepia color to white. We already have the black and white end points. We just need to create an intermediate sepia point. To create a new point, place the mouse cursor in the center of the range, hold down the shift key and click the left mouse button. A new point is created. Notice that it is assigned the number 2 while the end point is now number 3

   The new point 2 must be set to a sepia color. To set it, double click on the 2. The **Color Picker** is displayed. Select the sepia color you want. Lighter tones are generally preferable to darker ones because they preserve the most contrast.

4. **Preview** the transformation. Note that you can move point 2 to the left or right, are making the image lighter or darker. You may also want to experiment with slightly different color settings until you get the best result. Click **OK** to create a new image..




Set point 2 on the tonal scale to a sepia tone. (See **Color Line Control)**



## Tint Example: Coloring a Photograph

Coloring a photograph is similar to tinting it. Except in coloring the photograph, different areas must be tinted with different colors. A mask must be made for each color that is used. The mask isolates a portion of the image, allowing a color to be selectively applied to it. Once the masks are created, it is easy to experiment with different colors until the desired effect is achieved.

For the photograph in this example, seven different colors were used, requiring seven masks. (A mask for the coat is shown.)


Original Image

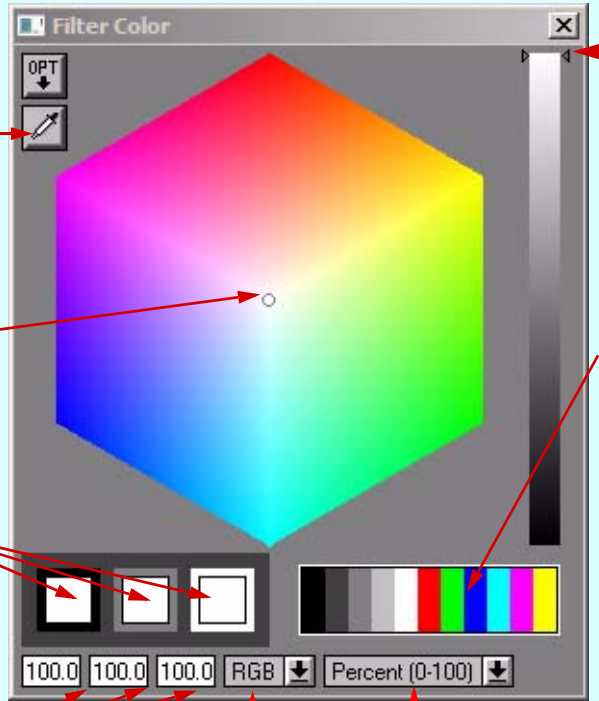
A mask for coloring the coat. It was one of seven masks used for this image.


Colored Image

# Color Picker

The Color Picker dialog is used throughout Picture Window for selecting colors. In the center of the color picker is the color hexagon which lets you select hue and saturation. Along the right edge, a slider controls the brightness of the chosen color, from full brightness at the top to zero (black) at the bottom.


Setting a Color
Options
Hue and Saturation
Concepts


**Probe:** Use this probe to pick a color from any open image.

**Slider** controls the brightness of the selected color

Use the cursor to choose color's hue and saturation.

Color buttons for selecting exact RGB, CMY primaries, black, 75%, 50%, and 25% gray, and white.

Selected color displayed against 3 neutral borders.

Readout showing the components of the selected color on a scale of 0 to 100. The selected color space is used.

Displays readout as a percent, decimal or hexadecimal value.

Control for setting the HSV, HSL, and RGB Color Spaces.

## Setting a Color

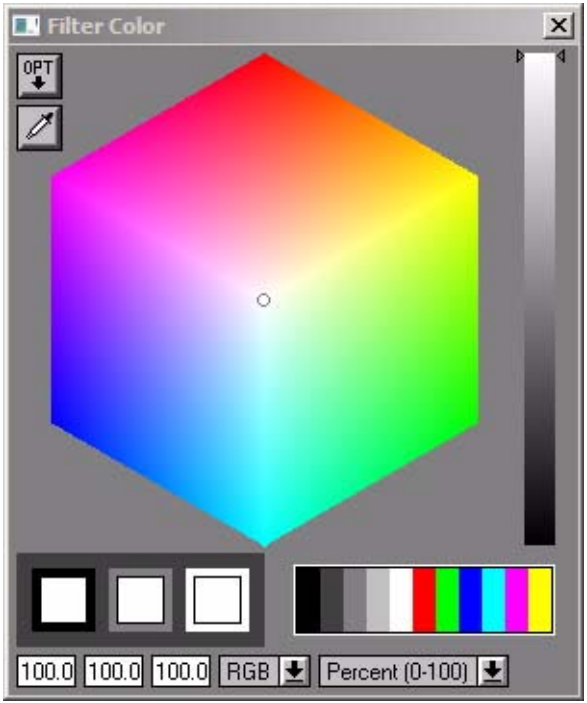
There are three basic ways of selecting a color using the Color Picker.

**Use Color Picker Cursors:** Set the color by clicking in the color hexagon to select the hue and saturation you want. Select the brightness using the brightness slider located near the right edge.

**Use the Probe:** Click on the **Probe** button. Select the color you want by clicking on a point in any image window.

Use the **Filter Bank**.

Which ever methods you use, the color you have selected is displayed in the color patches at the bottom of the Color Picker dialog.



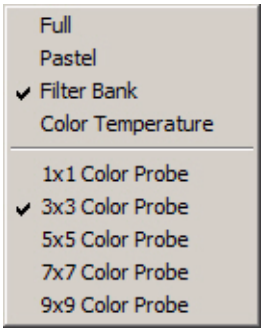

### Gray-scale Color Picker

A special version of the color picker is displayed in circumstances where a gray level is being specified instead of a color. This version has no color wheel, only a brightness slider.

## Options

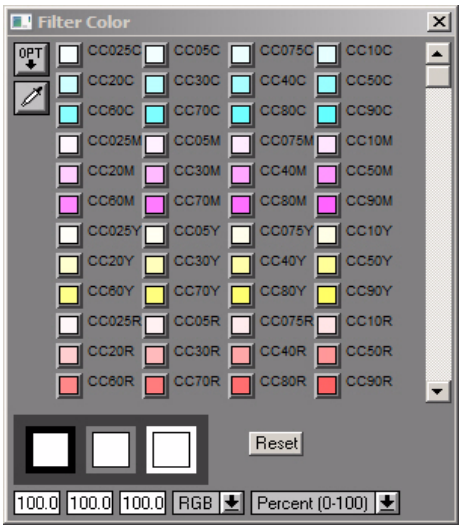
Clicking the 

button lets you set the following options:




### Full/Pastel

This is a zoom feature for the color wheel. **Full** displays the entire color wheel. **Pastel** zooms in to the central portion of the color wheel, so that you can select the more subtle, pastel colors with greater accuracy.




### Filter Bank

This option allows you to specify a color using its standard filter number rather than choosing it by its appearance. It displays a scrolling palette of colored buttons corresponding to the full set of standard CC (color correction) and Wratten filters, each labeled with its filter number.

**To select a filter,** click on its filter button. The resulting color is shown in the three patches at the bottom of the dialog against a white, gray and black background to help you judge the color. You can select several filters—the resulting color is equivalent to stacking the filters.

**To deselect a filter,** click on its button again.

**To deselect all filters,** click Reset.

The CC filters are organized into six groups, one for each primary and secondary color: Cyan, Magenta, Yellow, Red, Green, and Blue. Each series of filters is referenced by its optical density from 0.025 to 0.90. For example, a CC10R is a red filter with a density of 0.10.

Wratten filters come in a miscellaneous set of colors and are simply referenced by their filter number. The use of these filters is explained in many photography texts.

### Color Temperature *(Picture Window Pro only)*

You can select color by setting its color temperature. Color temperature is given in degrees Kelvin. The slider is initially set to the white point of the current working space or to 6500 degrees if there is none. Moving the slider to the left moves the color toward the red end of the spectrum, while moving it the other way sets it toward the blue end. The adjustment range is from 1000K to 25000K.

### Probe Size

You can set the probe size, in pixels, from 1 x 1 pixel up to 9 x 9 pixels. The 1 x 1 probe size lets you get the color value of a single pixel. Larger probe sizes average the color over wider areas. If the area you are interested in is a texture, set the probe to one of the larger sizes.

# Color Line Control

The Color Line Control is used to control blending from one color to another. The control is used on Tint, Gradient, and Texture dialogs.


In its starting state, the control shows a gray scale that smoothly changes from a complete black at control point 1 to a full white at control point 2. However, this is just the default state of the control. Here are the parameters you can set:

- Assign particular colors or (shades of gray) to the control points.
- Set the 'shape' of the transition from one color to another to linear, sine, or stepped.
- Create additional control points and move them along the strip. (However, the end points cannot be moved.)
- Select among various color space options.

## Setting the Color of a Control Point

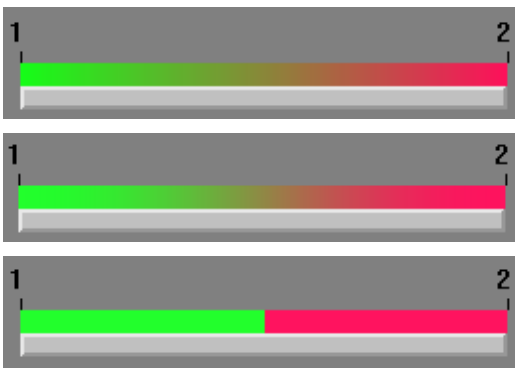
To set the color of a Control Point, double click on the number identifying the point. The **Color Picker** is displayed. Select the hue and saturation from the color cube and the brightness from the scale to the right of the cube. You can also use the probe in the color picker to match a color in any other image open on the screen. The example shows the result of setting the color of point 1 to green and the color of point 2 to red.

## Add Control Points


You can add control points to set additional intermediate colors. To add a control point, place the mouse cursor on the color strip, hold down the shift key and click the left mouse button. A new point is created. (Points are always numbered in order.) Assign a color or a shade of gray to the point.

You can move any intermediate point by dragging it with the mouse. You can also delete an intermediate point by holding down the Ctrl key, positioning the mouse over it, and clicking the left button.

## Shape the transition between points




The three transition shapes—line, sine, and step.

By default, the transition between two points is **line** — that is, the color changes at a constant rate from one point to the next. You can choose two other transitions — step and sine.

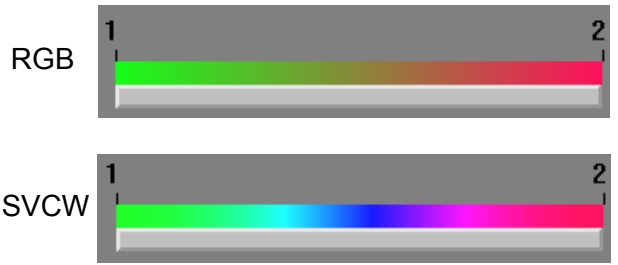
In **step** the color changes abruptly. You can set the point of transition at the left end, the middle, or the right end.

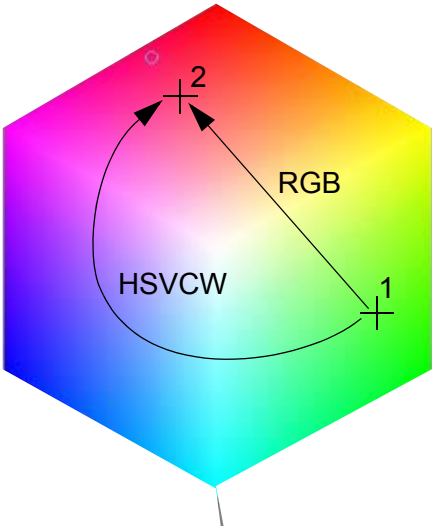
In **sine** the color changes smoothly, however the rate of change varies so that it is gradual at the ends and higher in the center.

To change the way colors transition, click on the button below the color scale and select the transition from the menu.

## Choose the color space

You can work in RGB, HSV, or HSL color space. One way to visualize how the color space choice affects blending is with the aid of the color hexagon. The RGB choice blends all the colors on a straight line between the chosen end points while the HSV-clockwise choice blends the colors along a clockwise path between the same end points.




HSL is much like HSV, except luminance rather than value is used to model brightness.

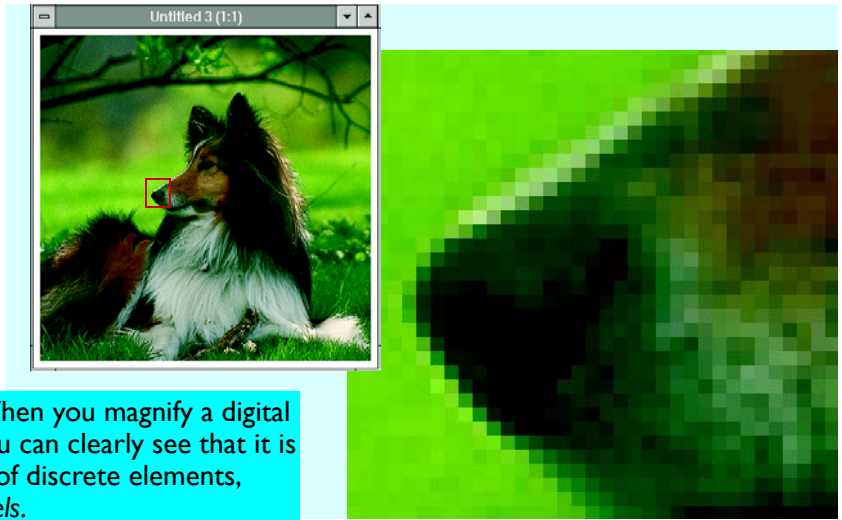
**To choose a color space**, click on the button below the color scale. Choose the desired color space from the menu.

# Color Space, Pixels, and Digital Images

As you work with your images, applying transformations and using tools, you are, of course, manipulating the underlying structure of the image. Applications like Picture Window do their best to hide the details of these low-level manipulations as much as possible, however it still pays to have some appreciation of what is happening.

## Structure of Digital Images

Digital images are constructed of elements called **pixels**. A pixel is a dot—it's the smallest detail that can be represented in the image. Resolution refers to how closely the dots are packed. For instance, many laser printers pack 600 dots to the inch. CRT monitors are considerably coarser. Typical resolutions range from 60 to a 100 pixels per inch.




**Pixels:** When you magnify a digital image, you can clearly see that it is made up of discrete elements, called *pixels*.

The simplest kind of pixel is called a **binary** pixel. A binary pixel can have only two states, black or white. From the standpoint of storage requirements, a binary image is the most compact. Since each pixel can be represented by a single bit, a byte can represent eight pixels.

But photographic black and white images also have shades of gray. To represent these shades, we need a more versatile pixel, one that can assume one of a number of gray tones. In digital images, this is done by assigning each pixel a brightness value. The higher the value, the brighter the pixel. It has been found that about 200 levels are sufficient to make the gray scale appear continuous. In practice, a range of 0 to 255 is used because it is conveniently expressed by a single byte of data. Thus a black and white image requires a byte for each pixel.

To represent color, we need a more versatile pixel still. In general, color representation involves three values instead of just one. The three values might be the brightnesses of three primary colors, for instance. If we want each primary to have 256

possible brightnesses, we need three bytes for each pixel. Since a byte contains eight bits, this system is also called 24 bit color. It allows representing 256 x 256 x 256 or about 16 million different colors.

Currently, three bytes per pixel is the best available system for display. To conserve memory, systems that use only one byte per pixel (and thus can only represent 256 colors) or two bytes per pixel (65,000 colors) are also in use. While they are quite sufficient for many graphic uses, only a full 24 bit color system is really satisfactory for photography.

### Extended Range Formats

Image formats based on 255 brightness levels for each channel are adequate for the final display. However, they don't provide enough dynamic range to deal with many image sources. That is why many scanners use 30 and 36 bit ranges, for instance. The extra bits provide a significant improvement in dynamic range. 36 bits allows the use of 12 bits or 4096 levels per channel, rather than 256 levels. Even 30 bits provides a 4x expansion to 1024 levels. The extra levels allow a scanner to handle difficult material and distinguish crucial detail in highlights and shadows. The extra levels are also useful in scientific imaging. For instance, multiple exposures of the same subject can be added without overflow. This enhances signal to noise and can tease out faint detail from an image.

To accommodate these extended ranges, Picture Window Pro supports 16 bit b+w and 48 bit color images as well as the standard range 8/24 bit b+w and color. In these extended ranges, two bytes are used for each b+w pixel and six bytes for each color pixel.

## Calculating Image Memory Requirements

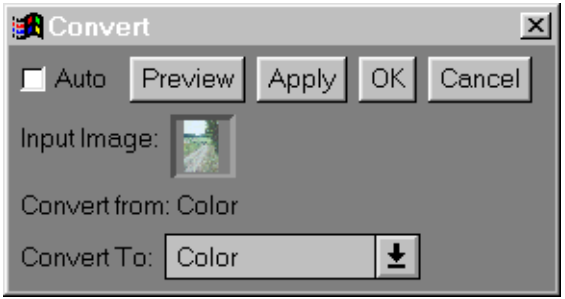
Once we know the dimensions of our image in pixels and how many bytes we need for each pixel, we can calculate the number of bytes we need for the entire image.

For example, the size of a 24 bit color image on a standard 640 x 480 VGA display is 3 x 640 x 480 or almost a megabyte. (That means we need at least a megabyte of display memory to handle 24 bit color at this resolution.) If we want to go to higher resolutions, we need more memory. For instance an 800 x 600 x 3 byte image requires about 1.5 megabytes. Since display card memory is installed in megabyte increments, we would need a 2 megabyte card for this resolution.

Images used for printing may be even larger. For instance, a 300 pixel per inch 8x10 print contains 7.2 million pixels and thus would require 21.6 megabytes of storage. Fortunately, there are techniques for compressing files and for interpolating from smaller images, so that we can work with images that are substantially smaller and still get excellent results.

## Convert Transformation

The Convert transformation allows you to convert between any two of the principal image structures—24 and 48 bit color, 16 and 8 bit monochrome (black and white), and 1 bit binary. **Convert** provides a quick and easy method of converting between these different ways of structuring images. However, it provides no real creative control. Therefore, if you want to be able to control the conversion process, other transformations are more suitable.




### Conversion Process

| Input Image | Output Image | Conversion Process |
|---|---|---|
| Color | Color<br>(48 bit color*) | Copies image to a 16 (48) bit color image<br><br>In the case of conversion to a 48 bit image, the image looks the same as before (i.e. no information is lost), however the image is rescaled to occupy the full 48 bit range. The lower 8 bits of each channel are filled with random values, creating smoother images and gradients. |
| Color | Black + White<br>(16 bit b+w*) | Converts 24 bit image to 8 (16) bit image. Luminance information is preserved while color information is lost. Use **Convert** to convert color images for use as masks. (Masks must be 8 bit images.) In the case of conversion to 16 bits, luminance is rescaled to occupy the full 16 bit range.<br><br>For more control in converting to black and white, use the **Monochrome Dialog - Filter Method**, **The Filter Dialog**, or **The Extract Channel Dialog**. |

| Input Image | Output Image | Conversion Process |
|---|---|---|
| Color | Binary | Converts 24 bit image to a 1 bit image. Each pixel is converted to either white (luminance is brighter than 50% gray) or black (luminance darker than 50% gray). |
| Black + White | Color<br>(48 bit color*) | Converts 8 bit image structure to 24 (48) bit color. The image looks the same as before (i.e. no information is lost). In the case of conversion to 48 bits, the brightness range is rescaled to cover the new range. The advantage of converting to color is that color transformations can now be used on the image to introduce synthetic color effects. However the image requires 3 (6) times as much memory. |
| Black + White | Black + White<br>(16 bit b+w*) | Copies image to an 8 (16) bit image.<br><br>In the case of conversion to a 16 bit image, the image looks the same as before (i.e. no information is lost), however the image is rescaled to cover the new range. |
| Black + White | Binary | Converts 8 bit image to a 1 bit image. Each pixel is converted to either white (luminance is brighter than 50% gray) or black (luminance darker than 50% gray). |
| Binary | Color<br>(48 bit color*) | Converts 1 bit image structure to 24 (48 bit) color. The image looks the same as before (i.e. no information is lost). The advantage is that color transformations can now be used on the image to introduce synthetic color effects. However the image requires 24 (48) times as much memory. |

| Input Image | Output Image | Conversion Process |
|---|---|---|
| Binary | Black + White (16 bit b+w*) | Converts 1 bit image structure to 8 (16) bit black and white. The image looks the same as before (i.e. no information is lost). The advantage is that brightness transformations can now be used on the image to make grayscale adjustments. However the image requires 8 (16) times as much memory. |
| Binary | Binary | Copies image |
| 48 bit color* | Color (48 bit color*) | Copies image to a 24 (48) bit color image<br><br>In the case of conversion to a 24 bit image, the image is compressed from 65K to 256 levels per color channel. The amount of memory required is cut to half. |
| 48 bit color* | Black + White (16 bit b+w*) | Converts 48 bit image to 8 (16) bit image. Luminance information is preserved while color information is lost. In the case of conversion to an 8 bit image, luminance is compressed from 65K to 256 levels.<br><br>Use **Convert** to convert color images for use as masks. (Masks must be 8 bit images.)<br><br>For more control in converting to black and white, use the **Monochrome Dialog - Filter Method**, **The Filter Dialog**, or **The Extract Channel Dialog**. |
| 48 bit color* | Binary | Converts 48 bit image to a 1 bit image. Each pixel is converted to either white (luminance is brighter than 50% gray) or black (luminance darker than 50% gray). |

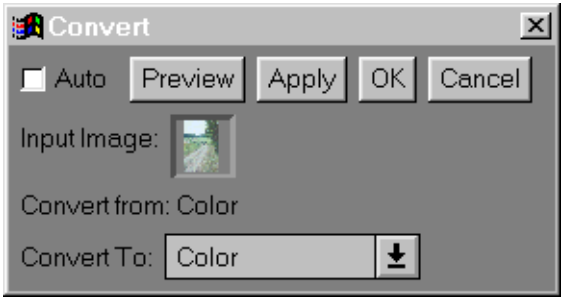
| Input Image | Output Image | Conversion Process |
|---|---|---|
| 16 bit b+w* | Color<br>(48 bit color*) | Converts 16 bit image structure to 24 (48) bit color. The image looks the same as before. The advantage is that color transformations can now be used on the image to introduce synthetic color effects.<br><br>In the case of conversion to a 24 bit image, the image is compressed from 65K to 256 levels per color channel. |
| 16 bit b+w* | Black + White<br>(16 bit b+w*) | Copies image to an 8 (16) bit image.<br><br>In the case of conversion to an 8 bit image, the image is compressed from 65K to 256 levels. |
| 16 bit b+w* | Binary | Converts 16 bit image to a 1 bit image. Each pixel is converted to either white (luminance is brighter than 50% gray) or black (luminance darker than 50% gray). |

*Format is supported by Picture Window Pro only.

## Convert Dialog

To use the Convert dialog:

1. **Select an image window.**
2. **Display the Convert dialog.** In the **Transformation** menu, select **Convert.** The **Convert** dialog box is displayed.
3. Set **Convert To** to the desired image type. Click **Apply** or **OK** to create a new image of the specified type.



## HSV, HSL, and RGB Color Spaces

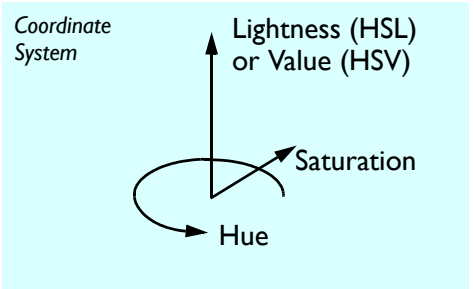
At first brightness might seem such an intuitively obvious concept that it is hardly necessary to define it in any rigorous way. And, in fact, it is fairly easy to arrange a series of gray patches in order of brightness. However trying to do the same thing with color patches exposes an ambiguity. Does a brighter patch look whiter? In other words, is its color less saturated? Or does a brighter patch maintain its saturation but simply reflect more light than a darker patch?

Our perception supports both interpretations, depending on conditions. In a scene of low or moderate illumination, we are quite able to judge saturation independently of brightness. However, in a brightly illuminated scene, like a beach in bright sun, we are less able to judge the saturation in bright areas. Colors in bright areas look "bleached" or pastel. In fact, if an area is very bright we perceive it as glare and cannot judge its color at all. It simply looks like a bright, perhaps blinding, white spot.

## Color Space

Color scientists handle the different perceptions of brightness by inventing **color spaces** which approximate the desired behavior. As used here, the term *space* is just an extension of our notion of three-dimensional physical space. Just as we can pinpoint a position in physical space by specifying its compass direction, distance and height, so we can specify a particular color by specifying the parameters of its "space". One possible triad of parameters is the primary colors—and indeed RGB or red-green-blue space, which specifies each color in terms of these primaries, is widely used.

However, to manipulate brightness, it would be handier if brightness were actually one of the dimensions of the space. Two commonly used color spaces, HSV and HSL, have brightness as one of their axes. Furthermore, the two spaces approximate the two kinds of brightness behavior discussed above. In HSV, saturation and brightness are fairly independent of each other, corresponding to our perception in moderate contrast situations. In HSL, bright colors become paler and move toward white as their brightness increases, corresponding to highly-illuminated scenes.



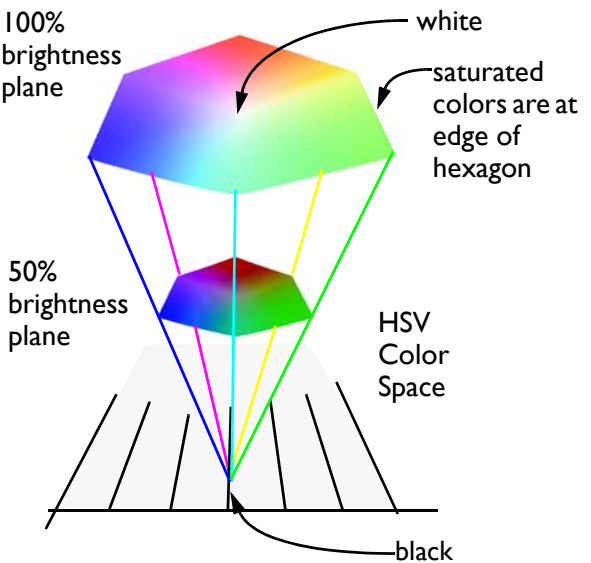

## Choosing a Color Space to Control Brightness

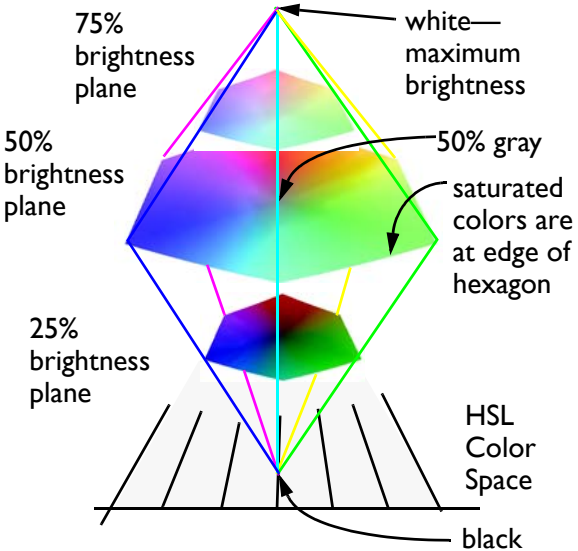
Since RGB, HSV, and HSL are each useful in adjusting brightness, the **Levels, Brightness** and **Brightness Curve** and many other transformations let you choose the desired color space. Here are the guidelines for using each choice:

### HSV (hue-saturation-value) Space

HSV space is shaped like a single inverted hexcone. Black is at the vertex at the bottom. The brightest colors and white are in the hexagonal plane on top.

Brightness adjustments affect the HSV **value** parameter. The other two parameters are not affected. Colors maintain their saturation as value is varied. Since this corresponds well with our perceptions in most situations, HSV is usually your best choice. It is the default color space in the brightness transformations.






### HSL (hue-saturation-lightness) Space

HSL space is shaped like two hexcones mated base to base. Black is at the bottom vertex, white is at the top vertex. The middle plane contains 50% gray in its center and the fully-saturated colors at its periphery.

Brightness adjustments affect the **lightness** parameter only. For bright colors, colors become whiter as lightness is increased. This corresponds best to our perceptions under bright lighting conditions. Choose HSL for high-key photographs containing glare, streaming light and similar extremely bright elements.

### RGB (red-green-blue) Space

RGB space is best visualized using the usual Cartesian (x, y, z) coordinates.

Each of the components contributes to brightness and so brightness adjustments affect all three parameters. Choose RGB when you want to affect both color and brightness simultaneously. In particular, RGB is a good choice for such special effects as posterization and creating negative color images.

## Color Curves

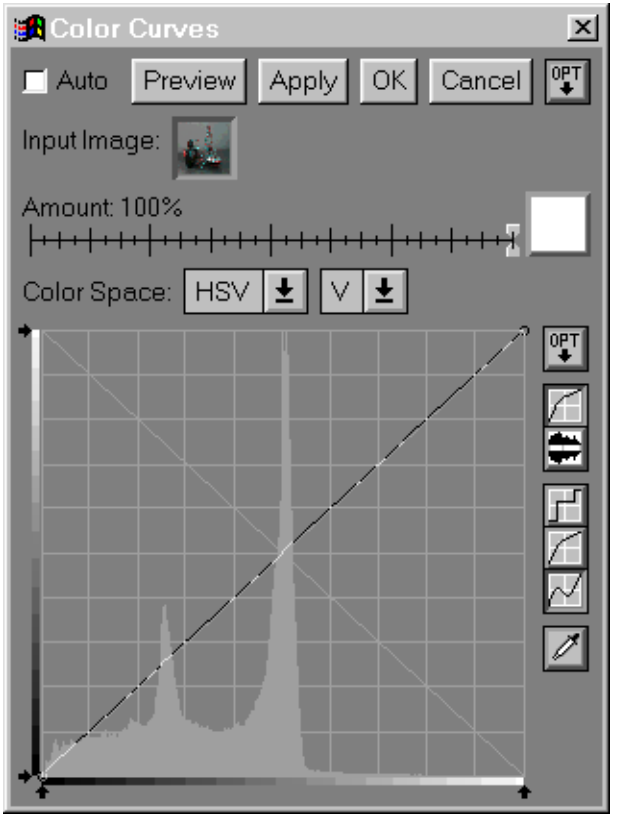
The Color Curves transformation allows you to control the brightness and contrast of each of the three components of color images individually. Since this transformation affects the brightness curves directly, it also affects color balance and saturation.

The Color Curves transformation is similar to the **Brightness Curve** transformation. Like the Brightness Curve, it displays data in curve or histogram form. However, it allows you to work on each of the components of the image rather than just on the brightness component. In all other respects, it is the same as the Brightness Curve.

Here is a brief procedure for using it. See **Brightness Curve** for a full description of all features.

To use it:

1. **Select an image window.**
2. **Display the Color Curves dialog.** In the **Transformation** menu, select **Color** and then select **Color Curves**. The **Color Curves** dialog box is displayed.
3. **Select the Color Space.** You can work in the **HSV, HSL, and RGB Color Spaces**. Select the component of the of the color space you want to adjust.



4. Click on the **Histogram** or **Curve** buttons to toggle between the two types of display. Set other **Brightness Curve Controls** as required

5. **Adjust the curve** by dragging control points. (To create additional control points **Shift Click** on the curve or below the histogram. To delete a point, **Control Click** on it. See **Creating and Deleting Control Points**) Use the **Amount** slider to control the degree of the effect.
   To see the effect of your changes, click **Preview**.

6. **Click Apply or OK** when you are satisfied with the adjustment you have made. The transformed image is displayed in a new window.

# 7. Sharpen, Blur and Noise Reduction

Picture Window provides transformations for sharpening, blurring and reducing noise in images.

**Sharpen Transformation** Provides a choice of several sharpening techniques, including Unsharp Mask. Unsharp mask's radius control allows you to control the aggressiveness of the sharpening. The threshold control allows you to limit sharpening to areas of high tonal variation.

**Advanced Sharpen Transformation** Noise and defects frequently prevent images from being sharpened to their full potential. The Advanced Sharpening Transformation includes tools for reducing noise and removing specks prior to applying sharpening. The result is that many images can now be made much sharper than in the past

**Blur Transformation** Blurring has a long history of use in photography, from shooting through vaseline-coated lenses to provide dreamy soft focus effects or smooth skin in portraits to blurring backgrounds to reduce their distracting effect. The blur transformation allows you to achieve all these effects.

**Noise Reduction Transformation** Smooths images to reduce the noise apparent in high ISO images. The transformation is also very effective at smoothing skin tones in portrait photography.

### How Preview Images are Displayed

Preview images for the above transformations are displayed at 1:1. This helps you see the structure of the image and make the optimum adjustment. Since the 1:1 preview can only show a portion of the image, make sure to make your decisions based on one or more important image areas. Click on the main image to set a new center of interest in the preview.

# Sharpen Transformation

Sharpen makes an image appear crisper by accentuating the difference between each point and its neighboring pixels. This makes details more prominent. Sharpen can be used to make soft images appear sharper. It is frequently very effective on textures. Sharpen is also useful after operations such as Warp which tend to soften images.

Unfortunately, sharpen also exaggerates film grain, noise, defects, and the pixel structure of images. This sets a practical limit on how much an image can be sharpened. Therefore, try to sharpen images that you will compress using JPEG before compression, to avoid accentuating any defects introduced by the compression process.

The Sharpen dialog gives you a choice of four sharpen methods—**Sharpen, Heavy Sharpen, Unsharp Mask** and **Bilateral Sharpen**.


**Sharpen Dialog**

**Unsharp Mask**

**Unsharp Mask Sharpen Example**

**Bilateral Sharpen**

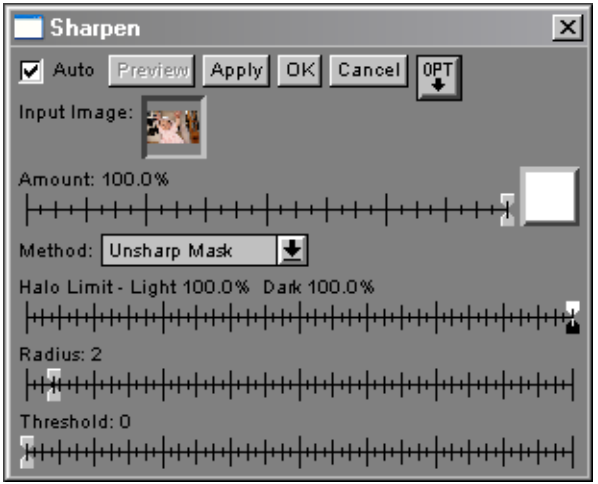
**Sharpen Options**


**See Also:**


**White Noise**

**Advanced Sharpen Transformation**

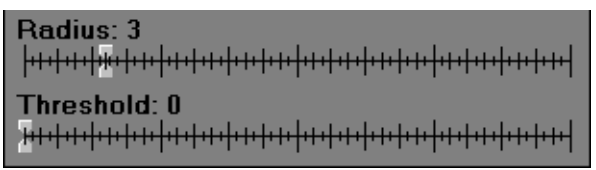
## Sharpen Dialog




To sharpen an image:

1. **Select an image window.**
2. **Display the Sharpen dialog.** Choose **Sharpen** from the **Transformation** menu.
3. **Choose the sharpen method.** You can choose **Sharpen, Heavy Sharpen,** **Unsharp Mask** or **Bilateral Sharpen**.
4. **Preview the image.** Click on the **Preview** button to see what the results of your settings are. To help judge whether you are achieving the desired effect, enlarge the same sections of the input and preview images to 1:1 and view them side by side. Try different **Amount** control and **Sharpen Method** settings until you get the effect you want.
5. **Click OK** or **Apply** when you are satisfied with the results. The transformed image is displayed in a new window.

### Unsharp Mask



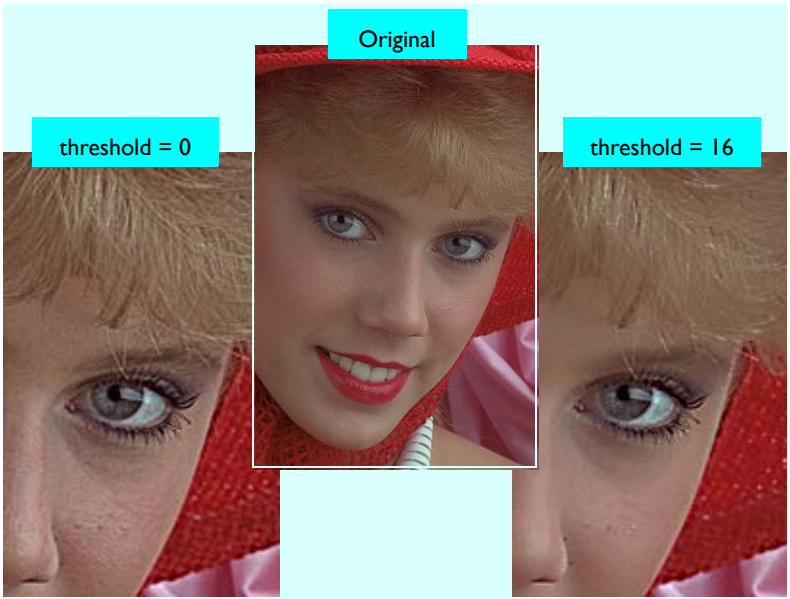

Unsharp mask works in a counter-intuitive way. It creates a blurred image internally as a kind of a proxy for the original blurring. It then subtracts the blurred image from the original image, yielding sharper image. The more accurately the original blurring is simulated the better the sharpening.

Unsharp Mask has several additional controls, **Halo Limit, Radius** and **Threshold.**

The **Halo Limit** control has two sliders for limiting light and dark halos. Halos are artifacts of sharpening and can appear as light or dark areas around boundaries in the image, particularly as you increase the radius. If you notice such a halo, reduce it by moving the appropriate slider to the far left until the halo is no longer noticeable. Limit settings of 5 -10% are typical. (Setting controls to 0% results in no sharpening, so set them only as low as necessary.)

The **Radius** control sets the size of the blur that is created. Since this blur simulates the original blurring, generally, the blurrier the original image, the larger you should set the radius.

The **Threshold** control lets you avoid sharpening in smooth areas, where sharpening detracts rather than enhances the image. For example, the sky may have small amounts of noise in it which should remain blurry and not exaggerated by sharpening. If you sharpen them, the sky starts to look grainy, like sandpaper. You might also want to avoid sharpening skin in portraits and keep it a bit soft so as not to call attention to skin blemishes.




**Threshold:** Compare the left and right details, above. Sharpening helps bring out the eye in both versions. However, the higher threshold setting in the right detail results in smoother skin.

**Setting Unsharp Mask Controls:** A good procedure to follow is to first set threshold to zero. Adjust the radius control for good sharpening in high detail areas. Then bring up the threshold control as you observe areas which should be smooth. The idea is the find the lowest threshold setting that will preserve smoothness in these areas and still be low enough to not affect high-detail areas. The actual setting numbers are highly image dependent.

Of course there is also no guarantee that there will be a compromise threshold value. If there is not and the smooth areas are sharpened too much, the alternative is to create a mask for those areas. The texture mask tool can be especially helpful for this purpose.

## Unsharp Mask Sharpen Example

This example shows the effects of the amount control on sharpening. In all cases, Unsharp Mask was used, with threshold and radius left at their default settings. The difference was in the Amount control settings. The last image was created by applying sharpen twice.

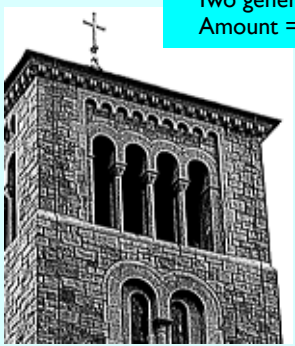
Notice how sharpening tends to bring out texture. In fact, with extreme sharpening, as in the last image of this series, the image starts to take on a graphic character, a possible interesting special effect for some images. So the best way to set the controls is by experimenting with a number of different settings, to get the feel of the optimum setting for a particular image.

Original

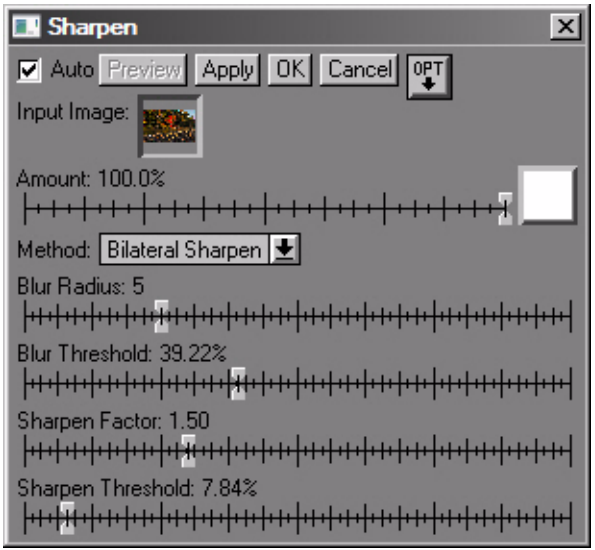
Amount = 50%

Amount = 100%

Two generations;
Amount = 100%



## Bilateral Sharpen




Bilateral Sharpen works like unsharp mask except that it uses a special method of blurring the image that preserves sharp edges. When computing the average of neighboring pixels, those pixels which differ from the central pixel by more than a specified threshold amount are excluded. This prevents bleeding of the blur across edges which in turn reduces halos in the sharpened image. Since the growth of halos can limit the amount of sharpening, this method allows more aggressive sharpening in some cases. It also provides local contrast enhancement, which helps images look sharper.

Here is a description of the settings:

**Blur Radius:** For more heavily blurred images, you may want to use a larger radius. The larger the radius, the slower the transformation however.

**Blur Threshold:** This slider adjusts the threshold for inclusion in the blurring average. A threshold of zero reverts to simple sharpening and can result in halos around edges in the result image. Too high a threshold eliminates the blurring effect and thus results in little or no sharpening. A value around 30% to 40% usually works pretty well.

**Sharpen Factor:** The greater the Sharpen Factor, the more pronounced the sharpening effect. At 0.00 you get the blurred image; 1.00 you get no sharpening; at higher values you get increasing amounts of sharpening. Typical useful values might run from 1.25 to 2.00.

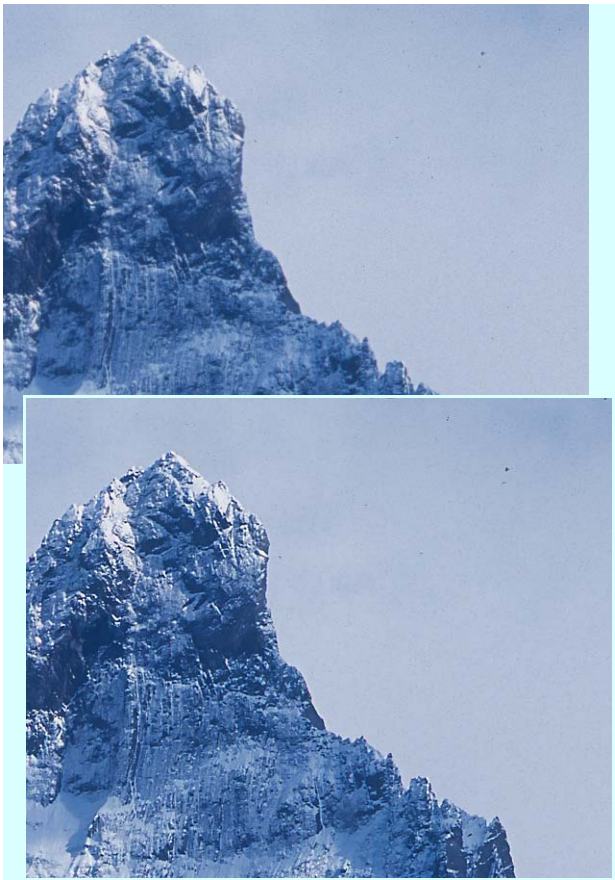
**Sharpen Threshold:** This setting works just like the sharpen threshold in Unsharp Masking. It can be used to reduce the tendency to exaggerate noise and fine texture in the input image. A value of 0.00% yields full sharpening; high values eliminate sharpening of increasingly coarse detail.

## Sharpen Options

You can create your own default sharpen settings. These settings replace the Picture Window built-in defaults.

**Save As Default.** Saves the current settings of the dialog box as the default settings. How the default settings are applied depends on Preferences/Remember Settings. If Remember Settings = No, then the default is applied each time the transformation is invoked. If Remember Settings = Yes, then the default is applied the first time the transformation is invoked in a PWP session or if it is invoked while holding down the Shift key.

**Clear Default.** Restores the built-in Picture Window default settings.



In this detail, the mountain has been sharpened substantially, without increasing the graininess of the sky. Note too that most of the black specs in the sky have been removed.

# Advanced Sharpen Transformation

When an image is digitally sharpened, everything in the image is sharpened at the same time. Unfortunately that include such artifacts as image noise (from the CCD or film grain) and various imperfections such as dust spots and scratches. Sharpening makes these artifacts more prominent and so when they become objectionable, the image has reached the practical limit of sharpening. The Advanced Sharpen transformation lets you reduce image artifacts and so allows a much greater degree of sharpening in many cases.

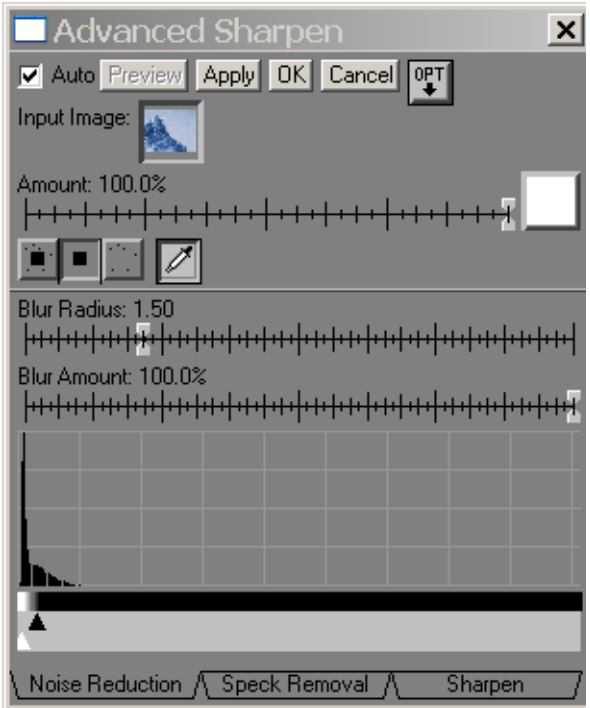
The **Advanced Sharpen** transformation is a tabbed dialog that is meant to be applied in three sequential stages. To use it, first read **Using the Advanced Sharpen Transformation** and then apply the relevant operations to your image. The operations are:

**1.** **Noise Reduction** In the first stage, blur is applied to reduce noise. Since noise is most objectionable in areas of even tone (like the sky) it is applied selectively to areas of low detail.

**2.** **Speck Removal** In this stage, specks and other small details are removed so they will not interfere with sharpening.

**3.** **Sharpen** Finally the image is sharpened.

## Using the Advanced Sharpen Transformation




The advanced sharpen transformation has a separate tab for each of the operations. The following controls are common to all tabs:

**Amount and Mask Window:** The amount control and mask work just like in other transformations. They apply to all tabs.

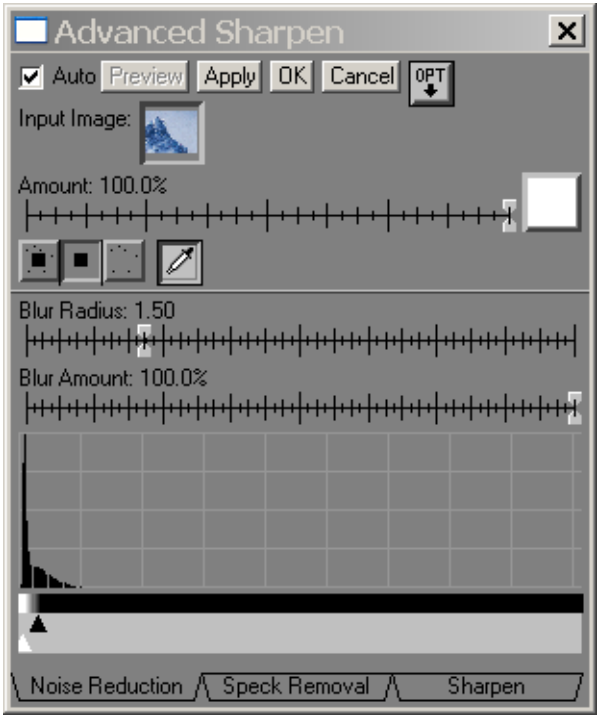
**Toolbar** has three buttons which control the display in the preview window. You can display:

- The input image to the current tab.
- The result of the current tab.
- The difference between the input and result images.

**Histogram:** The bottom of the display contains a histogram of the *variations* between neighboring pixels. For instance in an area of constant color variations between neighboring pixels would be zero. In general, in most images the majority of pixels are similar to their neighbors. So most histograms have a peak near the left and falloff rapidly to the right. Use the probe (eyedropper button) to determine where a particular portion of the image falls on the histogram.

The controls below the histogram let you selectively apply the current operation to a particular range of pixels. Arrange the black and white sliders so that the white area is below the part of the histogram you want to affect. The dialog shown here applies blurring to reduce noise and is set to affect areas of least variation only. Being able to restrict blurring in this way allows us to apply it copiously without compromising sharpness in areas of high detail.

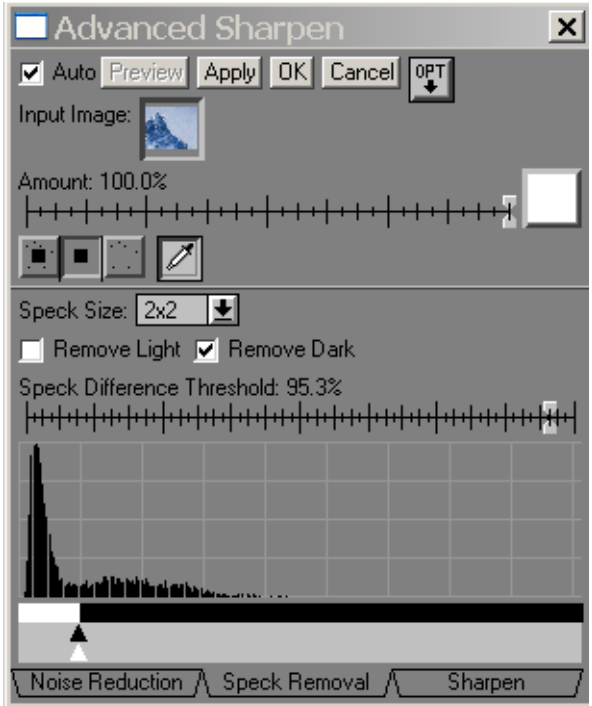
## Noise Reduction




1. **Select an image window.**
2. **Display the Advanced Sharpen dialog.** Choose **Advanced Sharpen** from the **Transformation** menu.
3. **Noise Reduction.** The purpose of the first tab is to reduce noise in even areas of the image. This allows you to sharpen more aggressively without accentuating annoying artifacts like film grain or noise that are most noticeable in areas of little variation.

   **Note:** To bypass noise reduction, just click on another tab.
4. Set **Blur Amount** to 100%. (It is set to 0% by default.)
5. **Histogram.** Set the black and white sliders to control the area of the image that will be affected. (To locate the image area you want to blur on the histogram, depress the eye-dropper button and drag the cursor across the area.)
6. **Blur Radius:** Set the blur radius to achieve the degree of blur you want. Concentrate on observing the area you want to affect — you can ignore blurring in other areas. Detail will be restored in the Sharpen operation. Remember you make the preview window larger.
7. **Click the next tab** when you are satisfied with the results.

## Speck Removal




The purpose of the this tab is to remove specks caused by dust. They are mostly a problem in scanned images.

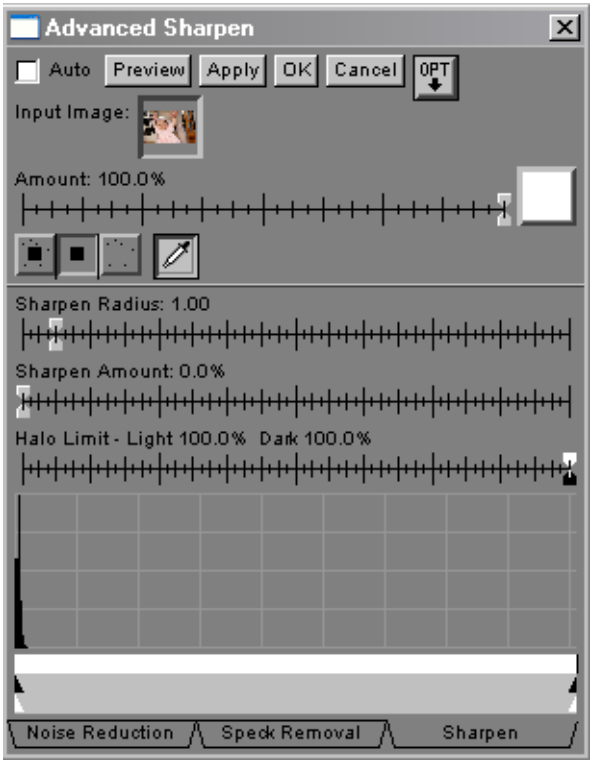
**Note:** To bypass speck removal, just click on the Sharpen tab.

1. **Set the Size.** Increase the size until most specks disappear. (If there are just a few large specks, it is better to remove them manually with the speck removal tool than to accommodate them in the size setting.)

   Do not be concerned if the image degrades — this will be fixed in the Sharpen operation.

2. **Check Light, Dark, or Both.** Specks tend to be either dark or light, depending on whether the image originated from a transparency or a negative. Check the boxes that apply.
3. **Set the threshold.** Move the threshold control to the left until specks start to reappear and then back the control off a bit.
4. **Histogram.** Set the black and white sliders to control the area of the image that will be affected. Typically you want to apply this operation to fairly featureless areas of the image. To locate such image an area on the histogram, depress the eyedropper button and drag the cursor across the area.
5. **Click the Sharpen tab** when you are satisfied with the results.

## Sharpen




The Sharpen tab uses Unsharp Mask algorithm. However, it allows you to apply it selectively to detailed areas of the image while holding it back from uniform areas where sharpening frequently just accentuates artifacts without materially improving image quality.

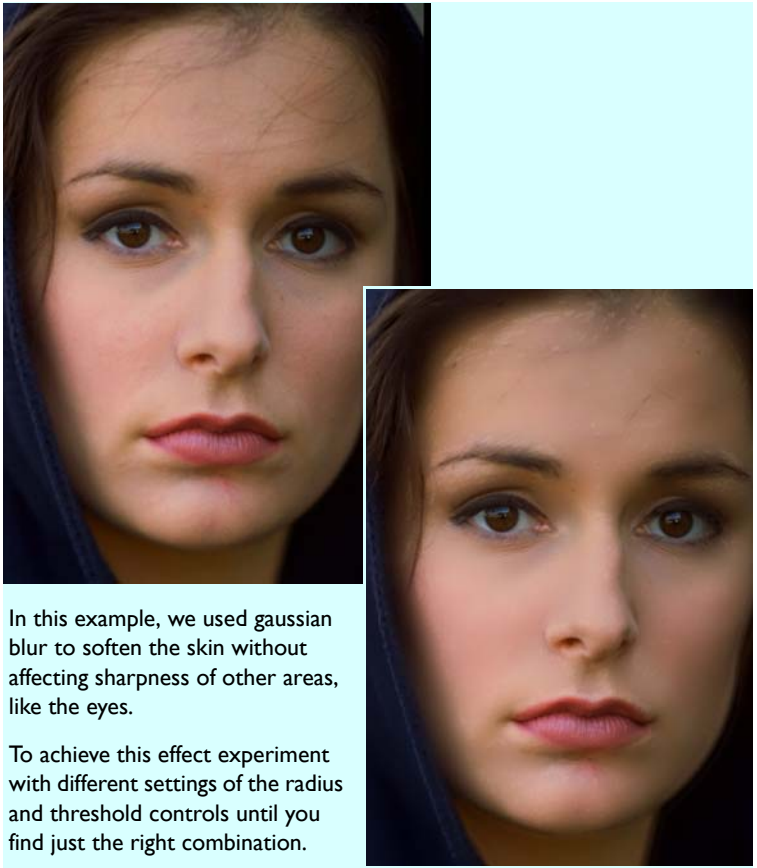
1. **Set the Sharpen Amount.** Set the amount to 100%. You can reduce it later if necessary.
2. **Set the Radius.** Generally the higher the value, the greater the amount of sharpening. However, if the value is set too high the image may become pixellated or halos may appear around light and dark objects. To find the optimum setting magnify the preview window when adjusting this control.
3. **Set the Halo Limit.** The **Halo Limit** control has two sliders for limiting light and dark halos. Halos are artifacts of sharpening and can appear as light or dark areas around boundaries in the image, particularly as you increase the radius. If you notice such a halo, reduce it by moving the appropriate slider to the far left until the halo is no longer noticeable. Limit settings of 5 - 10% are typical. (Setting controls to 0% results in no sharpening, so set them only as low as necessary.)
4. **Histogram.** Generally you want to apply the sharpening to areas of high detail while protecting uniform areas. (This is just the opposite of the strategy used in the previous two operations.) Adjust the black and white sliders accordingly. Typically the black slider is set right after the peak with the white slider slightly to the right. The area between

the sliders changes gradually, to avoid an abrupt difference in sharpness between low and high detail areas of the image.

5. **Refine the Sharpen Amount.** control, if necessary. You can trade-off the settings between Amount and Radius.
6. **Click Apply** or **OK** when you are satisfied with the results.

For more information and a fully worked out example see **Using the Advanced Sharpen Transformation** white paper.

# Blur Transformation



In this example, we used gaussian blur to soften the skin without affecting sharpness of other areas, like the eyes.

To achieve this effect experiment with different settings of the radius and threshold controls until you find just the right combination.

*Blur* softens an image by averaging each pixel with the pixels in its immediate neighborhood. This mimics the way light from a single point spreads out into a "circle of confusion" in an out-of-focus image.

Blur can be used for a number of creative effects. For instance, bothersome detail can sometimes be made less so by blurring it. Backgrounds can often be made less obtrusive by blurring the image using a suitable mask. (Here the **Blur** transformation is actually more powerful than the age-old technique of using a short depth of field to blur a background, since you can blur backgrounds that are nearly at the same distance as the foreground. See **Using a Mask**.) Blur can also be used to eliminate graininess or a pattern from areas of uniform color, like skies for instance.

**Blur Dialog**

**Blur Methods**

**Note on Precision Gaussian Blur**

## Blur Methods

The blur dialog gives you a choice of five methods—**Blur, Blur More, Gaussian, High Pass,** and **Median**

**Blur** and **Blur More** average a pixel with its neighbors. They are the two fastest blur methods. As its name implies, **Blur More** creates a more pronounced effect than blur and is somewhat slower.

**Gaussian** uses a weighted average, giving nearby pixels greater weight than those farther away. It lets you control the size of the averaging area with a **Radius** control. **Gaussian** produces an effect very similar to optical blurring. This is the best method for creating extreme blurring effects.

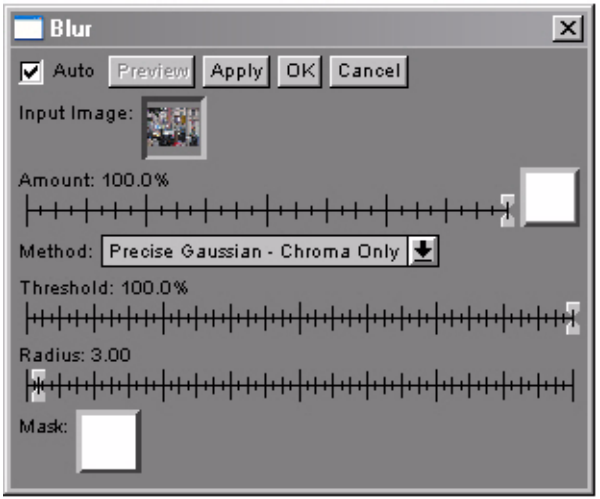
**Precise Gaussian** This method is the best method to use for blurring backgrounds through a mask because it less susceptible to halos and produces the most pleasing bokeh of all the blur methods. However it requires more computation and is therefore slower than the non-precision methods. (See **Precision Gaussian Blur Notes**.)

**Precise Gaussian - Chroma Only** This method blurs color information only and generally leaves edges well defined. Thus it is useful for reducing noise without affecting apparent sharpness.Experiment with the threshold control to obtain the best results. Like the other precision gaussian method, it requires more computation and is therefore slower than the non-precision methods.

**High Pass** is primarily useful for special effects. It creates a new image that is related to the offset distance between the unblurred and gaussian blurred versions of the image.

**Median** uses the median rather than the average. There are two versions of it—one that works over a 3 x 3 pixel area and another that works over a 5 x 5 area. The larger area creates greater blurring. Median is good at correcting small imperfections, such as removing isolated specks and making images appear less grainy, without blurring larger details or edges.

## Blur Dialog




To blur an image:

1. **Select an image window.**
2. **Display the Blur dialog.** Choose **Blur** from the **Transformation** menu.
3. Choose one of the **Blur Methods**.

   Use **Gaussian** if you are blurring the entire image.

   Use **Precision Gaussian** if you are blurring using a mask, for example to simulate shallow depth of field by selectively blurring the background. only. See **Using a Mask** for more details.

   Use **Precision Gaussian—Chroma Only** for noise reduction, particularly noise in shadow areas.

   For other situations, see **Blur Methods** above for details on the particular strengths of other, more specialized methods.

4. **Set the Radius control:** *(Gaussian methods only)* The radius controls the area over which each pixel is blurred, so the greater the radius the greater the blur. (Note that for the precision Gaussian methods, computation time increases with the square of the radius.)
5. **Set the Threshold control:** *(Gaussian methods only)* The effect of the threshold is to restrict blurring to those areas of the input image that are already relatively soft and to leave pixels that differ sharply from others around them alone. This can be very helpful, for example, in smoothing out film grain in a clear sky while leaving an adjacent tree

line unblurred. A threshold setting of 100% enables full blurring; relatively smaller values (say less than 10) are good for selective blurring*.

6. **Preview the image.** Click on the **Preview** button to see what the results of your settings are. To help judge whether you are achieving the desired effect, enlarge the same sections of both the input and preview images to 1:1 and display them side by side. Try different **Amount** control and **Blur Method** settings until you get the effect you want.
7. **Click OK** or **Apply** when you are satisfied with the results. The transformed image is displayed in a new window.

## Using a Mask

When you select **Precise Gaussian** or **Precise Gaussian - Chroma Only**, an additional Mask control is displayed at the bottom of the dialog box. This mask selects which parts of the image to blur and which to leave unchanged.

**Note:** The white areas of the mask define the portion of the image to be blurred. The black areas define the portions to be left unchanged. There is no amount control for this mask and no way to 'flip' the mask from within Blur. (However, you can flip the mask using **Transformation/Gray/Negative**.)

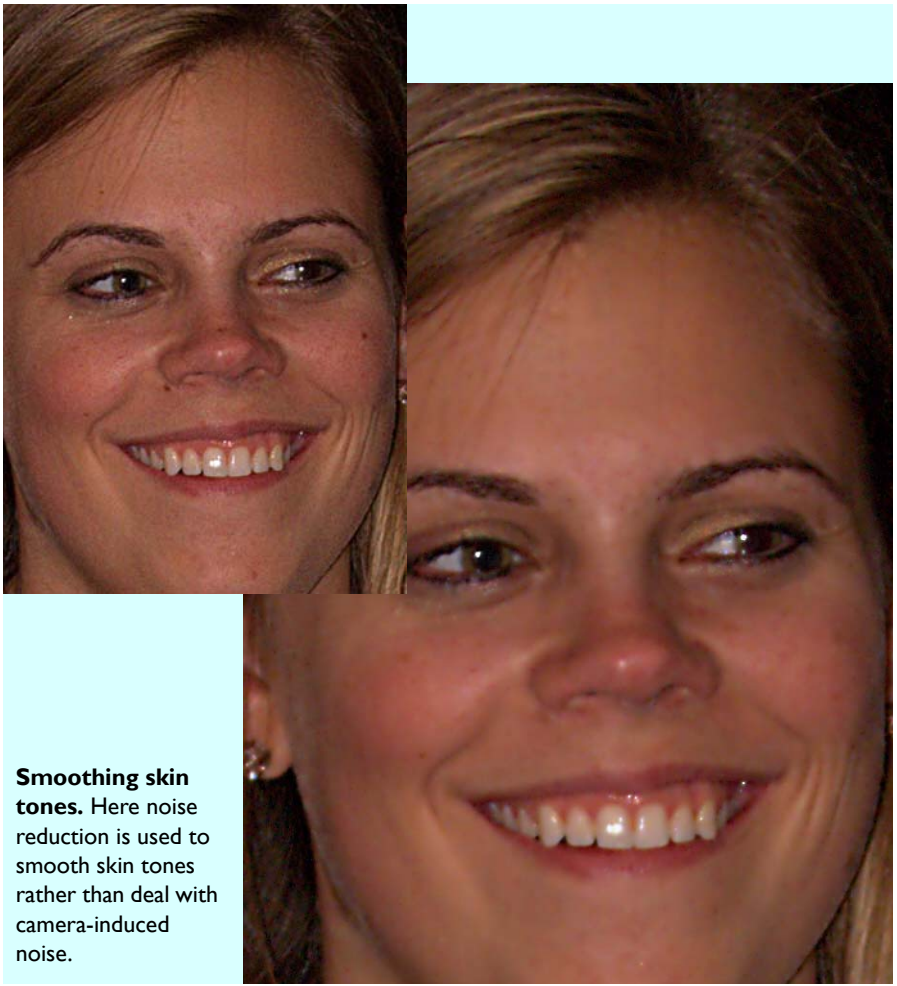
The Precise Gaussian (PG) mask works a little differently from the mask in the Amount control. While the PG mask actually controls blurring, the Amount mask works by selectively blends the blurred image with the input image. So for amounts between 0% and 100% the output image looks like a double exposure of a blurred and a sharp image — an effect akin to a fog filter. So while it is possible to use the amount mask with PG Blur, it is generally unnecessary to do so.

* Exact threshold operation depends on blur method. For **Blur** or **Blur More**, only pixels within the threshold value of the central pixel are used when blurring the image. For **Gaussian** blur, the blurred image is computed as usual. Then the blurred image is compared to the input image. Wherever the difference is less than the threshold, the blurred image replaces the input image; everywhere else the original input image is retained.

## Note on Precision Gaussian Blur

The Precise Gaussian and Precise Gaussian Blur - Chroma Only options on the Blur transformation are refinements of Gaussian blur that allow for more accuracy and control at the expense of slower performance.

The normal Gaussian blur is very fast for two reasons. First it does not perform a true Gaussian blur—instead it computes an approximation by performing two passes of a so-called box filter. Box filters have the huge advantage that they take about the same amount of time to apply regardless of the blur radius, while most other kinds of blur take a time proportional to the square of the radius. The second reason is that blurring is done in two passes—first each row of the image is blurred horizontally and then each column is blurred vertically. The two one-dimensional blurring passes are significantly faster than a single two-dimensional pass.



**Smoothing skin tones.** Here noise reduction is used to smooth skin tones rather than deal with camera-induced noise.

# Noise Reduction Transformation

*(Available in Picture Window Pro only.)*

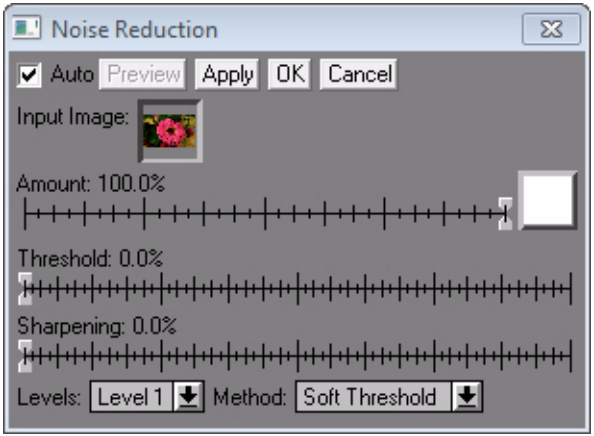
The principle source of noise in digital images is random thermal noise generated in the sensor and its associated amplifier circuits. The noise reduction transformation reduces the noise by averaging. This tends to soften the image. While the softening can be countered by sharpening, in the end noise reduction is really the art of optimizing reduction and sharpening for the best overall effect.

## Smoothing Skin Areas

The noise reduction transformation is also very useful in smoothing the rendering of skin. In the example at left, we first used noise reduction to smooth skin area. We also applied the **Speck Removal** tool to touch-up small skin blemishes.

**Noise Reduction Dialog**

## Noise Reduction Dialog




To apply noise reduction:

1. **Select an image window.**
2. **Display the Noise Reduction dialog.** Choose **Noise Reduction** from the **Transformation** menu.
3. **Set the Threshold Control.** This control has the greatest affect over how much noise reduction is applied.
4. **Level Control.** Noise reduction is applied iteratively, with each iteration expanding the area considered. In this sense, the level control acts as a radius setting. The effect of this is very image dependent. In some cases increasing the number of levels has little effect while in others it can have a large effect, so it is worth experimenting. (If it does not have an appreciable effect, use a lower level for better performance.)
5. **Method.** This control primarily affects high spatial frequencies. **Soft Threshold** produces more smoothing; **Hard Threshold** yields sharper textures.
6. **Sharpening.** After getting the best noise reduction, adjust the Sharpening control to reduce image softening. Since sharpening also increases apparent noise, you may want to tweak the noise settings for optimum effect.
7. **Amount.** This control blends the input and output images in the proportion set on the control. You may find that more aggressive noise reduction coupled with lower amount settings gives the best results.
8. **Click OK** or **Apply** when you are satisfied with the results. The transformed image is displayed in a new window.

# 8. Freehand Tools

Up until now, we have mostly manipulated images using *transformations*. Transformations like brightness or color balance operate on the entire image. Upon completion, transformations create a new image. The original image is left unchanged.

But sometimes you want to change just particular areas of an image. For that purpose, Picture Window has a whole panoply of freehand tools. The freehand tools all use a 'brush' that you manipulate with the mouse. They generally let you set the size of the brush and let you control the degree of blending. This is quite important, since when you use a mouse you cannot press harder or just graze the surface, as you can with a real brush. So to restore feel and control to the tool, most tools have three sliders—radius, transparency, and softness.

**Radius** controls the size of the brush.

**Transparency** controls how much change is created in a single stroke. By setting transparency to a high value, you increase the number of strokes it takes to achieve a given effect giving you more control.

**Softness** controls the blurriness of the tool edge. The blurrier the edge, the more the tool blends in with the surrounding area.

The tools are interactive— as you use the tools you see the results directly on the image you are working with. However, you can use undo to return to your original image stroke by stroke. (See **Undo Tool Operation**.)

**Available Tools**

**Using the Tools with a Mask**

# Available Tools

## Freehand Tools

Paint Tool
Clone Tool
Line and Arrow Tool
Miscellaneous Tools

- Miscellaneous Tool Operations
- Lighten/Darken
- Increase/Decrease Saturation
- Blur/Sharpen
- Add Noise
- Speck Removal
- Smudge
- Red Eye Removal

## Viewing Tools

Magnifier Tool
Zoom Tool
Readout Tool
Histogram Tool

## Undo Tool Operation

Since you are working directly on your image, you need some way to reverse a tool operation if you don't like the results. You can do that in two ways:

**Save the image** to a file before starting any of the tool operations. If you are not satisfied with the results, simply restore the image from the file, using the **File Revert** command. All the changes you made since the last **Save** are eliminated.

**Use Undo.** Undo has three settings—none, single level, and multilevel. The settings are made in the **Preferences** invoked from the **File** menu.

Single-level undo allows you to back out of the last operation only. (An operation encompasses all the changes made during a single mouse-button-down period.) Multilevel undo lets you back out of each operation during the current dialog, starting from the last operation, stroke by stroke all the way back to the first.

Obviously multilevel undo is the most versatile. However, it also requires the most memory. If you are working near your memory limits, using single-level undo combined with saving the file just before using a tool may be your best compromise.

## Using the Tools with a Mask

You can protect portions of your image with a mask while you use any of the freehand tools. The mask is like masking tape you might use while painting. Technically, a mask can be any black and white image with exactly the same pixel dimensions as the image being masked. (See **Making and Using Masks**.)


Mask protects foreground leaf

To use a tool with a mask:

1. Open the mask image.
2. Select the original image window and click on **Mask** in the main menu. A menu of all open images that can be used as masks for the selected image are displayed.
3. Select the mask you want to use. (You can also click **New** to make a new mask.) The mask is displayed over the image. The **Mask Dialog** is displayed as well. You can use it to control the color of the mask, to invert the mask to switch the protected and unprotected areas, and even edit the mask.
4. Use any of the tools. The changes are applied only to unmasked areas. Masked areas are protected from change; changes in the feathered areas of the mask are proportional to mask density.
5. Cancel the mask dialog to remove the mask.

# Paint Tool

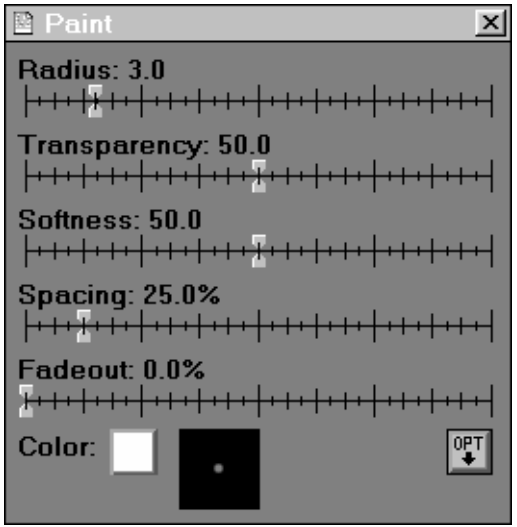
Paint lets you 'brush on' a color to an image. You can set the color with the color picker or match a color in the image. You can also control the size of the brush, the transparency of the color you apply, and how soft the edge of the applied color is. These controls allow you greater control over the painting process and help blend the color in so that it looks more natural.

Sometimes you can improve an image by adding small details. For instance, you can add or enlarge small highlights to make objects appear shinier. The paint tool is also useful for touching up masks.

**Using the Paint Tool**

**Example: Using Paint to Add Small Details**

## Using the Paint Tool




1. **Enlarge the image.** Using the **Zoom Tool**, enlarge the area you will be painting to 1:1 or larger. (The **Zoom** tool is located in the **Tools** menu.)
2. **Display the paint dialog.** Choose **Paint** on the Tools menu or click the toolbar button. The **Paint** dialog is displayed.
3. **Set the color.** To pick a color directly from the image, hold down the shift key and click the left mouse button on the color you want to use. (You can set the sample size, in pixels, by clicking OPT and choosing a 1x1 through 9x9 pixel square.)
   To display the **Color Picker**, click on the **Color** square. You can choose a color directly using the picker's color and brightness cursors. Or use the probe to choose a color from the image. After you are done with the color probe, select the **Paint** window to cancel the color probe and re-enable painting.
4. **Set the slider controls.** Set the radius, transparency and softness, etc. as needed. (See **Controls**.) By default, **Paint** paints over the image with the chosen color. However you can modify this behavior to achieve other effects. Among the options are to only lighten or only darken the image, or to tint it (just change its color without affecting brightness). (See **Options**.)
5. **Paint on the image.** Move the cursor to the image. Hold down the left mouse button and paint over the defect. The color you have selected is transferred.
6. **Close the dialog** when you are done.

## Controls

You cannot paint in color over a binary or black and white image without first converting it to a color image. You can accomplish this conversion by running the image through the **Convert Transformation**. You can paint in shades of gray on a black and white image without converting it to a color image.

Activating the paint tool pops up a window containing painting controls. These controls let you vary the brush radius, transparency, softness, color, and other characteristics.

**Radius**: This slider lets you control the brush radius in pixels. The smaller the brush, the finer the details you can paint; larger brushes are good for covering large areas quickly.

**Transparency:** This slider lets you control the transparency of the paint. The more transparent the brush, the more subtle the effect.

**Softness:** This slider lets you control how soft the edges of the brush are. The softer the brush, the more smoothly the effects of painting are blended with the original image.

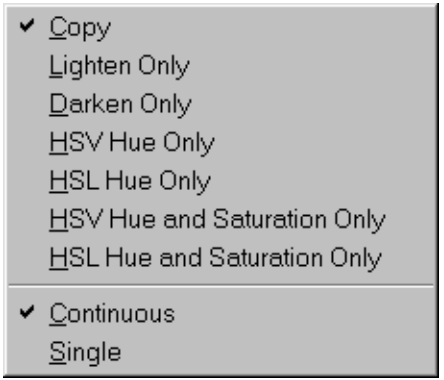
**Spacing:** This slider lets you control at what spacing interval the paint tool is applied as you move the cursor. The smaller the spacing, the more the paint applications overlap (but the more memory is required by the undo buffer).

**Fade-out:** This slider lets you control how the brush stroke fades out (becomes increasingly transparent) as you move the cursor. The smaller the value, the less the paint applications fade.

**Color:** This Color Control lets you select the paint color. To choose a paint color from an image, hold down the shift key, move the cursor to the color you want to match and click the left mouse button.

## Options

In addition to painting over the image, options allow you to selectively lighten or darken the image or to just change its color properties.




Click on the **Opt** button to select one of the options settings.

**Copy:** paints over the image without regard to what is already present in the image.

**Lighten only:** paints only if the result lightens the target area.

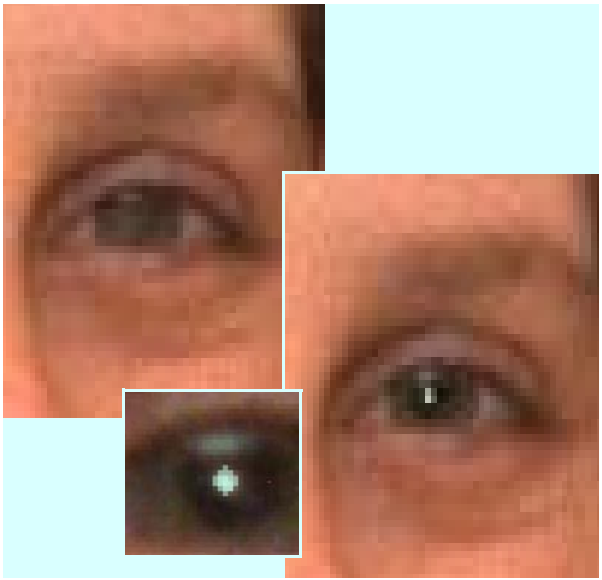
**Darken only:** paints only if the result darkens the target area.

**Hue Only:** changes the hue only; saturation and brightness remain the same. You can use either the **HSL** or the **HSV** color space.

**Hue & Saturation Only:** brightness remains unchanged. Use this mode to produce hand-tinted effects on Black and White photos. You can use either the **HSL** or the **HSV** color space.

**Continuous:** paints as long as the mouse button is held down.

**Single:** paints a single dab each time the mouse button is pressed.



## Example: Using Paint to Add Small Details

Sometimes you can improve an image by adding small, subtle, details. For instance, you can add or enlarge small highlights to make objects appear shinier.

In portraits, eyes are very important. You can sometimes improve the sense of presence by adding small highlights to the pupils, as in this example.

Painting in small details is fairly easy. For small areas, set the radius somewhat smaller than the feature size. Start with medium transparency and softness settings. Work at high magnification, so that you can clearly see what you are doing. As your area gets larger, increase the transparency setting. This lets you build up your color in multiple passes. Work slowly, so that your computer has a chance to update the image as you work.

If possible, pick your colors from the neighborhood you are painting. For instance to clean up a highlight, use the color picker probe to choose the color of an existing highlight. Then lighten that color with the color picker brightness control. In that way, your highlight will have the same hue as the original but be brighter. You can also use the color picker to match a color and then change only its saturation or its hue while keeping its other properties constant.

# Clone Tool

Images often contain distracting elements, like telephone lines, facial blemishes, or confusing background objects. Frequently you can eliminate these using the **Clone** tool. The Clone tool works like a paint tool. However, instead of painting with a solid color, it "paints" with another part of the image (or even a different image). That way you can transfer a background texture from another portion of the image and use it cover up the distracting element.

**Clone** copies pixels from one location to another. Usually, **Clone** is used to cover up a defect by "borrowing" a little bit of color and texture from the neighborhood of the defect. However, clone can just as easily copy pixels from a remote portion of the image or even from a different image.

The **one to one** mode of the Clone tool lets you clone corresponding areas of one image to another image. The source and destination images must have the exact same pixel dimensions. You can use this mode to manipulate an image in some way—for instance change its color balance—and then selectively copy just the areas you want altered back to the original image using the clone tool.

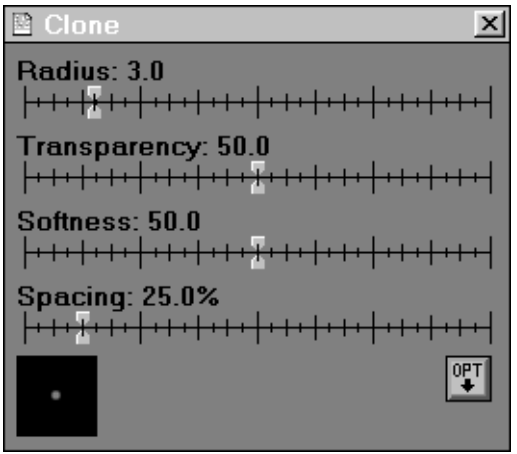
**Using the Clone Tool**

**Example: Eliminating Distracting Details**

**Example: Using One to One to Lighten Selected Areas**

For eliminating dust spots and scratches, see **Speck Removal**

## Using the Clone Tool




1. **Enlarge the image.** Using the **Zoom** tool, enlarge the area you will be cloning to 1:1 or larger. (The **Zoom** tool is located in the **Tools** menu.)

2. **Display the Clone dialog.** Choose **Clone** on the **Tools** menu or click the button on the tool bar. Adjust the radius, transparency, softness and spacing sliders, as needed. These function in the same way as the controls in the **Paint** tool. (See **Controls**).

   By default, **Clone** copies over the image. However you can modify this behavior to achieve other effects. (See **Options**.)

3. **Position the cursor to the area** you want to transfer. Hold down the shift key and click the left mouse button. A small circle outlines the area which will be copied. (Use the **Radius** slider to change the size of the circle.)

4. **Move the cursor to the defect** then hold down the left mouse button and paint over the defect. The area under the circle is transferred to the defect area shown by a circle-cross symbol. Notice that the circle—indicating the area you are copying from—and the circle-cross move in unison.

   **Hints:** If you are transferring a texture over a large area, it is usually less noticeable if you copy the texture from a number of different nearby areas rather than from a single area. Use the instructions in step 3 to reposition the source cursor.

   You can even clone if the input and output areas overlap as long as **Undo** is enabled. (Check **File->Preferences**.) The input image is copied from the undo buffer, which stores the image as it was before it was changed.

5. **Close the dialog** when you are done.

## Clone Options

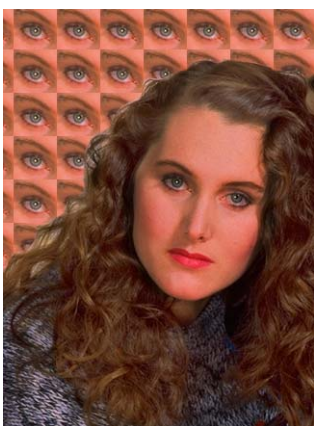

**Copy:** clones without regard to whether the source is lighter or darker than the destination.

**Lighten only:** copies pixels only if the result lightens the area to be cloned.

**Darken only:** copies pixels only if the result darkens the area to be cloned.

**Linked:** moves the source and destination cursor in lock-step all the time.

**Free:** moves the source and destination cursor only while the mouse button is down. This lets you reposition the destination cursor to copy the same texture into several different areas.



**Continuous:** copies as long as the mouse button is down.

**Single:** copies a single dab each time the mouse button is pressed.

**One to One:** copies pixels from another equal-size image.

**Tiled:** This is used for special effects. It lets you clone from one image to another in a kind of continuous mode—when the clone tool runs off the side of the source image it wraps around to the opposite edge.

In the image at left, we created a second image of just the subject's eye and tiled it over the background using the **clone** tool in **tile** mode.

## Example: Eliminating Distracting Details

Sometimes eliminating a discordant detail can make an image much stronger. In this example, we eliminated the traffic light by covering it up with the nearby stone of the building.

In this particular case, not much stone is visible between the traffic light and the corner of the building, so we had to use a small radius. Also, we wanted to extend the mortar lines. That meant that we had to work from right to left, with the source and destination cursors placed along the same horizontal line.

Otherwise, we applied all the general rules—we enlarged the image to several hundred percent and worked slowly, being particularly careful as we approached the hair.

Cloning out the traffic light behind the man's head

Selectively lightening the hair

## Example: Using One to One to Lighten Selected Areas

Hair is notoriously hard to print well. In the original image (**samples\onetoone.jpg** in the Application Data Folder), the face and sweater are well exposed. However, the hair is so dark that almost no detail is visible.

Picture Window offers a number of techniques to lighten the hair selectively. In addition to the **Clone One to One** option, you can make a mask for the hair and then apply a brightness dialog. You can also use the **Miscellaneous/Lighten** tool for freehand lightening.

Here is how we used the **One to One** option to create the lightened image shown at right.

**1.** Lighten the original image, using an appropriate transformation. (We used **Levels**.)

Use the hair to gauge the amount of lightening required. Ignore the rest of the image.

**2. Clone** the hair from the lightened image to the original image.

**a.** Select **Clone** from the **Tools** menu. Set the slider controls. We set the **radius**, **softness** and **transparency** controls to high values.

**b.** Select **One to One** from the options menu. Then place the cursor in the lightened image, hold the shift key and click the mouse button. A small circle is displayed. It shows the source for the clone operation.

**c.** Move the cursor to the original image and place it over the hair. Hold the mouse button as you go over the hair area. Work slowly. Be careful to stay away from the face, sweater and other areas that do not need to be lightened.

You can use this technique to apply other transformations as well, including color balance, saturation, and special effects transformations. For instance, we might have used the color balance to add red highlights to the hair. In fact any transformation which does not change the dimensions of the image (in pixels) can be used.

# Miscellaneous Tools

The miscellaneous tools provide you with a powerful set of freehand retouching options, including lightening, darkening, increasing or decreasing saturation, blurring, sharpening, adding noise, speck removal, smudge and red eye removal. These effects are applied using a brush with an adjustable radius, transparency, and softness.

Activating the miscellaneous tools pops up a window containing various controls. These controls let you select the operation to perform and vary the brush radius, transparency, softness, and other characteristics.

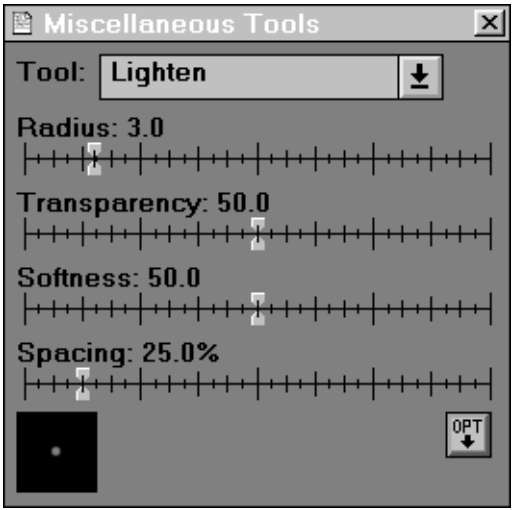
Using these freehand tools effectively takes some practice. For best results, use a large, soft brush, make very small changes (set the **Transparency** to a high value), and move the brush slowly and evenly over the entire area that you want to adjust.



The miscellaneous brush tools let you increase or decrease the brightness, saturation, or sharpness of an area by 'brushing' over it with the cursor. Each pass of the tool creates a progressively greater effect in the image in its path. The more passes you make, the more you affect the image area. These tools are intended primarily to operate on small areas. When using them, make sure you work slowly. Set the transparency to a fairly high value, to reduce the amount of change for each pass. Then work in multiple passes, varying your strokes so that no pattern becomes apparent.

Frequently it is easier to use a mask together with the **Levels**, **Brightness Curve** or **Brightness** transformation instead of the lighten and darken tool. A mask is definitely the better choice for brightening or darkening a sky, vignetting, correcting light fall-off toward the edges and corners of the image and for similar wide-area effects.

## Using the Miscellaneous Tools




1. **Enlarge the image.** Using the **Zoom** tool, enlarge the area you will be painting to 1:1 or larger. (The **Zoom** tool is located in the **Tools** menu.)
2. **Display the Miscellaneous Tools dialog.** Click on the  tool-bar button or choose **Miscellaneous** on the Tools menu. The **Miscellaneous** dialog is displayed.
3. **Select the tool.** Select the tool you want to use from the drop down list. (See **Miscellaneous Tool Operations** for more information on each tool type.)
4. **Set the slider controls** as needed. (See **Miscellaneous Tool Controls**.) Some tools also have **Options** settings.
5. **Use the tool.** The tool operates directly on the image.
6. **Close the dialog** when you are done.

## Miscellaneous Tool Operations

### Lighten/Darken

Selecting one of these options lets you lighten or darken selected parts of a black and white or color image by 'brushing' over it with the cursor. The effect is similar to dodging and burning in a darkroom. Each pass of the tool lightens or darkens the image in its path. The more passes you make, the lighter or darker the image becomes.

You can apply the tool to the entire area under the brush or restrict it to operate primarily on **highlight**, **midtones**, or **shadows**. For instance, choose **highlight** if you want to cleanup the highlights while leaving the general brightness level unchanged. To select any one of these options, click on the **Opt** button.

**Hints:** Using this tool (and the saturation and sharpen tools, below) requires a little trial and error, particularly in the beginning. So make sure you save your image before you begin.

The tools are intended primarily for local manipulation of small areas. When using them, make sure you work slowly. Set the transparency to a fairly high value, to reduce the amount of change for each pass. Then work in multiple passes, varying your strokes to prevent a pattern from emerging.

Another freehand technique for local manipulation of the brightness, saturation, and sharpness of an image is **Clone** in **one to one** mode. (See **Example: Using One to One to Lighten Selected Areas**.)

### Increase/Decrease Saturation

Selecting one of these options lets you increase or decrease the saturation of selected parts of a color image by 'brushing' over it with the cursor.

### Blur/Sharpen

Selecting one of these options lets you blur or sharpen selected parts of an image by 'brushing' over it with the cursor. Blur and sharpen can be applied to the entire area brushed or selectively within the brushed area by appropriate setting of the **Threshold** slider. Selective

**Blur Threshold:** The blur threshold slider can be used to favor blurring of softer over sharper details. At 100%, everything painted is blurred. As the slider is moved toward 0%, an increasing amounts of sharper details are protected from blurring. Small threshold settings frequently allow grain to be blurred while having little degradation on sharper detail.

**Sharpen Threshold:** The sharpen threshold slider can be used to favor sharpening of sharper over softer details. At 0%, everything painted is sharpened. (Note that this is the opposite over full blurring.) As the slider is moved toward 100%, an increasing amounts of softer details are protected from sharpening. The threshold setting can be frequently used to reduce unwanted amplification of grain while still sharpening the image appreciably.

To affect the entire image, use the **Blur Transformation** or the **Sharpen Transformation**.

### Smudge

This tool lets you smudge an image to create an effect like running your finger over a charcoal drawing. The image is both blurred and shifted in the direction in which you move the cursor. For the smoothest results, set **Spacing** to a low value such as 0% - 10%.

### Speck Removal

The speck removal tool lets you click on a dust speck or other localized imperfection in an image and erase it by interpolating inward from its neighboring pixels. To use this tool, first set the radius just large enough to surround the speck, then

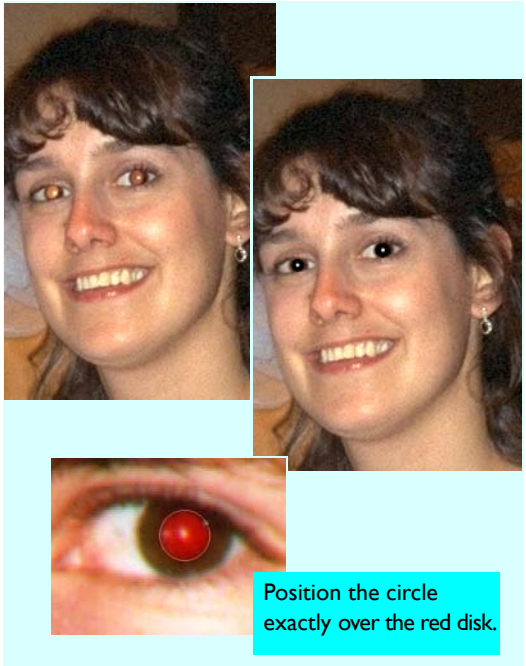
position the cursor over the speck and click the left button once. You can also use it remove a scratch by dragging it along the scratch.

This tool tends to work best with a low transparency setting.

### Add Noise

Add Noise adds random noise to the image, creating an effect similar to film grain. It usually works best at a high transparency setting.

If you want to add noise to the entire image, use the **White Noise** transformation.




## Red Eye Removal

This tool lets you fix red eye, an annoying red reflection from the back of the eye that often occurs when you use an on-camera flash to shoot portraits and the subject is looking directly at the camera. Red eye manifests itself as a red disk in the pupil of the eye; to eliminate it, the red eye removal tool lets you paint a dark disk that contains a central highlight over the red reflection.

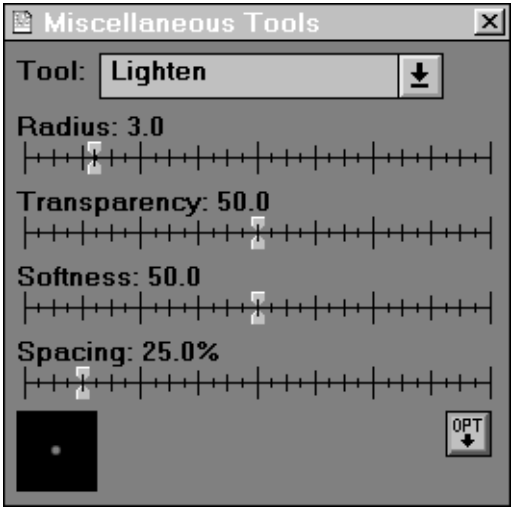
You can control the color of the dark disk and the central highlight. By default, they are black and white, respectively. However, if your image has no really solid blacks, pure black may look too dark. Similarly, if your highlights have a little color in them, white may look unnatural.

**Setting Colors:** To change the color of either element, click on the corresponding button. The **Color Picker** is displayed. You can set a color directly or use the picker's probe to match a color in the image.

**Replacing the Red Eye:** To use the red eye tool, first zoom in on the eye and then adjust the radius slider until the circle just covers the red disk. Then position the circle precisely over the red disk and click the left mouse button once. The circle is converted to a black disk.

If you make a mistake, just undo it and try again.

## Miscellaneous Tool Controls




**Radius:** This slider lets you control the brush radius in pixels. The smaller the brush, the finer the details you can alter; larger brushes are good for working on large areas quickly.

**Transparency:** This slider lets you control how strong the effect will be. Values near zero have the strongest effect; values near 100% are the most subtle.

For more controlled effects, it is often easiest to use a high transparency and make multiple passes over the area to build up the effects gradually. for instance, to blend in a texture in a fairly featureless areas, set the control to high transparency and clone over the image multiple times for the most blending.

**Softness:** This slider lets you control how soft the edges of the brush are. The softer the brush, the more smoothly the effects are blended with the original image. **Softness**: controls the "fuzziness" of the edges of the copy circle

**Spacing:** This slider lets you control at what spacing interval the various tools is applied as you move the cursor. The smaller the spacing, the more the individual brush patches overlap (but the more memory is required by the undo buffer). Usually the default setting can be used, so adjustment is seldom needed.

**Brush Display:** Brush settings are indicated by a small patch in the tool dialog boxes. The patch shows the radius of the tool, how soft or sharp the edge is and the transparency of the tool. The brush may be difficult to see when you select transparency values near 100%.

## Options

Clicking the options button lets you select various lightening and darkening options:

**Midtones/Highlights/Shadows/All:** These options are available only when the Lighten or Darken operation is selected (see above). Depending on the option you select, the corresponding parts of the image are most strongly affected. For example, to lighten the highlights of a region, first select the Lighten operation and then select the Highlights option; then use the tool over the area you wish to retouch.

**Continuous/Single:** If you select **Single**, then the selected operation is only performed when you click on an image and is not repeated as you move the cursor with the mouse button depressed.

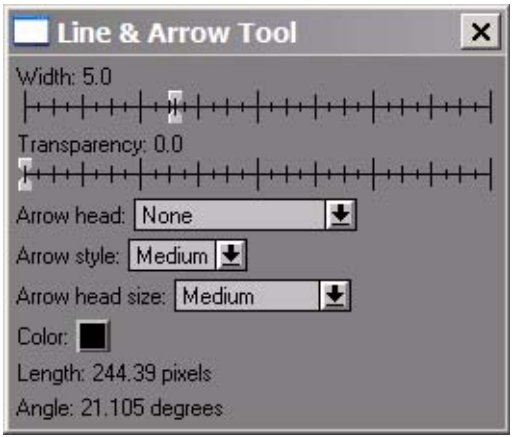
# Line and Arrow Tool

The line and arrow tool lets you draw lines (optionally with arrowheads at one or both ends) over an image. Settings allow you to control the line's width, color, and transparency. You can choose from several arrowhead styles, as well. The lines and arrowheads are anti-aliased to avoid jagged edges.

**Line and Arrow Dialog**

**Hints for Using the Line and Arrow Tool**

## Line and Arrow Dialog




1. **Display the Line and Arrow Tool dialog.** Select **Line and Arrow** from the **Tools** menu or click the button on the tool bar.

2. **Make the desired settings.** You can set line width, transparency, arrowhead location and style, and color.

   **Width:** This slider lets you control the line width in pixels. The smaller the width, the finer the line.

   **Transparency:** This slider lets you control the transparency of the line. The higher the transparency setting, the more subtle the effect.

   **Color:** This control lets you select the line color. You can either choose a color from an image or from the Color Picker.

   To choose a color right off the screen from an image, just shift-click on the spot whose color you want to select. (To Shift-Click, hold the Shift key down with one hand while you click the left mouse button with the other.)

   To choose a color using the Color Picker, click on the Color button and use the **Color Picker** to choose a color.

   **Arrow Head:** This control lets you select arrowhead placement. Select the beginning of the line, the end of the line, neither, or both.

   **Arrow Style:** This control lets you select **Blunt, Medium,** or **Narrow** arrowheads.

3. **Draw the line.** Position the cursor to the point where you want the line to start, press and hold down the left mouse button and move the cursor to where you want the line to end. When you release the mouse button the line is drawn (after a short delay). Like the other tools, the Line and Arrow tool modifies your image immediately. If you don't like the result, use the Undo command to erase the line and try again. (See Also: **Undo Tool Operation**.)

   **Length and Angle:** After you draw your line, the length of the line in pixels and its angle in degrees is displayed. The degree display shows degrees above or below an line pointing east. Swinging the line up from east toward north and then west results in readings of 0, 90, and 180 degrees, respectively. Swing the line the other way, down from east toward south and west results in negative degrees from zero, to -90 to almost -180.

   You can use this display to measure distances in your photograph. If you know the size of any feature in your photograph, you can scale other features using it. (Of course, the features must be in the plane of the photograph — otherwise perspective effects will give misleading results.)

4. **When you are done making arrows**, terminate the line and arrow tool by simply closing the dialog box.

# Hints for Using the Line and Arrow Tool

## Drawing over a black and white image

You can only draw black and white (and gray) lines and arrows on a black and white image, unless you first convert the image to color.

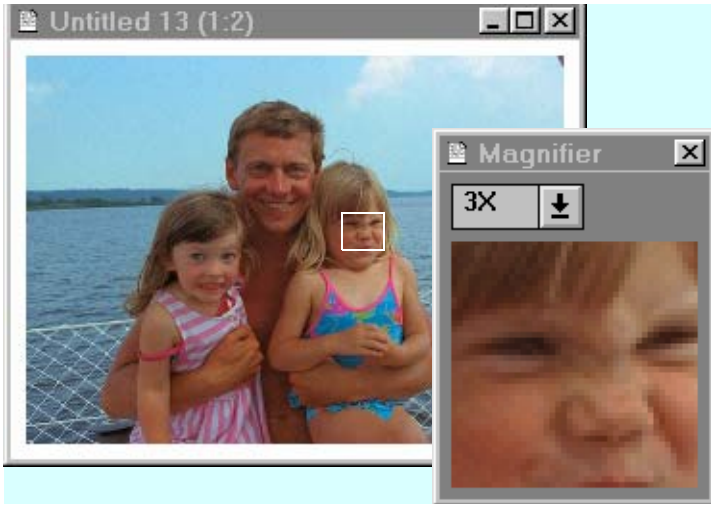
To convert your image to color, use the **Convert Transformation** and set **Output Image** to **Color**. While the resulting image will still appear to be black and white, you will now be able to add colored lines and arrows.

## Add a border

If you need extra space around your image, for instance to add labels, use the **Copy** transformation to want to add a white or colored border to your image.

## Zoom the image to full size

If you must place your lines accurately, zoom the image to a magnification of 1:1. In you want, you can use the **Magnifier Tool** to create an overview of the entire image while you are painting details. (To use the magnifier tool for an overview, set its magnification to reduce the image.)




# Magnifier Tool

The **Magnifier** tool uses an additional window to display a magnified or reduced view of a selected part of your main image. Holding down the left mouse button, sweep the cursor over any part of the main image—the selected portion is displayed in the magnifier window. The magnifier is particularly useful for checking on small details without bothering to zoom the whole window. Note that the Magnifier magnification factor is absolute. It is not affected by the magnification set for the main window. The Magnifier window is resizable.

Sometimes you may want to use the magnifier tool in reverse—that is you may want to greatly magnify the image in the main window and reduce it in the Magnifier window. This is particularly useful for operations like Painting or Cloning. Magnify the image window as much as you need to use the tool effectively. Set the Magnifier to display the whole image for orientation.

To use the Magnifier tool

1. Select **Magnifier** from the **Tools** menu or click the  button on the tool bar. Set the magnification.
2. In the main window, click on the area of interest. The area is shown enlarged in the Magnifier window.
3. After you have finished using the tool, close the magnifier window.

# Zoom Tool

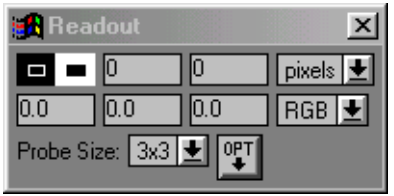
The **Zoom** tool lets you enlarge or reduce the main image itself. It is similar to using the magnification functions in the **Window** menu with one important advantage—you can pick the area of the image that will be centered in the window after magnification. This saves time, making it unnecessary to scroll the window to find the desired portion of the image. The Zoom tool can also be used to make the image smaller.

**Note:** Zooming an image in or out does not affect the size of the underlying image file. It only affects how the image is displayed.

To use the **Zoom** tool:

1. Select **Zoom** from the **Tools** menu or click the  button in the tool bar.
2. Move the cursor (displayed as a small plus sign) into an image window and place it at the point of interest. To enlarge the image, click the left mouse button. To make the image smaller, hold down the shift key and then click the left mouse button.
3. After you have finished using the tool, click the  button again.

# Readout Tool




The Readout tool shows you the position and color of any pixel you select.

To use it, select **Readout** from the **Tools** menu or click the button in the tool bar. Then click on a point in the image.

The top row of readout values are the position of the point selected, measured from the upper left corner. The bottom row is the color of the pixel in RGB, HSV, HSL, or Density (Den) units, depending on the setting of the drop-down menu. Density units are provided to let you use your scanner as a densitometer. The scanner must be calibrated for a gamma of 2.2 for the density information to be valid.

**Probe Size** setting. You can select probe sizes ranging from 1 x 1 to 9 x 9 pixels. Use one of the larger sizes if you want an average value, particularly if the area has a texture. Use 1 x 1 if you want the precise value for a particular pixel.

## Options Menu

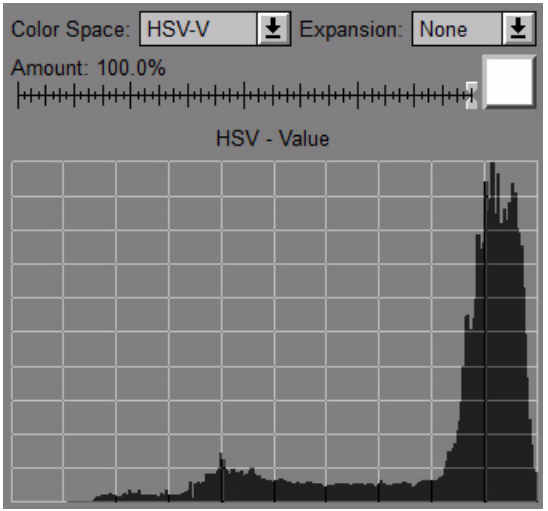
The options menu allows you to select percentage of absolute values and select the location of the origin. To display the menu, click the **OPT** button.

**Percentage or absolute values:** You can choose to display percentage or absolute values. Absolute values range from 0 - 255 for 8 bit and 24 bit images or 0 - 65535 for 16 bit and 48 bit images.

**Origin at Top Left** or **Origin at Bottom Left:** The origin of the coordinates reported at the top of the dialog can be set to the top left or bottom left corner of the image. The bottom left corner is the default.

# Histogram Tool

The histogram tool displays a histogram of the image window active at the time the tool is launched. It can displays a histogram of he luminance channel as well as the hue and saturation channels in both HSV and HSL color models. (See **Color Space** for an explanation of HSV/HSL.) In addition, it has a two channel mode whereby it can display the hue and saturation channels to show distribution at different points in the color hexagon.




To launch the Histogram tool, select the image window you want to apply it to and click the Histogram button  in the main toolbar.

Initially the luminance histogram using the HSV color model is displayed. However, you can choose other display options and view a histogram of masked areas only. You can also magnify the histogram.

### Mask (Amount Slider)

You can display the histogram of just the masked areas of an image. To do so, click on the window at the end of the Amount slider and select the mask you want to use. A histogram of just the masked area is displayed. If you are using the tool together with a transformation, set the black and white Amount sliders to the same values as in the transformation. The hstogram of the net image as processed through the mask will be displayed.

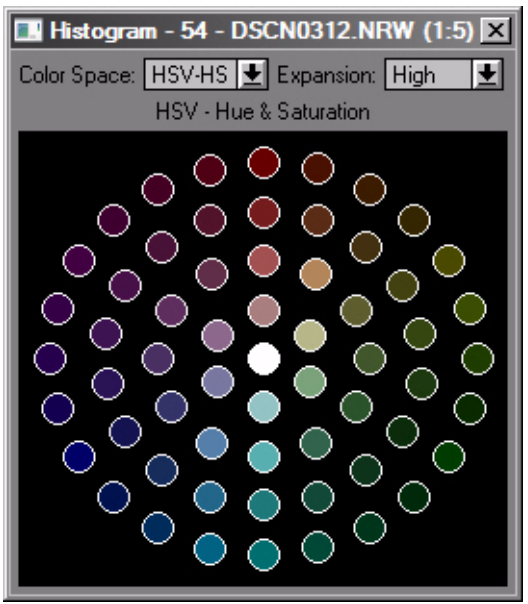
**Note:** The Amount slider setting is ignored whenever a mask ia not selected.

### Color Space

For color images this control lets you select the color space (HSV, HSL or RGB) and which channel or channels to histogram. You can select to histogram a single channel or two channels at once. In the latter case, a two-channel histogram as described below is displayed. (B+W images have only one channel.)

For more information on the concept of color space, see **HSV, HSL, and RGB Color Spaces**.

### Hue-Saturation Two Channel Histogram




This form of histogram breaks up the color wheel into a set of bins which are displayed as filled circles. The hue and saturation of the color of each circle corresponds to its location in the color wheel. The brightness of the color is proportional to the number of pixels in the image whose hue and saturation fall into the corresponding bin. Thus the histogram gives you an idea what colors are most common in the image while ignoring their brightness. Histogram expansion (see below) may be used in conjunction with this style of histogram to make some of the darker colors more visible.

### Expansion

This control lets you rescale the vertical axis of the histogram. If None is selected, histograms are scaled linearly. If Medium or High is selected, histograms are scaled to exaggerate smaller values which might otherwise be invisible. Expansion is especially useful when checking to see where the white and black points of the image are located as there may be only a small number of very bright or very dark pixels.

# 9. Making and Using Gradients

## Gradient Transformation

**Gradient** is a utility transformation that lets you create a *gradient*—that is, fill an area with color that changes smoothly across the area. The gradient can then be used as a background, a mask, or a filter.

For instance a gradient might be used to correct light fall-off in the corners of an image. (Such fall-off might be due to insufficient flash coverage, for instance.) To correct the problem, you would create a gradient whose density varies opposite to the light fall-off and then use it to correct the image brightness

Gradients can be used for vignetting, in effect causing light fall-off deliberately. Color gradients can be used as filters, to vary the degree and color of filtration across an image.

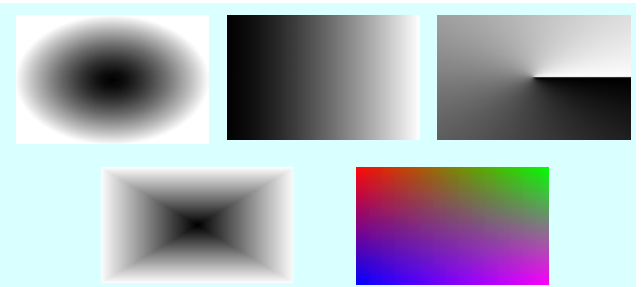
In addition to creating gradients, the Gradient Transformation can also create a **Checkerboard**.

In this chapter we discuss how gradients are created and applied and then show how a gradient can be used as a mask.

The gradient transformation gives you considerable control over shaping the gradient and controlling its color and density. The transformation also allows you to apply it to an image in several ways.

## Creating the Gradient

You can control the following aspects of the gradient:



**Gradient geometries:** top row, l to r: oval, linear, radial sweep.
bottom row: rectangular, multi-point (with 4 pts).

### Type

Type selects the shape of the gradient. The choices are illustrated at right. The types are: Oval, Horizontal, Vertical, Linear, Radial Sweep, Rectangular, and Four Corner. A linear gradient varies at a fixed angle across the image. Horizontal and Vertical are linear gradients which are fixed to vary horizontally or vertically, respectively. An Oval or Rectangular gradient expands outwards from a central point. A Four Corner gradient smoothly blends colors assigned to each of its four corners. The Radial Sweep varies as it goes through a full circle.

A **Checkerboard** type is used to create a checkerboard image. It has sharp edges and thus is not actually a gradient.

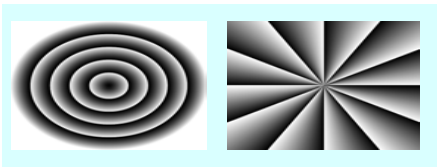
Any of the gradient types can be created in color or grayscale. You can create additional variations by applying the **Warp** Transformation to the gradient.

### Position and Size

You can move the entire gradient as well as compress it or stretch it out. You can also change the angle of linear gradients.

### Density and Color

You can set the color and density of the gradient at its end points. You can also create additional control points, position them along the gradient, and set their density and color.



### Number of Cycles

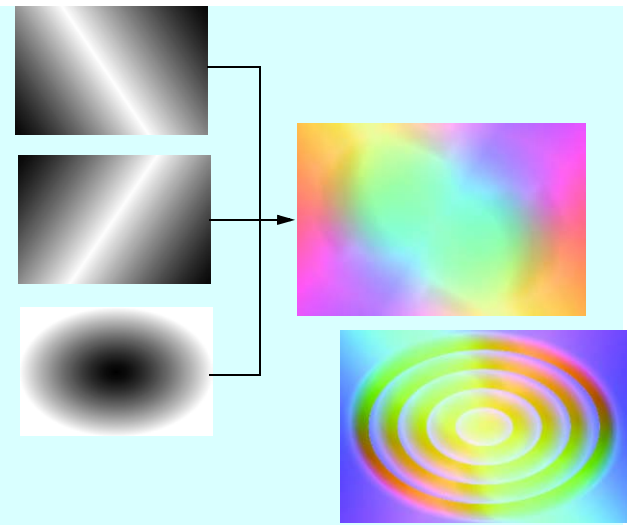
You can control how many times the gradient goes through its full range of colors or gray scales. Shown are a five cycle oval gradient and a twelve cycle radial sweep gradient.

### Anti-alias

Anti-aliasing makes jagged lines appear to be smoother. If the gradient you have created looks jagged, raise the alias setting until it is smooth. Anti-aliasing is only necessary if the gradient has abrupt transitions. However, it does make the gradient transformation run slower.

### Special Effects

Three black and white gradients are combined using the **Combine Channels** dialog to create a brilliant color pattern. The lower pattern was created in the same way, except the five-cycle oval gradient was substituted for the single-cycle one. The patterns can be used as filters with another photograph or just for their own sakes.



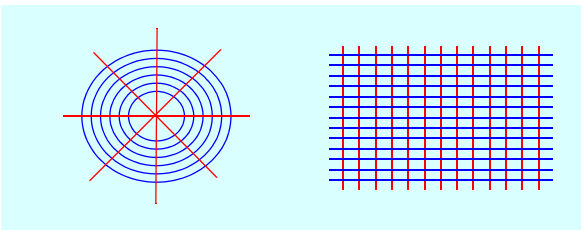
### Rainbow Gradients

You can create rainbow gradients with the color line control in the gradient transformation. Set both the starting and ending colors to red; then click on the button below the color strip and the transition to HSVCW.

You can then use the other controls in the gradient transformation to apply this gradient along a line or in a circle or oval.

## Terminology—Gradients and Contours

There are two important directions in a gradient—the gradient itself and the contour. The gradient is the direction of maximum variation. For instance, a slope is a gradient whose elevation varies. The direction of the gradient is the direction in which a ball would roll were it placed on the slope. The other important direction, the contour, lies along paths of zero variation. Contour lines on a map, for instance, trace paths of equal elevation. Together, gradients and contours form a net over a surface. They cross each other at right angles.



In the circular gradient (left) the contour lines (blue) are circles.The gradient lines (red) are rays that emanate from the center.

In the linear gradient (right) both the gradient and contour lines are straight.

## Applying Gradients

There are three ways to apply the gradient transformation:

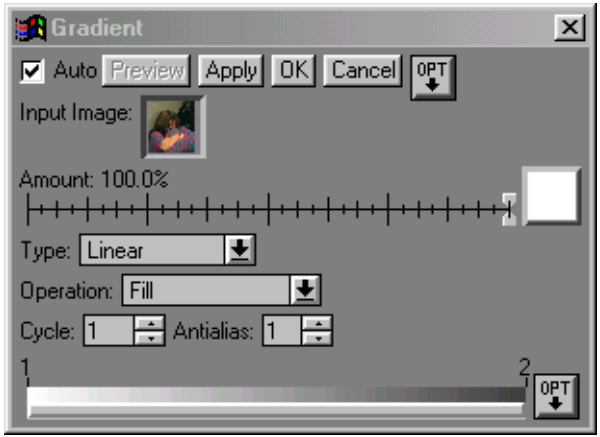
**Fill:** Fill creates a gradient as an independent image, mixing the image with the gradient according to the setting of the amount control. If the amount control is set to 100%, the input image serves only as a guide in creating the gradient—none of the content of the input image is then actually transferred to the gradient.

Black and white gradients can be used as masks with most other transformations. For example the image at the right was created by combining a full color image with a linear gradient in the **Saturation** transformation. Note how the image starts as a black and white image and slowly builds to full color.

**Filter:** Uses the gradient as a filter over the image. For black and white gradients, the areas of image corresponding to dark areas of the gradient darkened. Areas of the image corresponding to white areas of the gradient are unaffected.

**Subtractive Filter:** Performs the filter operation on the negative of the filter and image. For black and white gradients, the areas of image corresponding to light areas of the gradient are lightened. Areas of the image corresponding to black areas of the gradient are unaffected. You can use this technique for vignetting an image. (See **Example: Vignetting Using a Gradient**.)

# Gradient Dialog




Gradients are created directly over an input image, so that they can be aligned precisely with image features. However, the input image is not modified in any way by the gradient transformation. Instead, the resulting gradient is an image in its own right and is the same exact size as the image over which it was created.

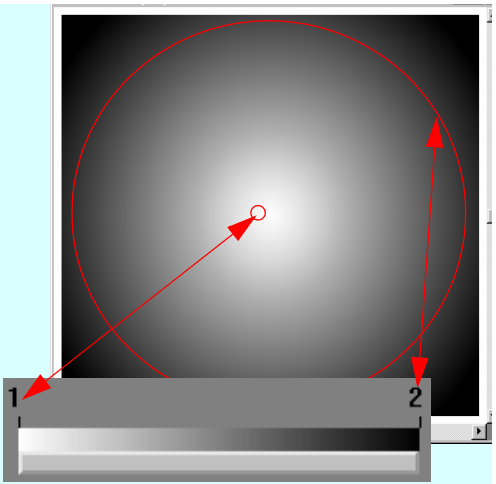
To create a gradient:

1. **Select an image.** (Alternatively, use **File->New** to create a new blank image of a desired size. Delete the image after you have created the gradient.)
2. **Display the gradient dialog.** Choose **Gradient** from the **Transformation** menu. A gradient line is displayed across the image.
3. **Select the Gradient Type:** Gradient construction lines are displayed on the image showing the location of the start and end of the gradient. They are numbered to correspond with the points on the gradient scale in the dialog. Set the **Number of Cycles** and the **Anti-alias** setting.
4. **Position the gradient over the image.** In the image, drag the construction line control points to position the gradient over the desired section of the image. You can move the construction lines past the edges of the image, if desired. To do so, enlarge the image window by dragging the window's border.

5. **Set the color or grayscale values.** The colors or grayscale values you choose depend on how you intend to use the gradient. If you intend to use the gradient as a mask, use grayscale values only. (A mask must be a black and white image.) If you intend to use the gradient as a filter or background, you can use either color or grayscale values.

   By default, the gradient varies smoothly from a full black, through all the gray tones, to a maximum white. You can accept the default or set a different color and/or brightness value by using the **Color Line Control**.

   **Note:** To use the gradient as a mask all control points must be pure shades of gray. To choose a pure gray shade, use the color picker's brightness control only. Leave the color cursor centered on white.




Control points on the glide strip in the dialog control corresponding points in the gradient. Here point 1 controls the center and point 2 controls the edge.

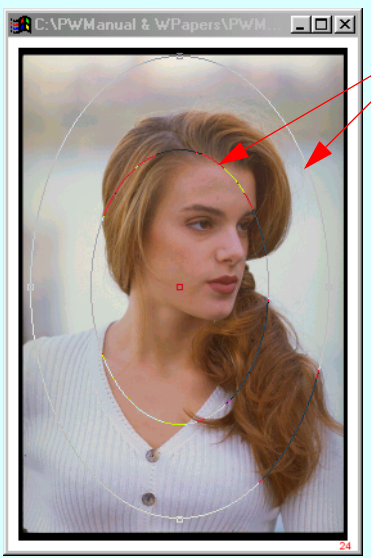
**Set the operation.** Select Fill to construct an independent gradient image. Select Filter or Subtractive Filter to use the gradient as a filter over the image. See **Applying Gradients** for more information and examples.

6. **Preview the gradient.** When you are satisfied with the adjustments you have made, click **OK** or **Apply** to create the new image.

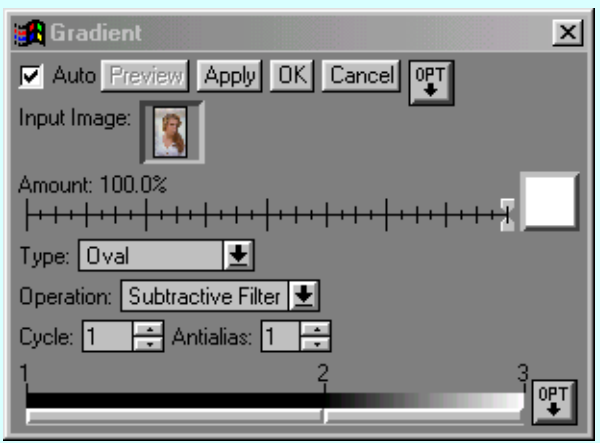
# Example: Vignetting Using a Gradient

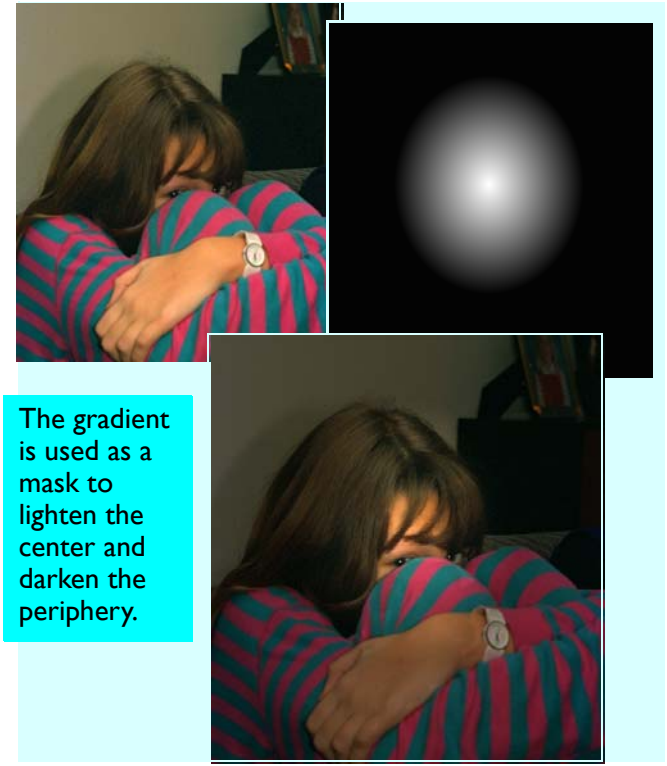
Vignetting is a technique for fading out toward the borders of an image, to eliminate extraneous detail. This technique can be easily accomplished using the **Gradient** transformation. To vignette the image, start by setting **Type** to *Oval* and **Operation** to *Subtractive Filter*. Position the center of the oval over the visual center of the image. Adjust the height and width of the oval to where you want the image to fade out completely.

Usually with just these settings, the image will fade too rapidly. The key to gaining control over how quickly the image fades is to create a middle control point (point 2 below). Make sure to set its brightness level to full black. Now you can precisely control where the fading starts. To do so, drag the control point to the right or left in the glide strip in the Gradient dialog. Notice that the size of the inner ellipse changes to show you the location of the point in the image.



Ovals corresponding to control point 2 (inner) and point 3. Point 1 is at the center.



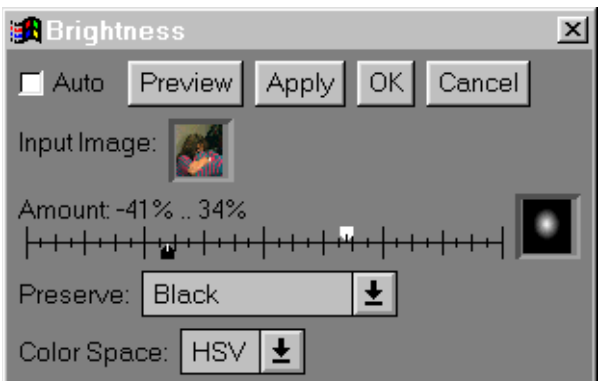



The gradient is used as a mask to lighten the center and darken the periphery.

# Example: Using a Gradient as a Mask

A gradient can be used as a mask to selectively control almost any transformation. In this example, we wanted to center attention on the eye of the subject. We do that by brightening the eye while darkening the periphery of the image

To create this effect, we made an oval grayscale gradient centered just above the eye. Then we used the gradient as a mask in the **Brightness** transformation. See **The Principle Behind Masks**.

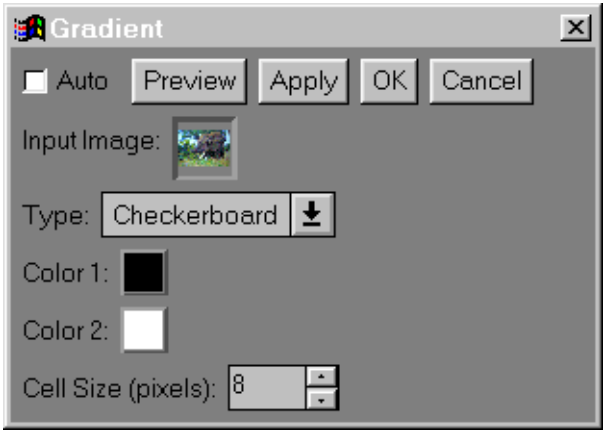


# Checkerboard

You can create checkerboards using the Gradient Transformation. Checkerboards can be used as design elements. Black and white checkerboards can be used as control images in the **Displace** transformation or as masks (see **Making and Using Masks**).

## Creating a Checkerboard

To create a checkerboard:




1. **Select an image** to set the size of the checkerboard. (Alternatively, use **File->New** to create a new blank image of a desired size. Delete the image after you have created the gradient.)
2. **Display the gradient dialog.** Choose **Gradient** from the **Transformation** menu. A gradient line is displayed across the image.
3. **Set Type to Checkerboard.** The **Color1, Color 2,** and **Cell Size** controls are displayed.
4. **To make a color checkerboard,** click on the **Color 1** and **Color 2** buttons. Use the **Color Picker** to select the colors. (Only a black and white checkerboard can be used as a mask or control image.)
5. **Set the Cell Size.**
6. Click **OK** or **Apply** to create the checkerboard.

# 10. Making and Using Masks

## Mask Transformation

Masks give you a powerful additional measure of control in applying transformations and tools to an image. Masks let you apply transformations to selected areas of an image while shielding other areas, leaving them partially or totally unchanged. For instance, you might want to treat an image's foreground and background differently. You may want to darken the edges of an image, or to create a composite from two or more images. You can create these effects by making a mask and then applying one or more transformations "through" the mask.

Masks can be used with most transformations as well as with the **Paint**, **Clone**, and **Miscellaneous** tools. Masks are also used with the **Composite** transformation to control exactly which parts of two images are combined into a new composite image.

In fact, once you become comfortable with masks, you will probably find them indispensable even in quite straightforward situations—they will become one more technique at your disposal for wringing out additional quality from your photographs.

The Principle Behind Masks  Mask Dialog  Procedure for Building a Mask

**See Also:** Creating and Using Masks

# The Principle Behind Masks

The principle behind masks is very simple. The mask is a way to separate a image into two areas—one area to which you will apply a transformation and another area which you will protect from the transformation. The areas themselves can be entirely irregular. They can be anywhere in a photograph. They don't have to be connected. Just about any transformation can be applied through a mask. Thus, once we have made the mask, we can use it in many different ways.

The next three sections are overviews to help you get oriented. We first present a very simple example, then show how a mask is used, and finally, how it's made.

**Getting Started with Masks—A Quick Tutorial**

**Blurring Through a Mask**

**Making Masks**

**Technical Note:**

A mask itself is just a black and white image. It must be exactly the same size, in pixels, as the image it is used with. Thus for every pixel in the image there is a corresponding pixel in the mask. When a mask is used with a transformation, each pixel in the image is adjusted according to the brightness of its corresponding mask pixel.

## Getting Started with Masks—A Quick Tutorial

Perhaps the best way to get started using masks is to go through the entire process of making and using a mask. Our goal the first time through is simply to understand the process, so we won't try to create anything useful.

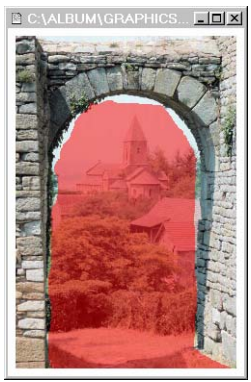
There are two parts to the process—making the mask and then using it. We suggest that you actually try these steps in Picture Window.

**Making a Mask**

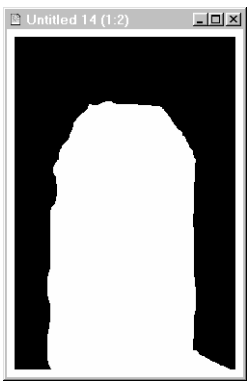
**Applying a Transformation through a Mask**

## Making a Mask


1. Open **samples\arch.jpg,** located in your Application Data Folder.
2. **Select the Mask dialog.** Select Mask and then New from the main menu. The Mask dialog is displayed. The dialog has a palette of tools for making masks and controlling their display.
3. **Select the Freehand Outline Tool.** Click on the  freehand outline icon (lower left corner of the dialog). This tool lets you use the mouse to outline areas you want to mask.




**4. Outline the arch opening.** Position the mouse at the lower left of the arch opening and outline its shape while holding down the left mouse button. Trace up the left side of the arch, around the top, down the right side and across the bottom. Let go of the button after you have completed the circuit. The area you have outlined is displayed as a transparent red overlay.




Since this is just a quick tutorial, it's not important to be very exact. However, if you do not like the results of an attempt, you can click **Undo** in the Mask dialog and try again. Note that outlining is only one of a number of mask-making tools available.

**5.Exit the Mask Dialog.** Click **OK**. The mask is 'slipped' off the image and displayed in its own window as a black and white image. You can save the mask just like any image file.

## Applying a Transformation through a Mask

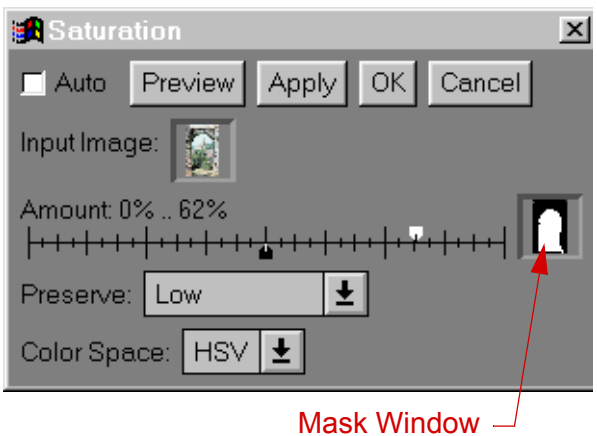
We will try using the mask in several different ways. Again, remember that we are not creating serious photographs—we are just interested in gaining a little hands-on experience with the process of applying masks. In this example we will use the mask with the **Saturation** transformation.

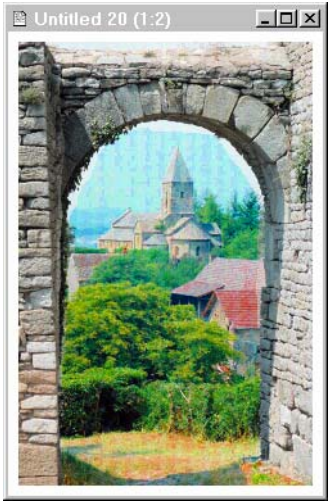
A more carefully prepared mask for the arch is available **samples\archmask.jpg** in your Application Data Folder.

This example continues from the previous page. If you want to start here without doing the previous example, open the images **samples\arch.jpg** and **samples\archmask.jpg**, before proceeding.

### Adjusting Saturation Selectively

1. Select the arch image window.
2. **Display the Saturation dialog.** Choose **Color** and then **Saturation** from the **Transformation** menu.
3. **Select the mask.** Click on the mask window (the small blank window located to the right of the amount slider). A menu listing all open images that can be used as a mask for the selected is displayed. In this case there will be only one such image. Select the mask image. It is displayed in the mask window in the dialog. Notice too, that the **Amount** slider has now split to a white and a black control.



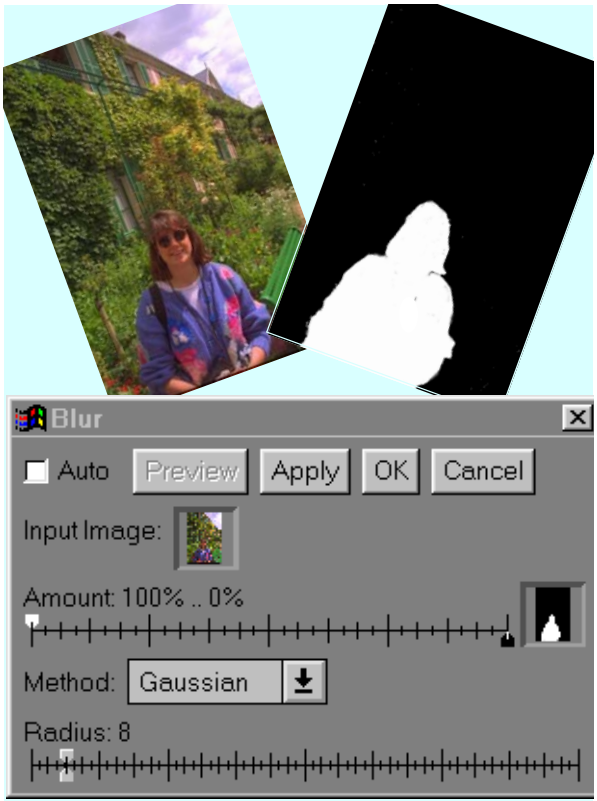



**4. Increase the saturation under the white areas of the mask.** Move the white slider toward the right. We moved to 62% to get an exaggerated effect. Click preview to see the effect (left). Notice that the area within the arch now has a very high, almost cartoonish saturation while the arch itself is not affected.


**5. Reverse the effect.** We can increase the saturation corresponding to the black areas and decrease it for the white areas. Just move the white slider left and the black slider right. Preview the image (right).

Steps four and five illustrate that the mask allows you to control areas of the image corresponding to white and black mask areas separately. Most transformations allow you to use masks. Thus we can apply the brightness, contrast, color balance, and most other transformations through the mask as well. Masks can also be used to create composite images and to protect a portion of an image while you are using one of the tools.

For a more realistic example, see **Blurring Through a Mask**.




The original image, a mask separating the background, and the **Blur** transformation.

## Blurring Through a Mask

In this example we use a mask with the **Blur** transformation. When we use a mask with a transformation, two **Amount** sliders are displayed—a white and a black one. The black slider controls blur where the mask is black. We set it to 100%. The white controls blur where the mask is white. We set it to 0%, then apply **Blur** to get the image at right.

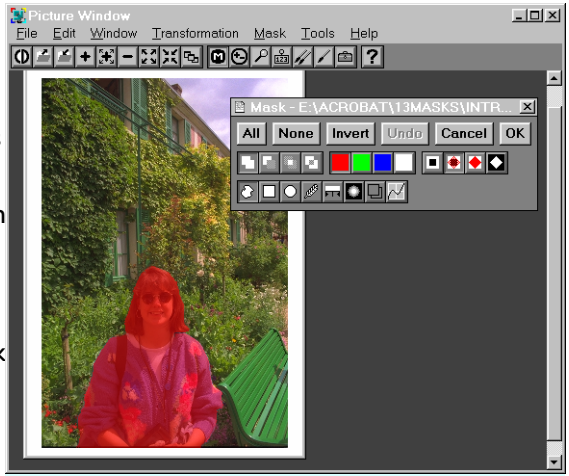
In this example, we applied the Blur transformation to blur the background. However, we could have used almost any of the other transformations, instead. We can use brightness to brighten one part of the image and darken another, or color balance, saturation, etc. Masks can also be used with the paint, clone, and miscellaneous tools to protect a part of the image. So, as you can see, once you have a mask, it's fairly easy to achieve all kinds of special effects. See **Making Masks** to see how you make a mask in the first place.

Blurred Background

## Making Masks

To make a mask, you use the mask dialog and create the mask as a layer 'over' the image. Normally, the mask is displayed as a transparent color overlay right over the image. The mask dialog gives you a palette of tools for creating this overlay. Typically, in the process of making the mask, you will use several different tools to build up the areas to be masked. You can switch between tools freely and you can use any of the tools to add new areas to the mask or erase areas already masked.

After you finish making the mask and click **OK** to end the dialog, the mask is 'slipped off' the image and displayed in a window of its own, as a black and white image. (Typically you would save the mask as a separate image file.) You then can edit the original image, by using the appropriate transformation with the mask.




To make a mask you work directly over the image, using various tools to build up the areas that will be masked.

After you have used the mask, you might find that you want to refine it further. There is no limit to the number of times you can refine it. To work on it some more:

1. Make sure the mask is open in its own image window.
2. Select the original image.
3. Click on **Mask** in the main menu and select the mask image. The mask is again overlaid over the image and the mask dialog displayed. Remember to save the mask image after you are done.

# Mask Dialog


The Mask dialog groups the mask controls together.

### All, None, Invert

**All:** Applies a mask over the entire image. **None:** Removes the entire mask. **Invert:** Inverts the mask.

### Area

Area is a readout that reports the percentage of the image masked and the number of image pixels covered by the mask. Feathered areas of the ask are reported as fractional pixels.

### Undo

**Undo b**acks out of the last operation.

## Tools

Use the tools to actually create areas of the mask. The tools can be used to add to area already masked, delete from the area, etc., depending on which **Combine** button is in effect.

 **Outline Tools:** You can mask areas of the image by outlining them. The five outline tools, in order, are free-form region, rectangle, oval, polygon, and spline.

 **Color Range Tool:** Builds a mask over all areas that fall within a specified color range.

 **Feather Tool:** Lets you blend the edge of the mask into the unmasked area or vice versa, to soften the boundary between masked and unmasked areas.

 **Blur Tool:** Provides another way to create a gradual boundary between masked and unmasked areas.

 **Mask Paint Tool:** The Mask Paint tool lets you mask broad areas of the image. Like the regular Paint tool, you can set the size and transparency of the brush. You can also use the tool selectively, so that it only paints over areas of similar color. This latter capability makes it a powerful tool for creating the outline near a mask boundary.

 **Combine Masks Tool:** You can combine masks. This lets you build a mask using a series of operations, save the results of each separately, and then combine the masks as needed into a single mask.

 **Brightness Tool:** Builds a mask over all areas based on their brightness.

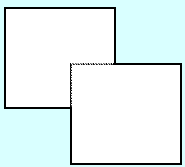
 **Flood-Fill Tool:** Locates edges and builds a mask within an area up to its edges.

 **Texture Tool:** Builds a mask over areas of similar texture.

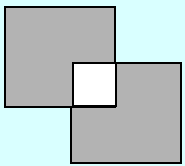
## Combining Operations

There are two ways to combine areas of the mask—while you are working on the mask you can build it up gradually, using different tools to modify the masked area. You can also create several different masks all based on the same image and then combine them in various ways. In the second case, each mask is stored as an image in its own right.

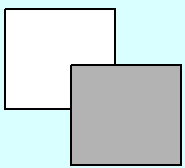
**Building up the mask using Combining Operations:** You can build up the mask using all of the above techniques. The buttons shown here let you combine the new area with the existing mask in one of four ways, shown below. (White represents masked areas, shading represents unmasked areas.)



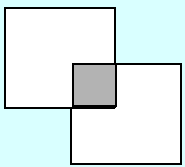
**Add:** adds the results to the existing mask.



**Overlap:** the new mask covers only the areas where the results overlap the existing mask.



**Subtract:** subtracts the results from the existing mask.

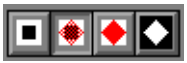


**Invert:** the same as add except that overlapping areas are removed from the mask.

**Combine Masks Tool:** You can combine masks. This lets you build a mask using a series of operations, save the results of each separately, and then combine the masks as needed into a single mask. For instance, you can use the Color Range tool for selecting broad areas and then refine the selection by adding to and subtracting from the main selection with the Outline and Paint tools.

## Display Options

These functions control how the mask is displayed. They do not affect the mask itself.



**Display Options:** These buttons let you choose different display options. they are, left to right, display image only, make mask semi-transparent, make mask opaque, and display mask only. Usually the best option is to display the mask as a semi-transparent overlay. However, you might make the mask opaque to check for pin-holes, or display the image only to identify a detail in it that's otherwise hard to see.

**Mask Color:** These buttons let you change the color of the mask. Red is the default. Choose the color which contrasts best with your image.

# Procedure for Building a Mask

To create a mask:

1. **Select an image window** for which you want to make a mask.
2. **Display the Mask menu.** Select **New** to create a new mask or simply click the mask icon.

   You can also refine an existing mask. To do so, open the mask image first. Display the **Mask** menu. Note that the menu also displays any open images that can serve as masks for the selected image. You can choose one of these if you want to refine an existing mask.

   For an image to be a mask candidate, it must be a black and white image and have the same width and height, in pixels, as the selected image. It doesn't matter how the image was created originally. It could have been created using the **Gradient** dialog, for instance.

3. **Build the mask** in one or more stages using the **outline, color range, brightness range, paint,** and **feather** tools in any order. Combine the effects of each tool by choosing the **add**, **subtract**, **overlap** or **invert** operator (see **Combining Operations**). This lets you build the mask gradually, combining different strategies to define exactly the area you desire.

   When you are done, you can use the mask immediately, without closing the Mask window. To do so, simply choose a transformation or tool and apply it. This technique is useful because you may discover the mask needs additional adjustments. You can make them and then reapply the transformation.

4. You can now use the mask with a transformation. You can continue adjusting the mask even while the transformation is active.

5. **Click OK** to end the mask session. The mask "slides off" the image and is displayed in its own image window as a black and white image. If you plan to use the mask in other sessions, use the **File: Save As** command to save the image in a file.

## Outline Tools

The Outline tools let you outline an area on the image and combine it with the mask. There are three outlining tools—**Rectangle**, **Oval**, and **Freehand** line. You can use them as primary tools for making a mask or to touch up gaps in a mask constructed with one of the other techniques.

**Saving and reusing outlines:** Outlines made with the two more complex tools—polygon and spline—may be saved and reused with other images. See **Saving and Loading Outlines**.

### The Outline Procedure

You use the Outline tools within the overall mask building procedure. To use the tools:

1. **Select a tool.** Click on one of the tool buttons.
2. **Select one of the Combining Operations.** Choose the **Add, Subtract, Overlap**, or **Invert**. operation for combining the outline mask with the existing mask.
3. **Draw the outline:**

   **To draw a rectangle,** click the  button. Position the cursor to a corner of the rectangle, hold down the left mouse button and drag the mouse to the diagonally opposite corner. An outline of the rectangle is displayed. You can reposition the entire rectangle and resize it by dragging its interior, sides, or corners. If you want the rectangle to be exactly square, hold down the shift key while dragging a corner.

   After you have shaped and positioned the rectangle as needed, click on the **Apply** button. The rectangle is combined with the mask, using the currently selected combine operation.

   **To draw a polygon,** click the  button. Position the cursor at one corner of the polygon and sweep it out diagonally to form a rectangle. You can now move each corner independently. You can also create additional corners by placing the cursor anywhere on or near an edge and shift-clicking the left mouse button. (To shift-click,

hold down the shift key and click the mouse button.) To delete a corner, place the cursor on the point, hold down the CTRL key and click the left mouse button.

After you have shaped and positioned the polygon, click on the **Apply** button. The polygon is combined with the mask according to the currently selected combine operation.

**Note:** You can adjust the height and width of the overall polygon by dragging the corner control points of the surrounding rectangle.

**To draw an oval,** click the  button. Start with the corner of an imaginary rectangle whose sides will just graze the edge, hold down the left mouse button and drag it to the diagonally opposite corner. An outline of the oval is displayed. Resize and reposition the oval as needed. If you want the oval to be an exact circle, hold down the shift key while dragging a control point.

After you have sized and positioned it, click on the **Apply** button. The oval is combined with the mask, according to the currently selected combine operation.

**To draw a freehand outline,** click the  button. Simply hold down the left mouse button and trace out the desired path. The area you have defined is added to the mask (using the current combine operation) as soon as you let go of the mouse button.

If you are trying to define a very irregularly shaped area, it is usually easier to make the first outline approximate, keeping it close to the desired boundary. Then you can refine the area by adding or removing small sections to it, tracing carefully along small sections of the boundary. If you make a mistake on an individual section, just click **Undo** to reverse the operation and try again.

**Using Splines:** Splines are smooth curves drawn through any number of points. By positioning the points along an outline, the curve can be made to 'hug' the boundary pretty closely, as shown in the mask of the boy's arm in the photo at right.


This mask (red) was created using the **spline** tool.

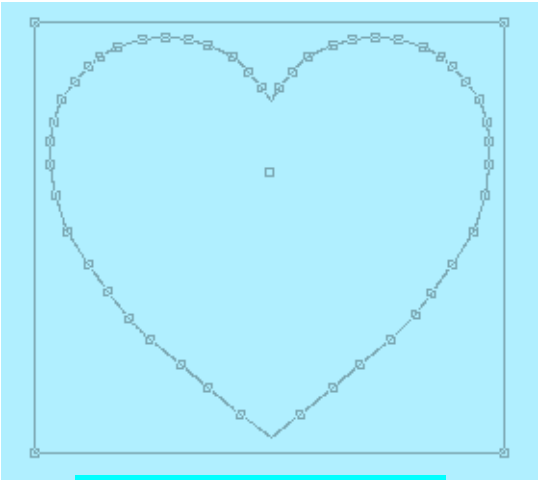
**To draw a region bounded by a spline,** click the  button and sweep out an oval. Initially, the oval has four control points.

Position the oval outline somewhere along the outline you are trying to follow. Then add additional control points by placing the cursor on or near the spline, holding down the shift key and clicking the left mouse button. After creating a control point, drag the point to a spot further along the outline you are tracing. Continue creating additional points and placing them along the outline, until the entire outline is traced out.

**Note:** You can adjust the height and width of the overall spline curve by dragging the corner control points of the surrounding rectangle.

When you have adjusted the spline to closely follow the shape of your outlined region, click the **Apply** button to add the region to your mask in accordance to the chosen combine operation.

**Feathering:** After all mask operations are complete (using outline as well as any other techniques), consider feathering the mask to blend it into the image. Then, when you are finished, click **OK**. A new black and white mask image is created. You can use it with most transformations and tools for enhancing the current image. You can also use the mask immediately, without exiting the mask dialog. Simply use the desired transformation while the mask is still overlaid on the image. You can continue making adjustments on the mask, even while the transformation is active.



One of the available outlines.

## Saving and Loading Outlines

Outlines made with the polygon and spline tools may be saved and later reused with other images. Picture Window also has a library of a number of ready-to-use outlines, like the heart-shaped spline curve shown at the left. The outlines are located in the **shapes** subdirectory under the main Picture Window directory.

To save a spline or a polygon:

**1.** Create the outline. Click the **Save** button at the bottom of the dialog box. The **File Save** dialog is displayed.

**2.** Navigate to the desired directory and assign the outline a file name. Click **OK**. The outline is saved.

**Note:** You must save the outline before you **Apply** to the mask.

To load an existing outline:

1. **Select the type of outline to load.** Click the **Spline**  **or Polygon**  button to select the type of outline you want to load.
2. **Open the outline.** Click the **Load** button at the bottom of the dialog. The **File Open** dialog is displayed. Navigate to the desired directory and select the file you wish to load. The outline is displayed in the image window.
3. **Adjust the outline.** Drag the corners of the enclosing rectangle to adjust the height and width. You can also move the entire outline by dragging it by its center. Finally, you can move the points of the polygon or spline and create new points.
4. **Apply the outline.** Click **Apply** to integrate the outline with the mask.

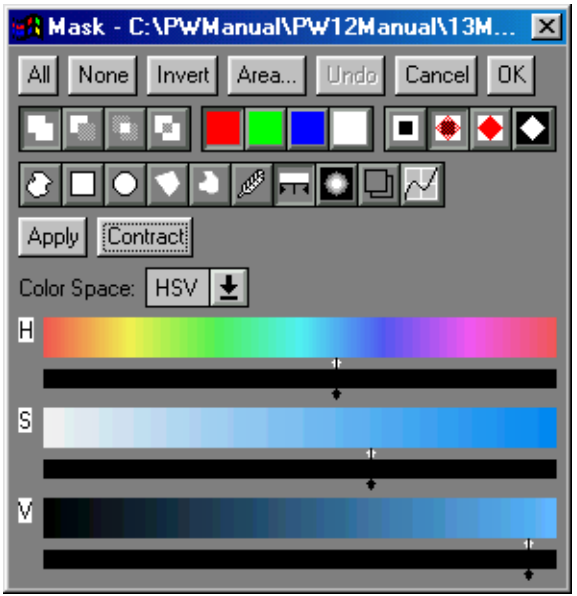
## Color Range Tool

The Color Range tool lets you select the areas of your image that fall within a particular range of colors. It lets you build an accurate mask quickly in situations where the areas you want to mask share a fairly narrow spread of values in at least one color channel. For instance, in the example below, we created a mask for the sky using the Color Range tool. We used the **Contract** feature of the tool to let Picture Window determine the appropriate color range automatically. The result is a composite image with a new sky that adds depth and drama to the image.

See the next page for the Color Range procedure.


## The Color Range Procedure

The Color Range dialog has three slider controls for selecting ranges to be masked. You can either adjust the sliders manually or let Picture Window adjust them automatically as you sweep the mouse over the area you wish to include.




To adjust the ranges automatically:

1. **Click on the Color Range button.** The color range controls are displayed. The controls have sliders for each color channel.
2. **Select a color from the image.** Move the mouse cursor to a point in the image that you wish to include in the mask and click the left mouse button. Notice that small black marks are displayed under each slider. These marks show the location of the selected color on each of the sliders.
3. **Click Contract.** Click the **Contract** button to initialize the ranges to just the selected color.
4. **Sweep the Mouse.** Move the mouse to the area you wish to include in the mask. Press down the shift key and depress the left mouse button while moving the mouse over areas you wish to include in the mask. You can choose areas using as many separate passes as necessary. Make sure that you strictly avoid sweeping areas that should not be included.

   Picture Window expands the sliders to include colors of all areas you sweep.

5. **Combine the new area with the existing mask.** Make sure the desired **Combine** button is depressed. (see **Combining Operations**) Click the **Apply** button to combine this mask.
6. If the mask left out an area you want covered, sweep on a sample of the left out area with the mouse, holding down the shift key and left mouse button. Click **Apply** to include the new area.

After you have made your mask, you can combine the two images using the Composite transformation. See **Combining Images** for details.

## Color Range Scales

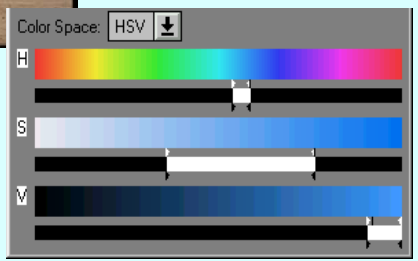
The range scales display the hue, saturation, and brightness (or HSL or RGB) of a selected point in the image. The brightness scale shows all the possible brightness values for the hue and saturation of the selected point. Similarly, the range of hues is at the selected saturation and brightness and the range of saturations is at the brightness and hue of the selected point.

Note that the hue scale "wraps around" so that the last hue at the right is followed by the first hue at the left of the scale.

**Color space options:** You can work in the **HSV, HSL**, or **RGB** color space. Usually the HSV color space is best, though you might choose HSL or RGB for special purposes. Use the **Color Space** control to change the selection.

Color range controls

The controls below are set to select all hue, saturation, and brightness values found in the sky of the sample image.





**Feathering:** Each control has two sets of sliders. The white sliders control the full-intensity portion of the mask. The black sliders control where the mask begins. The area in between transitions gradually from full mask to none.

## Setting the range manually

Though you will usually want to use the automatic color range feature described in the previous section, you can set the controls manually.

The easiest way to find where a area in the image falls on the three sliders is to click on a few representative areas of the image. The scales are redisplayed to show the color values of the selected point. Small black cursors show the exact position of the selected color on the three scales. Adjust the white sliders to include the areas indicated by the cursors.

You can also feather the mask by opening up the black sliders wider than the white sliders. The colors which fall in the margin between the white and black sliders will be masked proportionally.

After you have set he sliders, combine the new area with the existing mask. Make sure the desired **Combine** button is depressed. (see **Combining Operations**) Click the **Apply** button to combine this mask.

If the mask left out an area you want covered, click on a sample of the left out area and adjust the sliders to bracket it. Click **Undo** and then click **Apply**.

## Mask Paint Tool

The Mask Paint tool lets you add or remove arbitrary areas of the mask using a brush. You can use it to touch up gaps in a mask constructed with one of the other techniques or as a primary tool for making a mask. A **Feather Tool** feature makes it easier to paint the boundary of a mask.

### The Paint Procedure

You use the Paint dialog within the overall mask building procedure. To use the **Paint** tool:

1. **Click on the Paint button**. The paint controls are displayed.

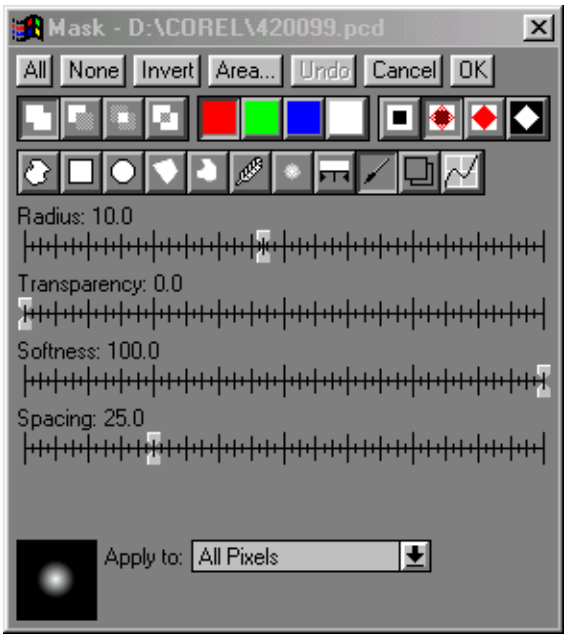
   **Radius:** the size of the circle painted, in pixels.

   **Transparency:** controls blending between the new and existing pixels. At 0% none of the old pixels are preserved; At 100% nothing is painted.

   **Softness:** controls the "fuzziness" of the edges of the paint tool.

   **Spacing:** Sets the maximum spacing between applications of the brush as the cursor is dragged. This smooths the brush stroke, making it independent of how quickly the brush is swept.

   **Apply to:** Allows you to apply the paint brush to all pixels or to selected pixels only. (See **Selective Painting**.)



2. **Enlarge the image, if necessary.** If you are doing fine work, enlarge the area you will be painting, perhaps to 1:1 or larger.
3. **Set the radius, transparency, and softness as needed.** If you want full coverage, set transparency to 0%. If you are working near a border separating features in the image, set softness to a low value to get a hard edge. You can feather the edge in a separate operation later.
4. **Select a combine operation.** You can choose **Add, Subtract, Overlap**, or **Invert**.
5. **Paint** by positioning the cursor over the image and holding down the left mouse button. It is often easiest to build up the mask in a series of short operations. Remember that you can subtract from the mask as well as add to it.

### Selective Painting

The hardest part of making a mask is following a complicated boundary of an object. One technique is to use the selective painting feature. By choosing the **Pixels in Color Range** or **Similar Pixels** option of the **Apply to** control you can use the paint tool to automatically mask over selected pixels while leaving others unmasked. Once the boundary is established, the rest of the mask is easy to create, since little precision is needed.

This outline was painted using the *Pixels in Color Range* setting.

Here is what each of the **Apply to** options do:

**All Pixels:** This is the default option and causes the paint tool to brush normally.

**Pixels in Color Range:** This option restricts painting only to those areas that fall within the currently selected color range as specified by the **Color Range Tool.** To adjust the color range settings, switch to the Color Range tool. After you have made the adjustment, select the Paint tool and trace the boundary.

**Similar Pixels:** This option restricts painting to colors that are similar to those in cursor location at the start of each

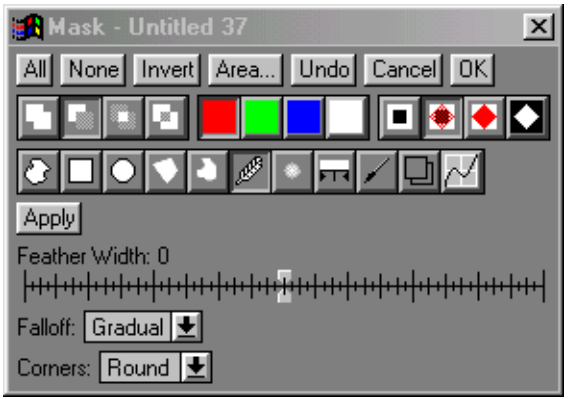
brush stroke. For the remainder of the brush stroke, only pixels whose color is close to the base color are masked when the brush is applied. Use the **Threshold** slider to adjust how closely other pixels must match the base color. The smaller the threshold value, the more closely pixels must match the base color for the brush to be applied.

After all mask operations are complete (using paint as well as other techniques), consider feathering the mask to blend it into the image. Then, when you are finished, click **OK**. A new black and white mask image is created. You can use it in most transformations in enhancing the current image or any other image having the same exact size.

To back out of all operations made in the current dialog session, click on **Cancel**.

You can also use the mask immediately, without exiting the mask dialog. Simply use the desired transformation while the mask is still overlaid on the image. You can continue making adjustments on the mask, even while the transformation is active.

## Feather Tool




The Feather tool lets you blend the edge of the mask with its surroundings. You can control the width of the feathered edge, whether the mask is feathered outward or inward, and the style of the corners.

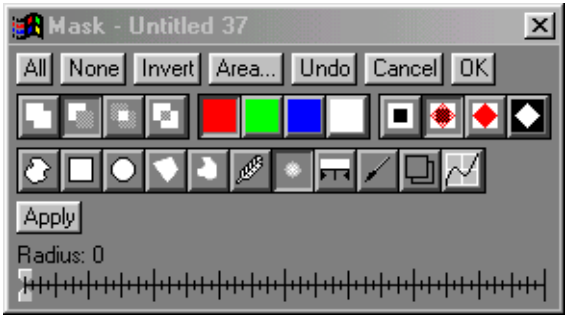
### The Feather Procedure

Usually, you use the Feather tool after you have built the entire mask, just before clicking the **OK** button. You can also apply it to previously-finished masks, if you find their edges are too obvious.

To use the Feather tool:

1. **Click on the Feather button.**  The feather dialog is displayed.
2. **Set the feather width.** The width and direction of feathering you choose generally depends on the image and the transformations you will use. For instance, if you are using the mask for dodging and burning, a large feathering width usually works best. On the other hand, if the mask's edge is near an edge in the image, small widths are usually better. Generally, the direction of feathering should be toward the side that can hide the mask boundary better.
3. **Make fall-off and corner selections. Fall-off** controls the edge of the mask. **Linear** or **Cosine** gives the mask a soft edge. **Step** gives the mask a hard. edge. **Corners** can be round or square. Usually **Cosine** and **Round** produce the most natural blending.
4. **Apply the feathering.** Click on the **Apply** button to feather the mask.

## Blur Tool




Another way to create a gradual boundary between the masked and unmasked areas is to blur the mask. To blur the mask:

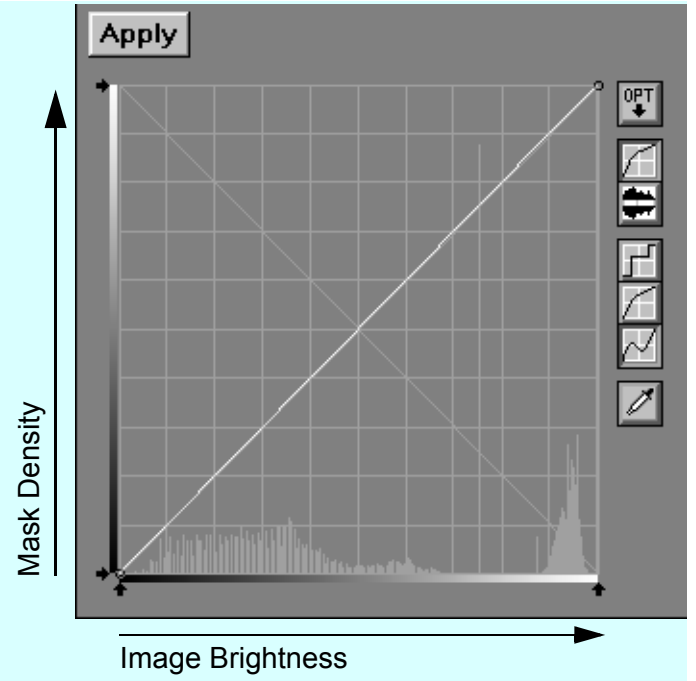
1. **Click on the Blur button**.  The blur dialog is displayed.
2. **Set the blur radius.** The blur radius controls how blurry the mask will be. The greater the radius the blurrier the result.
3. **Apply the blur.** Click on the **Apply** button to blur the mask.

## Brightness Tool

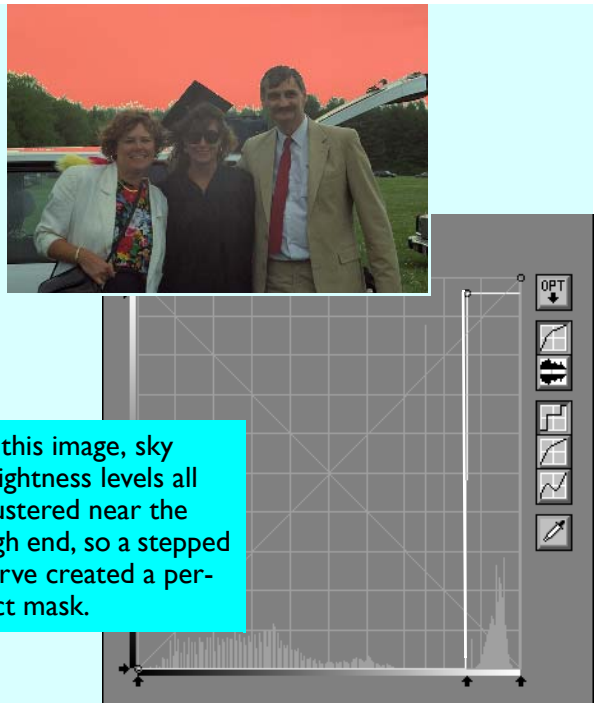
The brightness tool lets you select areas of an image according to their brightness. It is a very fast and effective way of building a mask is you want to mask areas that have a narrow range of brightnesses. This may be true of an area of sky, water, grass, etc.

It's also useful if you want to a apply a transformation primarily to shadows, midtones, or highlights of an image.

The Brightness tool works by letting you assign mask density according to image brightness level. You do this by manipulating the brightness curve. The idea is that for each brightness level, displayed along the horizontal axis, you can set a mask density by moving the curve up to increase density or down to decrease it. (If you don't adjust the curve at all, it will produce a mask whose density is directly proportional to image brightness.)




The Brightness Tool includes a probe, so you can explore the image's brightness characteristics. You can also shape the curve to be smooth, stepped, or made up of straight line segments. Finally, you can work either with the brightness curve itself or with the equivalent histogram. (See **Brightness Curve Dialog**.)




In this image, sky brightness levels all clustered near the high end, so a stepped curve created a perfect mask.

## Brightness Tool Procedure

To use the Brightness tool:

**1. Click on the Brightness button.** The brightness tool dialog is displayed.

**2. Click on the Probe button.** Sweep it over the areas of the image you want to mask. Observe where those areas fall on the brightness curve. Note the darkest and lightest points in the curve.

**3. Set control points at the points you noted in step 2.** To set a control point, position the cursor at the desired point, hold down the shift key and click the left mouse button.

**4. Move the control points to shape the curve.** Move the curve up where you want high mask density and move it down where you want low mask density.

> **Hint:** Use the Stair-step, Broken Line or Smooth buttons for Controlling How the Curve is Drawn.

5. **Select a combine operation.** You can choose **Add, Subtract, Overlap**, or **Invert**.
6. **Click Apply to create the mask.**

After all mask operations are complete click **OK**. A new black and white mask image is created. To back out of all operations performed in the current dialog session, click on **Cancel**.

## Flood-Fill Tool

The flood fill tool (sometimes called the magic wand) lets you select connected regions of an image of a similar color.

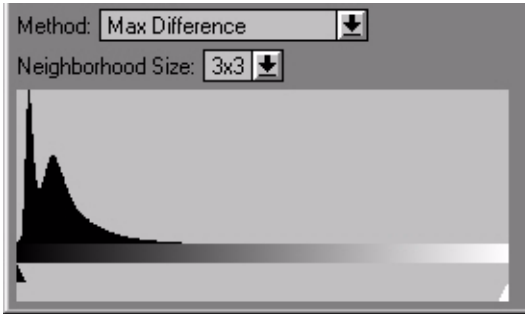
For example, the flood fill tool was used to establish most of the boundaries of the mask at the right. For instance, clicking the tool near the collar of the shirt filled the skin area up to the collar. After the borders were established other tools were used to fill in dropped-out areas.

To use the flood fill tool, just click on the feature you would like to mask. All pixels surrounding the one you click on that are similar in color will automatically be combined with the mask according to the current combine mode. Only pixels that are directly connected to the one you click on will be selected however. The selected region will stop growing once it reaches dissimilar pixels.

### Threshold

The threshold controls the selectivity of the tool. A threshold of 0.0 requires an exact match; larger thresholds loosen the matching criterion.

## Texture Tool




This tool lets you select those parts of an image with a given texture, where texture is defined as the amount of variation among pixels in a given area. Variation can be measured in several different ways. This tool can be used to create a mask that isolates edges or other areas of large local variation in an image. Such masks are often used in conjunction with blurring or sharpening to restrict them to smooth or rough areas.

### Method

The method setting lets you choose among three different ways of computing texture. The Max Difference setting computes texture as the largest difference between the central pixel and all the other pixels in its neighborhood. The Average Difference setting computes texture as the largest average difference between the central pixel and all the other pixels in its neighborhood. The Difference from Average setting computes texture as the difference between the central pixel and average of all the other pixels in its neighborhood. These three methods generally produce similar results with Max Difference producing the most pronounced effects and Difference from the Average producing the most subtle effect.

### Neighborhood Size

The neighborhood size may be selected as 3x3, 5x5, or 7x7. This selects how large an area around each pixel is considered to be its neighborhood. Smaller values are good at picking up fine detail, while larger values work better for blurrier images.

### Histogram Display with Black and White Sliders

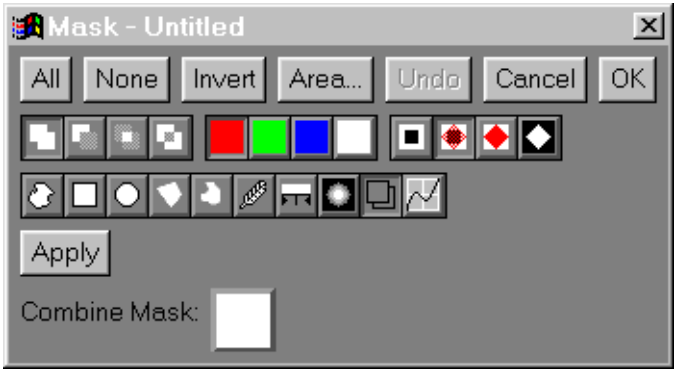
The histogram display shows you how common different texture values are over the entire image. The large spike near the left indicates how many pixels are in relatively smooth areas. Increasingly greater texture is generally less common except perhaps in very noisy images. By dragging the black marker to the right, you can exclude smooth-textured areas from the selection. Moving the white slider sets a progressive cutoff for higher textured pixels.

## Combine Masks Tool

Sometimes the best way to create a complex mask is to build it as two (or more) masks and then combine them into a single mask. The Combine Masks tool lets you combine another mask image with the present one using any one of the four combination operations. Building a mask this way can have a number of advantages. It gives you more security against errors, since each portion of the mask is independent and can be saved separately. It also allows you to apply transformations through different mask combinations without going through the work of masking the same areas multiple times. Finally, it gives you more flexibility in combining areas. For example, you can build a mask of highlights and another of the foreground areas and then subtract the highlights mask from foreground mask to create one that covers the foreground except for highlights.

### The Combine Masks Procedure

You use the Combine Masks tool within the overall mask building procedure. To use the tool:




1. **Click on the Combine Masks operation**. **Apply** and **Combine Mask buttons** are displayed.
2. **Click on the mask button.** A popup menu showing the available masks is displayed. Choose the desired mask. A thumbnail of the mask is displayed in the mask button. (The menu only shows open images which qualify as masks. If the desired mask is not open, open it before displaying the menu.)
3. **Choose a combining operation.** You can select **Add, Subtract, Overlap** or **Invert**.
4. **Click Apply** to integrate the second mask with the current mask. The results of the operation are displayed in the mask overlay in the image. The second mask itself remains unchanged. Click **Undo** to reverse this operation.

After all mask operations are complete click **OK**. A new black and white mask image is created. To back out of all operations performed in the current dialog session, click on **Cancel**.

## Completing the Mask

After all mask operations are complete click **OK**. A new black and white mask image is created. You can use it in most transformations, to mask the current image or any other image having the same exact size.

> **Note:** To back out of all operations performed in the current dialog session, click on **Cancel**.

To use the mask in later Picture Window sessions, save the mask as an image file.

**Using the mask immediately:** You can also use the mask immediately, without exiting the mask dialog. Simply use the desired transformation while the mask is still overlaid on the image. You can continue making adjustments on the mask, even while the transformation is active.

**Editing the mask:** You can edit the mask further at any time. To do so, make sure that both the mask and original image are open in Picture Window. Select the original image and click the **Mask** menu option. Select the mask image from the pop-up menu. The mask is reapplied to the original image. You can now add or delete areas from the mask.

# 11. Combining Images

The Composite transformation lets you combine images or blend a solid color into an image. You can use it for all kinds of creative effects ranging from adding an exciting sky to an image to make it more dramatic, to creating elaborate collages consisting of many images.



### Image Calculations

An alternate way to look at the Composite transformation is an image calculator. It takes two images as input, performs a selected operation on the images on a pixel by pixel basis, producing a third image as a result. To use Composite for image calculations, first register the images, if necessary. (See **Combining Astronomical Images - An example**) Then select the desired operation and combine the images. Addition, subtraction, and multiplication operations with various options for handling sign, scaling, and overflow are supported. See Help for more information on the underlying algorithms.

# Overlaying with a Solid Color

Original

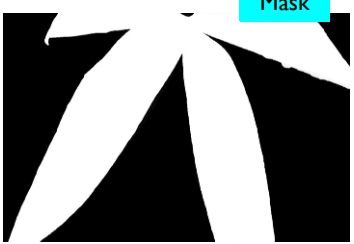
The **Composite** transformation can be used to overlay an image with a color chosen using the color picker. As with other transformations, you can apply the it to the entire image or just to a masked area. You can also blend the color with the image or use it to completely cover a part of the image.

Background blended with a solid color

In the original image (**samples\leaf.jpg** located in your Application Data Folder), the foreground leaf is not well differentiated from the leaves behind it, giving the viewer no clue of where to look. We can focus attention on the main foreground leaf by darkening background leaves.

Of course, to darken just the background leaves requires a mask. The mask (**samples\leafmask.jpg**) was prepared using the **Mask Dialog**. Since the foreground leaf is actually brightest, particularly along its edges, much of it could be masked by using the **Brightness Tool**. However, then a combination of the other tools was needed to complete the mask, shown at right.

Mask



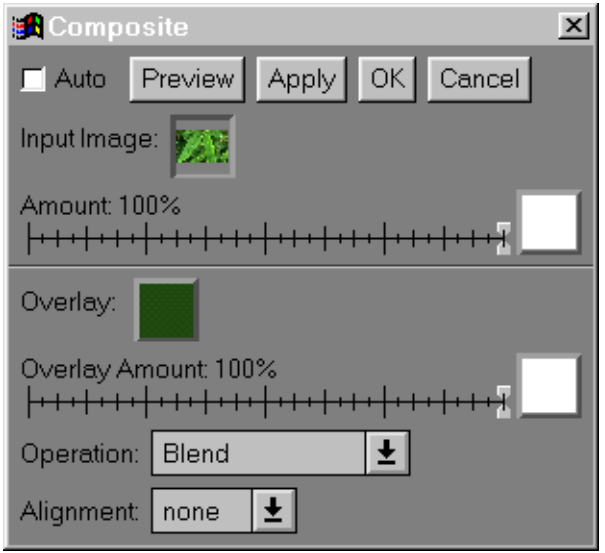
We then used the **Composite Dialog (Solid Color)** to darken the background leaves. We set operation to **Blend** and overlay control to **Solid Color**.

The color chosen was the complement (opposite on the color wheel) of a dark green taken from a background leaf. Choosing a color from the image itself helps the blended color look more natural.

When a mask is selected, the **Amount** control displays a white and a black slider. Each controls the amount of blending in its respective portion of the image—that is the black slider controls the amount of blending in portions of the image corresponding to black mask areas while the white slider controls blending for white mask areas.

In this case, the black mask areas correspond to the background. We set the black slider to 35% to blend 35% of the selected solid color with the background. White mask areas correspond to the leaf. We set the white slider to 0% to leave it untouched.

## Composite Dialog (Solid Color)




The Composite dialog is divided into two sections. The top section applies to the base image; the bottom part controls the overlay. The overlay can either be another image (See **Composite Dialog (Two Images)**) or a solid color.

To overlay an image with a solid color:

1. **Select an image.** Click on the window of the image you want to use.
2. **Display the Composite dialog.** Select **Composite** from the **Transformation** menu.
3. **Select a color.** Click on the **Overlay** button. Select **Constant Color**. The color picker is displayed. Move the cursor in the color cube to the hue and saturation you want to select; move the brightness slider to select the brightness of the color.
4. **Select a base mask.** If you are using a mask, click on the top mask button (at the right end of the **Amount** control) and select a mask from the menu. (The mask must already be open in an image window. If it is not, open it before performing this step.) This mask controls which areas of the base image will be overlaid. If you are not using a mask, (i.e. you want to overlay the entire base image) skip this step.
5. **Set the base Amount control.** If you are using a mask, set the white slider to control blending of the color in areas corresponding to white on the mask. Similarly, set the black slider for areas corresponding to black in the mask. Set the **Amount** to 0% for no effect up to a 100% for total replacement with the selected solid color.

6. **Set the Operation.** Here are the options:

**Blend:** Blends the overlay image with the base image according to the **Amount** setting. At 0% the result is the base image; at 50% the result is the average of the base and overlay image; at 100% the result is the overlay image.

**Lighten:** Uses whichever image is lighter (overlay or base image) and blends that according to the **Amount** control setting.

**Darken:** Like lighten, except that the darker of two images is blended.

**Filter:** Uses the overlay image as a filter. Essentially, filter simulates sandwiching two slides— i.e. the darker the overlay image, the greater is it's filtering effect.

**Subtractive Filter:** Uses the negative of the overlay image as a filter against a negative of the base image and then flips the result. Essentially this simulates printing a sandwich of negatives of the two images.

**Soft Light, Hard Light:** Two additional techniques that combine filter and subtractive filter in different ways.

**Negative:** Uses the overlay image to selectively invert the base image. The base image is inverted in areas where the overlay is dark and left uninvested in areas where the overlay is light. The effect is somewhat reminiscent of solarization; however it is controlled by the overlay image rather than the brightness of the original image. This is a special effect whose results are hard to predict but may be interesting.

**Add:** Adds the base and overlay images. Out of scale values are truncated.

**Subtract:** Subtracts the overlay image from the base image. Out of scale values are truncated.

**Absolute Difference:** Same as subtract except that the difference is always converted to a positive value. This operation is useful to compare two images. Areas where the images are identical will show as black. Areas of difference will be brighter, with the degree of brightness being proportional to the difference.

**Register:** This operation produces an output image that has the same content as the overlay image but is aligned to the base image. The output image is resamples and is exactly the same pixel size as the base image. Areas in the overlay image that lie beyond the base image are cropped; areas where the input image does not cover the base image are black. Registered images can be combined using transformations such as the **HDR/Stack Images** and **Combine Channels** transformations which do not offer an alignment function. Register may also be used to resample masks so they can be used with different size images.

7. **Preview the results.** Click **OK** when satisfied to create a new composite image and dismiss the dialog.

# Combining Images

The Composite transformation lets you overlay one image over another.

The first image is called the **base** image. The final photo has the same size and resolution as the base image.

The second image is called the **overlay** image. The overlay image can be positioned anywhere on the base image. It can be rotated, resized, and even warped. If any part of the overlay image extends beyond an edge of the base, it is cropped.

Each image can also have a mask. The masks determine which portions of each image are used. However, both masks are not always needed. Frequently, a composite image can be created by using a mask for only one of the images or sometimes using no mask at all.


**Photographic Considerations**

**Composite Image Procedure**

**Composite Dialog (Two Images)**

**Combining Images—Base Mask**

**Combining Images—Two Masks**

**Combining Astronomical Images - An example**

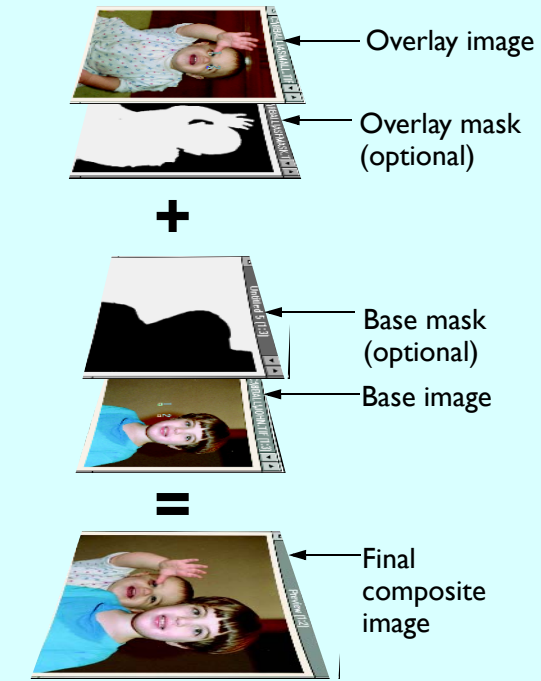




Diagram shows how images are combined. Optional masks control which areas of each image will appear in the final composite.

## Photographic Considerations

Just overlaying one image over another does not necessarily make a convincing composite. The eye is quite critical and is able to pick out inconsistencies in lighting quality, shadow angles, scale, perspective and color balance. The more consistent you make the two images, the more convincing the composite will be.

Try color balancing the two images in the same way. For instance, if you are adding a red sunset to a daytime scene, use the **Color Balance Transformation** to 'warm up' the scene before combining the images.

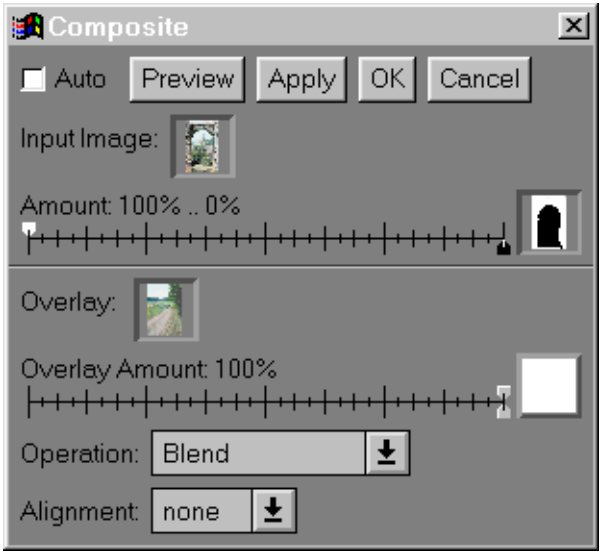
Similarly, adjust brightness and contrast so the images match. Use warp to make small adjustments in perspective if necessary. Finally, while you are previewing the overlay, experiment with small changes in the image size to make sure the relative size of the overlay, is consistent with its presumed distance from the camera in the composite image.

## Composite Image Procedure

To create a composite image:

1. **Choose two images** and decide how you would like to combine them. The base image defines the size of the composite result.
2. **Make the base mask,** using the **Mask Transformation**. The base mask protects areas of the base image from the overlay. These areas appear to be 'in front' in the final image. (The base mask is not always needed. It can be omitted if no part of the base image is to appear in "front" of the overlay image.)
3. **Make the overlay mask.** The overlay mask 'knocks out' areas of the overlay image, making them transparent. Usually these are background areas. (The mask is not needed if the entire overlay image area is to be used.)
4. **Use the Composite dialog** to combine the images. See **Composite Dialog (Two Images)**.

# Composite Dialog (Two Images)




The Composite dialog is divided into two sections. The top section applies to the base image; the bottom part controls the overlay. The overlay can either be a solid color (See **Composite Dialog (Solid Color)**) or another image.

To overlay one image with another one:

1. **Select the base image.** Click on the window of the image you want to use as the base. The final image will be the same size as the base image.
2. **Display the Composite dialog.** Select **Composite** from the **Transformation** menu.
3. **Select a base mask.** The base mask determines which area of the base image will be protected from the overlay and is optional. If you are not using a base mask, skip this step.

   If you are using a base mask, click on the top mask button (at the right end of the Amount control) and select a mask from the menu. (The mask must already be open in an image window. If it is not, open it before performing this step.)

4. **Set the base Amount control.** The control determines how much of the overlay image is blended into the base image. If you are using a base mask, set the white slider to control blending in areas corresponding to white in the mask. Similarly, set the black slider for areas corresponding to black in the mask.

5. **Select overlay image.** Make sure the overlay image is open in Picture Window. Click on the **Overlay** button and select it from the menu showing all open images.
6. **Select an overlay mask.** The overlay mask determines which area of the overlay image will be transparent, letting the underlying base image show through. If you are not using an overlay mask, skip this step. Otherwise, click on the mask button at the end of the **Overlay Amount** control and select a mask from the menu.
7. **Set the overlay Amount control.** If you are using and overlay mask, set the white slider to control blending of the color in areas corresponding to white on the mask. Similarly, set the black slider for areas corresponding to black in the mask.
8. **Choose one of the Alignment Options.**
9. **Choose an Operation.** The default, **Blend**, is used most often.
10. **Preview the results.** Click **OK** or **Apply** when satisfied to create a new composite image and dismiss the dialog.

### Operation

The **Operation** control how the two images are combined. It works together with the **Amount** control.

**Blend:** Blends the overlay image with the base image according to the **Amount** setting. At 0% the result is the base image; at 50% the result is the average of the base and overlay image; at 100% the result is the overlay image. Blend is similar to a double exposure.

**Lighten:** Uses whichever image is lighter (overlay or base image) and blends that according to the **Amount** control setting.

**Darken:** Like lighten, except that the darker of two images is blended.

**Filter:** Applies the overlay image as an additive filter to the base image (similar to the way the Filter transformation works). The effect is similar to sandwiching two transparencies.

**Subtractive Filter:** Applies the overlay image to the base image as a subtractive filter. This is opposite to the normal (additive) filtering. Light areas of the filter are opaque while dark areas transparent.

**Negative:** Uses the overlay image to selectively invert the base image. The base image is inverted in areas where the overlay is light and left uninverted in areas where the overlay is dark. The effect is somewhat reminiscent of solarization; however it is controlled by the overlay image rather than the brightness of the original image. This is a special effect whose results are hard to predict but may be interesting.

**Add**: The overlay image is added to the base image. This is the best operation to use for noise reduction.

**Subtract:** The overlay image is subtracted from the base image.

Add and Subtract can generate out-of-range pixel values. Values that are larger than the maximum are truncated to the maximum. Values less than zero are clamped at zero. The maximum is either 255 or 65535, depending on

the base image. It is 255 for 8-bit B+W and 24-bit color images. It is 65,535 for 16-bit B+W and 48-bit color images.

**Absolute Difference:** The absolute value of base image minus the overlay image. Thus negative differences (i.e. where the overlay image is brighter than the base image) are converted to positive values instead of being truncated to zero, or black.

**Register:** As in **Blend**, the overlay and the base images are blended according to the settings of the **Amount** and **Overlay Amount** sliders. However the areas of the base image which are not covered by the overlay image are converted to black in the result image. To produce an output image that it composed of the overlay image only, Set the overlay slider to 100%. See **Combining Astronomical Images - An example** for how Register may be used.

### Alignment Options

You have a number of options for aligning the two images. If you choose no alignment points, the images are simply superimposed on each other, aligned by their lower left corner. As you add alignment points, you increase the amount of control that you have. See **Aligning the Overlay** for an example on using the alignment points.

Here is the control each of the alignment options gives you:

**None:** The two images are simply superimposed over each other, aligned by their lower left corner.

**1-point alignment (shift):** The two images are superimposed over each other, aligned by the single alignment point. (Note that an alignment point is shown in each image. You can drag the point using your mouse to position it anywhere within the image.)

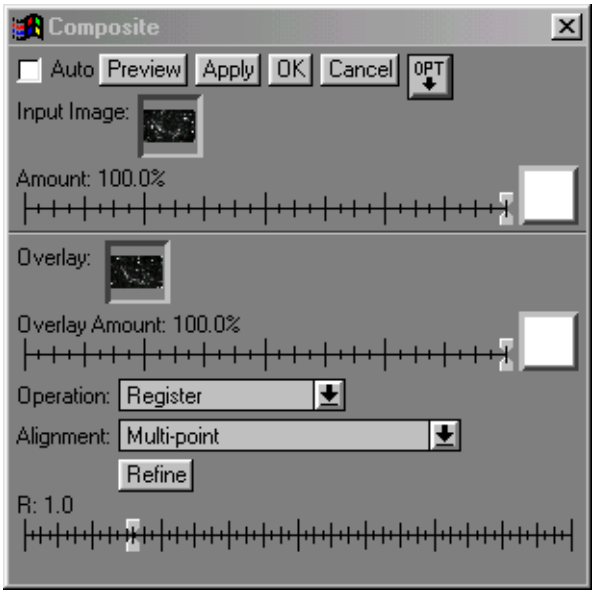
**2-point alignment (shift and rotate):** The two images are superimposed over each other, aligned by control point one. The overlay image is also rotated so that the direction from control point 1 to control point 2 is the same in both images.

**2-point alignment (shift, rotate and scale):** The overlay image is shifted, rotated, and scaled so control points 1 and 2 in the two images line up. Two-point alignment is probably best in most cases, since it controls scaling and rotation and guarantees that the overlay will not be distorted.

**3-point alignment (shift, rotate, scale, and shear):** The overlay image is shifted, rotated, scaled, and sheared so all three corresponding control points line up.

**4-point alignment (perspective warp):** The overlay image is shifted, rotated, scaled, and warped so all four corresponding control points line up.

**Multi-point Alignment:** (PW Pro only.) The overlay image is warped using 3-point alignment based on the first three alignment point pairs. Additional points (up to a maximum of 62) can be added. These points cause local corrections to be made. See **Combining Astronomical Images - An example**.



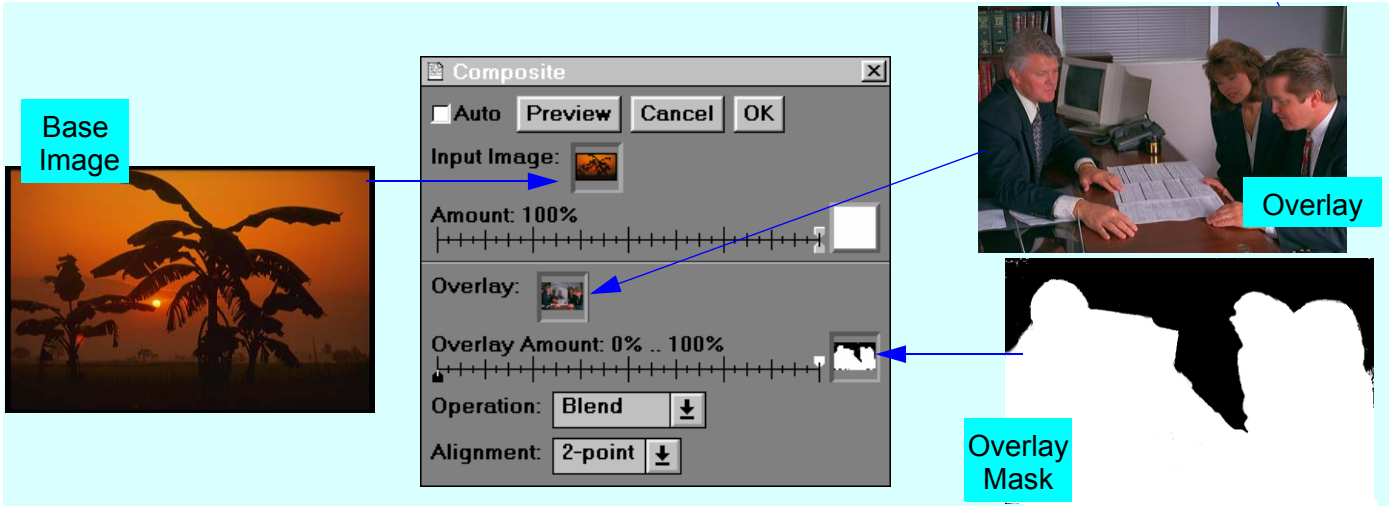

To add or remove points:

**Adding alignment points:** To add a new pair of alignment points, select the base image window. Position the mouse to the location of the new point and shift-click the left button. An alignment point is created at the location of the cursor, and a corresponding alignment point is also created in the overlay image based on the 3-point alignment currently in effect.

**Removing alignment points:** To delete a pair of points, select the base image window. Position the mouse to the point you wish to delete and ctrl-click the left button. The point is removed. Note that any points with higher numbers are renumbered.

**Note:** The add and remove point functions work in the base image only.

**Correction algorithm:** In multi-point alignment, additional points (after the first three) cause local corrections to be made in the overlay image. The method used to distribute the corrections can be chosen from the options menu. Choices are Shepard, Hardy, Thin Plate, and Gaussian. Hardy, which usually produces the smoothest result. is the default.



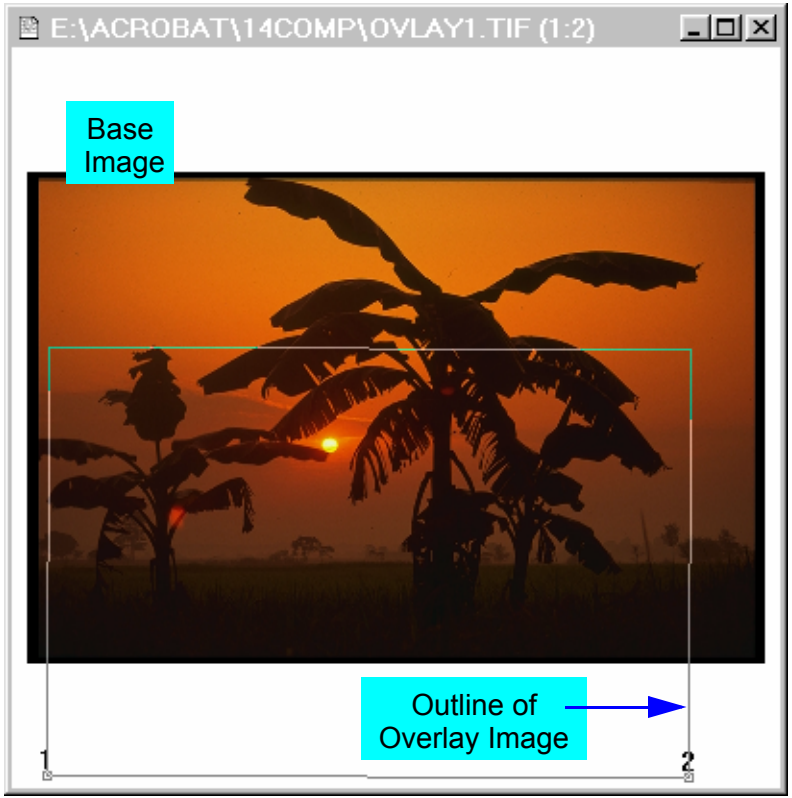

## Combining Images—Overlay Mask

An overlay mask defines areas in the overlay image that will be transparent, allowing the base image to be visible under it.

In this example, we wanted to use the overlay image showing a business meeting (**samples/meeting.jpg** located in your Application Data Folder) as the foreground and the base image of a tropical island (**samples\tropical.jpg**) as the background. Thus we created an overlay mask (**samples/meetmask.jpg**) to 'knock out' the original background of office partitions, so that the tropical sunset would show through. We then used the Composite dialog with the settings shown.

## Aligning the Overlay

There are a number of **Alignment Options**. We chose 2-point (shift, rotate, and scale) for this image. This option lets you position 2 points (labelled 1 and 2) anywhere in the base window. Note that as you move the points in the base window, the projected outline of the image is redrawn to show you the effect of the change.

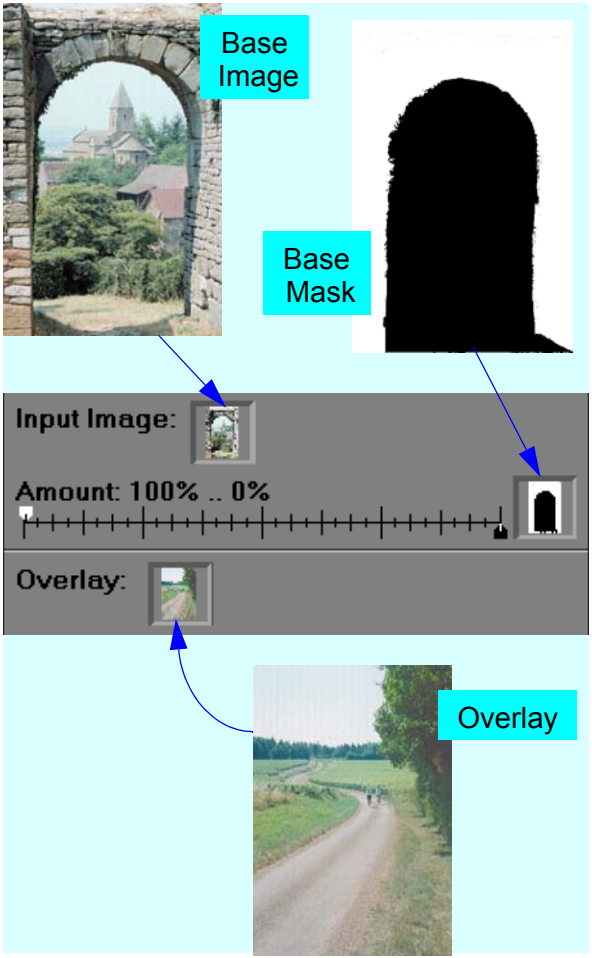



To align the overlay, simply move the points to the desired location. (Enlarge the window if necessary.) Each point moves independently, allowing you to rotate and size the overlay.

For instance, to rotate the overlay, move one point up or down, around the other. To change the size of the overlay, move the points closer together or farther apart.

By default the points are placed at the two lower corners of the overlay. However, you can place them anywhere in the overlay you want. To reposition a point, drag the point you want to reposition to the desired location in the overlay image. To reposition all the alignment points at once, hold down the shift key and drag the mouse cursor.

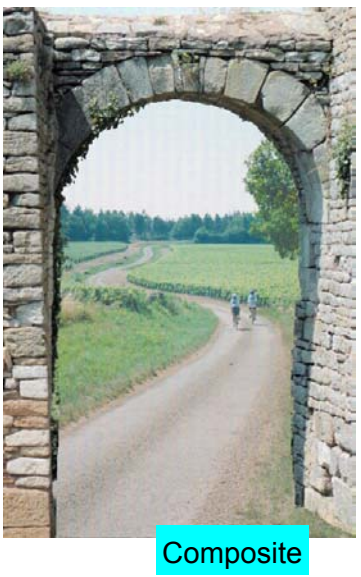
## Combining Images—Base Mask




The base mask protects areas of the base image that should not be covered by the overlay image. In this example, the arch (**samples/arch.jpg** located in your Application Data Folder) serves as a frame. We want our mask (**samples/archmask.jpg**) to protect the arch itself, while allowing the overlay image (**samples/road.jpg**) to show through inside the arch opening.

The figure at left shows the base image and mask, and the overlay image used. and how they were selected into the Composite dialog. Note too, how the black and white **Amount** controls were set.

The result is an arch now realistically framing an entirely different scene.

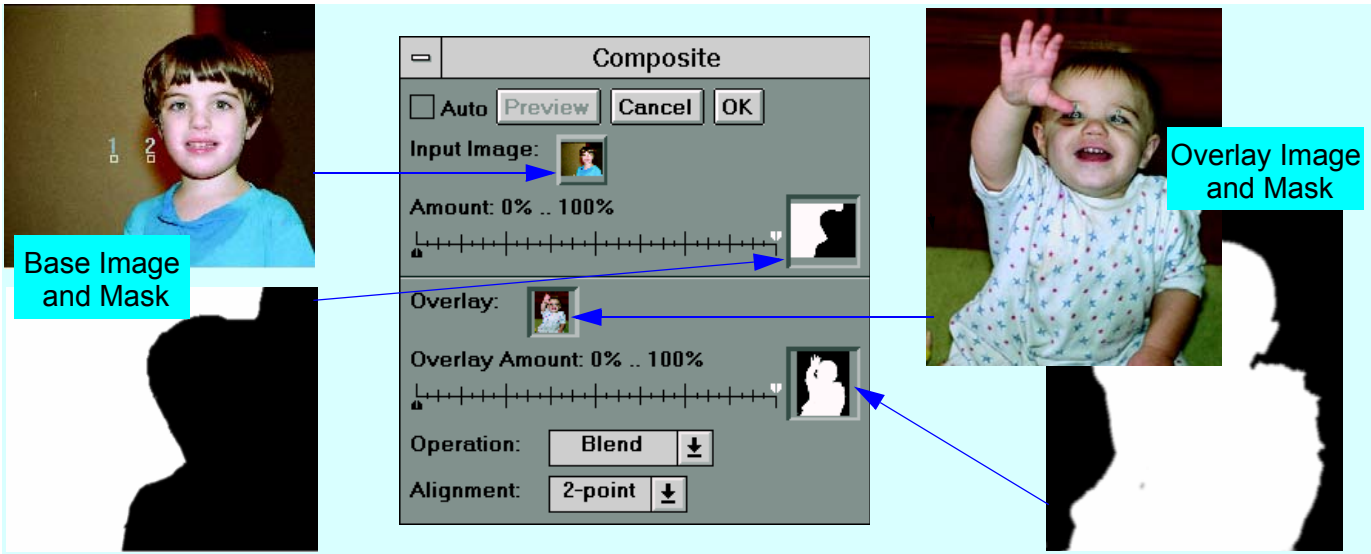


## Creating Libraries

It is worth noting that the masks you create can be reused to make different composites.

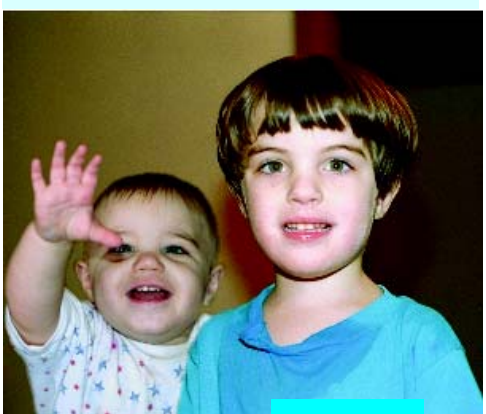
For instance, once you have made a mask for the arch, you can use the arch to frame many different pictures, as the example at left shows.

Remember too, that the mask is related to its image—not to the image's use as a base image or an overlay. Similarly, once you create a mask for an overlay, you can use it to drop the overlay onto many different backgrounds.



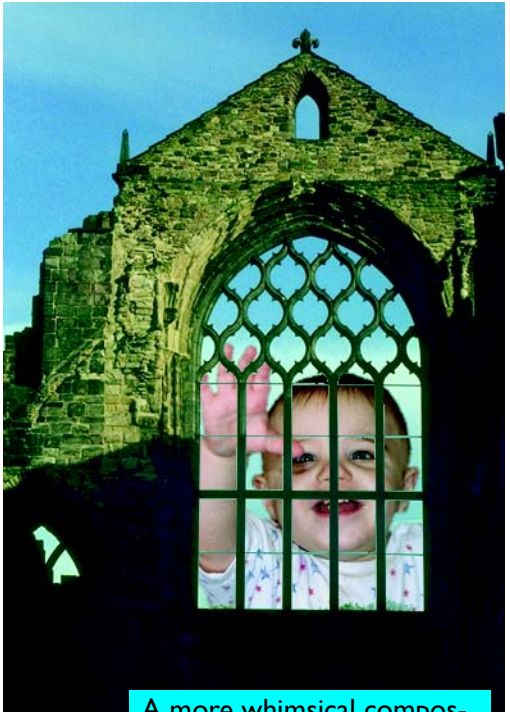

## Combining Images—Two Masks

In some cases, we need to use masks for both overlay and base images. For instance in this example, we need a base mask to protect the child from being covered by the overlay. We need an overlay mast to make the background behind the baby transparent. The figure above shows the image and mask selections made in the composite dialog.



### Scaling and Alignment

To make the composite image look natural, we must find the right scale for the overlay image. In this case, the distance between the eyes serves as a handy scale marker. So we used 2-point alignment (see **Aligning the Overlay**). But instead of leaving the points at their default positions in the corners of the overlay image, we moved them to the baby's eyes. We then placed corresponding points in the base image beside the child, adjusting the distance between the points to be approximately equal to the distance between the child's eyes. That insured that the two heads would be in correct proportion to each other.



A more whimsical composite image, using the same overlay image with a new base image.

# Combining Astronomical Images - An example

Usually you will be combining astronomical images for one of two reasons:

- To make a color image from separate red, green, and blue exposures.
- To enhance the signal to noise ratio by averaging out the noise and recovering additional fine detail not apparent in the individual images.

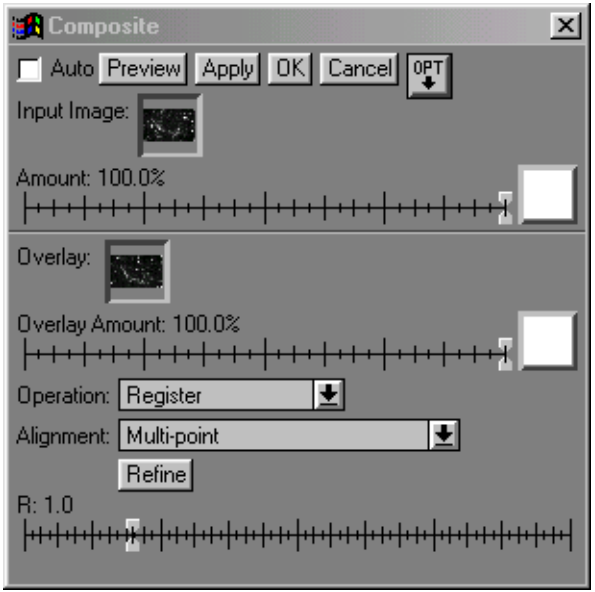
Our example shows how you can combine three monochrome images taken through colored filters into a final color image. The basic steps are:

1. **Preprocess the monochrome images** to enhance their contrast and eliminate artifacts. See the **Using Picture Window in Astrophotography** white paper for important tips on handling high contrast images effectively.
2. **Register the images.** Select one of the images as the reference and register the other two images against it. You will now have three monochrome images that are all the same size and in perfect registration.
3. **Combine the three images** into a single color image by using the **Combine Channels** transformation. This transformation lets you assign each monochrome image to a color channel. It stacks the images to produce a single color image.

The detailed procedure starts on the next page.

## Register Two of the Images

We are now ready to combine the images.




1. Select one of the three images. This will be the base image. We have chosen the red image channel.
2. Display the **Composite** transformation. Open the **Transformation** and select **Composite**.
3. In the Composite dialog, click the Overlay window and choose a second image. We have chosen the green channel image. Note that no masks are needed.

   **Hint:** Make the image windows small enough so that you can see them both at the same time. Position them next to each other so they do not overlap. This makes moving corresponding points in the two windows easier.

4. Choose an **alignment** option. If you are using PW Pro, the most flexible option is **multi-point alignment**. It allows you to use upward of 60 alignment points. (If you are using the regular edition of Picture Window, choose either 3 or 4 point alignment.)

   We chose multi-point alignment. Thus, strictly speaking, the rest of this procedure only applies to PW Pro. However much of it is also applicable to the regular edition.

   Notice that after you chose the multi-point alignment option, three points are displayed in each image. They are numbered and positioned in three corners of each image.

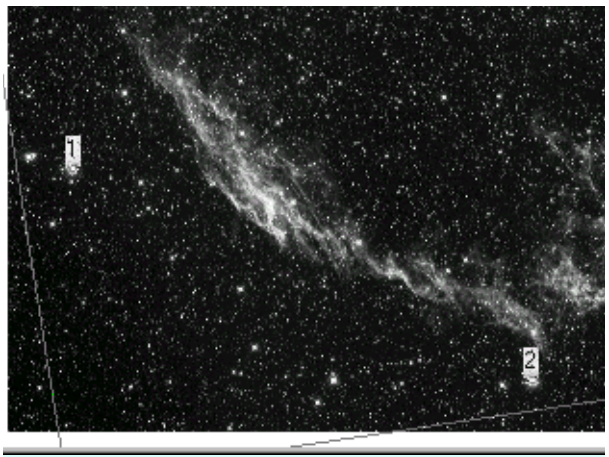
5. Click the **Operation** drop-down menu and choose **Register**. This operation does not combine the images. Instead, it creates a new output image that is a copy of the overlay image, except that it is rotated, scaled, stretched, and cropped to exactly register with the base image. The base image is not changed. (Of course, exact alignment assumes you have chosen a sufficient number of points and positioned them accurately.)

6. You are now ready to position the alignment points. First position them approximately on three large, easily recognizable stars in each of the images. Choose stars that are widely spaced for best results.

   Exact positioning is not important at this time. The dashed line is an outline of the overlay image, projected onto the base image.

7. You are now ready to fine-position the points. Zoom the images to a magnification of 2:1 or more.

8. Select the first image. Press the number **1** key to center the first point in the two images. Find a recognizable star (the smaller the star, the better) and position the point on it as precisely as possible. Select the other image and again position the point on the same star. Repeat this procedure for the other alignment points.




A portion of the red image window is shown after points 1, 2, and 3 in both image windows have been placed on corresponding prominent stars. (Only points 1 and 2 are visible in the figure.)

The dotted outline is the projection of the overlay

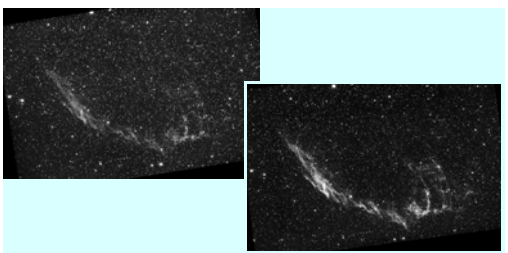
9. In most cases, Picture Window Pro can automatically refine positioning further by jiggling the points and finding the position where there is minimum difference between the images. Click the **Refine** button to automatically refine positioning of the points.

**10.** In some cases additional alignment points can improve the registration of the images. When combining identical images, you can determine areas of the image that are misregistered by setting the **Operation** to **Absolute Difference** and previewing the image. Areas that are well registered will be black; areas that are not well registered will show stars. To improve registration, simply add an alignment point in any areas that are not well registered. Note that since the images are not identical in our case (they are different color channels), absolute difference will always indicate differences. Make sure that you to reset the operation to **Register**.

To add an alignment point, move the mouse cursor to the area on the base image where you want to add the point and shift - click the left mouse button. (Hold down the shift key while you click the mouse button.) Then follow step 8 to fine-position the point.

**11.** When you are satisfied with the registration of the images, confirm that the operation is set to **Register**. Click **Apply** to make the registered version the green channel image.

**12. Repeat the process to register the third channel** with the same reference image. Click on the Overlay window. Select the third image from the popup menu. Since the alignment points are already positioned in the base image, all you have to do is position the alignment points in the overlay image (steps 8 - 10). When you are satisfied with the registration, click **OK** to create a registered version of the blue image and exit the dialog.



Left: The green channel registered against the red channel. Right: The registered blue channel. Note that the image is black where there is no overlap with the reference image.

The result of this process is three separate monochrome images that are all the same size and perfectly registered. They must now be combined to create a composite color image. (See **Combine Channels**.)

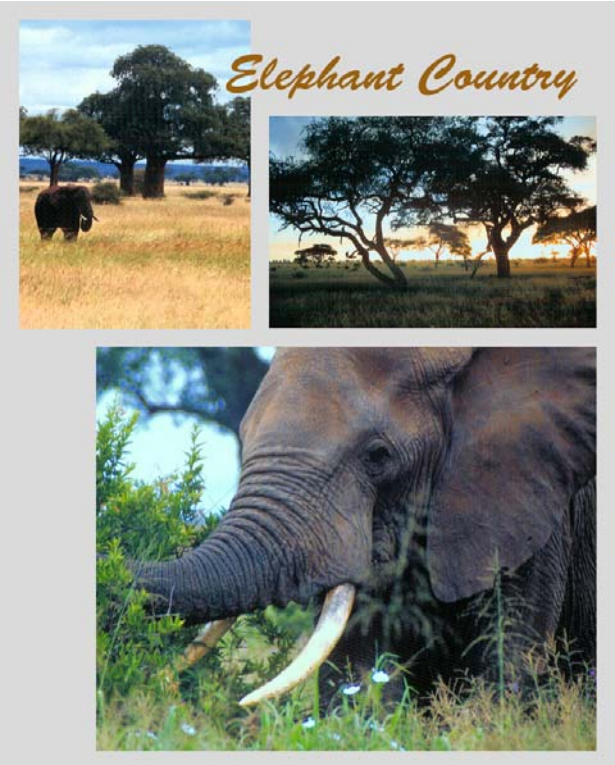
## Final Steps

After you have created the three channel composite you may want to crop it, improve its contrast and saturation, crop it and sharpen it.

### Cropping a rotated image

The area of the composite image where all three images overlap may well be rotated. The best way to simultaneously crop and rotate an image is to use the **Warp** transformation. To avoid distorting the image, set the Warp option to **Rigid**. Using this option you can still rotate, move, and resize the grid. However the grid will remain rigid, preventing accidental distortion of the image.

The final result is shown at right.




# 12. Creating Layouts

The layout transformation lets you place a number of images and text blocks on a page. You can select different background colors (or patterns), arrange images, overlapping them if desired, and add captions, titles and other blocks of text. You might use **Layout** to create album pages or journalistic-style photo essays, make business cards, greeting cards, or note paper, or simply group a number of images on a single page for more economical printing.

Layouts can be saved. Thus you can create a layout that you might use repeatedly, with different images each time.



**See Also:**

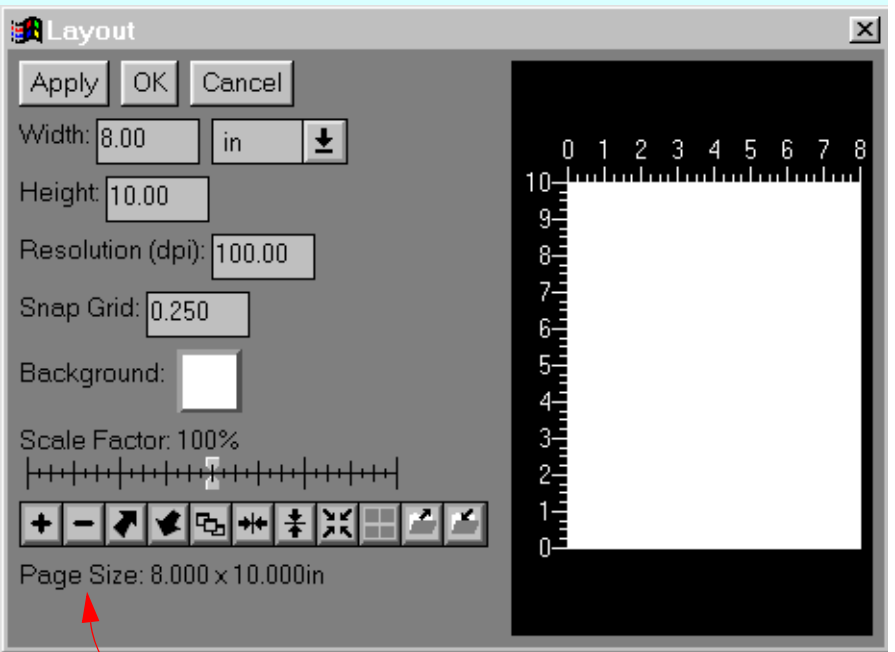
The white paper **Using the Layout Transformation** contains many interesting examples, tips, and ideas.

# Layout Dialog

You can create a new layout or edit a previously saved layout. (See Modifying an Existing Layout.)

To create a new layout:

1. **Display the layout dialog.** Choose **Layout** from the **Transformation** menu. The layout dialog is displayed.
2. **Set Layout Width and Height.** Choose the units you want to work in and then type in the desired width and height. (You can edit the dimensions at any time while using the transformation.)




Size and Location Readouts show the size and location of the current panel. If no panel is selected, the size of the background is displayed instead.

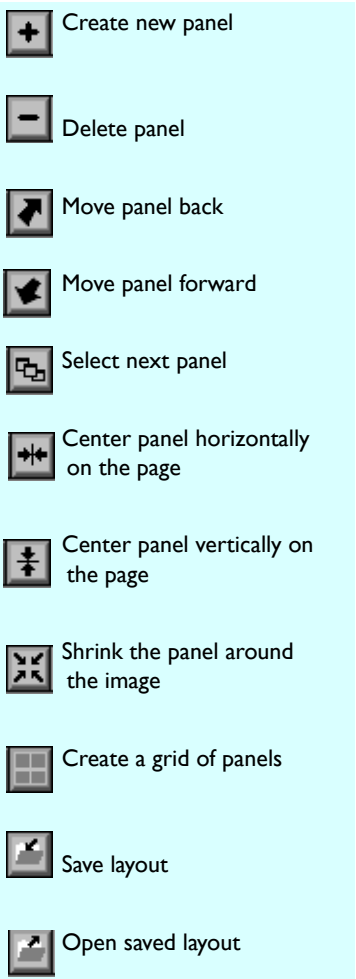
3. **Set the resolution.** The resolution you choose depend on how you will use the image. For instance, if you are preparing a layout for printing, 200 to 300 dpi is a reasonable choice. If the image will be primarily displayed on the screen, 100 dpi is a good setting. You can change the resolution setting at any time.

4. **Choose a background.** The default background is white. You can choose any solid color or image for the background.

   **Solid color:** To choose a solid color, click the **Background** button. Choose **Solid Color** from the pop up menu. The **Color Picker** dialog is displayed. Choose the color that you want.

   **Image:** Open the image you want to use in an image window. Click the **Background** button. Choose the image from the pop up menu. The image is tiled (i.e. repeated) across the page. Adjust the **Scale Factor** to control the size of the image. The smaller the image, the more times it is repeated.

   Hint: A **Texture** frequently makes an interesting background.



5. **Create one or more panels** and fill each panel with an image, text, or both image and text.

   To create a new panel or copy an existing panel, click the **Panel Add**  button. A new panel and a **Panel Properties Dialog** window are displayed. (See **Working with Layouts** to see the relationship between a panel, its Panel Properties dialog and the image window.)

   The new panel is placed in the center of the layout. (If an existing panel had been selected, the new panel reproduces the selected panel. This makes it easy to copy panels.) Move the panel to the desired location by dragging it by its center. You can also resize the panel by dragging its edges or corners.

   Notice that when you move or resize the panels, they move in increments. This helps you align elements in your layout easily. The size of the increment is set by the **Snap Grid.** You can set the increment to any convenient amount. To eliminate snap, set the increment to zero.

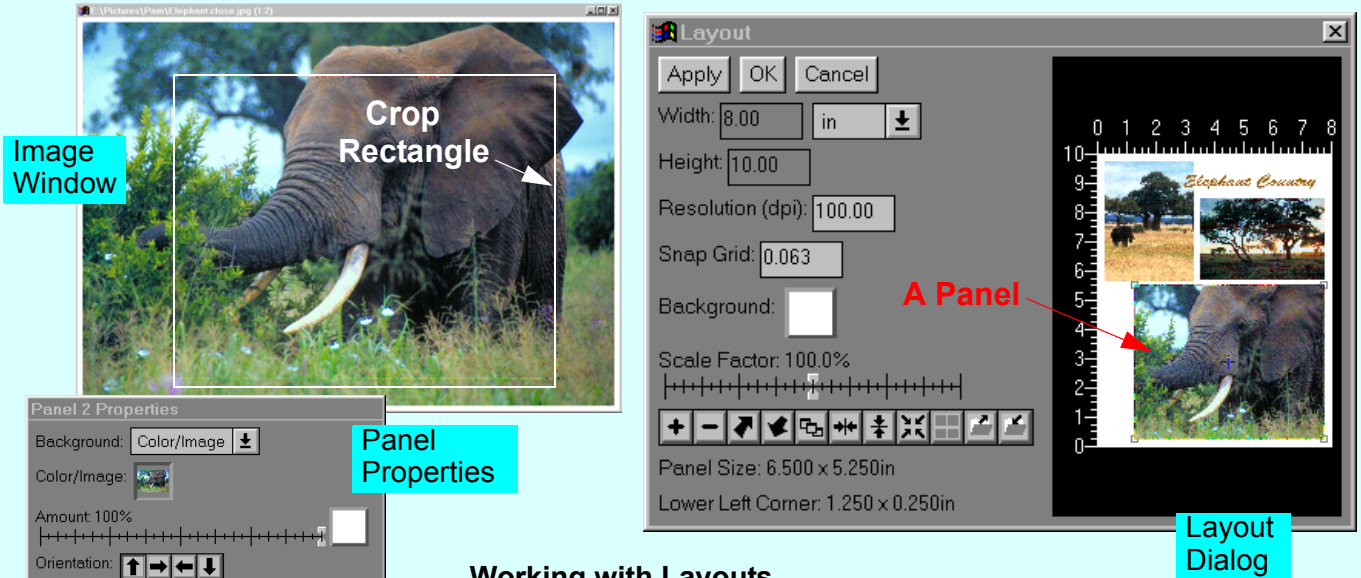
   Panels may stacked so they overlap each other. You can control a panel's place in the stack. Click the **Move Forward**  button to move it forward one position in the stack. Click the **Move Back** button  to move it back.

   Finally, use the **Panel Properties Dialog** to add an image and text to the panel.

**Note:** You can also create a group of panels arranged in a grid. This is useful if you want to use the layout to make many multiple images, such as business cards, wallet-size prints, etc. See the **Create Grid Dialog** for more information.

6. **Save the layout.** To be able to modify a layout later, you must save it in a .lyt layout template file.

   You can save the layout in one of two ways—as a template without the images or exactly as you see it with the images. (Note however, that the image files are referenced rather than embedded in the layout. Thus if you modify the image file, it will be modified in the layout. If you delete, rename, or move the image file, its panel will be




## Working with Layouts

A layout consists of panels. Each panel can contain an image and text. Each panel also has a **Panel Properties** dialog which you use to select the image and specify any text the panel will have.

When you select an image, a crop rectangle is displayed in the original image window. Manipulating this rectangle determines which part of the image is placed into the panel.

Use the **Cycle Panels** button to switch to the panel you want to work on. It selects each panel in turn and automatically displays the panel's corresponding **Panel Properties** dialog.

empty.)

To save the layout, click the **Save**  button. The standard **File Save** dialog box is displayed. Name the file and click **OK**. Respond to "Include images with the saved layout?" message. The layout is saved. Later you can load the layout again and work on it further.

7. **Create a new composite image.** When you are satisfied with the layout, click **Apply** or **OK** to create a new composite image.

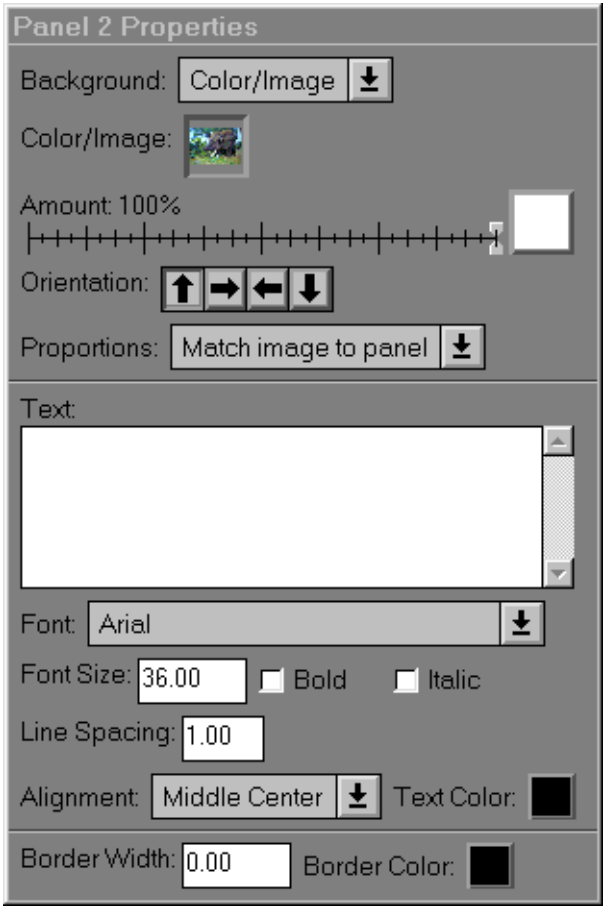
   **Note:** You cannot modify the layout using the composite image. Thus if you want to be able to modify the layout later, make sure you save the layout before clicking **OK**.

## Panel Properties Dialog

The Panel Properties dialog is used to choose the image and text for a panel. Each panel has its own dialog window.

To select a panel's image and or text:

1. **Select a panel.** Use the **Cycle Panels** button to select a panel. Its corresponding **Panel Properties** dialog is displayed. You can insert an image and/or text into the panel.
2. **To insert an image:**
   a. Set **Background** to **Color/Image**.
   b. **Select an image.** Click on the Color/Image button and select an image. (The image must already be open. If it is not, open it first using **File Open,** as usual.)
   c. **Select its orientation** by clicking one of the arrow buttons. The arrows point toward where you want the top of the image to be.
   d. **Set Proportions.** Use **Match image to panel** to make the image fill the entire panel. Use **Free** if you want to set the image proportions using the crop rectangle independently of the panel's proportions.
   e. **Set the image's cropping.** Notice that the image's original image window contains a crop rectangle. (See **Working with Layouts**.) Use the crop rectangle to set the



exact portion of the image that is displayed in the panel. You can adjust the cropping by drag the whole crop rectangle by its interior or by dragging any edge separately.

**Note:** You can blend the image with whatever is behind the panel. To blend the image into the background, adjust the **Amount** control.

3. **To insert text:**

   a. **Type the text** into the text box. The text is shown in the panel. Each time you make a change, the panel is updated to show you the effect of the change.

   b. **Set the font, font size, and line spacing.**

   c. **Set the line spacing.**

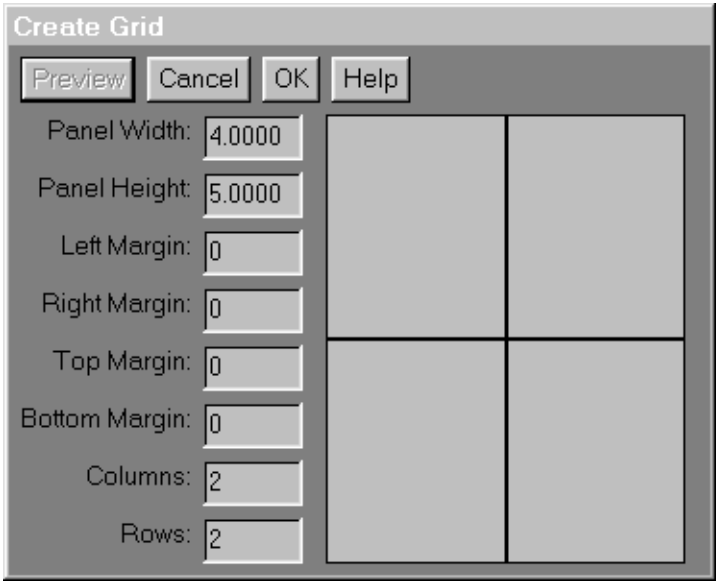
   d. **Set the alignment.** The alignment affects how the text is positioned within the panel.

   e. **Set the text color.** Click on the **Text Color** button and choose a color from the **Color Picker.**

   **Note:** If a panel is only used for text, you can make the background transparent, so that whatever is behind the panel shows though. To make the background transparent, choose **Transparent** from the **Background** drop down list.

4. **Set the border width and color.** If you want a border to mark the edge of the panel, set a border width. Click on the **Border Color** button and choose a color from the **Color Picker.**

## Create Grid Dialog




The **Create Grid** dialog is used to create multiple panels arranged in a grid of rows and columns. The dialog allows you to set number of rows and columns and the size of the panels.

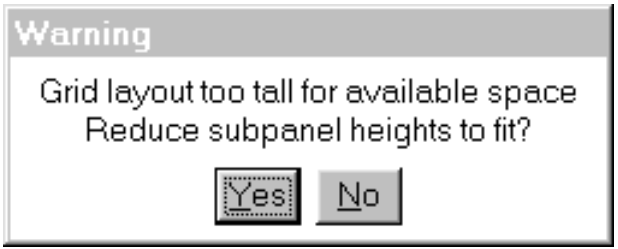
Once the panels are created, they behave like any other panels. They can be filled with an image and text using the **Panel Properties Dialog**. The panels can also be resized and moved.

To create a grid of panels:

1. **Select a panel to match.** The overall size of the whole grid of panels is determined by the currently selected panel. To match a particular panel, select it. To make the grid as big as the entire layout, make sure that no panel is selected by clicking just outside of the layout page.
2. Click the **Grid** button. The **Create Grid** dialog is displayed. The dialog has controls for setting panel parameters and a preview window showing how the resulting grid looks.

3. **Set panel parameters.** You can set the height and width of each panel, the number of rows and columns in the grid and margins around all the panels. Click **Preview** to see the effect of your settings.

   If you set incompatible parameters a warning message is displayed. Choose **Yes** for automatic adjustment or **No** if you want to make adjustments manually.




4. After you are satisfied with the settings, click OK to create the grid of panels. Use the **Cycle Panels** button to select each panel. Insert an image and/or text into the panel using its corresponding **Panel Properties Dialog**. You can also move or resize the panels, if desired.

# Modifying an Existing Layout

To modify a previously saved layout:

1. **Display the layout dialog.** Choose **Layout** from the **Transformation** menu. The layout dialog is displayed.
2. **Open a Layout.** Click the **Open**  button. The standard **File Open** dialog box is displayed. Select the desired layout file and click **OK**. The layout is loaded into the layout dialog. If the layout includes images, the images are opened and displayed in their image windows.

   **Note:** When attempting to open a saved layout, an image of the same pathname will automatically be opened if it is not already open. If an image file having an exact match on the pathname cannot be found, Picture Window then searches for an image with the same filename in the directory containing the layout file. Therefore if you store the layout file and all of its related images in a single directory, Picture Window will be able to locate and reopen all of the included images, even if you move the directory to a different location on your hard disk, to a different disk drive, or to another computer.

3. **Edit the Layout.** You can now work on the layout as before. (See the **Layout Dialog**.)
4. **Save the layout.** To be able to modify a layout, you must save it in a .lyt file.

   To save the layout, click the **Save**  button. The standard **File Save** dialog box is displayed. Name the file and click **OK**. Respond to "Include images with the saved layout?" message. The layout is saved. Later you can load the layout again and work on it further.

5. **Create a new composite image.** When you are satisfied with the layout, click **Apply** or **OK** to create a new composite image.

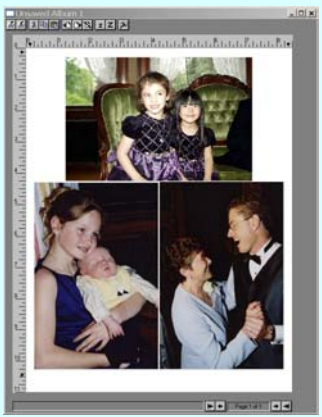
# Specifying a Default Layout

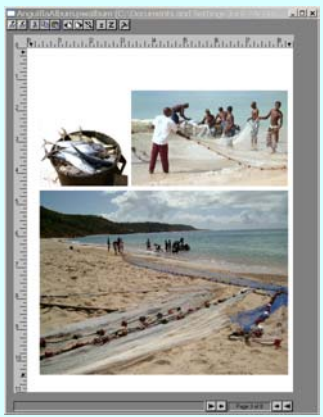
If you use a certain layout frequently, you can make that layout the default each time you invoke the Layout transformation.

If a file called **Default.lyt** exists in the **Application Data Folder**, then the Layout transformation loads this file on startup to establish its initial layout. If **Default.lyt** is absent or cannot be found, standard default settings are used to initialize the layout.

To create a default layout file, simply create or load the layout you want and save it under the name Default.lyt in your **Application Data Folder**.

# 13. Albums & Multi-Image Printing





**Two kinds of albums:** At left we used automatic mode to print a collection of 4 x 6 images. Note that images are placed flush for easy cutout. At right we laid out images manually for best effect to create album pages.

The Album function is a flexible layout and printing tool that can be used in a number of ways:

• **Standard-size prints:** Automatically layout and print a whole collection of images in a single operation in a choice of standard sizes from full page sizes down to wallets and contact sheets. Images can be grouped flush with each other for easy cut out. Many standard forms (business cards, post cards) are also supported.

• **Album pages:** Manually place images onto album pages. The position, size, and crop them as desired. Use this mode to create photo essays and make album pages for a personal photo journal.

• **Printing:** Use the album function to any open image as an alternative to the standard print function. It lets you layout images using mouse motions. You can also easily add images and print multiple pages.

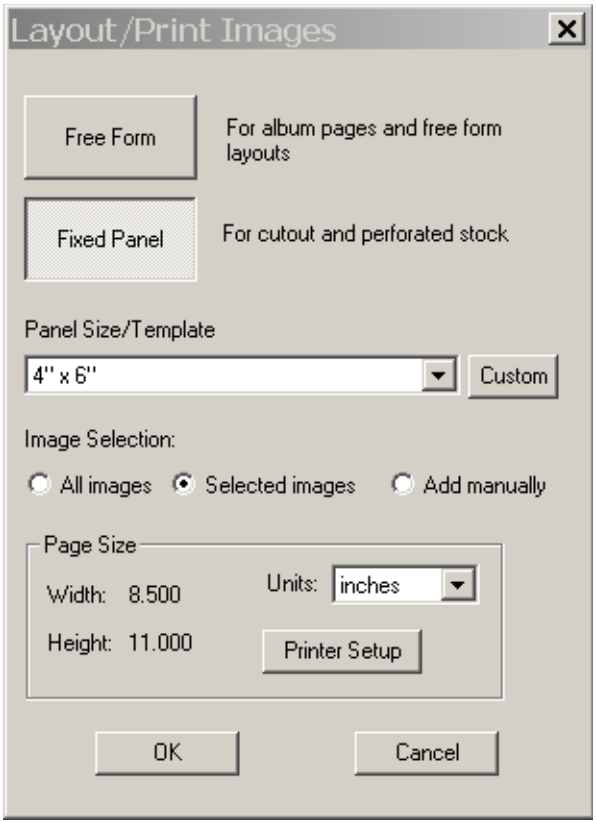

Creating An Album | Album Display | Working with Images | Adding Text to an Album

Creating Custom Templates | Creating a Lie-Flat Album | Saving The Album and Images

# Creating An Album

There are two ways to create a new album — from a Browse window and from the file menu. The first is most convenient for printing multiple images from the browser. The second is easiest if you want to print an image from the screen.

This section describes how to create an album from browse. This is most convenient when you want to include a collection of images. (To use album to print opened images directly, see **Print Album**.)




1. Display the images you want to include in the **Browse** window. (You will be able to add images later.)
2. Select images from the browse window, if desired.
3. In the Browse toolbar, click the  **Album Print** button. The Layout/Print Images dialog is displayed.
4. Select **Free Form** or **Fixed Panel** mode. Free form mode is used for manually adding and laying out images to create album pages. Fixed panel mode is used for automatic layout of standard sizes.
5. For fixed panel mode:

   Select the **Panel Size** from the drop-down list. You can also create your own gridded panel layouts by selecting Custom. (See **Creating Custom Templates**)

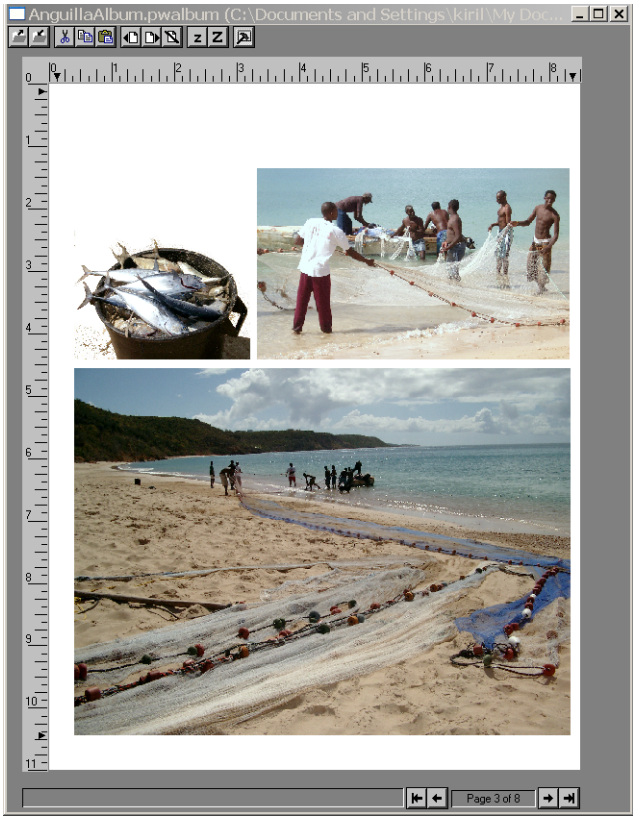
   Check an **Image Selection** option. Regardless of your selection, you will be able to add and delete images later.

6. Click **Printer Setup** to set page size. If you are planning to use lie-flat binding, select a page size equal to the double page spread. (See **Creating a Lie-Flat Album**.) Otherwise select a page size equal to a single page, as usual.

   Note, in **free form** mode page size is fixed at this time and cannot be changed later.

7. Click **OK** to create a new album. If you selected images in the browser, the album will contain the selected images.

# Album Display




The album window displays a single page. It shows the images just as they will appear when they are printed. It also has a:

- **Toolbar:** The toolbar has buttons for opening and saving albums, clipboard functions, adding and deleting pages, zooming the image and displaying the album property dialog.
- **Status display:** The status display shows the filename and size of the image under the cursor.
- **Page buttons:** Buttons below the album page navigate to the first, previous, next, and last pages.
- **Rulers and Margins:** Rulers show the dimensions of the page and positions of all the elements on it. Little black triangles in the rulers control the usable area on the page.

  In **Fixed Panel** mode changing margin settings forces a repositioning of the image panels and may even change the number of panels that fit on the page. (Template layouts are fixed on the page and do not have margins.)

  In **Free Form** mode, any part of an image that extends into the margin area is cropped. Unlike Fixed Panel mode, adjusting margins in Free form mode does not reposition the images or affect the layout of images on the page.

# Working with Images

The Album has been designed to let you work with images easily and naturally. Adjustments to all aspects of an image — its placement, size, cropping, and magnification within the frame — can be made interactively with the mouse. Because of the dynamic nature of these operations, they are hard to describe in words. So by all means, create an album and try the operations as you read about them. You will be glad you did.

You can adjust images by using the mouse and from the panel menu. (See **Panel (Right-click) Menu**)

## Using the Mouse

**Selection:** To select an image, simply click on it. This causes eight handles to be displayed — four in the corners and four in the centers of each edge. For some operations, more than one image must be selected. You can select additional images by Shift-clicking on them. Note that the handles are black on the first image selected and white on additional images. The black handles indicate the reference image in alignment operations. During alignment operations, the reference image stays still while other images are aligned against it.

**Image Size:** Drag the image by a corner handle to make it larger or smaller. The image is resized so that its proportions are maintained. **Cursor style: double arrow**

If you want the corner of the image to track the cursor exactly, hold down the shift key while dragging. This lets you vary the proportions of the image as you are resizing it.

**Cropping:** To crop an image, drag the middle handles. Notice that the full image is displayed as drag, so you can make a better composition choice. (Hold down the shift key to disable the full image display.) **Cursor style: double arrow**

Notice that the middle handles are either square or triangular. A triangular handle indicates that the image is

cropped and that there is more image beyond the edge. When the handle is square there is no more image beyond the edge.

**Zooming:** You can zoom the image in and out within its rectangle. Place your mouse on the point you want to fix as you zoom and turn the mouse wheel to zoom. (Some mouse drivers restrict the mouse wheel to scrolling only. In that case use either the up and down cursor keys or the zoom buttons in the album toolbar.)

**Panning:** If the image is cropped, you can pan it within the displayed rectangle. To pan, just click in the center of the image and drag to pan. **Cursor style: hand**

**Note:** In **fixed panel** mode it is possible to move the image off the panel. However if you subsequently add or delete images ahead of this image, automatic repositioning may create an undesirable result. Thus it is recommended that you keep the image within the panel.

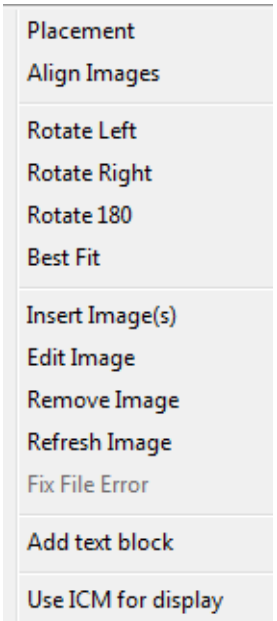
**Positioning:** To position the image on the page, place the mouse *between* handles near any edge and drag. This moves the entire image on the page without affecting size or cropping. **Cursor style: four-headed arrow**

**Editing the image:** If you want to edit the image using any of Picture Window's transformations or free-hand tools, double-click on the image. It will be opened in an image window. Make your edits. In most cases, when you return to the album you will be given the option to swap the image with the new edited version.

If the change is not detected automatically, you can refresh the album image manually. Right-click on the image and select **Refresh** from the menu.

**Note:** You must save all edited images, before you can save the album. If an image is not saved, you will be prompted to save it.

## Panel (Right-click) Menu




The panel menu sets various panel parameters. In general, select the panel (or panels) you want to adjust first and then right click on the selected panel to display the menu.

**Placement**: Displays a sub-menu to crop, adjust drawing order (front or back) and reapply default album defaults for the image.

**Align Images**: Aligns images with each other or with the page.

**Rotation:** Rotates the image to any of the four 90 degree orientations. In **fixed panel** mode You can also select **Best Fit** to rotate the image for best fit in relation to panel orientation. Once you rotate an image, it is protected from any change made globally in the Property Dialog. To reset it to album defaults, use the **Placement** menu.

**Insert Image(s):** You can insert images from the disk or images open in Picture Window. The images are inserted to the current page. In **fixed panel** mode, images after the insertion are moved forward and new pages are created as needed. In **free form** mode, images are inserted on the current page. Existing images are not affected.

**Edit Image:** Opens the selected image in an image window. You can edit the image using any PWP transformation or free-hand tool. When you return to the album, you will be given the option to replace the current image with the latest edited version. (For changes made in place, you must manually use the **Refresh Image** function.)

**Remove Image:** Removes the image from the album.

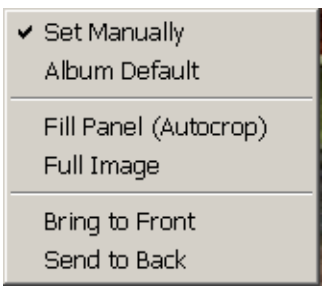
**Refresh Image:** Forces a refresh of the image. Use this to reread after a file error or after in-place editing.

**Fix File Error:** Allows you to manually browse for an image that was not found when an album is first opened or refreshed.

**Add Text Block:** Right-click on an image to add a caption to the image or on an empty area of the page to add text to the page. Captions are linked to one of the image borders and retain their relative position as the image is edited or moved to other pages. Page text stays anchored to the page. See **Adding Text to an Album** for details on using this feature.

**Use ICM for display:** *(Picture Window Pro only.)* When checked, a color profile is applied in displaying album pages. Since you are not making color judgements based on the album display, you may want to uncheck this item for faster image display. This setting has no affect on printing.

### Placement




To display this sub-menu, select a panel and then right-click and select **Placement** from the **Panel** menu.

**Set Manually/Album Default:** Chooses whether image rotation and cropping is determined by general album settings or are overridden for this image.

**Autocrop/Full Image:** Either fills the entire panel, cropping the image as needed, or displays the full image with no cropping.

**Bring to Front/Send to Back:** Determines the Z-order of the image. This function is intended for use in **free form** mode albums. In **fixed panel** mode images should normally not exceed panel boundaries, making this function unnecessary. If this function is used in a **fixed panel** album, avoid image insertion or deletion as automatic reformatting may lead to unexpected results.

## Align Images

There are two sets of alignment functions — alignment of images with respect to each other and alignment with respect to the page inter-margin area. This function applies to **free form** mode only.

To align images with respect to each other, select the reference image first, then shift-click on the other images. Alignment is performed relative to the reference image (black handles).

To align images with respect to the page, select one or more images in any order. All selected images are treated as one group in calculating the alignment.

# Toolbar

## File Functions

 **Open Album.** Displays the standard Windows file dialog so you can open a previously saved album. You can perform the same operation using **File/Open**.

 **Save Album.** Lets you save the current album under its current file name. (Equivalent to File/Save) Images are linked rather than copied into the album. If any images used by the album are not saved, you will be prompted to save them first. If you move the album file, make sure to move the images as well. The standard extension of Picture Window albums is *.pwalbum*. See **Saving The Album and Images** for more information.

## Clipboard Functions

 **Cut.** Saves the currently selected image to the clipboard and then deletes it from the album.

 **Copy.** Copies the currently selected image to the clipboard. The image in the album is not affected.

 **Paste.** Pastes the image into the album. If an image is selected, you have the option of replacing the selected image or of just inserting the new image on the page. If the image has been copied from an album with the same panel size, cropping and magnification is preserved.

## Page Functions

  **Add Page:** Adds a new blank page before or after the current page. In Fixed Panel mode a new page cannot be added at the end. (This is because empty trailing pages are automatically removed.)

 **Delete page(s):** Deletes a page or range of pages. All images on the pages are removed from the album.

**Zoom:** Zooms the selected image in or out. You can also zoom the image with the mouse wheel or up and down cursor keys.

**Display Album Property Dialog:** Displays the property dialog. This dialog lets you change layout parameters and print the album. You can close the dialog when you are not using it and display it easily when you need it again.

## Property Dialog

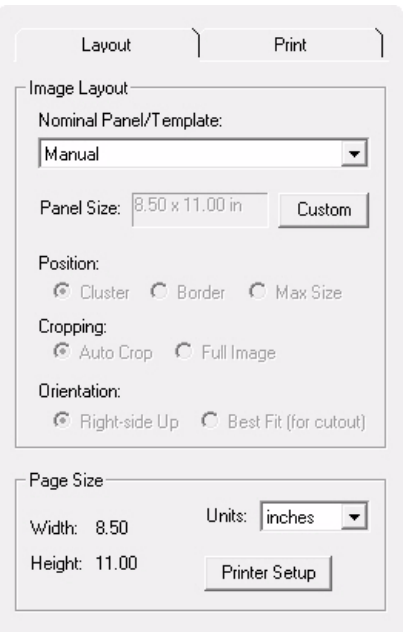
The property dialog has two tabs **Layout** and **Print**.

### Layout Tab

**Nominal Panel/Template:** In **fixed panel** mode, sets the nominal size of the panel. (If **Max Size** is set, the panel may be larger than the nominal size.) The actual panel size is shown in the window below. Picture Window uses the panel size to determine how many panels fit between margins on the page. To convert an album to **free form**, select **Manual**.

**Custom:** Creates a custom layout. (See Creating Custom Templates)

**Position:** Determines how the panels are arranged on the page. **Cluster** places them flush against each other for most efficient cutting. **Border** centers each panel within its area of the page, creating a border around each image. **Max Size** makes the panel as large as possible, filling out the available space. **Fixed Panel** mode only.



Layout Tab

**Cropping:** Determines whether the image is cropped to fill the panel or made as large as possible without cropping. In

either case you use image controls to adjust cropping, panning, size, and position. **Fixed Panel** mode only.

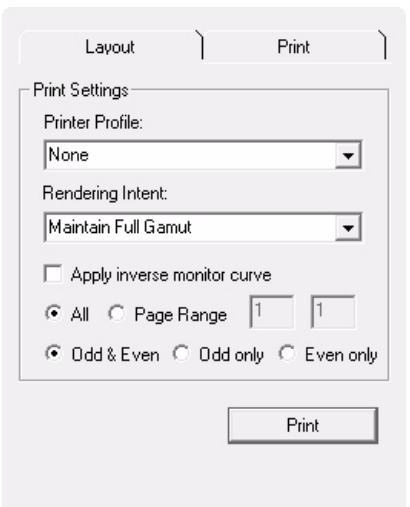
**Orientation:** Sets the orientation of the image relative to the page or the panel. If you intend to cutout the images, use **best fit**. If you are going to use the page as is, select **right-side up.** (Of course if the image orientation in the file is wrong, you will have to rotate the image manually to make it right side up.) **Fixed Panel** mode only.

### Page Size

**Width & Height:** The page size is set by choosing paper size in your printer dialog. Use **Printer Setup** to select printer parameters.

**Units:** Select English or metric units. The standard panel sizes are slightly different in the two systems.

### Print Tab




**Color Management Settings:** *(Picture Window Pro only.)* If Color Management is enabled and you are printing a color image, two additional controls are displayed in the print dialog for setting color management options.

**Custom Profile:** Choose the printer profile appropriate for your printer and paper you are using.

**Rendering Intent:** The rendering intent controls how colors are translated from their current color profile to the printer's profile. The default setting, **Maintain Full Gamut,** translates by making the best use of the full range of colors available on the printer. It is the best choice for most pictorial purposes. **Preserve Saturation** matches color saturation when possible even if that introduces some inaccuracy in hue and brightness. **Preserve Identical Colors** and their White Point and Black Point variants favor color accuracy

over making the best use of the available gamut. Use this setting for cases where absolute color matching is most important.

**Apply Printer Curve:** *(Picture Window Pro only.)* When checked, the current printer curve is applied during printing. You can set the curve that will be used or create a new curve by selecting **File/Printer Curves** from the main menu.

Printer curves provide an additional correction you can apply to printing to make the printer output closely match your screen display. This is a net correction and thus compensates for all factors including lighting under which the print is viewed. (ICC curves do not take display lighting into account.) Printer curves can also be used in black and white printing to control the tonality of blacks from blue-blacks through neutral to brownish-blacks. To create a printer curve, see **Printer Curves**.

**Page Range:** Sets the range of pages to be printed. You can print all pages in the range or just odd or just even pages. The latter options allow you to print double sided work on single-sided printers.

**Close the dialog:** You can close the dialog at any time without affecting settings. Click **the X close window button** to close the dialog. Reopen it from the album toolbar.

### Creating an Adobe Acrobat (PDF) File

You can create a PDF file of the album by choosing an Acrobat printer driver as your printer and then printing the album. The Acrobat printer driver 'prints' to a file, creating a PDF of the album. Acrobat printer drivers are available from Adobe as part of their Acrobat suite of tools. There are also a number of very good free PDF drivers that are easy to download and install from the web. Here is a link to a review of free **PDF drivers**. We have tested and like the **Bullzip** driver.

# Adding Text to an Album

You can add text to your album. Text can be added as a caption to an image or placed on a page. Text is added in blocks. Caption blocks can be referenced to any of the four edges of an image and maintains its relative position as the image is moved of resized. Similarly, text blocks placed on a page maintains its position even as pages are inserted or removed ahead of the page.

Text blocks can be moved and their edges can be dragged to make the block wider or narrower. The length of the block adjusts automatically to accommodate all the text in the block. Finally, the font style, size, color, line spacing and alignment can be set independently for each text block. Font settings can also be applied to multiple blocks to make widespread changes easy to make.

## Adding a Text Block

**Caption Text Block.** To create a caption text block, right-click on an image and select **Add Text Block** and choose the reference edge. A default text block is created along the chosen edge. Double-click on the text block to display the **Text Properties Dialog** and enter and format the text.

**Page Text Block.** The procedure to create a page block is similar. Right click on an empty area of the page at the location you would like to create the block. A default block is created. Double-click on the text block to display the **Text Properties Dialog** and enter and format the text. Note, page blocks can only be created in free-form pages (i.e. albums using the manual template).

## Positioning, Sizing and Formatting Text Blocks

To size and position a text block, click on the block to select it. Drag either side edge of the block to change its width. The length of the block will adjust automatically to accommodate all the block's text. To position the block, drag it by its body. For caption blocks, positioning is relative to the reference edge of its image. Red lines are extended across the page to help

you position or size the block in exact alignment with another feature on the page or at a particular ruler position. To edit the text or change its formatting double-click on a block to display the Text Properties Dialog.

## Text Properties Dialog

The Text Properties dialog is used to enter/edit text and to set its font size, style, color, line spacing and alignment. Most functions work the same way for image captions and page text. (Exceptions are noted.)

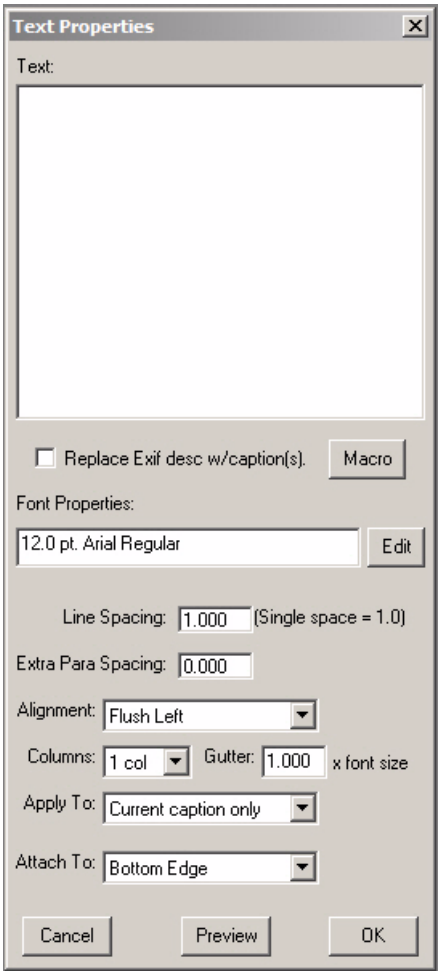
To display the dialog, double-click on a text block.

**Text.** Enter the text for the block into the **Text** edit control. You can also add macros for create and modify dates, camera setting information, file-name, and page number. The macros are expanded in the text of the block. To add a macro, position the cursor where the macro is to be inserted, click the **Macro** button and select the macro you want to insert.

**Replace Exif Comments.** Adds caption to the EXIF description in the image file, overwriting the current description, if there is one. (If this panel has more than one caption, all captions with this option set are written to the description.) The image must be opened in Picture Window for this function to be enabled. This function saves the effort of having to update the EXIF description separately. (Image captions only.)

**Font Properties.** Click the **Edit** button and set the desired properties on the standard Windows Font dialog.

**Line Spacing.** Line spacing is set relative to font size. Single spacing equals 1.00. You can use any decimal fraction or multiple.



**Extra Paragraph Spacing.** Paragraph spacing adds spacing after a carriage return. For example, to skip a line, set paragraph spacing to 1.00.

**Alignment.** Select flush left, flush right, center or justify.

**Columns and Gutter.** Sets the number of columns. (Options are 1, 2 or 3 columns.) The overall text block is divided into equal-width columns separated by a gutter. Gutter width is set as a multiple of the font size.

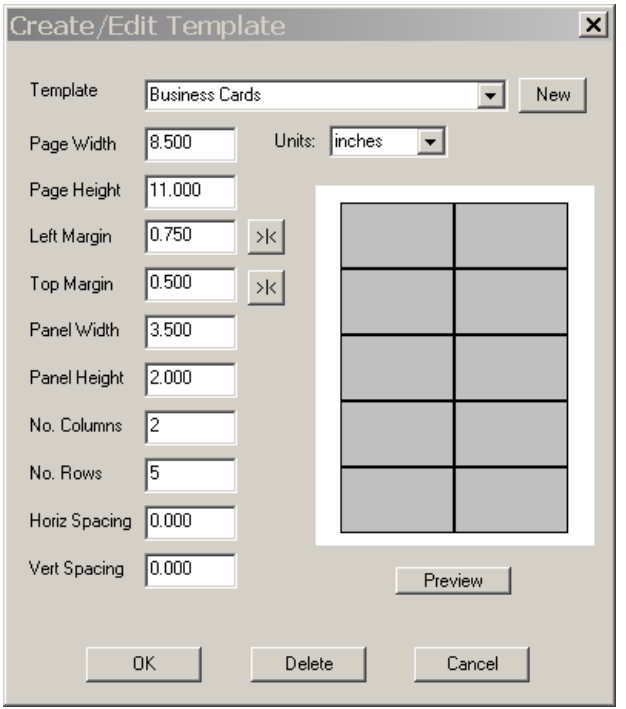
**Apply Format To.** This option allows you to apply format changes to just a single text block or multiple text blocks, up to and including all the blocks in the album when you click the **OK** button. This setting has no effect when you click **Preview**.

**Attach To.** Let's you anchor the caption to a different edge of image's panel. (Image captions only.)

**Preview, OK, Cancel. Preview** applies the settings but keeps the dialog open so you can experiment further. **OK** applies the settings and closes the dialog. **Cancel** closes the dialog and leaves the text block unchanged.

# Creating Custom Templates

You can create your own gridded templates. These templates can be used with perforated stock (such as business cards and labels) or to simply create your own layouts.




Templates are specified using the following parameters:

- Panel dimensions
- Spacing between panels
- Number of panel rows and columns
- Page size and left and top margins

In addition, templates have names. Names do not absolutely have to be unique, though it is good practice.

To create a new template or edit/delete an existing one:

1. Display the Template dialog. On the **Album Properties** dialog click **Custom**.
2. To edit a template, choose it from the list of templates. To create a new template, click **New** and assign it a name.
3. Set the template parameters as required. Use the >|< buttons next to the margin controls to center the panels on the page. Use the **Preview** button to refresh the display.
4. Click **OK** to apply your edits, **Delete** to delete the selected template, or **Cancel** to back out of the changes.

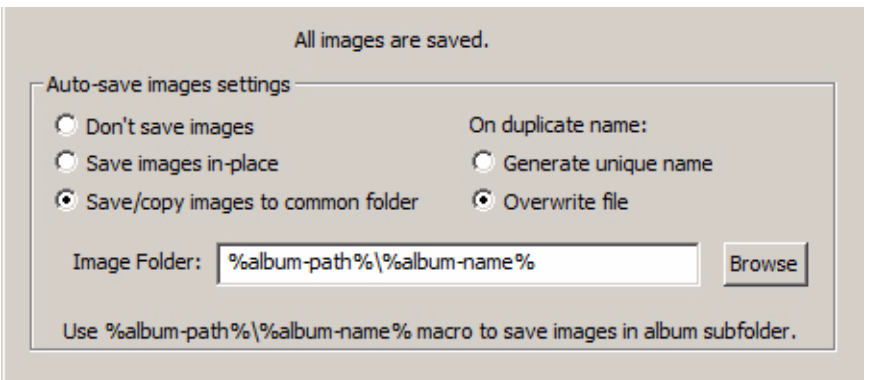
### How templates are stored

All template specifications are stored in a single file called **PWTemplates.txt** in the Album subfolder under the **Application Data Folder**. The file is updated with any changes made during a Picture Window session when PW is shutdown. Changes include edits, additions, and deletions made in the Template dialog. Also, new templates found when an album file is opened are also automatically added to the template file.

# Saving The Album and Images

Albums are saved as .pwalbum files. The file records general layout information, text, and positioning and cropping information for each image as well as the image's full pathname. (The image itself is not stored in the file). Thus the .pwalbum file fully defines the album and allows you to open it again at any time and edit it or add additional pages and images to it. To save an album, simply use the standard Windows File/Save As dialog to assign the album file a folder and filename. This dialog gives you three options for storing images, as described below.

## Options for Saving Images




The **File Save As** dialog provides three options for storing images:

**Manually:** Use the **Don't save images** option to save all images manually. If you select this option, you will be prompted to save any unsaved images before the album itself can be saved.

**In-place:** You can choose to **Save images in place** -- that is in their original folder. If you choose this option, you must also choose an **On duplicate name** option. **Generate unique name** is recommended to avoid overwriting an existing image.

**Common folder:** This option saves (or copies) all of the album's images into an image folder dedicated to the album that you specify. By default, the folder is created as a subfolder of the album's folder and uses the album's name. (Thus the images for MyAlbum.pwalbum would be stored in a folder name MyAlbum.) This option makes it easy to

copy albums to other locations for backup or other purposes. All you have to do is copy the album and its image folder and you can be confident that everything has been transferred.

When using this option you will probably want to set **On duplicate name** to **Overwrite file**. That way the album image folder will not accumulate intermediate edits of images.

The image options are saved as part of the album file. That way the settings are maintained the next time you open and work on the album.

# 14. Special Effects


In the previous chapters, we have mainly considered techniques that can be characterized as photographic—that is, they deal with images "realistically". However, Picture Window also includes a number of transformations which are primarily graphical. Here the photographic image serves as a starting point for creating a wide range of graphical effects running the gamut from tame to wild. Compared to conventional photography, the realm of special effects is still virgin territory, ready for your exploration. In this chapter, we cover each of the following techniques individually.

- Bad Pixels
- Button
- Calendar
- Conformal Mapping
- Contour
- Contour
- Displace
- Drop Shadow
- Edge
- Emboss
- Equalize
- Extract and Combine Channels
- Fan
- Grid
- Halftone
- High Contrast
- Interlace
- Kaleidoscope
- Monocolor
- Posterize
- Spiral
- Stereo
- Text
- Tile
- Texture
- Watercolor
- Wave
- White Noise

# Emboss

samples\leaf.jpg

Emboss can heighten the sense of relief (shadow method, height: equals 2).

Emboss lets you add a variety of three-dimensional or "etched" effects to images. It makes edges in an image appear raised. Depending on the options chosen, it can give images the feel of engravings or add a shadow effect. Embossing can also be used to make text characters stand out from the background.

Emboss settings can make a big difference in the final result, so it pays to experiment

Using emboss in combination with **Posterization** can sometimes yield interesting effects. First the image is posterized. This creates contours which are then emphasized further using emboss.

**Controlling the Embossing Effect**

**Using the Emboss Dialog**

## Controlling the Embossing Effect

Embossing text (shadow method)

You control the overall embossing effect by selecting the embossing method and setting the radius, height, angle, and color space. Here is what each of these do.

**Method:** You can choose **Normal** or **Shadow**. **Normal** produces more of a copperplate etching effect—brightness changes are used to make the "edges" stand out. "Flat" areas are all rendered at an even medium brightness. **Shadow** retains most of the brightness and realistic colors of the original image. Edges appear to cast shadows. (See **Comparison of Normal and Shadow Settings**.)

**Radius:** Defines how sharp transitions in the image must be (in pixels) to be considered an edge. If you have a image with sharply delineated outlines, use a small radius. For instance, for text, a value of 0.5 works well. If your image is softer, use a larger radius.

**Height:** Controls the contrast between shadow and highlight added to define the embossed edges. Greater contrast makes the relief appear higher.

**Angle:** Specifies the direction of the "light" and thus controls the direction of the shadows. The default angle places the apparent light source at the upper left (10:30) position, conventional in illustration and painting.

**Color Space:** This control selects the channels affected by the Emboss dialog. To affect brightness only, set this control to **HSV** (to affect V) or **HSL** (to affect L). To affect each of the color channels individually. set this control to **RGB**.

## Comparison of Normal and Shadow Settings

**Original image:** The image was posterized before embossing to emphasize transitions between colors.

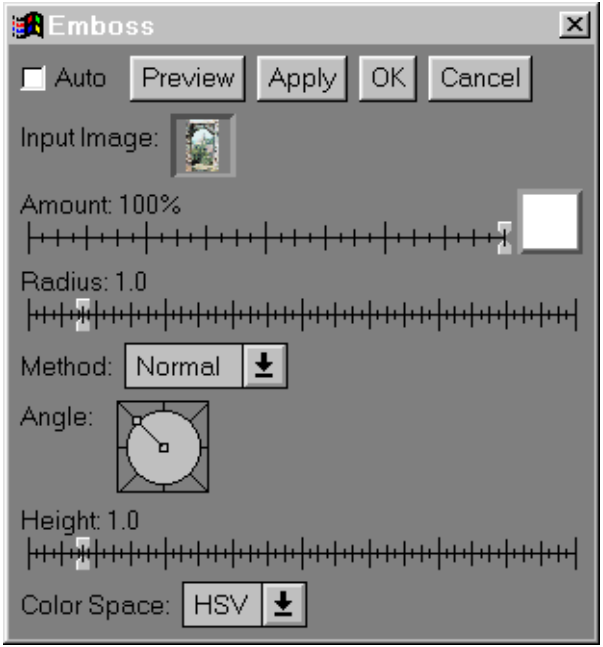
Normal Method

Shadow Method

## Using the Emboss Dialog

To create an emboss effect:

1. **Select an image to emboss.** Click on the window containing the image.
2. **Display the Emboss dialog.** Choose **Emboss** from **Special Effects** under the **Transformation** menu.
3. **Make the dialog settings.** You may want to experiment with a variety of settings to get the most interesting effect. (See **Controlling the Embossing Effect**.) Use the **Amount** slider to control the degree of the effect.
4. **Preview.** Click **Preview** to see the result. Make any changes required and preview again until you are satisfied.
5. **Click OK** or **Apply** to create a new image in its own window.



# Drop Shadow

This command lets you apply a drop shadow to an input image based on a shape determined by an mask for the input image. A drop shadow is a graphic artist's trick to make part of an image look like it is floating above a background plane. To use the drop shadow transformation, you will normally have and object in the input image that you want to cast a shadow on the rest of the image. First you need to create a mask that isolates the object that will cast the shadow. Then you can proceed to use the drop shadow transformation to apply the shadow to the image.

### Input Image

The input image control displays a thumbnail of the input image for reference purposes.

### Mask

The mask color or image control lets you specify a mask for the input image that defines the shape of the area that will cast a drop shadow on the input image.

### Angle

The angle control lets you specify the direction the shadow is cast. Normally drop shadows are cast to the lower right, but you can choose other directions if you wish.

### Offset

The offset slider lets you specify how far the drop shadow should be displaced from the shape specified in the mask. Larger values make the masked object seem higher above the input image.

### Transparency

The transparency slider lets you make the shadow more or less transparent.

### Blur Radius

The blur radius slider controls how soft a shadow is cast. Normally, the larger the offset, the higher the blur radius should be.

### Shadow Color

The shadow color specifies the color of the shadow. Black is the most common setting.

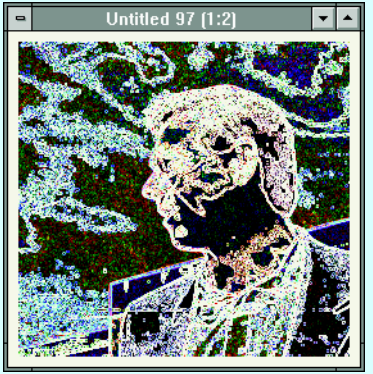
# Edge

Edge delineates the edges of elements of an image. The transformation gives you a range of options which create various interesting effects. As with the Emboss transformation, it is hard to predict results so there is really no substitute to experimenting with the settings.

**Edge Examples**

**Edge Options**

**Using the Edge Dialog**





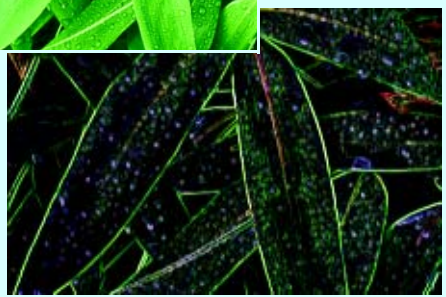
***Edge:*** Two examples of the edge effect. The top effect is achieved with the Roberts method; the bottom with the Sobel method.

The difference between the two methods depends on the image. In many cases, it is less pronounced.

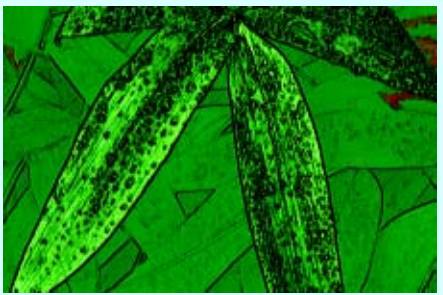
# Edge Examples

A Sampling of Edge Settings

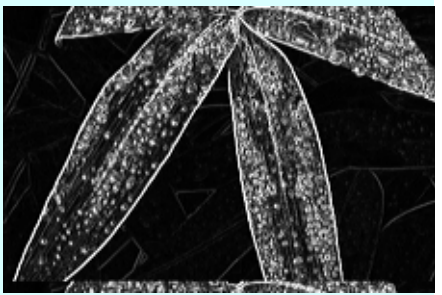
Original Image
(samples|leaf.jpg)



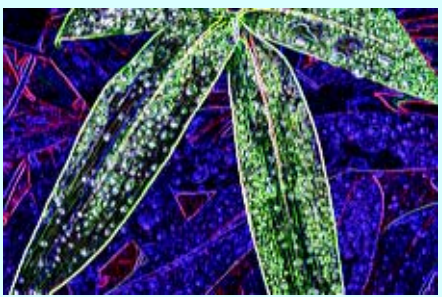
Roberts, RGB, Compute



Sobel, RGB, Darken



Sobel, HSV, Compute



Sobel, RGB, Compute

Sobel, RGB, Lighten

Laplacian, HSV, Lighten

## Edge Options

Depending on the settings you use, effects can vary from fairly realistic to quite abstract. Some of the possibilities are illustrated in the figures. Since effects can vary widely, it is probably best to determine settings for your image experimentally.

Here is a description of the options:

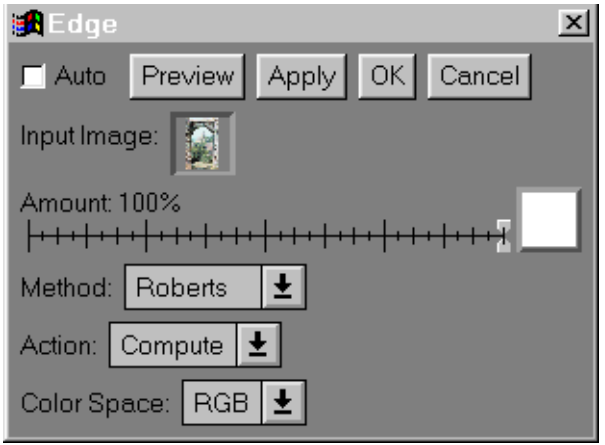
**Method:** This is the technique used to find edges in the image. You can choose **Roberts, Sobel** or **Laplacian**. The Roberts method creates finer but less distinct edges than the Sobel method. The Laplacian edge detector works by computing the difference between a pixel and its eight nearest neighbors.

**Action:** Selects the action that is applied to the edge found by the chosen method. **Compute** creates an image which has light edges and is dark everywhere else. **Lighten** lightens the edges; **Darken** darkens the edges.

**Color Space:** Gives you an additional parameter to control the overall edge effect. To use only the brightness channel, set this control to **HSV** (to affect V) or **HSL** (to affect L). To apply the dialog to all three color channels. set to **RGB.** The channels are each treated separately.

## Using the Edge Dialog

To create an edge effect:




1. **Select an image to edge.** Click on the image window containing the image.
2. **Display the edge dialog.** Choose **Edge** from **Special Effects** under the **Transformation** menu.
3. **Make the dialog settings.** See the text for a discussion of method, action, and color space. You may want to experiment with various settings and definitely use the **Amount** slider to control the degree of the effect.
4. **Preview.** Click **Preview** to see the result. Make any changes required and preview again until you are satisfied.
5. **Click OK** or **Apply** to create a new image.

# Conformal Mapping

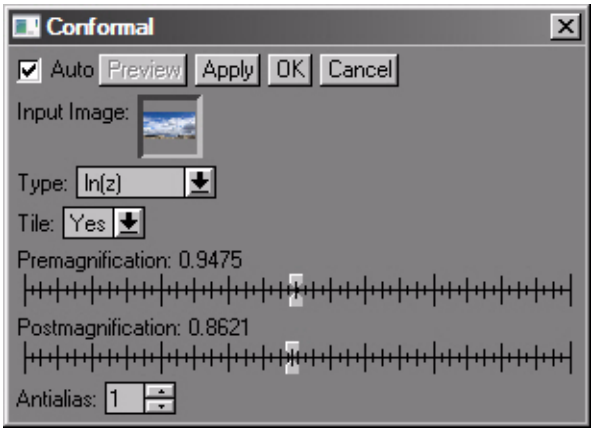
This transformation generates a variety of effects based on the mathematics of complex functions. A complex number has a real and an imaginary part which may be mapped to x and y coordinates. Thus a complex function maps one set of coordinates to another. These mappings have certain interesting mathematical properties such as preserving the angles between intersecting lines. But mostly within Picture Window the mappings are simply a way to achieve some bizarre distortions. Each mathematical function has its own special character which is best discovered by experimentation.

The best way to use Conformal mapping is to choose an image and then experiment with the available functions. After you choose a function, experiment with different placements of the center point, input and output magnification and the tiling checkbox.

Image courtesy Dennis Wilkins

**Conformal Mapping Example:** There is really no image that can be said to be characteristic of Conformal Mapping. You can anything from strange distortions to kaleidoscopic effects. This example used the ln(z) function with the center point moved to the lower right corner.

## Conformal Mapping Dialog




To launch Conformal Mapping, choose **Transformation->Special Effects->Conformal Mapping** from the main menu.

The transformation gives you the following controls:

**Type:** This selects the function that is applied.

**Tile:** Tiling can be either on or off. When it is on, the input image is treated as though it covers the entire x-y plane by being replicated over and over ad infinitum. This setting produces some very striking effects. If tiling is off, any coordinates that fall outside the input image are simply displayed as black.

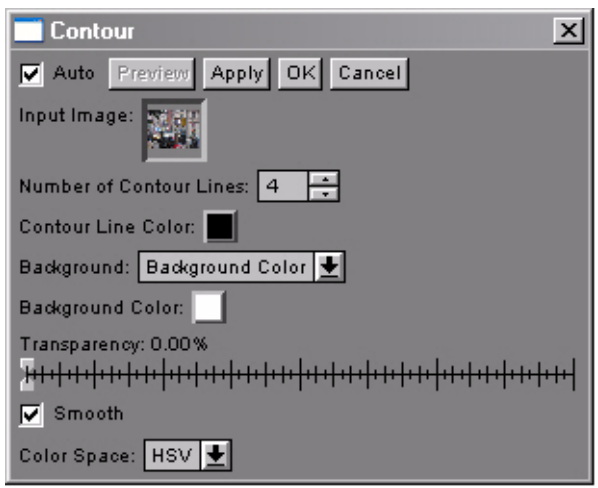
**Pre- and Post-Magnification:** These sliders let you scale the coordinates entering the and exiting the mapping calculation. The results of the two are somewhat different and both are worth experimenting with.

**Antialias:** This control lets set the antialiasing level. The higher the antialiasing, the more accurate the result image but the longer it takes to compute.

**Center Point:** The center point is displayed in the main image window. It is a good idea to experiment with its placement. You can move it to change When you start up the Conformal Mapping transformation, it displays an overlay over the input image window to set the center of the image. You can drag this to a different location to offset the input coordinates to the complex function.

# Contour

The Contour transformation analyzes the image and creates contour lines along luminance boundaries. You can control the number of contours created and their color. You can also superimpose the contour lines on the image or make the background behind the contour lines a solid color of your choice. A transparency control sets the transparency of the contour lines.




## Contour Dialog

To launch the transformation select **Transformation/Special Effects/Contour** from the main menu.

**Number of Contour Lines:** Contour lines are equally spaced in brightness.

**Contour Line Color:** The color of the contour lines.

**Background:** The background can be the original image or background mode which allows you to choose solid background color. If you pick background mode, the original image is excluded from the output producing a paint by numbers effect.

**Background Color:** The color of the background in background mode.

**Transparency:** The transparency of the contour lines.

**Smooth:** Selects whether or not the contour lines are smoothed.

**Color Space:** Lets you choose how brightness is defined for calculating brightness intervals for contour lines. The choices are HSL and HSV. HSV is most commonly used. (See **HSV, HSL, and RGB Color Spaces**.)

# Difference

**Difference** is another technique for creating special effects. The Difference transformation subtracts an image or a constant color from an input image. It is really a technique for combining two images and can create quite interesting results. The transformation can also be used for various utility purposes. For instance, you can subtract an image that has been touched up or otherwise changed from the original to find where the differences are.

The subtraction is performed pixel by pixel—the red, green, and blue pixel values of corresponding pixels are subtracted, resulting in a new image.

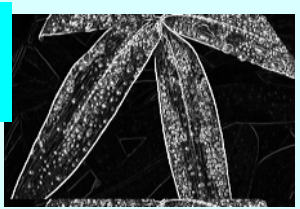
**Difference Options**

**Using the Difference Dialog**

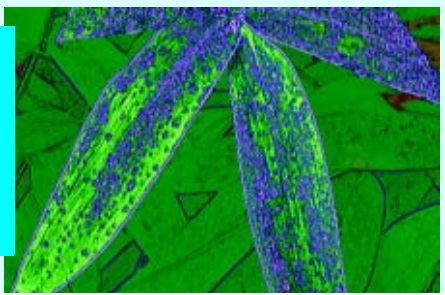
**Difference Example**

Original image

Original image modified by Edge transformation (see **Edge Examples**.)



Final image, created by subtracting second image from first, using **Absolute Difference**



## Difference Options

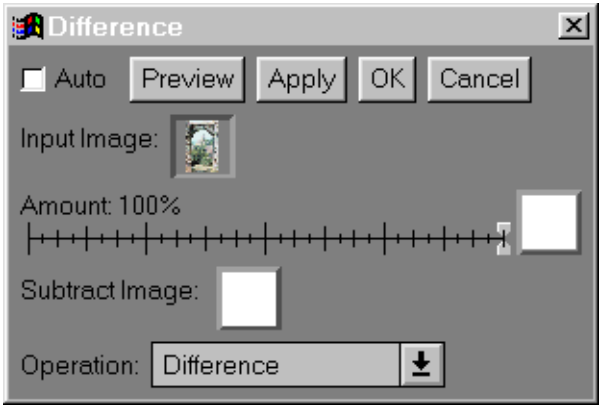
The dialog lets you define subtraction in one of three ways:

**Difference:** This is the normal subtraction process. The second image is subtracted from the first; if the result is negative, it is set to zero, or black. Therefore, areas in which the second image is brighter than the first are black.

**Offset Difference:** The images are subtracted, as above. However the result is then offset by adding a neutral gray level to it. Therefore, areas that are lighter in the second image are rendered lighter than a medium gray while darker areas are darker than a medium gray. However, areas that are different by more than the intensity of a medium gray are rendered entirely black or white.

**Absolute Difference:** The images are subtracted, as above. If the result is negative, its sign is switched to positive. Therefore, lightness is proportional to difference. Identical areas are black.

## Using the Difference Dialog




To use the difference dialog:

1. **Select an image.** Click on the image window containing the image. If you want to subtract an image from it, make sure the second image is open also. Note, the size of the second image must be identical to that of the first image.
2. **Display the Difference dialog.** Choose **Difference** from **Special Effects** under the **Transformation** menu.
3. **Select the second image.** Click the second image button. Select a second image or select constant color and choose a color from the color picker.
4. **Make the settings.** Select the difference mode. See the text for details.
5. **Preview.** Click **Preview** to see the result. Make any changes required and preview again until you are satisfied. Try the **Amount** slider to control the degree of the effect.
6. **Click OK** or **Apply** to create a new image.

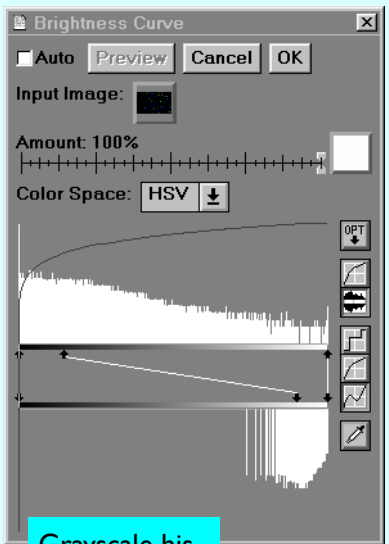
## Difference Example

JPEG compression is a 'lossy' compression technique—that is a little bit of image information is lost. We can use the **difference** transformation to discover exactly how much is lost and where in the image the loses are greatest.

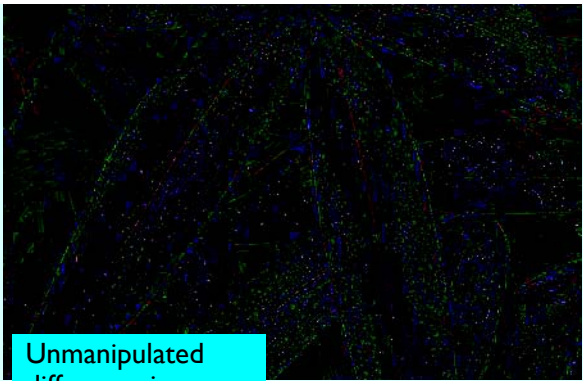
We used the difference transformation to compare the image of the leaf after high-ratio compression (50:1) to its original.

If there were no differences at all, the result would have simply been a solid, all black image. As it turns out, the image is nearly all black, with just a scattering of brighter pixels, indicating some differences between the original and compressed versions.

Original image

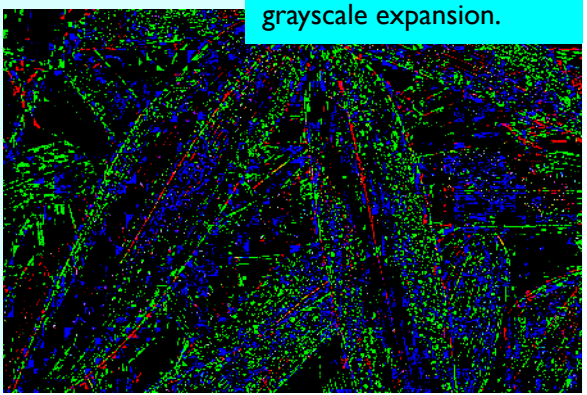



Grayscale histogram of top difference image



Unmanipulated difference image.

Difference image after grayscale expansion.

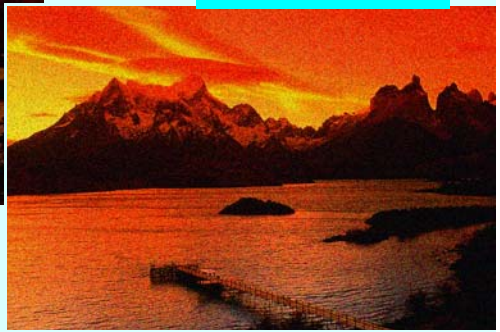


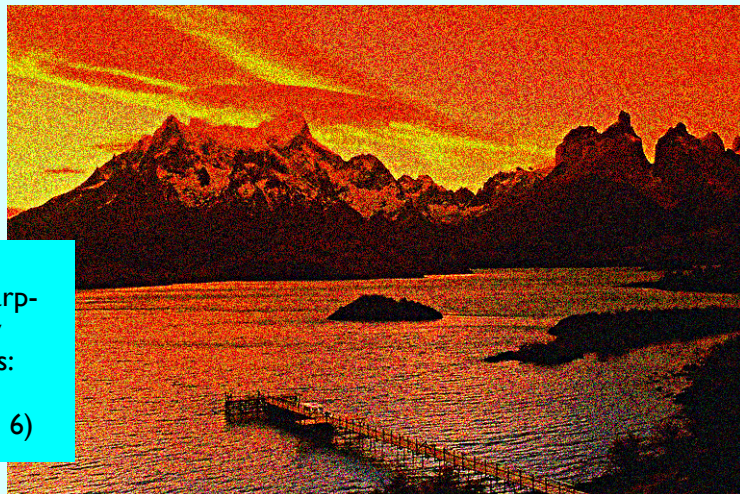
Next we exaggerated the differences in order to see them better by greatly brightening all but the darkest pixels. This brought out a kaleidoscope of color dots. We can now plainly see the outlines of the original leaf, indicating that most of the differences are clustered along outlines—that is, areas of relatively sharp transition in the original image.

# White Noise

Original image

Add noise: (Gaussian, 25%)





Final image: Created by sharpening the noisy image. (Settings: unsharp mask method, radius 6)

Noise is a random variation mixed in with an image. It can be added for its own sake or as a way of introducing randomness that can then be manipulated further, as in the example image (**samples\seamtn.jpg** located in your Application Data Folder) at left.

Depending on how the noise is added, it can mimic effects like photographic grain or pointilistic paintings.

**Noise Options**

**Using the Add Noise Dialog**

**Creating Realistic Grain**

## Noise Options

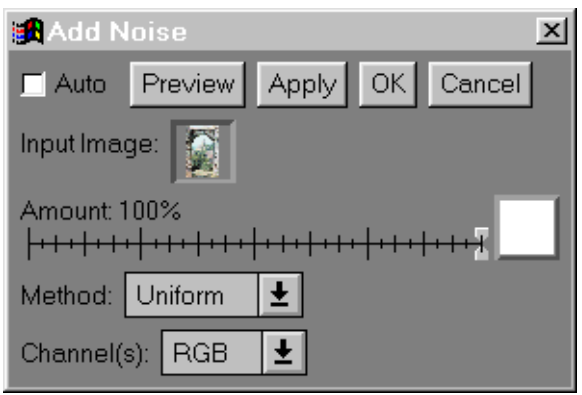
The Add Noise dialog lets you control lets you introduce it to the three RGB color channels, to the HSV value channel only, or to the HSL lightness channel only.

Two methods are available. **Uniform** random noise is evenly distributed across all possible values. **Gaussian** random noise is more likely to make small changes to the image than large ones.

Exactly how settings will interact with your image is hard to predict, so experiment to determine which combination of settings are best in a articular case.

## Using the Add Noise Dialog

To use the Add Noise dialog:

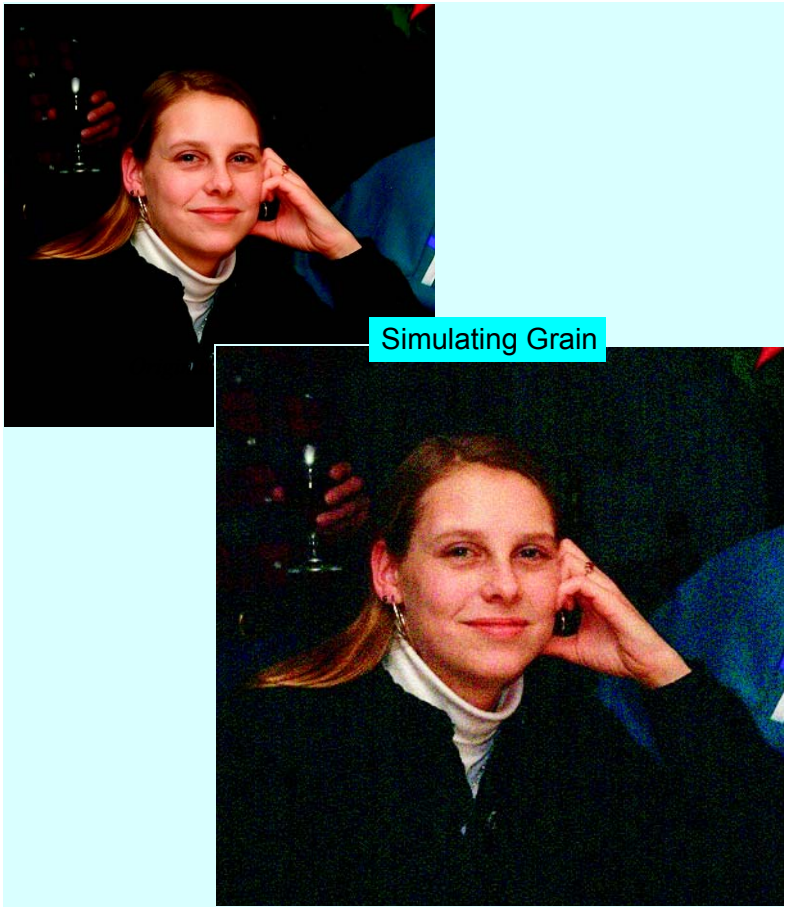



1. **Select an image.** Click on the window containing the image.
2. **Display the Add Noise dialog.** Choose **Add Noise** from **Special Effects** under the **Transformation** menu.
3. **Make the dialog settings.** Select the desired **Method, Channel(s),** and set the **Amount** slider.
4. **Preview.** Click **Preview** to see the result. Use the **Amount** slider to control the degree of the effect. Make any changes required and preview again until you are satisfied.
5. **Click OK** or **Apply** to create a new image.

## Creating Realistic Grain

If you are primarily interested in simulating graininess in a color image, you may want to experiment introducing different amounts of noise into each of the three color channels. This improves realism because film layers are not all uniformly grainy. For instance, you might introduce 7% noise to the red and green channels and 3% noise to the blue channel.

To introduce noise into individual channels, use the **Extract Channel** transformation to separate the image into the three RGB channels. Use the **Add Noise** dialog to apply noise to each channel separately. You may want to create several versions of each channel, introducing a different amount of noise into each. Finish by using the **Combine Channels** transformation to reconstruct the color image.




Original image. Note the crop rectangle. It allows you to crop within the Tile transfor-mation.

Tiled image

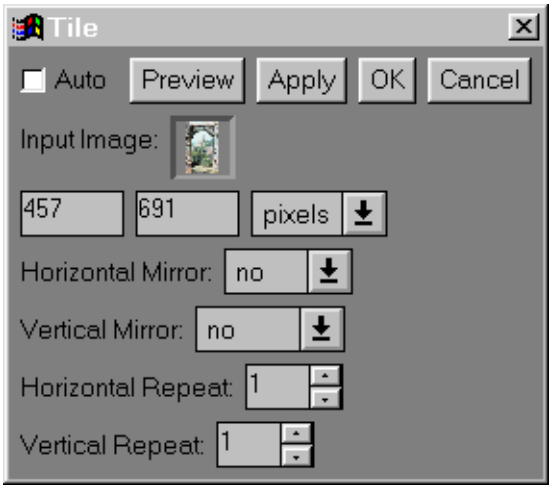
# Tile

Tile lets you repeat a single image, reflecting it to the side and above or below the original image. You can choose the direction of the reflection and the number of repetitions.

You can use the transformation to create a wide variety of effects, from a calm, albeit synthesized, reflecting pool to a wild graphic kaleidoscopic effect.

**Using the Tile Dialog**

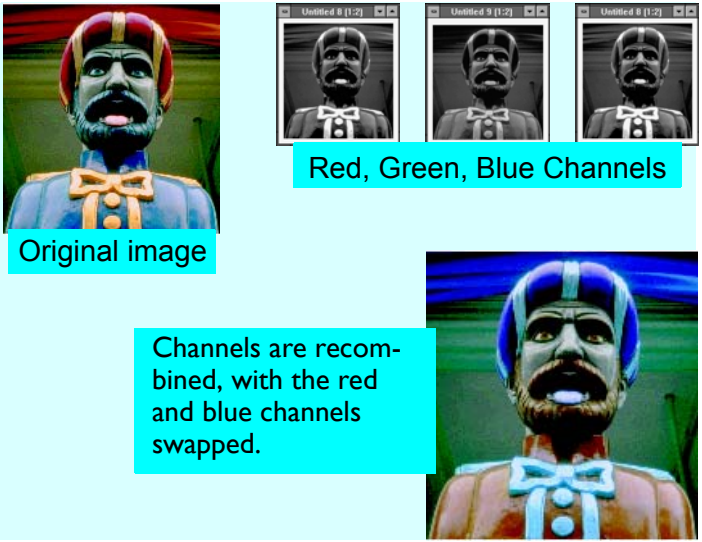
## Using the Tile Dialog




To use the Tile dialog:

1. **Select an image.** Click on the window containing the image.
2. **Display the Tile dialog.** Choose **Tile** from **Special Effects** under the **Transformation** menu.
3. **Crop the input image** if necessary. You do not have to use the entire input image. Crop the image as required. You can size and position the crop rectangle just as in the main **Crop/Add Border** transformation.
4. **Make the dialog settings.** Select the desired direction(s) of reflection and the number of reflection cycles.

   **Note:** The readout shows the size of the final image. It is a multiple of the original image. If this is larger than you want, either **Resize** the original image before applying the **Tile** dialog or resize the output image afterward.
5. **Preview.** Click **Preview** to see the result. Make any changes required and preview again until you are satisfied.
6. **Click OK** or **Apply** to create a new image.






# Extract and Combine Channels

Two complementary transformations allow you to work with individual channels of a color image.

The **Extract Channel** transformation lets you pull one or more channels out of a color image. You can extract luminance, the red, green, and blue RGB channels; or the hue, saturation, and brightness channels using either the HSV or HSL color space. Each extracted channel forms a separate black and white image.

The **Combine Channels** transformation lets you assemble three separate black and white images into a single color image. You can work in **RGB, HSV,** or **HSL** color space, assigning an image to each of three channels in the color space your choose.

You can use the transformation for a variety of purposes. For instance, you can create black and white images from color images by extracting the luminance channel. You can also extract a particular channel to gain a better understanding of how it contributes to the image. You can manipulate it separately, using various transformations, and then recombine it. You can also extract channels, scramble them and recombine them to create various false color effects, as shown.

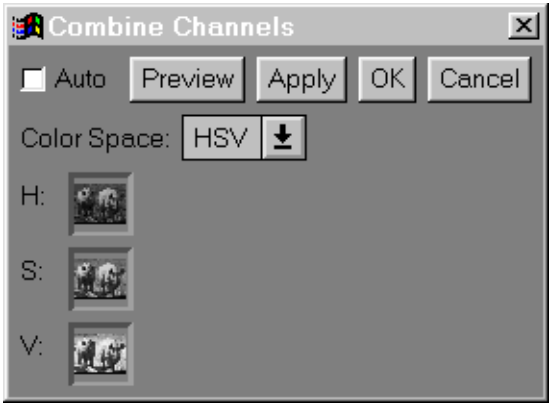
**Extract Channel** **Combine Channels**

## Extract Channel


To extract the luminance, RGB, HSV, or HSL channels from a color image:

1. **Select an image.** Click on the window containing the image.
2. **Display the Extract Channel dialog.** Choose **Extract Channel** from **Color** under the **Transformation** menu.
3. **Select a channel.** Select **Luminance** or any **RGB**, **HSV**, or **HSL** channel.
4. **Click OK** or **Apply** to create a black and white image of the channel.

## Combine Channels



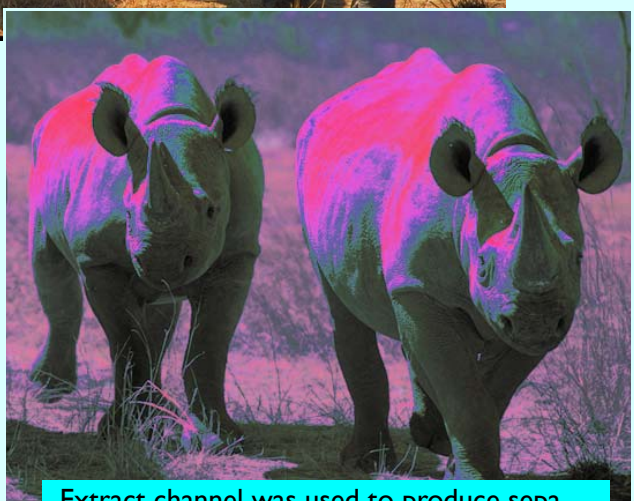

The Combine Channel transformation allows you to assign a black and white image or a specific level for each color channel. You can work in the RGB, HSV, or HSL color space.

The images you use must be black and white images and must all be exactly the same size. They may be produced, for example, using the **Extract Channel** transformation, **Combine Channels** Register operation, the **Gradient Transformation**, or the **Mask Transformation**. You can use the same image for more than one channel.

To combine up to three images into one color image:

1. **Open the images you plan to use.** If the images are not already all be the same size, use **Crop/Add Border** or **Resize** to adjust them. You can also use a solid gray instead of an image for one or more channels.
2. **Display the Combine Channels dialog.** Choose **Combine Channels** from **Gray** under the **Transformation** menu.
3. **Select a color space.** Select the **RGB**, **HSV**, **HSL**, and **CMY** color space.

   CMY combines the channels additively as cyan, magenta, and yellow light, as opposed to the more common subtractive combination of cyan, magenta, and yellow ink.
4. **Assign an image to each channel.** Click each channel button and assign an image to each channel.
5. **Preview the result.** You may want to experiment with image assignment or color space selection.
6. **Click OK** or **Apply** to create a new combined color image created from the individual single-channel images.



Extract channel was used to produce separate images for the RGB channels. They were recombined as HSV channels.

## Extract/Combine Channels Example

The Extract and Combine Channel transformations can be used to create some striking abstract-color effects. This example (**samples\rhino.jpg** located in your Application Data Folder) shows just one of a myriad of possibilities.

The basic idea is to separate an image into its channels and then recombine the channels in a different way. In this example, we separated the input image into its red, green and blue channel, using the **Extract Channel** transformation. We then recombined the images using the HSV color space rather than RGB using the **Combine Channels** transformation. We assigned green to the value (brightness) channel, red to the hue channel and blue to the saturation channel.

These are, of course, somewhat arbitrary assignments. There are many other possibilities. In addition to simply experimenting with different color spaces and channel assignments, one can also manipulate the extracted black and white images. **Posterization** or **Solarization** of one or more channels might produce interesting results. A gradient or a mask might also be used as one of the channels.


Using Text to make a card

# Text

Picture Window lets you add text to your photographs. You can use this feature simply to annotate your photos to record the names of people, the date, place and other particulars. You can also use the text feature to create greeting cards and announcements.

The text feature allows you to use any font that is available on your system. You can select a color for the text, and position the text anywhere on the image.

You add the text over a background rectangle whose size and position you can control. You can choose a contrasting color for the background rectangle, to help the text stand out, or make the rectangle transparent.

Once you exit the Text dialog, the text you have added is integrated with the image. That means that adjustments to color balance, brightness and contrast, and geometry (to mention just three) affect the text together with everything else in the image. Therefore you will generally want to add text as one of the last operations—after you have completed the other adjustments. If you think you will want to edit the text later, save the version of the image just before entering the Text dialog.

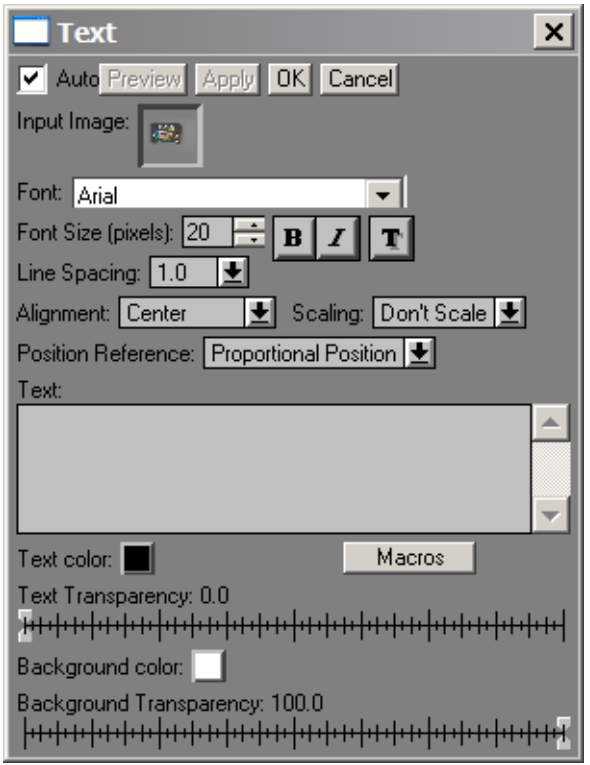
**Using the Text Dialog**
**Placing Text into a Border**
**Using the Grid to Align Text**
**Using Displace to Rotate an Image**

## Using the Text Dialog

To add text to your photograph:

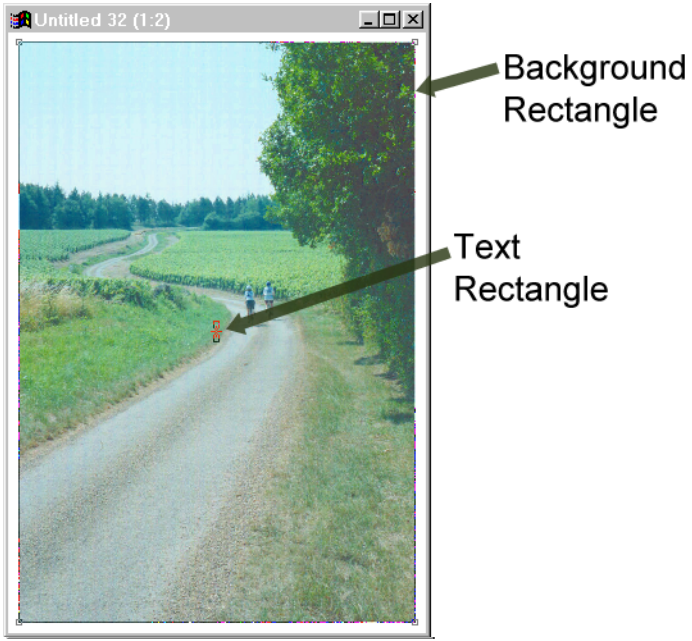
1. **Select the image to which you want to add text.** If you want to place text into the border, use **Crop/Add Border** to create the border first.
2. **Display the text dialog.** Choose **Text** from the **Transformation** menu. Notice that two rectangles are superimposed on your image.

   The small rectangle in the center of the image shows the boundary of the text. It will grow and shrink as you type and making other adjustments to your message. You can position this rectangle by dragging it.

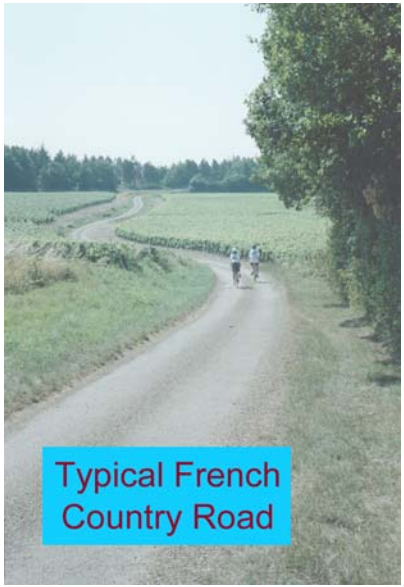


A second rectangle forms the background to your text. Initially it is the same size as the whole image. It has handles in its corners. You can drag these to change its size. You can also position the entire rectangle by dragging its interior.

If you choose a colored background, you will want to size and position the background rectangle. It must be at least as big as the text rectangle, since any part of the text that is outside the background rectangle is truncated. (If you choose a transparent background, simply ignore this rectangle. It will not be visible in the final image.)




3. **Type the text.** In the **Text** control, type your text. Note that as you type, a text rectangle in the image grows. the rectangle shows the current size and position of your message. You can also enter a macro expression by clicking the **Macro** button and selecting an expression from the menu.
4. **Select the text attributes.** Use the **Font** drop down list to select the font style. Set the **B** and *I* buttons for Bold and Italic, respectively. Set the **Font Size** and **Line Spacing** to the height and spacing you desire.
5. **To create a drop shadow** behind your text, click the **T** button. (See **Using the Drop Shadow Dialog** for more information.)



Text within a colored rectangle

**6. Select the text color.** If you want text to be a color other than black, click in the color square. The **Color Picker** is displayed. Choose a color from the picker. You can also use the color picker probe to match the font color to a color in the image.

**7. Set the text transparency control.** Move the control to the right to make the text increasingly transparent.

**8. Position the text rectangle:** Drag the control point to place the rectangle at the desired position in the image. You can use the grid to make text alignment easier. (See **Using the Grid to Align Text**.)

**9. Background Rectangle.** If you want a colored rectangle behind the text, adjust the **Background Transparency** slider to make the background increasing opaque. Click on the background color square and use the **Color Picker** to select the background color.
Size and position the background rectangle as desired. To change the size of the rectangle, drag one of its corners or edges. To position the entire rectangle, drag it by its interior.

**10. Preview.** Click **Preview** at any point in the process to see the result. Make any changes required and preview again until you are satisfied.

**11. Click OK** or **Apply** to create a new image. The text is integrated with the image. Repeat this procedure to add additional blocks of text.

## Using the Text Widget

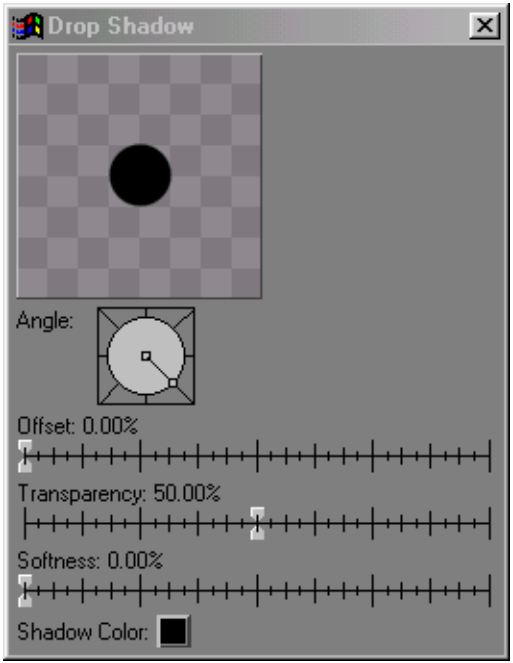
The Text transformation is also available as a widget for use in workflows. The text widget operates in the same way as the transformation. However, since images in a workflow may have different sizes, the widget version has two additional controls to scale and position the text intelligently.

**Scaling:** This control gives you the option of scaling the text according to the size of the image. If scaling is selected, the size of text, the size of the background rectangle and their positions are scaled in proportion to image size. To be precise, the scaling ratio is calculated as the square root of the area of the current image divided by the area of the prototype image.

**Position Reference:** You can control how the text will be positioned on images that have a different size or proportions compared to the prototype image. You can set the reference point to any one of the image corners or to the center of the top or bottom edge. (If **Scaling** has been chosen, the position is scaled in proportion to image size.) Generally the Position Reference should be coordinated with alignment. For instance if you set the reference to **Top Left** or **Bottom Left,** set alignment to **Left**.

You can also choose **Proportional**, which positions the text in the same relative place as you have positioned it on the prototype image.

## Using the Drop Shadow Dialog




You can add a drop shadow behind text. The Drop Shadow dialog is launched from the Text Dialog. (See **Using the Text Dialog**.)

To create a drop shadow behind the text. display the Text dialog.

1. **Click the** **T** **button**. The **Drop Shadow** dialog is displayed.
2. Adjust the drop shadow options. You can adjust:

   **Angle.** By default, the drop shadow is displayed as if the light source was at the upper left corner. If desired, you can drag the angle control to move the shadow angle.

   **Offset.** To adjust the distance by which the shadow is offset from the text, move the offset slider. Increasing the offset makes the text appear to hover further above the surface of the image.

   **Transparency.** Move the slider to the right to make the shadow more transparent and to the left to make it more opaque.

   **Softness.** You can adjust the sharpness of the shadow's edge. Move the slider to the right to make the edge softer.

   **Color.** If you want shadow to be a color other than black, click in the **Shadow Color** square. The **Color Picker** is displayed. Choose a color from the picker. You can also use the color picker probe to match the shadow color to a color in the image.

3. Return to the **Text** dialog to complete the operation.

## Placing Text into a Border

Frequently, you will want to place the text into a border next to the image. You can create such a border with the **Crop/ Add Border** transformation (choose **Geometry** in the **Transformation** menu). You can make the border wide enough to provide room for a greeting card message. Create the border before selecting the **Text** dialog.

## Using the Grid to Align Text

To use the grid, select the image window. Then select the **Info** dialog from the **Window** menu. Set the grid parameter to the number of grid lines desired. Click **OK**. A grid is superimposed on the image.

You can set a different number of grid lines or remove the grid at any time.

# Stereo


To view this image in stereo, use red-cyan 3-D glasses. Check our web site (www.dl-c.com) for stereo equipment sources.

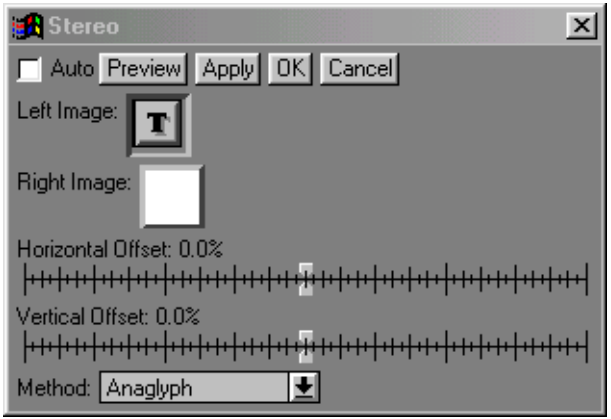
The Stereo transformation lets you prepare stereo images for viewing. It is designed to be used with stereo pairs—images of the same scene that were photographed from two slightly offset vantage points. Such images can be created using a stereo camera or a regular camera that is shifted between the first and second exposure. The latter method, of course, can only be used if the subject is still between exposures, so it's best suited for still lifes or landscapes. On the other hand, a stereo camera can be used just like a regular camera, for both live and still images. The example images (**samples\stereol.jpg** and **samples\stereor.jpg** located in your Application Data Folder) were photographed with a stereo camera.

In order for the stereo effect to be seen, the images must be viewed so the right eye views only the right image and the left eye views only the left image. Various techniques have been developed for achieving this. The stereo transformation supports two of them. The **side by side** method lets you use a viewer that merges two images displayed next to each other. The **anaglyph** method creates red and cyan images viewed using special glasses with red and cyan lenses (red on the left, cyan on the right). You can create monochrome or color anaglyphs.

**Using the Stereo Transformation**

## Using the Stereo Transformation

To use the stereo transformation:




1. **Open the two stereo images.**
2. **Display the stereo dialog.** Choose **Special Effects** from the **Transformation** menu. Click on **Stereo** in the sub-menu.
3. **Select the Images.** Click on the Left Image window and select the left image from the menu. Similarly, click the right image window and select the right image.
4. **Adjust the horizontal and vertical offsets.** This is necessary to produce the best stereo effect. To adjust the offsets, set the method to Red/Cyan. Preview the image and locate a foreground object. The goal is for the red and cyan images of the foreground object to line up vertically as closely as possible. Varying the horizontal offset adjusts the 3-D effect by moving the image closer or further away.

   Enable **Auto Preview**. Adjust the horizontal and vertical sliders as needed until the images of the foreground object are coincident. Enlarge the preview window if necessary.

   Note that images of background objects will be offset. That is normal. Our visual system uses this offset as a depth cue. Therefore the further back an object is, the greater the offset between its two images should be.

5. **Choose the method.** Select **Anaglyph or Color Anaglyph** if you will view the image using red/cyan glasses. (Note that the Anaglyph method automatically converts color images to black and white.) Select **Side by Side** if you will use a stereoscope-type viewer.
6. **Click OK** or **Apply** to produce the stereo image.

Original stereo pair

Anaglyph output

Side by side output

Original Image

High Contrast Output
(threshold = 37%)

# High Contrast

The High Contrast transformation tends to emphasize the masses in an image while suppressing detail. Thus it is another technique for abstracting images.

In creating a high contrast image, you select a threshold brightness level. All areas of the image which are brighter than the threshold are rendered as white; those which are darker are rendered as black. The transformation automatically feathers a small band between the black and white areas to smooth out the transition.

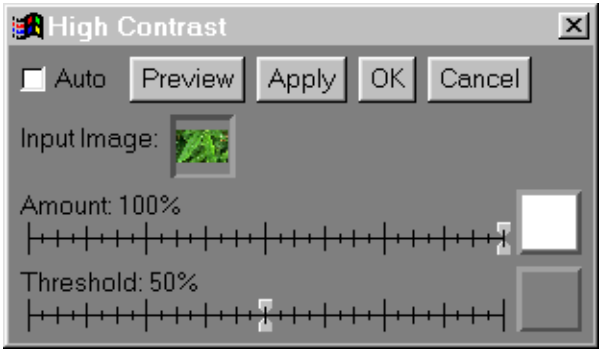
After you create the high contrast image, you may want to add some color to it. One technique is to use the **Tint** transformation to colorize the image. Another technique is to adjust the Amount control to blend some of the original color image back into the output image. The example image is **samples\hicntrst.jpg** located in your Application Data Folder.

**Using the High Contrast Dialog**

High Contrast and original blended.
(Amount = 40%)

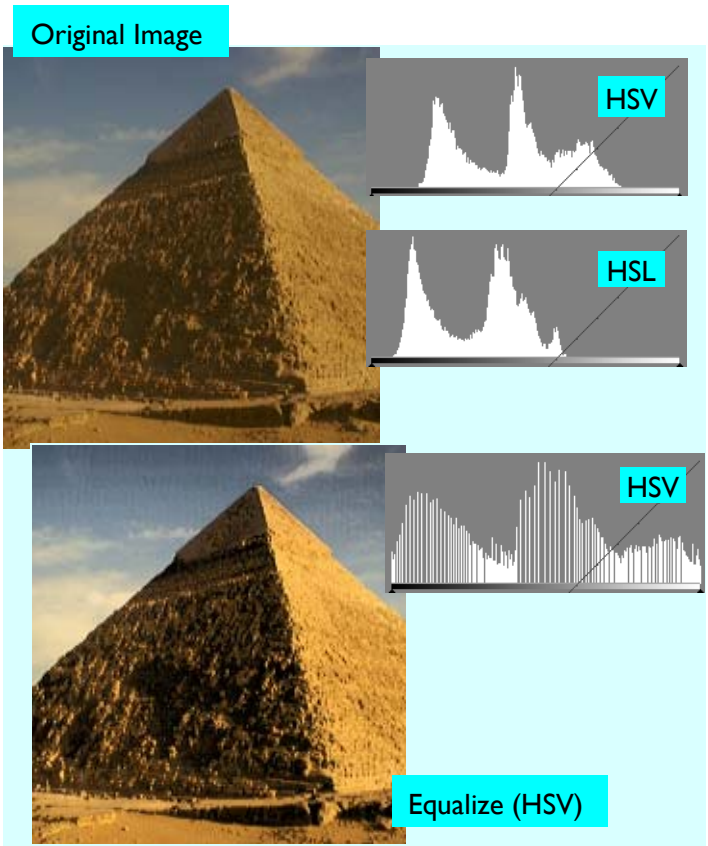
## Using the High Contrast Dialog

To use the High Contrast transformation:



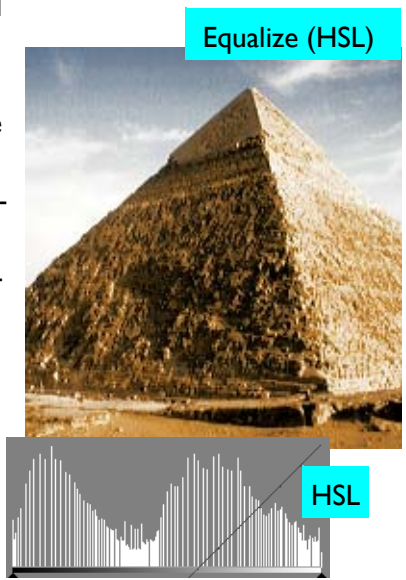

1. **Select the image you want to transform.**
2. **Display the high contrast dialog.** Choose **Special Effects** from the **Transformation** menu. Click on **High Contrast** in the submenu.
3. **Adjust the Threshold slider.** Enable the Auto Previews and adjust the threshold control. The control sets the brightness which divides areas which are rendered white from those which are black in the output image.
4. **Click OK** or **Apply** when you are satisfied with the result. A new image is created.

# Equalize



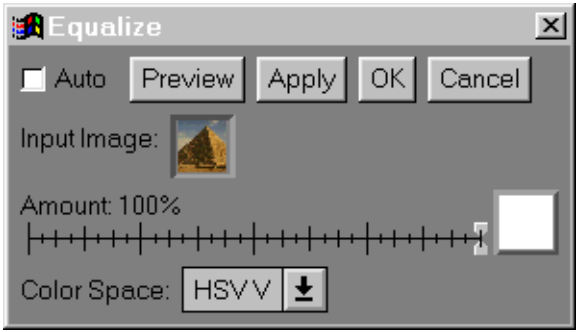

The equalize transformation adjusts brightness levels so that each of the brightness levels is more equally represented in the final image. This tends to bring out hidden detail and enhance texture. For some images it is a quick way to obtain close to an optimum brightness and contrast setting.

The images on this page (**samples\pyramd.jpg** located in your Application Data Folder) show the results of applying Equalize using HSV and HSL color space. The brightness histograms are also shown. Notice how **Equalize** stretches out the histograms to cover the full range of brightness values.



## Using the Equalize Dialog

To use the Equalize transformation:



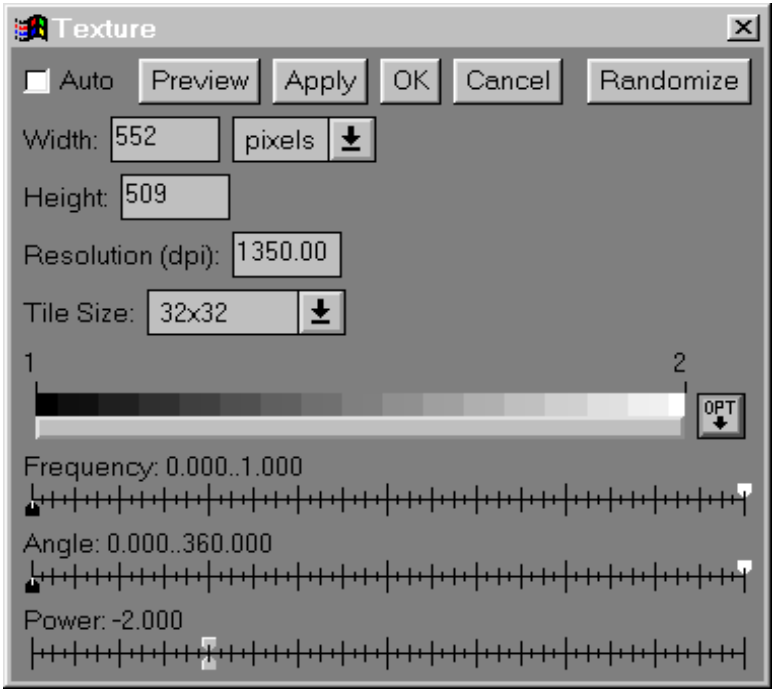

1. **Select the image you want to equalize.**
2. **Display the equalize dialog.** Choose **Special Effects** from the **Transformation** menu. Click on **Equalize** in the submenu.
3. **Set the Color Space.** HSV is generally the best setting for most images.
4. **Preview the result.** If the result is too extreme, back off on the **Amount** slider.
5. **Click OK** or **Apply** when you are satisfied with the result. A new image is created.

# Texture

The Texture transformation creates a variety of texture patterns. The patterns can be black and white or colored. Textures can be used for a variety of purposes. They can be used to create an interesting borders for photographs, or as backgrounds in graphic art applications, to name two. Black and white textures can also be used as masks with most transformations.

## Texture Dialog

To use the **Texture** dialog:




1. **Select an image window** if you want to create a texture of the exact same size as the image.
2. **Display the texture dialog.** In the **Transformation** menu, select **Texture.** The **Texture** dialog box is displayed.

   Edit the **Width** and **Height** dimensions, if desired.

   Set the **Texture Controls**. A wide variety of textures can be created by adjusting the settings. Sometimes even a small change in a setting can have a significant effect.
3. **Preview the texture.** Click the Preview button to display the current texture.
4. **Click Apply or OK** when you are satisfied. An new image of the texture is created.

## Texture Controls

Textures are generated by using a repeating tile to fill the entire surface of the output image. Tiles are created so that they connect seamlessly, without a noticeable boundary. Tile patterns are calculated using a mathematical technique called an inverse 2-dimensional Fourier transform. By adjusting the texture controls, you can generate a wide range of different textures.

### Randomize

A given setting of the controls determines not one texture but rather a family of related textures. To generate other textures in the family, click the **Randomize** button. A new set of random starting parameters is generated resulting in a new texture. Click **Preview** to view the texture.

### Tile Size

This popup list lets you choose the size of the texture cell that is repeated to fill the output image. The smaller the tile, the finer the pattern. Also, small tiles require less time and memory to compute. If your computer has a limited amount of memory (8 MB or less) you may want avoid the very large tile sizes.

### Color Line

Use the color line control to assign colors to portions of the pattern. You can assign colors or shades of gray to the control points, create new control points, and control how colors blend from one to the other. See **Color Line Control** for more information.

### Frequency

Frequency is a measure of detail in the texture. Fine structure in the texture has a high frequency while coarse structure has a low frequency. The double slider frequency control lets you specify the range of frequencies to be used. The black

slider sets the lower limit and the white slider sets the upper limit. You can also 'cross' the sliders by moving the white slider to the left of the black slider. In that case, the frequency range between the two is excluded from the texture.

### Angle

This double slider lets you specify the orientation of the texture. The black slider sets the lower limit and the white slider sets the upper limit. Only frequency components whose direction falls in the range between the lower and upper limit are used to synthesize the texture. If the lower limit exceeds the upper limit, then the range between the two is excluded rather than included.

### Power

This slider lets you alter the weighting of the 'power spectrum' with respect to frequency. Lower values generate coarser textures; higher values generate more fine structure.

## Modifying Textures

Since the texture is an image in its own right, you can use any of Picture Window's transformations to modify it further. Therefore you can apply warp, emboss, sharpen, blur, equalize, resize, or tint, to mention just some of the possibilities.

You can create interesting effects by combining textures. You can combine three different textures using the **Combine Channels** transformation. You can also use the **Filter**, **Difference**, and **Composite** transformations to combine textures.

Of course there are many other possibilities as well. Once you create a texture, you can use it directly or you can apply it to another image in various ways.

**Applying Textures to an Image**

**Creating a Textured Border**

## Applying Textures to an Image

There are a number of different ways to apply a texture to an image. You can use the texture as a mask with various transformations. You can also use it as one of the images in a composite. Each of these techniques give somewhat different results. The composite technique allows use of colored textures. If you a texture as a mask it must be black and white and exactly the same size as the image you are using it with.

**Using Textures as a Mask**

**Using Textures with the Composite Transformation**

### Using Textures as a Mask

The first step is to generate a texture image that has the same dimensions as the image to which you wish to apply the texture. The texture must be black and white.

Decide on the transformation you want to use. Two good candidates are **Brightness** and **Filter**. Brightness uses the texture to introduce a pattern of lighter and darker areas. With Filter, the texture is imprinted as a variation in color. Of course any transformation which accepts a mask can be used.

In the example at left we created a texture and then embossed it, to make the surface seem raised. We then used the Brightness transformation, selecting the texture as a mask. (See **Applying a Transformation through a Mask**). We set the white (highlight) slider to 38% brighter and the black (shadow) slider to 37% darker. Areas in the image corresponding to gray in the texture are changed by the average of the two slider value—which is zero in this case.

The result is an image that appears embossed.

### Using Textures with the Composite Transformation

This technique can produce the same effect as making a double exposure of the image and texture.

Start by creating a black and white or colored texture image whose dimensions match those of the image you want to texture. Then open the image you want to texture in a window, click on it to select it, and select the Composite transformation. Then click on the white square to the right of the Overlay control in the Composite dialog box and select the name of the window containing the texture image. Finally, experiment with different positions of the Overlay Amount slider and the Operation options, to get different effects.

In our example we used the same image and texture as in the Brightness example (**Using Textures as a Mask**). We set the **Overlay Amount** control to 30%.

In this case, the main difference between the Composite and Brightness techniques is the effect on very dark areas. Note also, that colored textures can be used with Composite.

## Creating a Textured Border

The Texture transformation can be used to create a textured border for a photograph. In the example at left, we created a texture using white and a color from the background of the image.

To create this particular texture, we first decided how wide a border we wanted. Using Info, we found the image was 500 x 750 pixels. A border of 150 pixels—a bit less than a third the width—seemed about right. So we added 300 pixels to each dimension, producing a texture width and height of 800 x 1050. We set the texture colors (points 1 and 2) to white and a color from the image background, respectively. We chose a large tile size (256 x 256) and a **Power** value of −3. We used defaults for all other values.

We then used the Composite transformation to combine the image with the texture. We used one point alignment and a grid to center the image on the texture. In another variation at the right, we combined the images using an oval mask with the overlay.

Circular Displace Example

# Displace

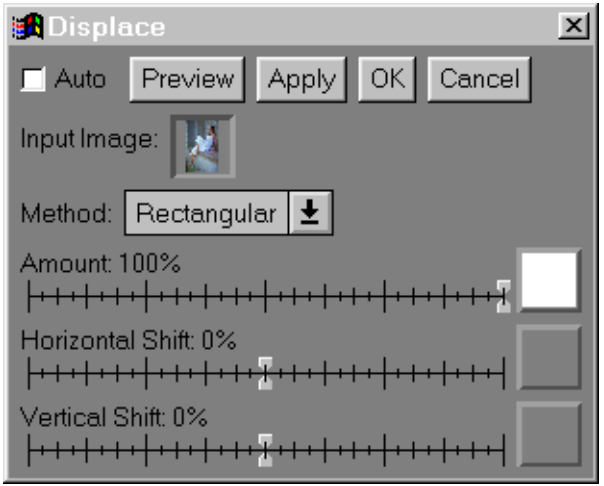
The Displace transformation is used most often to create rippled distortion effects. It can also be used uniformly over the whole image to displace it horizontally and vertically or to rotate it through an arbitrary angle.

The Displace transformation has two methods—**Rectangular** and **Circular**. When Rectangular is selected, it shifts the image horizontally and vertically. When Circular is selected, it rotates the image and changes its magnification.

Though these effects can be applied uniformly to the entire image, they are more interesting when they are applied through control images which vary the amount of the effect from one area of the image to another. Any black and white image of the same size as the original image may be used as a control image. Interesting control images may be created using the **Texture**, **Checkerboard**, and **Gradient Transformation**.

**Displace Dialog**
**Using Displace to Rotate an Image**
**Creating Rectangular Ripple Effects**
**Using Circular Displace for Special Effects**

## Displace Dialog




To use the **Displace** dialog:

1. **Select the image you want to displace.**
2. **Display the displace dialog.** In the **Transformation** menu, select **Geometry** and then **Displace.** The **Displace** dialog box is displayed.
3. Choose the Displace Method and set the shift controls.

   **Rectangular**: The rectangular method gives you independent control over horizontal and vertical shifts. You can select a constant shift or use a separate control image for each direction.

   **Circular:** The circular method gives you control over image magnification and rotation. You can select constant amounts or apply these parameters through control images.

4. **Select control images, if desired.** To select a control image for a particular parameter, make sure the control image is opened in a separate image window. (The control image can be any black and white image whose pixel dimensions are exactly the same as the main image.) Double-click on the button next to the slider control for the parameter. Select the control image from the menu.
5. **Preview the result.** Click the Preview button to display the current settings. **Click OK** or **Apply** when you are satisfied. A new image is created.


## Using Displace to Rotate an Image

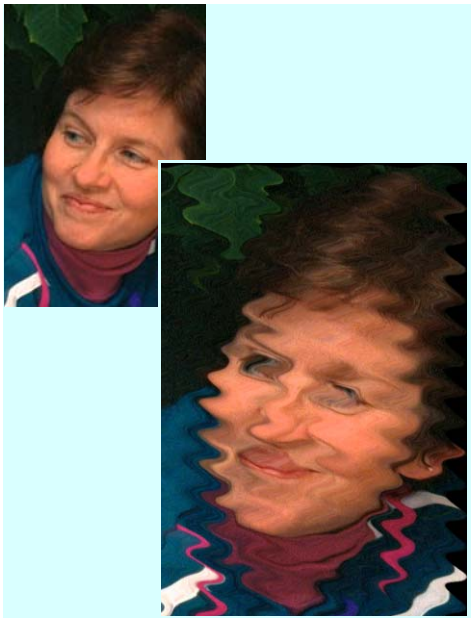
Displace can be used to rotate an image through an arbitrary angle. In this example we use this feature to rotate a caption.

We first used **File->New** to create a blank image with a plain white background. Then we used the **Text** transformation to create the text.

We then rotated the text using the **Displace Dialog**. We set the method to **Circular**. The **Rotation** slider allows you to rotate the image counter-clockwise (move the slider to the left) or clockwise (move the slider to the right).

Notice that after rotation, there are black spaces visible around the image. Often these spaces can be eliminated by magnifying the image, using the **Magnify** slider on the **Displace** dialog. However in this case, we used the **Paint Tool** tool to white them out, making the entire background behind the caption white.

Finally, we combined the caption with the image of the baby using the **Composite** transformation. (See **Composite Dialog (Two Images)**.) On the composite dialog, we chose the **Darken** operation. That way only the darker text was blended into the base image, eliminating any need for a mask. The result is shown at right.

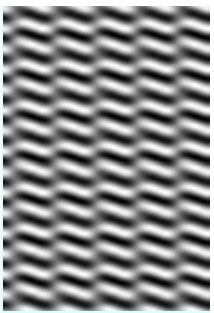


## Creating Rectangular Ripple Effects

You can use displace to create ripple effects similar to those produced looking through rippled glass. They are created by using a black and white texture as a control image. This creates an image with a pattern of displacement variation.

To create this example, we first created a texture. the texture must be exactly the same size (in pixels) as the image to which it is applied. Also, the scale of the texture should be appropriate for the selected image.

To create our texture, we selected the original image and then selected the **Texture Dialog** in the **Transformation** menu. The settings we used for our texture were **Frequency** of 0 – .6, **Angle** of 110 – 200, **Power** of 3.5, and a **Tile Size** of 128 x 128. However, by all means, experiment with other settings.



Texture

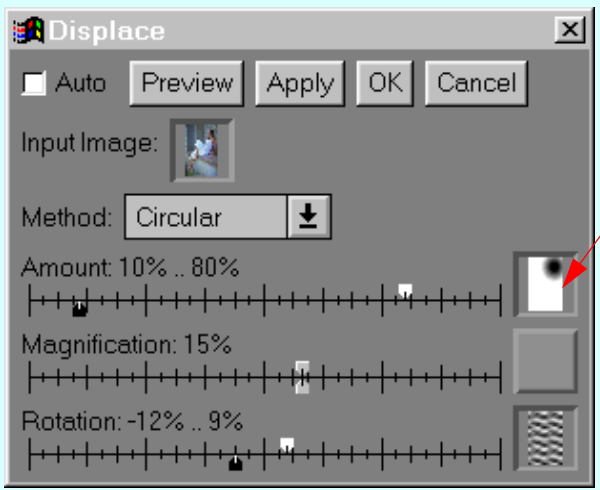
After building the texture, we selected the original image again and opened the **Displace Dialog**. we selected the **Rectangular** method and used the same texture for both the Horizontal and Vertical displacement controls. To achieve the effect shown, we used horizontal settings of 0 – 37% and vertical setting of 0 – 13%. You may want to try using different textures for the two dimensions and experiment with different settings.

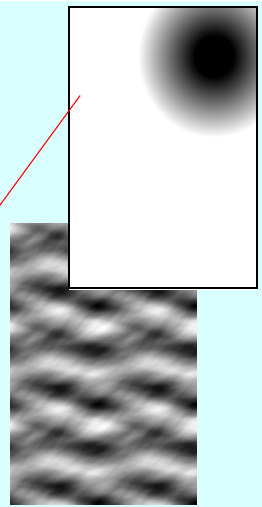
## Using Circular Displace for Special Effects

Another way to create ripple effects is to use the Displace Transformation's **Circular** method. Circular effects may look less regular and thus may suggest reflections in water or 'dreamy' effects rather than the more geometric rippled glass' effects of the Rectangular method.

In this example, we used two control images.

The first control image was created using the **Gradient Transformation**. An oval gradient centered on the woman's face was used as a mask. It reduces the displace effect in the face area, to make the

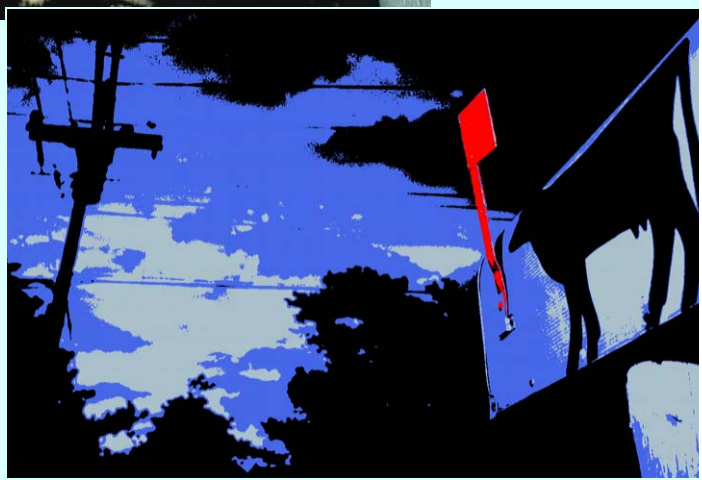


face more recognizable. In this example, we set the amount sliders to 10% for the black areas of the mask and 86% for the white areas.

The second control image is a texture used to control Rotation. (See **Texture Dialog**.) The black **Rotation** slider was set to −12% and the white to 9%. This creates both clockwise and counter-clockwise rotation, leaving the overall image rippled yet appearing upright.

We did not use a control image for the magnification. We set the slider to 15% to eliminate most of the black areas near the borders.





# Posterize

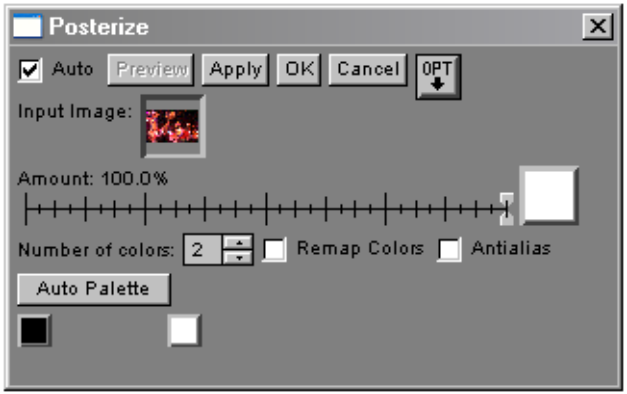
The Posterization transformation converts continuous tone photographs to ones that use a limited palette of 'flat' colors, in imitation of silk-screened posters. There are several ways to achieve the effect. One involves the use of the **Brightness Curve Transformation** in **rgb** mode (see **Posterization**). But for the greatest amount of control, use the **Posterize Transformation,** described below.

## How Posterize Works

The Posterize transformation lets you select the palette of colors you will use for the image. You can select anywhere from two to thirty two colors. Picture Window analyzes the image and converts each picture to the closest color. You can use these colors for the image or you can create a false color effect by substituting one or more of the colors with other colors. You can also use the amount control to blend the original image with the posterized image.

**Posterize Transformation** **Posterize Example**

## Posterize Transformation




To use the **Posterize** dialog:

1. **Select the image** you want to posterize.
2. **Display the posterize dialog.** In the **Transformation** menu, select **Special Effects** and then **Posterize.** The **Posterize** dialog box is displayed.
3. **Set the colors** into which the input image will be divided.

   **Set the Number of Colors** control to the number of colors you want to use, from 2 to 32 colors. Each color is represented by a small color rectangle in the dialog.

**Assign colors to the rectangles.** You can have Picture Window assign the colors or assign them manually.

To have Picture Window automatically select the colors, click **Auto Palette**. Picture Window scans the image and assigns the number of colors you requested.

To assign colors manually, click on each rectangle displayed below the **Auto Palette** button. The **Color Picker** is displayed. Choose a color from the color cube or use the **probe tool** in the picker to choose a color from the input image itself.

**Preview the image.** Small changes in the colors you select can sometimes make a big difference in how the output image looks, so its worth experimenting with the exact color assignments. You can also use the **Amount** control to blend some of the original image back into the output image.

4. **To substitute colors**, click the Remap Colors box. A second set of color rectangles is displayed. These rectangles show the colors that will be substituted in the output image. Click on each rectangle whose color you want to change, using the **Color Picker** to set its color. Preview the image and make adjustments as needed.
5. **Click the Antialias check box** to make the image appear smoother. Antialiasing makes diagonal and curved lines between areas of different color appear less jagged.
6. **Click OK** or **Apply** to complete the dialog and create an output image.

### Options

The following options are available by clicking the 

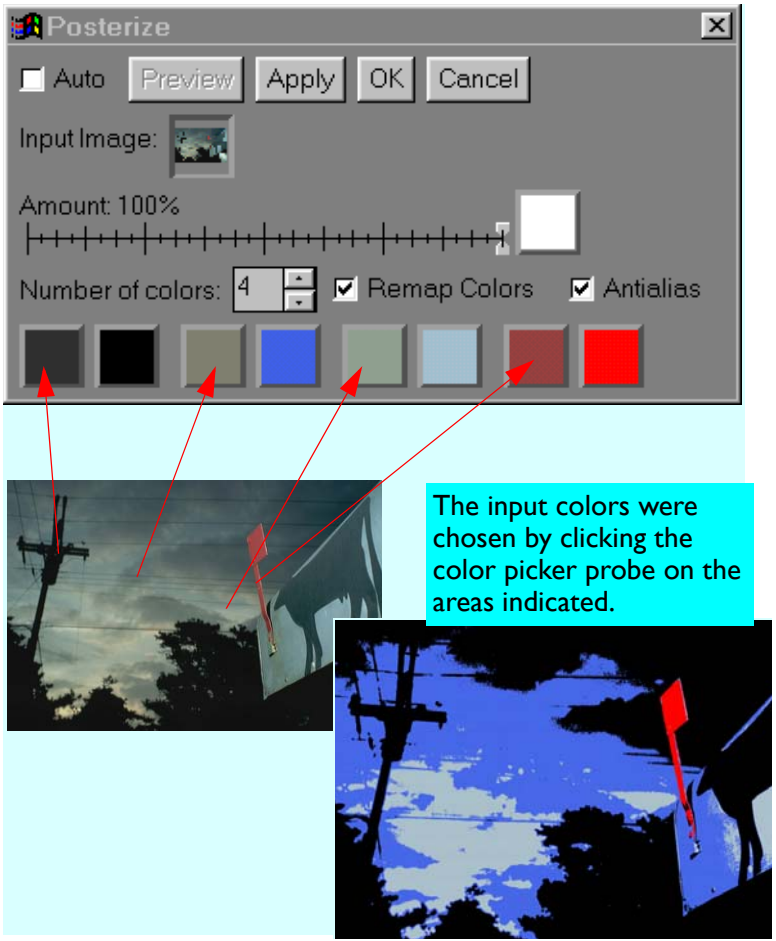
button:

**Reset All:** Resets the dialog to its original default values.

**Reset Remapped Colors:** Resets each remapped color to its source color.

**Load:** Loads settings stored earlier.

**Save As:** Stores current settings:




# Posterize Example

## Color Input Image

The key to creating posterization effects is to visualize your image as being composed of a few flat areas of color. The colors can be similar to the originals, as in this example, or be entirely different. You may also want the colors you choose to be somehow related to each other. In this example, the colors chosen are more vibrant—one might say electric—than the originals.

While you can choose as many as 32 colors, it is best to start with far fewer. In this example, the photographer Bob Bouchal chose to break up most of the picture into just three colors. The very dark areas are converted to black, darker colors in the clouds are converted to a full blue, and lighter colors to a lighter blue. Finally, Bob gave the flag on the mailbox special attention, converting to a very vivid red. In the end, the final image has just four colors.

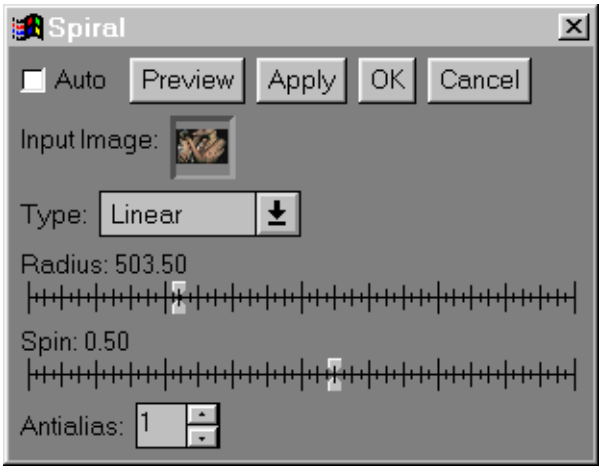
# Spiral

Spiral lets you twist a portion of the image. This can be an effective special effect when it heightens motion implicit in the image. In the image above created by photographer Bob Bouchal, **Spiral** heightens the sense of entwining in the couple's embrace.

**Spiral Dialog**

**Spiral Example**

## Spiral Dialog

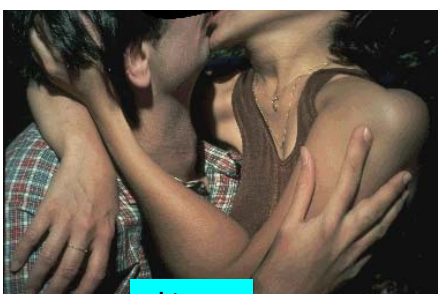



To use the **Spiral** dialog:

1. **Select an image.**
2. **Display the Spiral dialog.** In the **Transformation** menu, select **Special Effects** and then **Spiral.** The **Spiral** dialog box is displayed and a circle is superimposed over the image. The circle indicates the portion of the image that will be twisted.
3. **Adjust the circle.** Adjust its size by moving the **Radius** slider in the dialog. Adjust its position by dragging it by its center point in the image itself. Everything within the circle will be twisted. The kind of twist is controlled by the **Type** setting.
4. **Set the type of spiral.** You can choose one of four types:

   **Linear** produces a spiralling effect that increases smoothly from none at the periphery of the circle to the amount of spiralling selected by the **Spin** control in the center.This is probably the most frequently used setting.

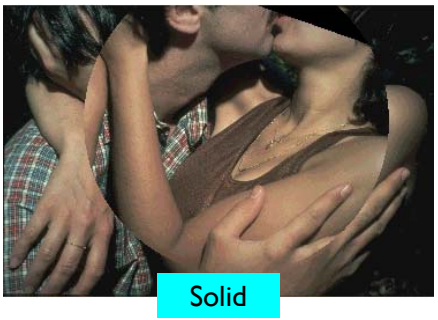
   **Logarithmic** produces a spiralling effect similar to linear. The spiralling effect increases from none at the periphery to a maximum at the center. However, it increases less rapidly than the **linear** setting.



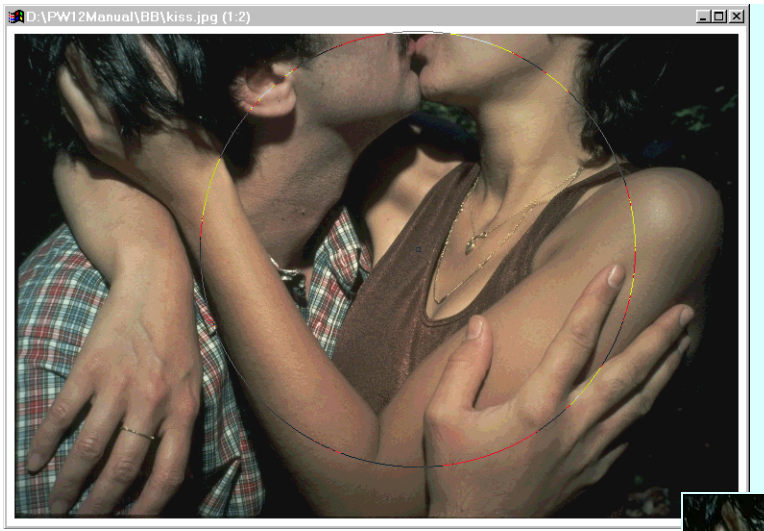
Linear

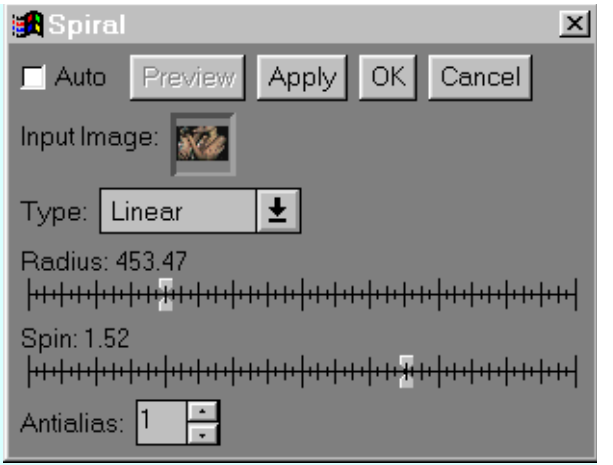
**Hyperbolic** produces a tightly-wound effect. The twist angle is proportional to the reciprocal of the radius. Thus spiralling increases from none at the periphery building rapidly to multiple revolutions toward the center.


**Solid** twists everything in the circle by a uniform amount, producing a definite boundary between the twisted and non-twisted portions of the image.




5. **Set the Spin slider.** The **Spin** slider lets you select the amount of twist to be applied to the input image. The lower the value you select, the less the input image will be distorted. Negative values twist in the opposite direction.
6. **Set the Antialias control.** The spiral control may make the image look jagged or 'aliased'. If so, raise the **antialias** setting to smooth out jagged edges.
7. Preview the image and make adjustments. When you are satisfied with the settings, click **Apply** or **OK** to generate a new image.




## Spiral Example

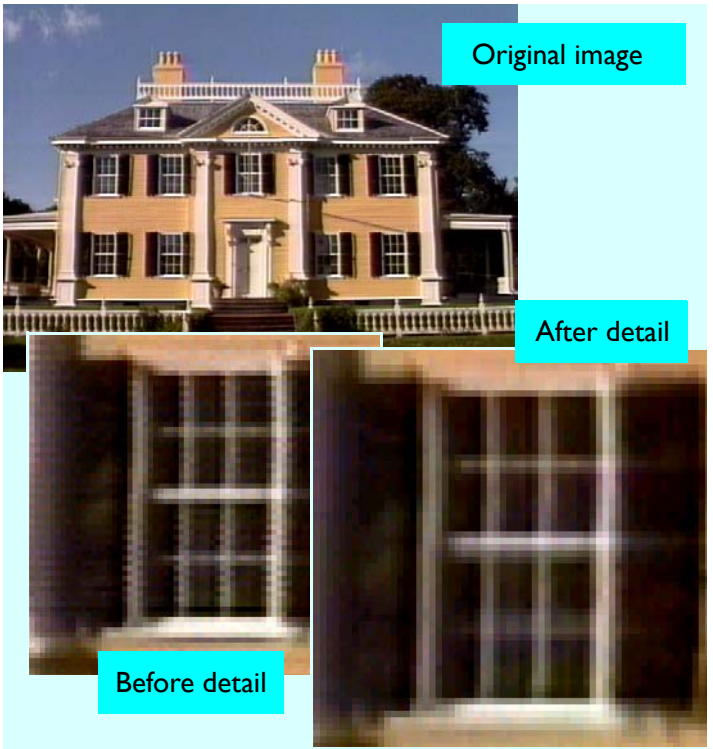
These images show how the spiral example was created. Note the position of the circle and the dialog settings.

For this example, even very small changes in the position of the circle, and the amount of twist can made a big difference in the final effect. So it's definitely worth experimenting with the settings when creating your own images.

# Interlace

Video images captured from a video camera or frame grabber employ a technique known as *interlace*. A video camera creates a video frame in two passes. It scans all the odd scan lines in one pass and then fills in, scanning all the even lines. This scanning technique was developed to reduce flicker without increasing the frame rate. However, because the even and odd scan lines seldom line up perfectly (particularly if there is either camera or image movement), interlaced images can frequently be improved by removing even (or odd) scan lines and interpolating between the remaining lines. This operation is performed by the **Interlace** transformation. To use it:

1. **Select an image.**
2. **Display the Interlace dialog.** In the **Transformation** menu, select **Special Effects** and then **Interlace.** The **Interlace** dialog box is displayed.
3. Select **Odd** or **Even** scan lines. (You may want to preview both settings. Sometimes one or the other is significantly sharper.)
4. Click **Apply** or **OK** to create the new image.




The misalignment between alternate scan lines appears as a sawtooth pattern in the vertical edges (left detail). Clean edges are produced by interpolating between alternate lines (right detail).

The color smearing evident in the images results from low color resolution in standard video. The two color channels are sub-sampled at ratios of 1:3 and 1:9 with respect to the luminance channel.

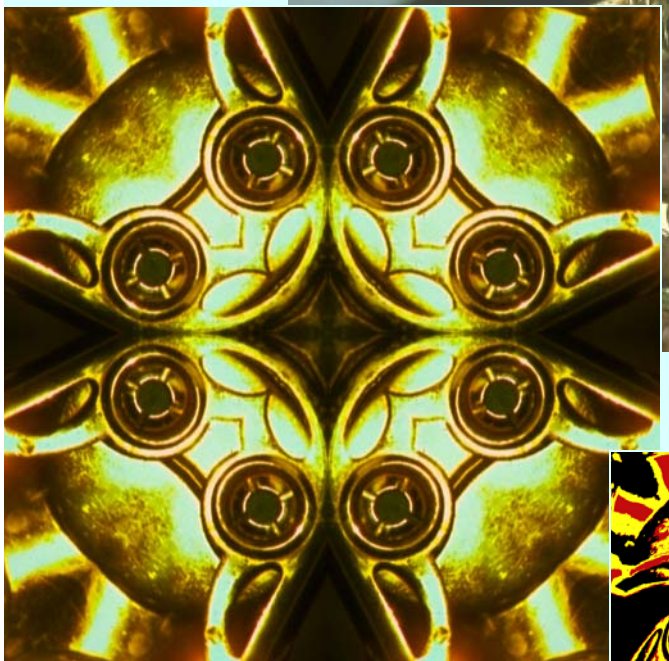
# Kaleidoscope

The Kaleidoscope transformation works just like an optical kaleidoscope, taking a wedge-shaped sliver of reality reflecting it and then repeating it over and over symmetrically around a center.

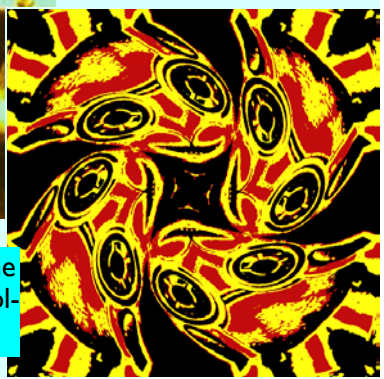
Though you can use a large portion of your image, many interesting effects may be created by just choosing a small detail. So the possibilities are endless, as every little element in an image can be used as the seed of yet another unique kaleidoscope.

**Kaleidoscope Dialog**

The image below looks like four cats. It was created by repeating and reflecting one of the valves on the sax.

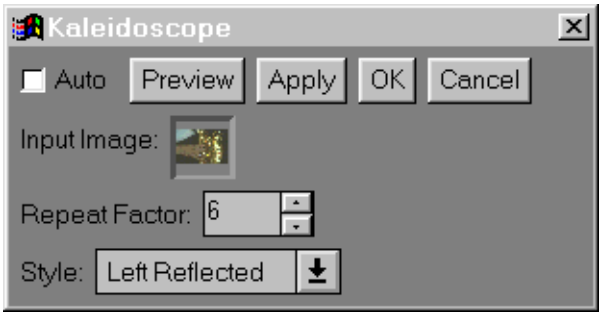


Copyright (C) 1997, Bouchal/Breadbox



The image at right spins the cats using the spiral dialog plus remaps some of the colors via posterize.

## Kaleidoscope Dialog




To use the **Kaleidoscope** dialog:

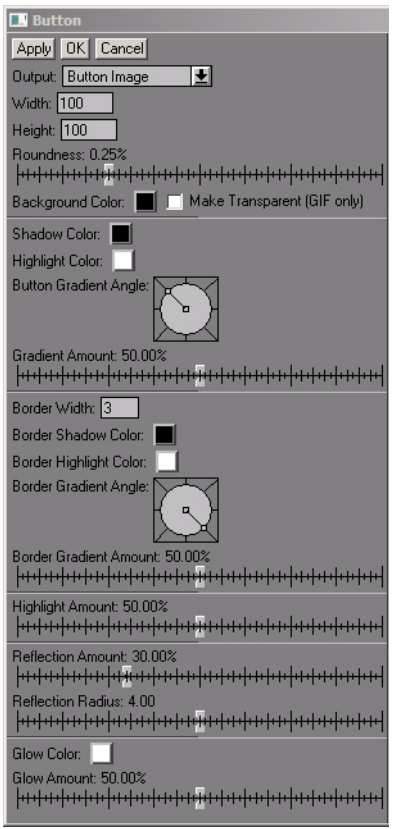
1. **Select an image.**
2. **Display the Kaleidoscope dialog.** In the **Transformation** menu, select **Special Effects** and then **Kaleidoscope.** The **Kaleidoscope** dialog box is displayed. A wedge, representing one segment of the kaleidoscope, is superimposed over the image. Initially, its apex is positioned at the center of the image. The apex will be at the center of the kaleidoscope.
3. **Adjust the wedge.** You can move the wedge by dragging its apex or one of the other corners. Position the apex to a detail of the image that you want in the center of the kaleidoscope. Position the opposite point near a detail that you want at the periphery of the kaleidoscope.
4. **Adjust the repeat factor and style.** The repeat factor sets how many times the wedge will be repeated in the kaleidoscope. The style determines the orientation of the wedge and whether it will be reflected or not. Note that the repeat and style settings affect the angle of the wedge. For example, if you choose a repeat factor of six and one of the reflected styles, the wedge will be repeated a total of twelve times. Thus its angle will be a twelfth of a full circle or 30 degrees. (Traditional kaleidoscopes use six repeats, with reflection.)
5. **Preview the image** after you have made the initial adjustments. Because it's very hard to visualize the result of this transformation, experiment with the setting and wedge position until you get an interesting image. Click **Apply** or **OK** to create the new image.

# Button

Sample Button

The Button Transformation builds buttons that you can use on web pages or as graphics in other applications. The buttons have a three-dimensional look. The Button dialog gives you control over many of the button's physical attributes, including overall dimensions, degree of rounding, and border width. You also get extensive control over the colors of various elements and how they are blended, the angle of illumination, and the degree of specular highlight and reflection.

The Button dialog has its own preview -- it does not use the usual preview window. You can also click the **Apply** button to visualize the button in its final proportions.




## Button Dialog

**Width, Height:** Button dimensions in pixels.

**Roundness:** Controls corner rounding over the full range from square corners to a fully circular or elliptical button.

**Body Highlight and Shadow Colors:** Set the highlight and shadow colors of the button's body. The highlight light direction is set by the gradient angle control. The colors are blended across the body of the button. The intensity of the most intense areas of the color are set by the gradient amount control.

**Border Highlight and Shadow Colors:** These work the same way as the body colors, except they are applied to the border.

**Highlight Amount:** Sets the prominence of the highlight (or off-center) reflection of the light source.

**Reflection Amount and Radius:** Controls the prominence and roundness of the button surface.

**Glow Color:** Controls the color and prominence of the central reflection of the button surface.

### Background options

You also can use one of three techniques to integrate the button's background (the corner areas) into your web page or layout. You can

- choose a background color that matches your page background,
- use the mask option to create a mask and then use the **Composite Dialog (Two Images)** to integrate the button into your page
- define the background as the GIF transparency color. The last method requires that you save the button as a GIF file and then display the button in a web browser or other program that understands GIF transparency.

Finally, once your have created your button, you can add text to it using the **Text** transformation.


# Calendar

The calendar transformation adds a calendar to your photos giving you an another interesting way to use your images.

You can make calendars containing anywhere from a single month to a full year, in a number of different layouts. Two basic styles are available. In the *large date* style the date fills the available space. In the *appointment* style, the date is in the upper right corner leaving room for annotations. You can also choose font styles, colors, and sizes, a colored or transparent background, various styes for the days of week, and position the calendar anywhere on your image.

When the calendar is used in a workflow, it can be set to increment the date automatically. This allows you to output an entire year of individual months in one workflow operation.

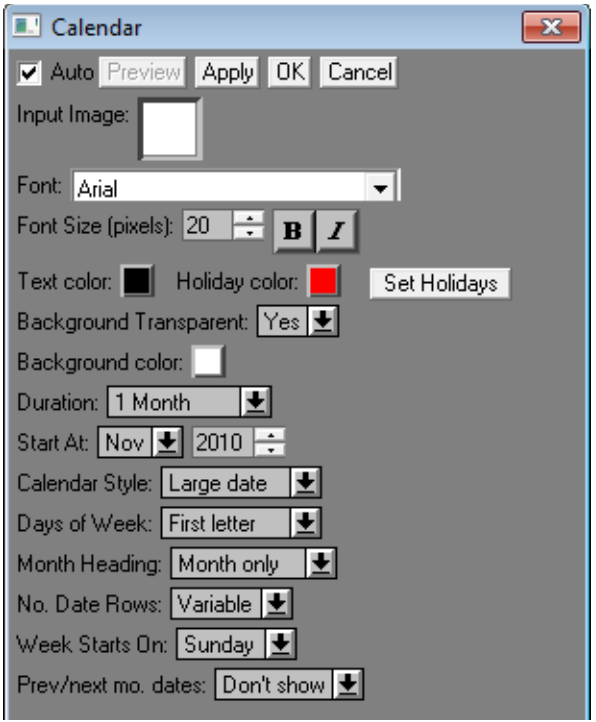
**Calendar Dialog** **Holiday Dates Dialog** **Using Workflow to Create a Full-Year Calendar**



**Calendar styles:** Two styles are available-- a large date and an appointment style.

**Holidays:** You can also choose to display Sundays (or other days) in a contrasting color and to define and display holidays.

## Calendar Dialog




To use the Calendar dialog:

1. **Select an image** to which you want to add a Calendar. If you want to add the calendar in a clear space next to the image, use the **Copy** dialog to add a border before using **Calendar**.
2. **Display the Calendar dialog.** In the **Transformation** menu, select **Special Effects** and then **Calendar.** The **Calendar** dialog box is displayed.

   Two rectangles are displayed over the image.

   The rectangle in the center of the image shows the extent of the calendar using present settings. You can move the rectangle by dragging it by its center. You can also make it larger or smaller by changing the **Font Size** or selecting a different **Duration**.

   **Calendar Background:** A larger rectangle outlining the full image is also displayed. This rectangle represents a possible colored background for the calendar. If you want the background to be transparent, just ignore this rectangle.

   If you want a solid background, set **Background Transparent:** to **No** and click on the **Background Color** button to set its color using the **Color Picker**. You can resize the background by dragging any one of the corners of the background rectangle or move the rectangle by dragging it by its center.

3. **Choose the duration and start month.** Choices indicate the number of months and the layout. For instance **3 x 2 months** is a calendar of six months arranged in three columns (side by side), in two rows. Set the start month.

4. **Set options:**

   **Increment Start Date (Workflow only):** Set this control to Yes to automatically increment the start date by the duration for each new image. For instance, you can use this feature to create a 12 month calendar using 12 different images with a single run of the workflow.

   **Calendar Style:** Two styles are available. In the Large date style dates are large and fill the entire date area. In the Appointment style, the dates have borders and are small giving you room to write in information.

   **Days of Week:** This control lets you choose among three styles for the days of week heading. You can choose the first letter of each day (S, M, T etc.), abbreviations (Sun, Mon, Tue ...) or the full words spelled out. (Note, days of the week are rendered in the localized language.)

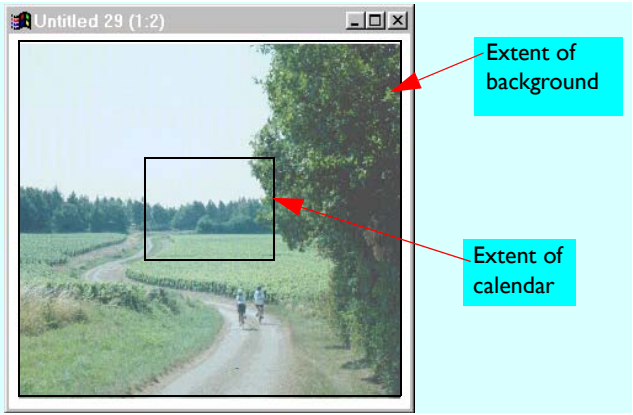
   **Month Heading:** You can choose the heading to show just the month or both the month and year.

   **Week Starts On:** You can set the first day of the week to Sunday or Monday.

   **No. of Date Rows:** You can choose Variable or fixed to Six rows. Variable creates 5 or 6 row months as required. Six row fixes the month at its maximum size. The latter option is helpful in workflow where you are creating multiple months automatically. The months will all be the same size and thus will align with your images in the same way.

   **Prev/Next Month Dates:** This option allows you to fill empty days in the first row before the beginning of the month and empty days in the last row after the end of the month with the dates of the previous and following month.

5. **Position the calendar rectangle** and adjust the font size and style so that it fills the desired space in your image. Preview the image to gauge the overall effect.
6. **Set the text color** to contrast with the image. Click on the Text Color button and use the **Color Picker** to set its color.
7. **Set Holiday Options.** If you want your calendar to show holidays in a different color, click the **Holiday Color** button and set the color. (See **Setting Holidays**, below.)




8. **Position the background rectangle.** If you want a colored background behind the calendar, set **Background Transparent** to **No**. Position the background rectangle and set its color. Note, that the calendar is clipped by the background rectangle. Thus the background rectangle must, at the very least, cover the entire calendar rectangle.
9. Click **Apply** or **OK** to create a new image.

## Setting Holidays

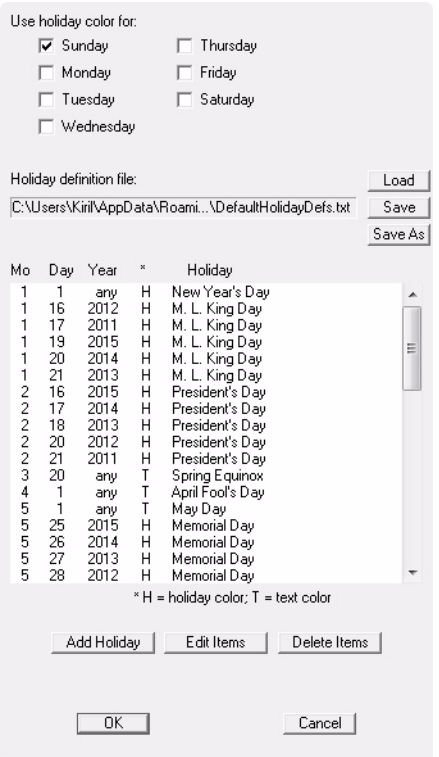
The Calendar can display a short legend for each holiday you define. Optionally, the date can be rendered in a contrasting color. In addition you can also have Sundays (or any days of the week you choose) displayed in the holiday color.

Holidays are defined in the **Holiday Dates Dialog**. There are two types of holidays--*fixed holidays* which occur on the same date every year and *floating holidays* whose date varies from year to year. For example, birthdays are fixed whereas holidays such as Easter move through the year. The holiday definitions you make can be saved to a holiday file, so you can create and reuse a standard set of definitions. Picture Window ships with a set of default definitions of U.S. federal holidays which you can use as a guide and personalize to include the holidays in your area as well as family occasions.

## Holiday Dates Dialog

Use this dialog to set which days of the week use the holiday color, and to customize holiday definitions.

1. Launch the dialog by clicking **Set Holidays** in the **Calendar Dialog**.
2. Check the days of the week that are to use the holiday color.
3. The Calendar dialog automatically loads the default or last-used Holiday Definition file. To override this choice click the **Load** button and select a different file.
4. Edit the list of holidays by adding, editing or deleting entries (see below). Click **OK** to complete the operation. (If you have modified the holiday definitions, you will get an option to save the changes for future sessions.)



Holiday Dates Dialog

### Defining Holidays

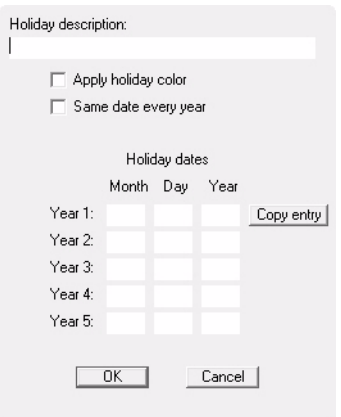
A holiday definition consists of the holiday name, and holiday date. Fixed holidays, such as New Year's which occur on the same date each year are defined by a single month and day entry. Variable holidays such as Easter are defined by an entry for each year. (The definition dialog allows you to define up to five years at a time.) Each holiday can also be displayed in the holiday color or in the text color. This allows you to note minor holidays, birthdays and other special dates without making them standout unduly.

The holiday name should generally be limited to about twenty characters -- the amount of text which fits on a single line. That way when two holidays happen to occur on the same date, both can be listed in the two lines available. (The absolute limit for a holiday name is forty characters.)

Holiday definitions can be saved in a text file which resides in your **Application Data Folder**. Picture Window ships with a *DefaultHolidayDefinitions.txt* file which is automatically loaded when the Calendar transformation is first invoked in any PW session. As shipped, the file contains the US federal holidays. You can easily modify it to the holidays celebrated in your area, including family birthdays and anniversaries. After modifying it, you can save the file for use in future sessions. If you want to use different holiday definitions in different calendars, you can create additional definition files and load them as appropriate. Finally, if do not want to have any holidays in your calendar, simply delete all entries. You can save this state as the *DefaultHolidayDefs.txt* file to make no holidays the default case.

### Adding a Holiday

To add a holiday to the list, click **Add Holiday**. This displays the Add Holiday dialog. Enter the holiday's description. Check the color and fixed date options as appropriate. For fixed holidays, enter a single date; for variable holidays, enter up to five dates. (The **Copy Entry** button is used to reproduce the first entry, making adding multiple entries a bit less of a chore.)



Add/Edit Holiday Dialog

### Modifying a Holiday

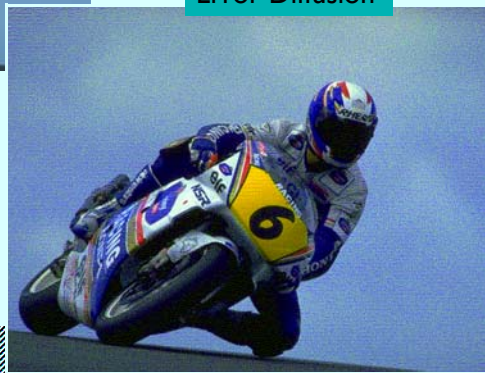
To modify a holiday, select up to five entries which pertain to a particular holiday and click **Edit Holiday**. Edit the information as appropriate. If the holiday has more than 5 entries, edit it in multiple passes.

### Deleting Holidays

To delete one or more items (including all items), select the items and click **Delete Items**.

After making changes to the holiday definitions, you will be given the option of saving them in the current definition file. You can also use the **Save As** command in the Holiday Dates dialog to create a separate file for the definitions.

Error Diffusion



Left Diagonal 6x6

# Halftone

Halftoning is a technique for representing a continuous tone image using only two colors -- black and white. It was developed to allow the printing press to simulate a continuous tone image using only black ink on white paper.

Halftones are made by breaking up the image into small cells. The proportion of black to white within each cell is adjusted to approximate the brightness of that area in the original image.

The transformation gives you a choice of many different patterns as well as error diffusion, which creates a more random effect. It also allows you to use your own pattern.

Viewing halftones on the screen is tricky, since both the screen and halftone are patterned. The combination of the two patterns introduces an additional pattern called a *moire*. Try using a zoom factor of 1:1 whenever possible.

**Halftone Dialog**

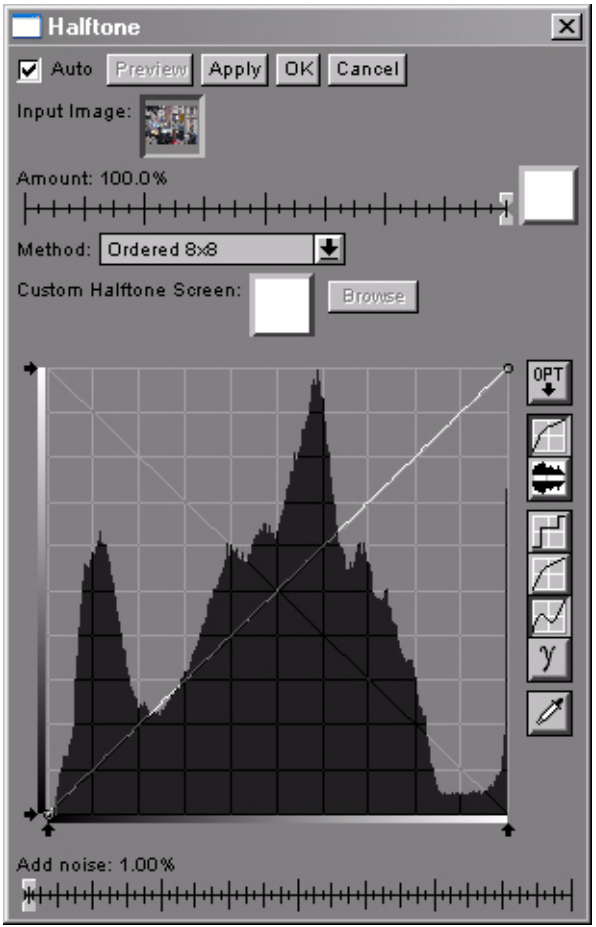
**Custom Method**

## Halftone Dialog

**To create a halftone:**

1. **Select an image.** In the **Transformation** menu, select **Special Effects** and then **Halftone.** The **Halftone** dialog box is displayed.
2. **Select a method.** Generally, methods refer to halftone patterns. Various patterns, including horizontal, vertical and diagonal, are available. Choose the **Custom Method** if you want to provide your own pattern.

   The dimensions (such as 8x8) refer to the pixel dimensions of the pattern's cells. The bigger patterns have finer tonal gradations at the expense of being coarser and thus more noticeable. Thus frequently the finer patterns work better.
3. **Ajust the Brightness Curve:** Adjust the brightness if necessary. See **The Brightness Dialog** for more information.
4. **Add Noise:** If your halftone exhibits patterning or artifacts, adding noise can frequently mask or break-up the effect.
5. **Preview the image.** Because patterns may interact with the image itself, it is best to experiment with different cell sizes and orientations. You can also use the **Amount** control to blend the halftone with the original image. Click **OK** or **Apply** when you are satisfied with the results.



### Custom Method

Any black and white (grayscale) image can be used as a halftone screen.The halftone is created by comparing the brightness of each pixel in the image with a corresponding image in the halftone image. If the image pixel is darker, the output image is set to black; if it is lighter it is set to white.

A number of halftone screens are available on our web site at **http://www.dl-c.com/site/downloads/pwp-other.php**. Once downloaded, screens can be accessed via the **Browse** button in the Halftone dialog.

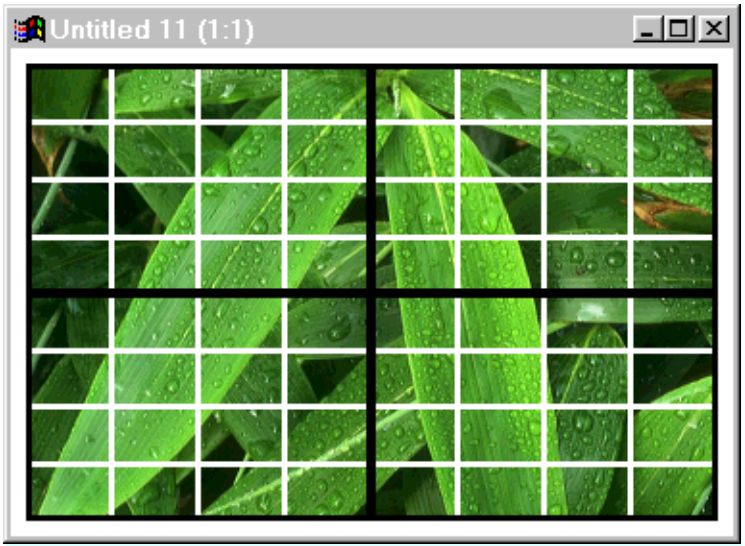
You can create halftone screens by using the **Texture** transformation. You may want to run the texture through **Equalize** to equalize the brightness distribution of the pixels in your texture.

To use a custom image for a halftone screen:

1. Set the **Method** to **Custom**.
2. **Open the image** you intend to use for the screen, click the **Browse** button. It must be a black and white image. However size doesn't matter. If the halftone is smaller that the input image, it is simply tiled to cover the input image.

   **Note:** The standard folder for storing halftone images is in Applications Data folder under Digital Light and Color\Picture Window\halftone Screens.

3. **Select the Halftone image.** Click on the Halftone Screen Image button and select the halftone from the pop up menu.
4. Experiment with different Amount settings. Click **OK** or **Apply** to create a new image.




This grid has two major divisions horizontally and vertically. Each major division is further divided into four minor divisions.

# Grid

The Grid transformation superimposes a colored grid over your image. You can control the number of major and minor divisions, and the line width and color of the division rules. You can resize and drag the grid anywhere over the image. You can also apply a solid color to the exterior or interior of the grid. By using the **Amount** control, you can blend these colors with the image.

The grid can be used over aerial photographs, to create a set of coordinates. It can also be used as an aid in hand-enlarging an image, as you might in painting a mural from a photograph for example.

Grids can also be used to add graphic elements to the image. A grid consisting of a single rectangle can be used to outline an element in the image. A grid combined with a solid-color exterior can be used to crop an image and add a colored border in a single operation.

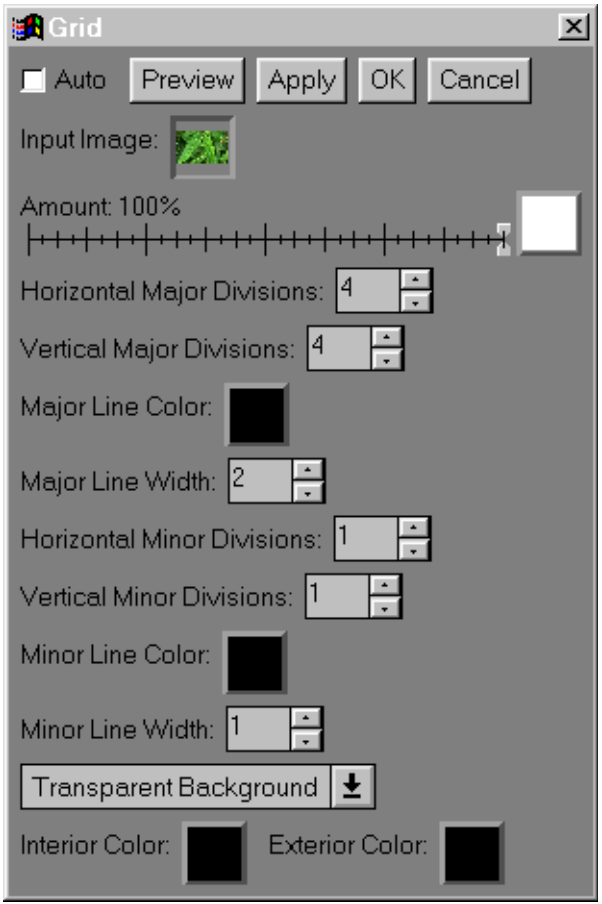
## Grid Dialog

You can also project a grid temporarily over an image, as an aid for adding text for instance. For that function, use the **Grid** menu choice in the Window menu.

## Grid Dialog

To add a grid to an image:

1. **Select an image.** In the **Transformation** menu, select **Special Effects** and then **Grid.** The **Grid** dialog box is displayed.
2. **Set the major and minor divisions** to number of you desire. An evenly spaced grid is displayed over your image.
3. **Size and position the grid.** You can change the size of the grid by dragging any of the four corners or sides. You can also position the grid by dragging it by its interior. The grid divisions are confined to the rectangle you specify. (To position a grid precisely, zoom the image.)
4. **Set interior and exterior transparency.** Select Transparent Background, Colored Interior, Colored Exterior, or Colored Background.
5. **Set line widths and colors.** To set a color, click on the corresponding color button and use the **Color Picker** to choose a color.
6. Preview the result. When you are satisfied with all the settings, click **OK** or **Apply** to create a new image.



# Watercolor

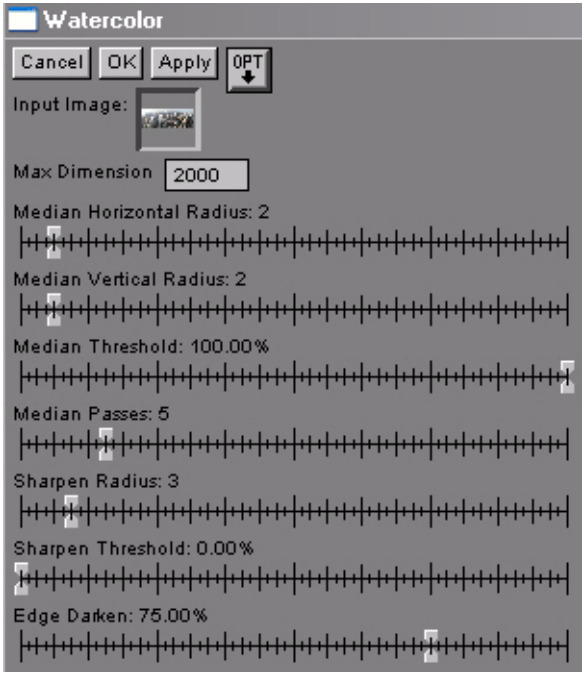
The Watercolor transformation gives images the look of a watercolor painting by simulating brush strokes and darkening edges to simulate the way watercolors pool near brush boundaries. It simulates a painting from a photograph by first simplifying the image by removing detail and then to making the remaining elements of the image stand out. Sometimes an image that doesn't work well as a photograph comes alive as a painting. Paradoxically, sometimes a loose painting succeeds at capturing the feel of a place more than a sharp photograph, and problems such as blown highlights and blocked shadows that can detract from a photograph can make a painting luminous. Generally, simulated watercolors look best displayed or printed large and viewed from close up -- the further away you get the more they revert to looking like the photograph from which they were derived.

You can control the look by controlling the amount of blurring within the 'brush stroke' and the sharpening and darkening of stroke boundaries and making other adjustments.

**Watercolor Dialog**

**Watercolor Transformation Notes**

# Watercolor Dialog




The Watercolor transformation works by performing a specific series of operations on the input image. At each stage you can fine tune the result by adjusting the corresponding settings.

To launch the Watercolor dialog select **Transformation/Special Effects/Watercolor** from the main menu.

## Step 1 - Resize

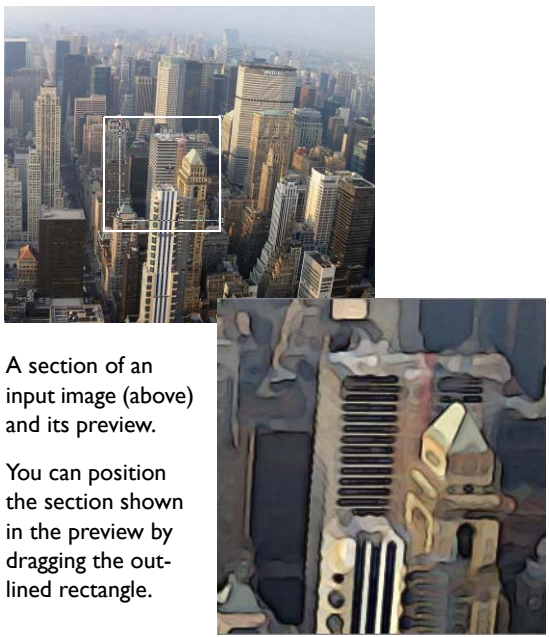
Before any other operations are performed, the input image is resized. This is done by specifying the maximum dimension (width for landscape or height for portrait) in pixels of the result image. Generally the image size is reduced in order to reduce the amount of detail in the image, but if the input image is already small, resizing it larger may also produce good results. The larger the output image, the more detail it will capture.

## Step 2 - Reduce Detail by repeated Median Filtering

The next step is to blur the image by performing multiple passes of median filtering. The larger the median radius and the more median passes, the more the image is simplified. Horizontal and vertical filtering can be controlled independently so as to vary the effect.
The Median Threshold control lets you dial back the tendency of median filtering to blur detail and to round corners.

### Step 3 - Sharpening

The next step is to sharpen the result of median filtering using unsharp masking. Since median filtering tends to preserve areas of solid color, sharpening serves to accentuate the boundaries between the solid color regions and make them stand out a little like brush strokes. The larger the sharpening radius, the more sharpening is performed. Increasing the sharpening threshold prevents indistinct edges from being sharpened.



A section of an input image (above) and its preview.

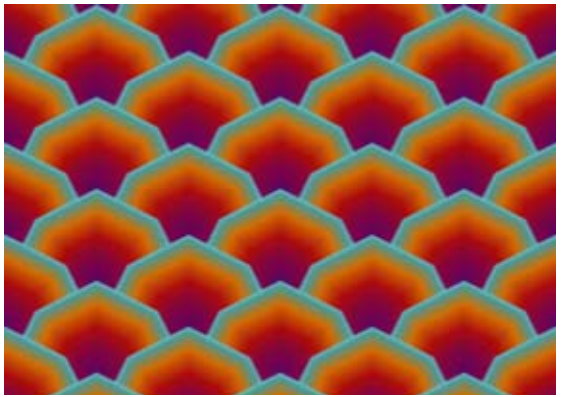
You can position the section shown in the preview by dragging the outlined rectangle.

### Step 4 - Edge Darkening

The final step is to darken the edges of the sharpened image. This simulates the way watercolor tends to pool and deposit pigment at the edges of a brush stroke and further accentuates the boundaries between solid areas by giving them a dark outline. The more edge darkening is performed, the stronger the effect and the darker the overall image.

### Preview

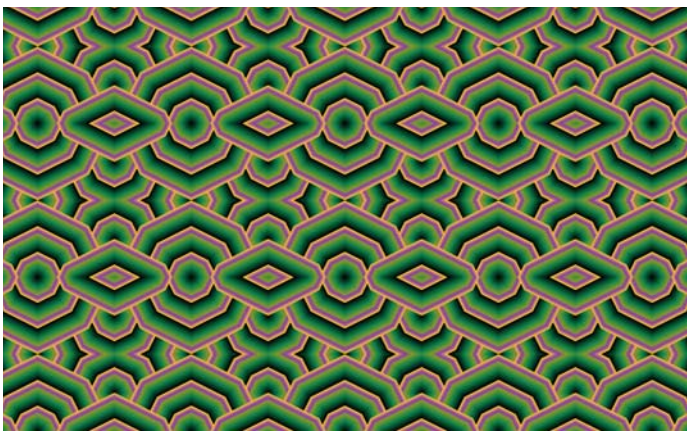
Previewing works a little differently than other transformations. The preview shows an enlarged section of the final image, so that you can see the effects of your adjustments. The right hand side of the Watercolor dialog box shows a preview of the part of the result image that corresponds to the highlighted rectangle overlay displayed over the input image. You make the preview larger or smaller by resizing the Watercolor dialog box. To select the part of the image to be previewed, drag the highlight rectangle.



# Wave

The Wave transformation lets you create patterns of interlocking shapes that can be tiled like the pattern shown at left. These patterns can be used to create interesting borders, mats and backgrounds.

The Wave transformation creates images that can be seamlessly tiled. These images are constructed by painting a pattern in overlapping rows with every other row offset by half the pattern width. The repeating pattern can in turn be either a radial gradient in one of several shapes or it can be defined by a custom image and mask.



**Two examples of Wave patterns:** Both examples were created using Wave and then tiled with the Tile transformation. For more details on the second design see **Wave Example.**

The original motivation for this transformation was to create a simulation of *seigaiha* or wave patterns originally used as a fill pattern to indicate ocean on Japanese maps and later adopted as a common pattern for papers and embroidery.

### Applying Wave Patterns

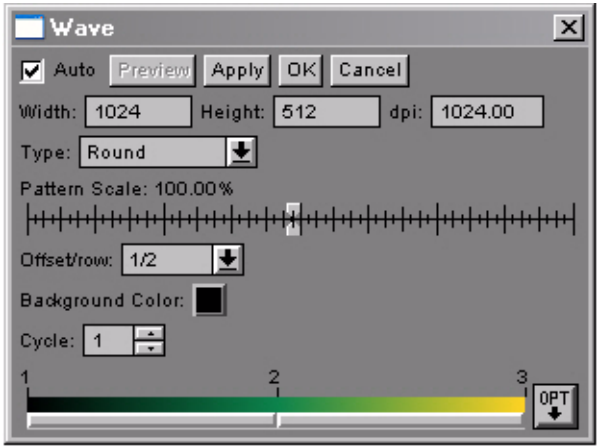
Wave patterns may be used as borders in the **Crop/Add Border** transformation and for mat patterns in the **Mat and Frame** transformation.

Wave patterns can also be turned into repeating designs of any size using the **Tile** transformation.

**Wave Dialog** **Wave Example**

**Wave Transformation Notes**

# Wave Dialog




## Width/Height/dpi

These settings determine the dimensions of the output image in pixels and the resolution in dots/inch. The width setting just controls the width of the result image. The height setting determines both the height of the result image and the amount of overlap between successive rows of patterns -- the larger the setting, the more space between rows.

## Type

The Wave transformations supports several different types of pattern:

**Round/Diamond/Square/Octagon:** These pattern types all use the same gradient to define the pattern, but differ in the shape of the pattern produced. The easiest way to understand this is to see a few examples:

**Custom:** When you set the Style setting to Custom Image, the cycle and color Line controls are replaced by image selectors for a custom image and a mask for that image.

When you select a custom image, it is resized so that its width in pixels is equal to the width you specified in the Width control. This resized image is then painted in rows instead of a gradient pattern. If specified, the mask image is used to define what parts of the custom image are painted. The mask should be white where the object to be repeated is located and black for the background.

### Offset/row

This setting determines how much each row is shifted to the right or left as a fraction of the full pattern width.

### Background Color

The background color setting determines the color of the background that the result image is filled with before painting rows of patterns over it. In most the examples shown so far, the background is totally obscured so its color doesn't matter, but as you increase the height setting enough, space can open up between rows and the background color fills this space.

### Cycle and Color Line

The cycle and color line controls at the bottom of the dialog box determine the nature of the gradient used to fill the pattern. While these are the same controls used in the Gradient transformation, some examples may be useful to illustrate the available range of effects. The cycle setting simple causes the gradient defined by the color line to be repeated multiple times.

The color line defines the colors in the gradient with the left edge corresponding to the center of the pattern and the right edge corresponding to its outer edge. For example, here is the color line that produced the patterns above: The color line starts out with two control points labeled 1 and 2 at either end -- these two control points are fixed at the ends and cannot be moved.

- To lengthen the color line to make detailed editing easier, resize the dialog box to make it wider. The color line automatically expands to match the width of the dialog box.
- To create an additional control point shift-click on the color line near where you want to new control point to appear.
- To remove a control point ctrl-click on the color line near its number label.
- To reposition a control point drag it by its number label. You cannot drag one control point past another.

- To change the color of a control point double-click above the color line near its number label. This brings up a color picker you can use to set the color. One useful feature of the color picker to remember is that you can use its eyedropper to select colors from an image.
- To change the transition between control points click the lower part of the color line between two control points. This brings up a menu with various options.

### Step Left/Step Right/Step Center

These options produce an abrupt transition that occurs at the left control point, the right control point or at the midpoint between the two.

### Line/Sine

These options produce a gradual transition from the left control point to the right control point by linear or sinusoidal interpolation between them. The sine option often produces a smoother-looking transition.

### RGB/HSVCW/HSVCCW/HSLCW/HSLCCW

These settings determine the color space used to interpolate between control points. RGB is the default and produces the simplest transition. The other options interpolate in HSV or HSL color space with the hue varying either clockwise (CW) or counter-clockwise (CCW) around the color wheel. These latter transitions can be used to produce rainbow-like results.

### Options Menu

Clicking on the Opt button at the right end of the color line brings up an options menu:

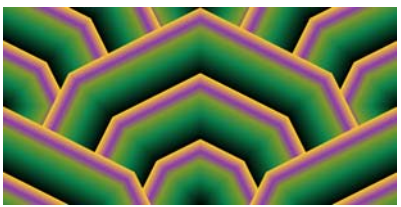
**Reset:** This resets the color line back to its initial state.

**Equal Spacing:** This moves the control points so they are equally spaced along the entire color line. This is useful if you want to produce a pattern consisting of equal width bands of color.

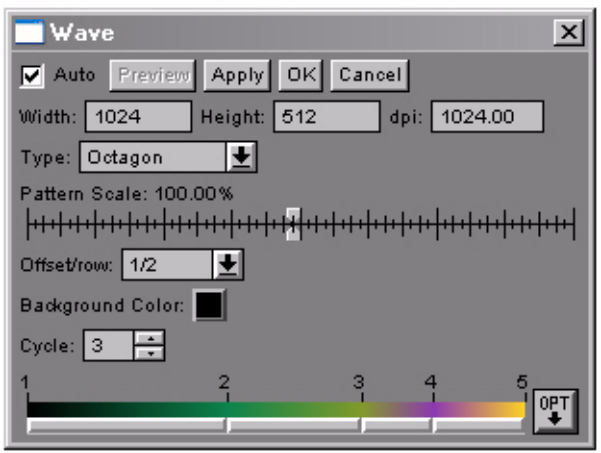
**Load:** This command lets you load a saved color line file.

**Save As:** This command lets you save the current color line as a file for later re-use.

## Wave Example



**1. Create a single Repeat** using the Wave transformation. The deign at left used five colors. The triple octagon was achieved by setting cycle to 3.




**2. Apply the pattern.** You can use your pattern in **Crop/Add Border** and in **Mat and Frame** transformations. These will tile your design automatically.

If you want to use the design in other situations, use **Tile** to extend the pattern. Here we reflected the pattern vertically by setting **Vertical Mirror** to **Top**, This created the full octagon and diamond figures.

# Bad Pixels

This transformation detects bad pixels in a camera sensor and constructs a bad pixel file that you can use in the Raw dialog to fill in the damaged pixels. To use the transformation, you make two test exposures and then use the transformation to analyze them and create the bad pixel file.

## Using the Bad Pixel Transformation


Create the test exposures and then use the transformation to create the bad pixel file, as follows:

1. Set your camera to raw and make two images -- an overexposed 'white' image and an underexposed 'black' image. A convenient way to create the white image is to photograph an area of sky; and the black image by exposing with the lens cap on.
2. Open the images in the raw converter and click OK without applying any correction. You can use the **Histogram Tool** to confirm that the black and white images are under and over exposed, respectively.
3. Select the white image and open the Find Bad Pixels transformation. (Transformation/Special Effects/Bad Pixels).
4. Click on the Black Image window in the transformation and select the black image.
5. Click OK. If there are any bad pixels a bad image file will be created. (If not, your camera has no bad pixels.) Save the file, naming it to identify the camera.

You can now use the file in the Raw dialog when converting raw images. (See the **Sharpen/Noise Tab**.)

# Monocolor

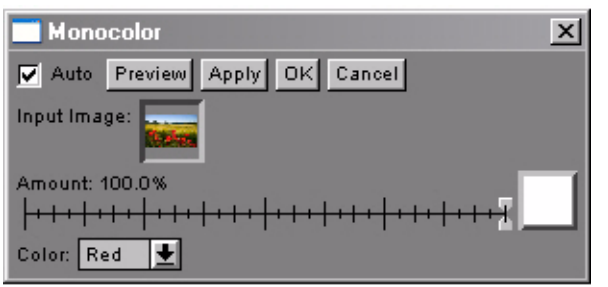
Monocolor lets you transform your image to an image using only two colors -- black and your choice of red, green or blue, to emphasize the chosen color.

## Monocolor Dialog

To launch Monocolor, choose **Transformation/Special Effects/ Monocolor** from the main menu.

Choose the second color using the **Color** control.

You can blend the original image with the transformed image using the Amount control. You can also apply Monocolor through a mask to limit its effect to a particular area of your image.



# 15. Using Batch Workflow


**The Workflow Window**

The workflow function allows you to automate image processing by performing a series of steps on a collection of images. For instance, you can use it to transfer images from a camera card to your computer. Or you can use it on any group of images to perform a set of repetitive operations.

Operations include a selection of about a dozen Picture Window transformations, such as sharpening, brightness and contrast adjustments, curves, and color balancing. You can also resize images, convert them from one file type to another, rename them, and automatically route them to an album for easy printing.

## The Workflow Window

The batch process is set up in a Workflow window, a special type of window which allows you to collect a set of images and specify a series of operations. The window is split into two sections. The top section displays thumbnails of the images to be processed. The bottom section displays the operations as a workflow diagram of icons, also known as *widgets*. You create the workflow by adding or deleting widgets. You then set the parameters of the operation by double clicking on the widgets to display their dialogs. The workflow can be saved, so you can create a library of processes you commonly use.

Launching the Workflow Window  Previewing Your Images  Creating Workflows  Widget Reference

# Launching the Workflow Window

To launch a new workflow window, click on the workflow toolbar button.  or select **File/New/Workflow** from the main menu.

**Note:** You can also launch a workflow from the command line or by dragging and dropping images on a workflow shortcut on your desktop. See **Workflow Shortcuts** for more information.

## Thumbnail Section

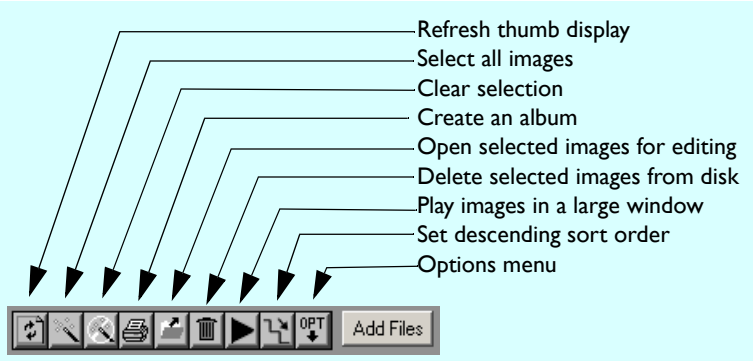
The thumbnail section displays thumbnails of all the images that can be processed by the workflow. You can select them by clicking the Add button and choosing them from the open file dialog. However the most convenient way is to drag them from the browser window. You can drag individual images or an entire folder. If you drag a folder, it is 'cracked open' and all the images in the folder and its subfolders are placed into the thumb section. (A **Remove** function accessed from the right-click menu lets you remove images from the workflow.)

**Hint:** To add an image that is open in PWP to a workflow, right-click on the image and select **Add to Workflow**.

While the workflow thumb display looks similar to the Browse display, there is one big difference worth special mention. The images in the thumb section do not necessarily reside in the same folder. In fact, they can be located anywhere on your system. This allows you to perform a batch operation on any group of images, regardless of where they are located.

## Thumb Section Operations

The thumb operations are controlled from a toolbar. The button functions are shown in the figure.




### Options Menu

The options menu controls:

**Tiny / Small / Medium / Large Images:** This group of menu items lets you select the size of the images displayed in the browse window. If you choose smaller images, more will fit on the screen at once, but the detail will be less. At the smallest two sizes, a small font is used and the file modification date is abbreviated to save space.

**Show Details:** Toggles between showing the image file name, date, and size or showing more thumbnails in the space available.

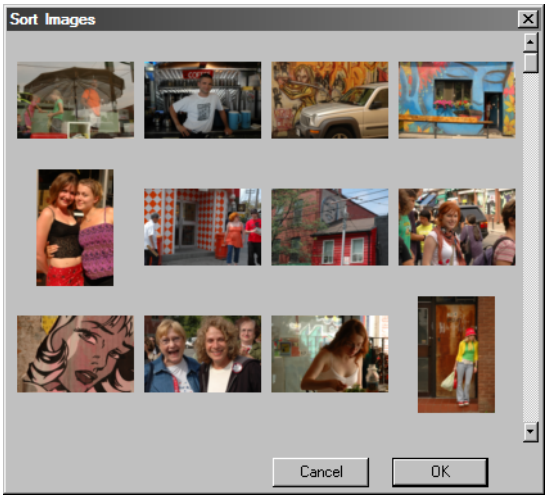
**Show Mats and Borders:** Toggles between displays a mat and border around each thumbnail or displaying the thumbnail on a neutral background.

**Use Bold Font:** Toggles between using a bold and regular font for file information.

**Sort by Name / Create Date / Modify Date / File Type / Manually:** This group of menu items let you select the order in which the miniature images are displayed -- alphabetical by name, by create date, or by the date last modified. For the create date, the EXIF date is used when available; otherwise the Windows file creation date is used. Sorting by file type sorts the images first alphabetically by extension and then by file name.

**Sort Manually** displays an additional dialog. Use this dialog to drag images into any order you choose. When you click OK the images will shown in the order you set. They will also be processed by the workflow in this order. Note: once you re-sort the images with any of the other sort options the manual sort is lost. However if a particular sort has a permanent value, you can use the Save File widget to add sequence numbers to the file names and thus preserve the order.

You can toggle the sort order between *ascending* and *descending* by clicking  in the thumbnail toolbar.




**Manual Sort dialog:** To sort, drag the images to their desired positions.

# Previewing Your Images

Once you get the images into the workflow window, you may want to preview your images at a larger size for more critical evaluation. The **Play** function, launched by the  button, does exactly that. It displays the images sequentially in a separate window in ad hoc slide show fashion. It has a *triage* function, letting you mark images as thumbs up, thumbs down or leave them unmarked. These marks can later be used to apply the workflow just to images marked a particular way.

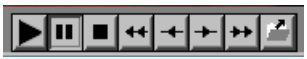
The play window has control buttons under the image to playback, display duration, select which images should be included and mark the images. In addition, there is right click menu for rotating the image and displaying its EXIF information. (You can also edit the EXIF description, artist and copyright fields.)

*OK and Reject triage marks*

### Triage

Triage allows you to categorize your images into three groups. The green **OK** mark is used for images you want to particularly tag for further processing. A red **reject** mark is used to tag images you do not want to include in further processing or may even want to delete. Untagged images form the third category. You tag the images by clicking the appropriate button in the play window or by using the right-click menu in the thumbnail display. The image is marked in the upper right corner. You can change your mind any time and retag the image or clear the tag.

Later, when you run a workflow, you can specify whether it should be applied to all images, all but rejects or OK images only. Tags are in effect only during the lifetime of a workflow window and are not stored with the image.



*Playback Buttons*

*Duration: 3, 5, and 8 seconds*

## Playback controls

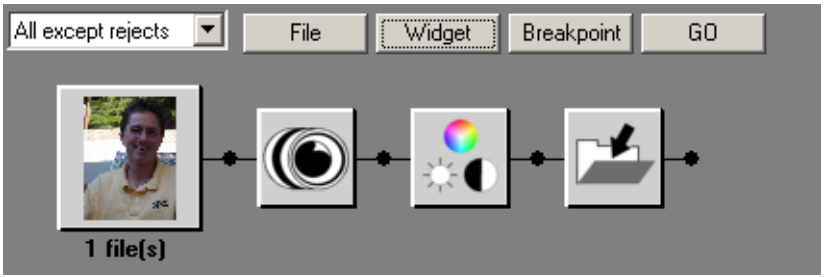
Playback buttons are similar to those found on CD players. Left to right, they are **Play, Pause, Stop, Fast Reverse, Previous, Next,** and **Fast Forward.** The last button opens the image for editing. (Alternatively, you can open an image by double-clicking it.)

Slide duration can be set to 3, 5 or 8 seconds. Once all images are displayed, the sequence repeats from the beginning. Stop, Pause or the Previous and Next buttons stop automatic advance and put the player into manual mode.

A dropdown dialog controls which images are displayed. For instance, if you set it to **All but Rejects**, rejected images are removed from the sequence as you mark them.

# Creating Workflows

A workflow is a chain of operations performed sequentially on one or more images. Workflows are represented by a series of **widgets**, small icons that each control an operation. Available widgets include selected Picture Window transformations and special operations designed just for workflow processing.



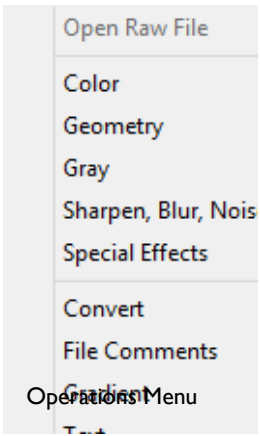

For example, the workflow above consists of four widgets.

- **Input widget:** 'Holds' the images to be processed by the workflow. The images to be processed are determined by selecting one of the criteria on the drop-down menu above the input widget. The image displayed in the input widget is the prototypical image that will be used to set parameters of the widgets in the chain. The image may be changed by using the mouse wheel.
- **Sharpen widget:** The sharpen transformation.
- **Levels and Color widget:** The Picture Window Levels and Color transformation that controls brightness, contrast, saturation and color balance.
- **File Save widget:** A special widget that controls the file type, destination folder and file name of the output image. Images can also be optionally resized.

The flow must be terminated by an output widget, such as the File Save widget above. This is because the output widget specifies where the resulting images should go. Without an output widget, the images created by the workflow would be inaccessible.

## Setting up a Workflow

When a new workflow window is displayed, it contains just an input widget. The input widget is the container for the images that are to be processed. You can control which images are selected by choosing the appropriate option from the drop-down menu.



Operations Menu

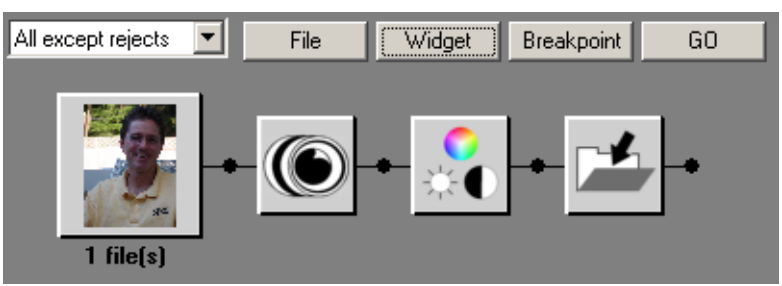
### Adding Widgets to the Workflow

You add other widgets to the end of the workflow either by clicking the **Widget** button or right-clicking in the window. In either case, the menu of available widgets is displayed. If you have used Picture Window before, you will notice it has the same categories as the Transformation menu. Indeed, many of the operations are exactly the same. In addition, there is an Output heading. This contains widgets that control how the new images are saved to disk, saved as an album or displayed.

To reproduce the workflow shown above, select

**Sharpen Blur Noise/Sharpen,**
**Gray/Levels and Color,** and
**Output/Rename-File Save.**

Each widget is added in turn. You can also insert widgets into the workflow by right-clicking on the connector between widgets. You can delete a widget by selecting it and pressing the Delete key.



## Setting Widget Parameters

Next you must set the parameters for each widget. To do so, working from left to right, double-click on each widget in turn. The widget's dialog is displayed. If it's a transformation widget—one that adjusts the appearance of an image—the image and preview windows are also displayed. (No image is displayed for non-transformation widgets such as File Save.) Set the dialog's parameters as required and click OK. Notice that the widget now displays a check mark. This shows that its parameters have been set.

You must set all widgets before you can execute the workflow. While you will generally use the same image for all the widgets, there is no requirement that you do so. The image that is used can be changed by selecting the input widget and advancing the images with the mouse wheel.

Double-clicking on a transformation widget displays its dialog (far right) and the before and after images.

The brightness curve is being adjusted here.

## Executing the Workflow

Once all the widgets are set, you can execute the workflow by clicking on the **Go** button. The images are processed through the workflow, As each image is completed, it is marked with a check mark ☑

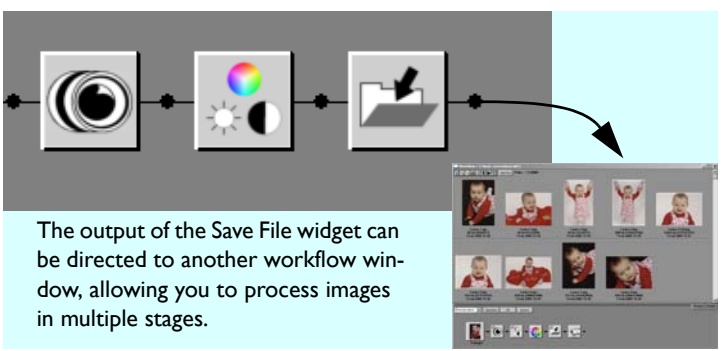
The purpose of the check mark is to help you track which images are done. For example, if some of the images are under exposed while others are not, you may want to process them with different settings from the rest of the images. You can do that by processing just the dark images with workflow parameters set to lighten them. Then you may change the workflow parameters and process the rest of the images. You can also break workflow execution at a widget and set its parameters manually. See **Setting Breakpoints.**

For that reason check marked images are not processed when a workflow is executed, even if they meet all the other selection criteria. However, you can reprocess these images if you manually clear the check marks, using the right-click menu.

**Errors:** If an error is encountered during the processing of an image, the image is marked with a red ☒ instead of a check mark. To determine the cause of the error, right click on the thumbnail and chose the **Display Error** option from the menu. An error message is displayed. If you can correct the error, clear the red x (using the right-click menu) and try executing the workflow again.

## Cascading Workflows

After you have processed the images in a workflow you may want to apply a second workflow to them. You may also want to keep the output images together, so you can work on them manually. The easiest way to do that is to cascade workflows by feeding the output of one workflow



The output of the Save File widget can be directed to another workflow window, allowing you to process images in multiple stages.

into a new workflow window. Workflows are cascaded by directing the output of the **Save File Widget** to a new workflow window.

### Saving Workflows

Workflows can be saved for reuse. Thus you can create a library of workflows you commonly use so you do not have to recreate the same workflow over and over. Workflows are saved and loaded from the File menu in the workflow window.

## Setting Breakpoints

You can interrupt workflow execution at most widgets by setting a *breakpoint* at the widget. The workflow pauses at the breakpoint and displays the image and widget dialog, letting you customize the setting for each image. For example if you set a breakpoint at the Crop widget, you can select a different cropping for each image.

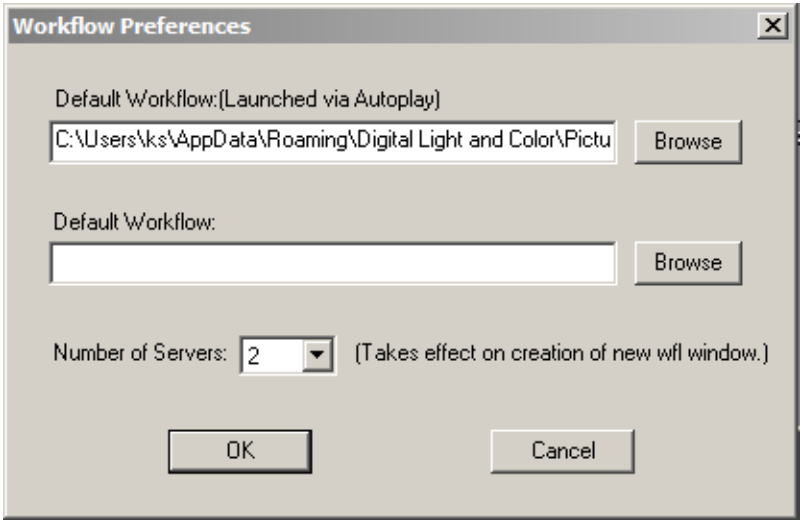
To set a breakpoint, select a widget and then click the **Breakpoint** button. The widget is outlined in red to indicate the breakpoint. To cancel the breakpoint, select the widget and click the **Breakpoint** button again.

### Breakpoint and Multitasking

On multi core machines, the workflow is divided among multiple tasks and these are run simultaneously for higher performance. Because tasks can finish in any order, the images may be presented out of order. To avoid this and force all breakpoints to occur in the sequence of the widgets and images in the workflow, you can turn multitasking off. To do so, click the **File** button and select **Do Not Multitask**.

## Workflow Preferences

To display the Preferences dialog, click the File button and select **Set Preferences**.




### Default Workflows

When you launch a new workflow window, it generally has no workflow associated with it. If you prefer, you can specify a default workflow that is automatically loaded when the window is created. Two defaults can be set — one for workflows launched from within Picture Window and the other for workflows launched from the Autoplay menu. (The Autoplay menu is automatically displayed when you insert a mass storage device such as a camera memory card.)

This feature is particularly handy for workflows that are launched from the Autoplay menu. That way, you can automatically load the workflow you use for transferring images from your camera to your computer.

### Number of Servers

The workflow usually takes advantage of all the cores on your system by dividing the workflow among a number of server tasks and running them simultaneously. Set the number of servers to limit the number of simultaneous tasks. If your system only has one core, simultaneous execution is not used.

# Widget Reference

Widgets fall neatly into three categories:

- **Transformation Widgets:** These widgets modify the image itself, performing operations such as brightness adjustment, setting color balance, sharpening, etc. These are identical to their respective transformations and so are not documented separately.
- **EXIF Comment widget** lets you set the EXIF description, author and copyright fields for workflow images.
- **Output Widgets:** These are widgets which save, print, or otherwise output the images processed by a workflow. Every workflow must end in an output widget. Otherwise the processed images would be inaccessible.

  There are three output widgets—a Save File widget, a Copy Move widget and an Album widget. The Save File widget is used to save files to disk and also has features for resizing them, converting them to different file types and automatically assigning file names. The Copy Move widget is similar, except that it does not open the file but rather uses the Windows copy or move function to relocate the file. The Album widget inserts images into an album. After workflow processing is complete, the album is ready for review, printing and saving.

Extract Jpeg Widget | EXIF Comments Widget | Save File Widget
Copy-Move Widget | The Album Widget


## Extract Jpeg Widget

This widget opens raw files by extracting jpegs rather than converting the raw data. This produces images that have all the default in-camera adjustments applied. It is also faster but generally does not produce images of the same quality as are possible from properly adjusted raw image files.

The widget has no parameters and must be positioned as the first widget in the workflow. The **Raw** widget cannot be used when this widget is used. Any non-raw files are opened in the same way as always — they are not affected by this widget.

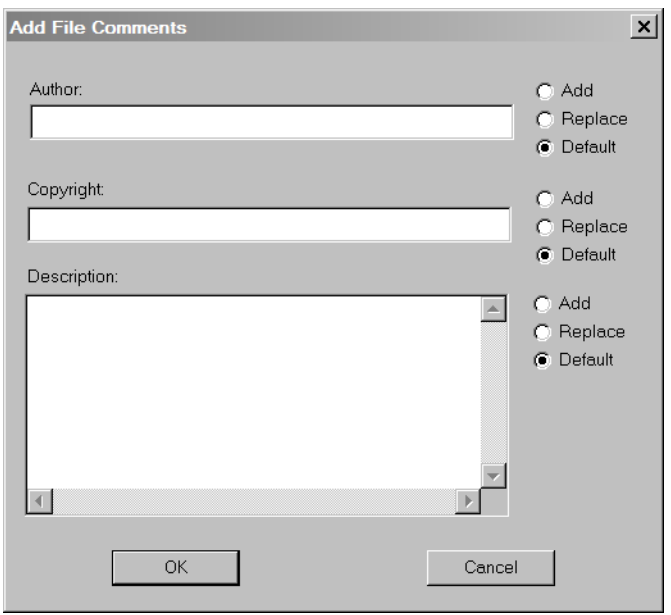
## EXIF Comments Widget

The comments widget is used to edit the EXIF description, artist and copyright fields of all the images in the workflow. For each of the fields, you have the option

- **Add:** Add text to whatever is already in the field. This is useful to add keywords to descriptions. The new text is appended to the end of any text already there.
- **Replace:** This option deletes any existing text and replaces it with new text.
- **Default:** This option adds the new text only if the field is currently blank.

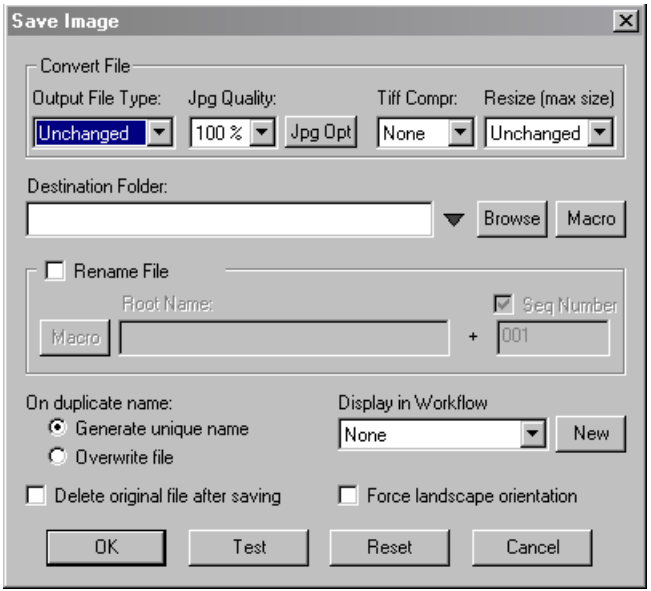
The EXIF Comments widget is the widget version of the **Add Comments** dialog that can be accessed through the right-click menu.

You can be use the Comments widget and the Add Comments dialog together. For example, a few images in a workflow require a custom comment while the rest can use a standard one. You can add the comments efficiently by first using the **Add Comments** dialog to apply the custom comments. Then apply the standard comment to the rest of the images using the widget and the **default** option.



## Save File Widget

The Save File widget specifies where images will be stored. It can also be used to resize the image, change its file format and rename it. Here is a description of its fields:




**Output File Type:** Can be set to unchanged or a type such as tiff, jpeg, etc. If the original file is one of the types that cannot be written by Picture Window (PhotoCD and RAW), it is saved as a tiff.

**JPEG Quality:** The compression quality of images saved in jpeg. Lower quality results in greater compression.

**JPEG Options:** Allows you to include or exclude comments and color profile from the jpeg file and to set sampling of the color channels. (See **JPEG File Options**).

**TIFF Compression:** Specifies the compression that is used whenever TIFF files are saved. You can specify None, or an LZW compression. **None** results in the largest file. However, it is also the simplest and most universally-recognized format. An **LZW Compression** option reduces the file size.

**Resize:** Resizes the file. Choices are in megapixels. This is primarily used to make files smaller so that they can be e-mailed or used on a web page.

**Destination Folder:** The folder in which the new image should be saved. If the folder does not exist, it is created. There are several ways to set the folder. You can use the **Browse** button to choose an existing folder. You can also provide an

expression that will be expanded into a folder name. Available expressions are displayed when you the **Macro** button. (See the Macro section below.)

**Rename File:** You can use the name of the existing file or rename it. If the file name is simply a sequence number assigned by a digital camera, this feature lets you assign it a more meaningful name. To create your own name, check the Rename File checkbox and fill in the root name field.

**Root Name:** The root name can be a constant string which characterizes the images, a macro expression or a combination of the two. Again, you can build the macro expression by clicking the **Macro** button.

After you have filled in the folder and file name fields, you can test the file naming you have specified. This is especially recommended for checking macros. To check the naming, click the **Test** button. The name that will be assigned to the current image is displayed. Check it carefully for syntax errors. Particularly check for missing or double \ characters,

**Seq Number:** Sets the starting sequence number. To make every file name unique, the root name is concatenated with a sequence number. To omit the sequence number, uncheck the Seq Number check box.

**On duplicate name:** Specifies what should be done if a file of a particular name already exists. Your choices are to have Picture Window modify the name to make it unique or to overwrite the file. In the **Copy/Move** widget only, an additional option allows you to skip the file entirely.

**Delete original file:** Once the new file is saved, you can choose to delete the original. This is useful when you are copying images from a camera card to your hard drive. If an error is detected when the new file is created, the old file is not deleted.

**Display in Workflow Window:** You can display the output files in a new or existing workflow window. This is useful if you want to work with the files further.

**Force Landscape Orientation:** Saves all images as landscape images. Images that are originally portrait are rotated. Thus information on the original orientation of images is lost. This function is provided for cases when all images must have uniform orientation for printing or other post-processing requirements.

Click the **OK** button to save your settings and end the dialog.

### Building Macro Expressions

The Destination Folder and Root File Name can be specified by using any combination of text and macro expressions. For instance, let's say you have shot pictures Bryce Canyon. You may choose to place them in a destination path as follows:

*<MyPictures>\<CreateYear>\<CreateMonthNum>\BryceCanyon*

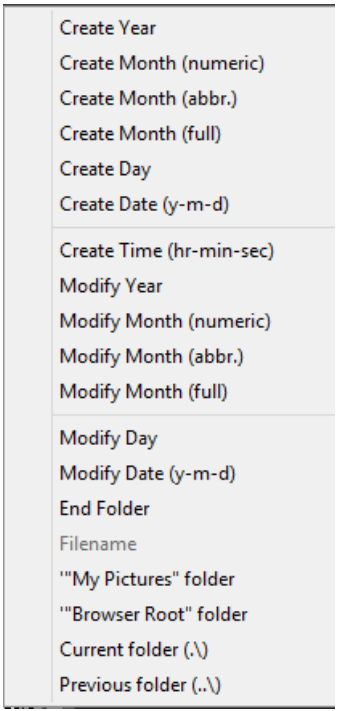
When the images are stored, the macro expressions is expanded. Dates are expanded according to the date information in the file being saved. For create dates, the EXIF date is used if available. Otherwise the Windows file create date is used. Modify dates are always Windows file modify dates. To make dates sort in chronological order, they are output in year, month, day order. Leading zeros are used for month and day. Constant strings such as *BryceCanyon* are transferred verbatim. So the above expression would translate to an actual pathname like this:

*C:\Documents and Settngs\Username\MyDocuments\MyPictures\2005\09\BryceCanyon*

The macro *<MyPictures>* is expanded to the full MyPictures path name in the current environment. The expressions ..\ and .\ for previous folder and current folder are interpreted with respect to the image's original location.

**Browse Root folder:** The browse root folder macro translates to the browser root

Macro Menu



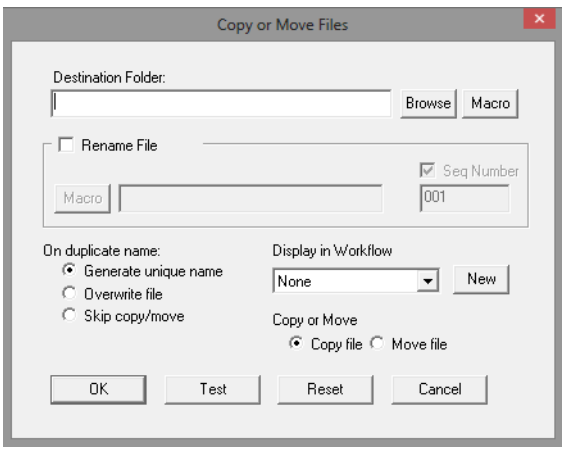
folder defined in **File/Preferences**. If no folder is defined, it defaults to your **Pictures** folder.

### Using Multiple Save File Widgets

If you want to make more than one version of a file, you can use additional Save File widgets. For example you may want to create one full-resolution file for archiving and a second resized file for sending photos via e-mail. You can do so by chaining two Save file widgets. Of course, the second widget will receive the file processed by the first widget. That means the first widget should save the file at full resolution while the second widget can downsize it for e-mailing. If you reversed the widgets, you would wind up with two downsized files. You can also use Save File widgets in the midst of a workflow if you want to save intermediate results.

## Copy-Move Widget

This widget is similar to the Save File widget, except that it copies or moves a file without opening it. It is used primarily to archive files directly from a camera memory to disk storage. Like the Save File widget, it can rename a file and store it in any existing or new folder. Since it does not need to open a file, it can store files in any format, including video files, encrypted files and RAW files that Picture Window cannot write. Copying or moving a file also does not change the file modify date and it does not cause jpeg files to be resampled. On the other hand, since no changes can be made to the file, the image cannot be resized nor converted from one format to another.




To use the Copy-Move widget dialog, see the Save File Widget.

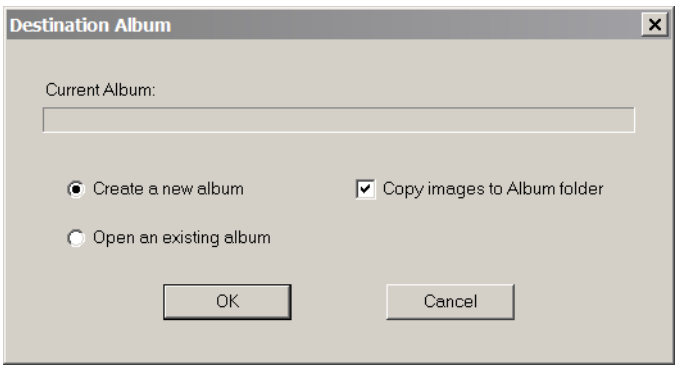
## The Album Widget

The Album widget places images into an album, providing an easy way to print images produced by a workflow The widget can be used to create a new album or to open and existing album. After the workflow is completed, you can review the album, make any manual changes that you like and then print the album or save it.

The album widget saves the images it places into the album in the same folder as the album. That insures that the album has its own copy of the images. This also means that the album widget is a terminal widget -- it can be used as the last widget in a workflow.

### Album Widget Dialog

When you double click the Album widget, the dialog on the right is displayed. It allows you to either create a new album or use an existing one and specify whether the album will save a private copy of its images.




**New/Existing Album:** If you open an existing one, a file dialog letting you choose the album you want to use is displayed. If the album is already open, it is simply linked to the workflow.

If you choose to create a new album the standard album **Layout** dialog is displayed.

**Copy Images to Album Folder:** This checkbox lets you specify that a new copy of each image should be placed into the same folder as the album. Each image is copied as a JPEG file at a quality of 95%. Checking this box is recommended. It insures that all the edits made previously in the workflow are saved and that the album's images are conveniently placed in the same folder, simplifying moving or copying the album.

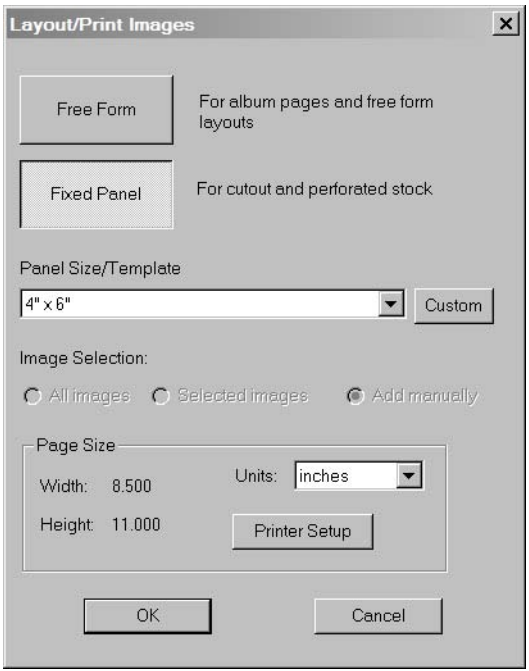
However, if you want to save the images in a different format or to a different location, leave the box unchecked. You must then ensure that the workflow saves the images appropriately. For instance, you can place the Save File widget immediately ahead of the album widget and use it to save the images how and where you like.

### Album Layout Dialog

The layout dialog lets you choose the page size, landscape or portrait orientation and image panel size. Currently only the Fixed panel album mode is supported. The free mode cannot be used within a workflow.

However, if you want more flexibility in laying out the images, you can convert to the free mode after the album is created. Initially the images will be positioned exactly as they were in the fixed mode. However you will now be able to place them anywhere on the page.

After you complete the dialog, a File Save dialog is displayed. Use it to assign a filename to the new album. The images that will be placed into the album will be saved in the same folder as the album.



# Workflow Shortcuts

Workflows can also be launched directly from your desktop either from the command line or via a desktop shortcut.

Launching from the Command Line  Launching from a Desktop Shortcut

## Launching from the Command Line

You can launch a workflow from the command line and populate the workflow with images. The syntax is:

>"*pathname*\pw70.exe" "*pathname**workflow-file*.wfl" *images*

where the pathnames are the paths to Picture Window, and the folder containing the workflow, respectively. Images can be specified by one or more image filenames or by a folder pathname. If a folder pathname is used, all the images in the folder and all the subfolders will be included in the workflow. (Images are optional; if no images are specified, the workflow still opens letting you add images manually.)

The example below launches the Crop.wfl and populates it with all the images in the Cross Stitch folder.


**Note:** In Windows 8 you can open the Command Prompt window (i.e. a DOS window) by clicking the Windows plus X keys and choosing the Command Prompt from the pop-up menu.

Because all the pathnames can involve alot of typing, the most practical way to use the command line option is either via a shortcut on your desktop or through a .bat batch file. (Yes, these are still supported!)


## Launching from a Desktop Shortcut

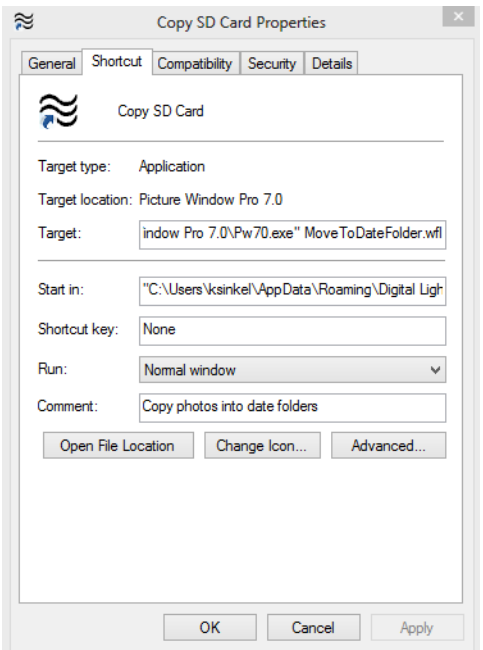
You can open images in a workflow by simply dragging and dropping individual image files or a folder containing images unto a Workflow shortcut.

Picture Window includes a shortcut for copying camera SD cards automatically. Dropping images on the shortcut launches PWP, opens the **MoveToDateFolder** workflow and displays the dropped images in the workflow window. Executing the workflow copies the images into folders based on the create date of the image. For example, an image file named P0123.jpg on your SD card that was photographed on January 20, 2014 would be stored under the following pathname

*browse_root*\2014\01 Jan\P0123.jpg

where *browse_root* is the your Pictures folder (You can override this definition by specifying a different folder under **Browser Root** in **File/Preferences**.)

Of course, you can modify the default workflow. If you do so, it is recommended that you save the workflow under a new name and create a separate shortcut to insure that the modifications are not overwritten when you install the next Picture Window update.

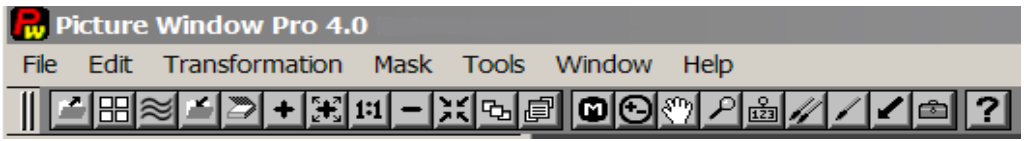


### Creating New Workflow Shortcuts

The easiest way to create a new shortcut is by Coping and Pasting and existing shortcut onto your desktop. After you paste it, display the shortcut properties, Edit the name of the workflow file specified in the **Target** field to the file you want to launch. Edit the **Comment** field to define the operation. Finally, rename the shortcut to a meaningful name.

# 16. Utility Functions

Picture Window groups a number of utility functions under the File, Edit, Window and Help menus. These are discussed in the following sections.




**File Menu**: The file menu contains operations for opening and saving files, reading images from a scanner, printing, making slide shows, and setting preferences.

**Edit Menu:** The edit menu contains Undo, Copy, and Paste functions.

**Window Menu:** The window menu gives you extensive options for resizing windows, an Info dialog which contains details about the image displayed in each image window, and

**Help Menu:** The help menu provides access to the on-line help system, the electronic manual, white papers, and support functions. Support functions include a facility for resolving DLL conflicts, downloading updates, and other functions.

**Important Folders**: This section details the folders Picture Window uses to hold program files and configuration and definition files.

# File Menu

In this section we discuss common file formats for storing images and the main file menu functions. Menu choices include functions for opening and saving images, reading images from a scanner, printing images and setting preferences.

**New Image, Album, Workflow**

**Browse**

**Image File Formats**

**Opening Images**

**Save As**

**Save As Widget**

**Scan - Reading Scanned Images**

**Print**

**Print Album**

**Monitor/Printer Curves**

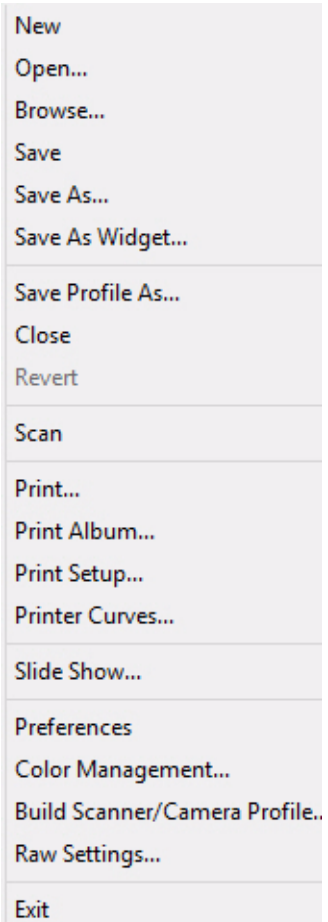
**Making Slide Shows**

**Preferences**

**Color Management**

**Build Scanner/Camera Profile**

**Raw Settings**



## Image File Formats

Picture Window works with images in many standard file formats, allowing you to read images produced by most imaging applications. The workhorse formats TIFF, BMP, JPEG, and Photo CD—are adequate to cover most uses. In addition, Picture Window also supports FITS, FlashPix, EXIF, JTIF, PNG, GIF, TARGA, and PCX formats. Here are descriptions of some of the more important formats.

**TIFF** is a standard format supported by most current imaging applications running under Windows, Macintosh, LINUX and UNIX. Thus it is a good interchange format. It is also the only widely recognized format that stores 16 bit per pixel formats.

TIFF can be used to save images without any compression, or using LZW or ZIP compression. Both compression types are lossless. This means there is no deterioration in image quality regardless of how many times you read and write the same image file, making it a good choice for saving intermediate versions of images you are working on. However lossless compression is not as aggressive as some high quality but lossy alternatives like JPEG.

**BMP** is the native standard of Microsoft Windows and is supported by most Windows programs.

**JPEG** is another widely supported standard format. Its main advantage is that it offers high degrees of compression—over a user-selectable range of about 3:1 up to perhaps 50:1. There is virtually no discernible deterioration in the image at the lower compression ratios. However, the same image should not be compressed and decompressed repeatedly, as even small losses in quality will eventually accumulate and become noticeable. JPEG's good compression allows you to fit most images encountered in photography on a single floppy. Thus it is convenient to use JPEG for archival storage and image export.

**GIF** is an image format popular on the Web. It uses lossless compression. However it is limited to 256 colors and therefore is not recommended for primary storage of photographs.

JPEG and GIF are the two image formats universally supported on the Web. In general, JPEG is the format of choice for photographs while GIF is best for graphics or photographs in which text is important.

**Photo CD** provides an inexpensive and convenient method for your photofinisher to deliver digitized pictures to you.

Since the Photo CD is a read-only medium, after you read in a Photo CD image and manipulate it, store it using TIFF, JPEG, or one of the other formats.

**FITS** is used for scientific imaging. Picture Window supports 8 bit black and white images; Picture Window Pro supports 8 and 16 bit black and white images.

**FlashPix** is the native format of many digital cameras. Picture Window supports both reading and writing the format. FlashPix actually uses two sub-formats. It can save files in a lossless format or use JPEG compression. In the latter case, it has the same quality setting that is used by standard JPEG.

### Raw Images

Raw files are nearly unprocessed images created by digital cameras. They can produce higher quality images than the processed jpg versions of the same exposure because the raw format generally has a wider dynamic range and greater bit depth. Picture Window Pro's raw converter can open images from nearly all raw cameras and let you adjust the images for greatest quality. See **Converting Raw Files** for more information.

### 48-bit Image Support

Picture Window Pro supports both 24 and 48 bit color images and 8 and 16 bit black and white images. The number of bits refers to an image's bit depth or *dynamic resolution* and corresponds to the maximum number of brightness levels that can be expressed. 24 bit images allocate 8 bits to each color channel and can express up to 256 brightness levels per channel. In contrast, 48 bit images allocate 16 bits to each channel and can express up to 65,000 different brightness levels per channel.

The additional dynamic resolution allows Picture Window Pro to capture the output of 30 and 36 bit scanners without the need for scaling the image down to 24 bits. (Of course, the scanner driver must include a mode that outputs the unscaled image.) The additional dynamic resolution can be important in capturing detail in compressed areas of the tonality range, frequently in shadow or highlight areas. This may make it easier to deal with certain difficult lighting situations such as backlighting, hair in portraits, or areas 'burned out' by being too close to a flash.

Extra dynamic range can also be important in certain image processing operations. For instance image signal to noise ratios can be reduced by summing multiple exposures of the same subject. Image information, which is systematic, is thereby enhanced while noise, which is random, is diffused. To avoid overflow, summing images requires the greater headroom afforded by 48 bit dynamic range.

## Opening Images

Images of all supported types can be opened using the Open command. In addition, Picture Window has a special command for opening Photo CD images stored on fully-compliant Photo CD discs.

### Using the Open Command

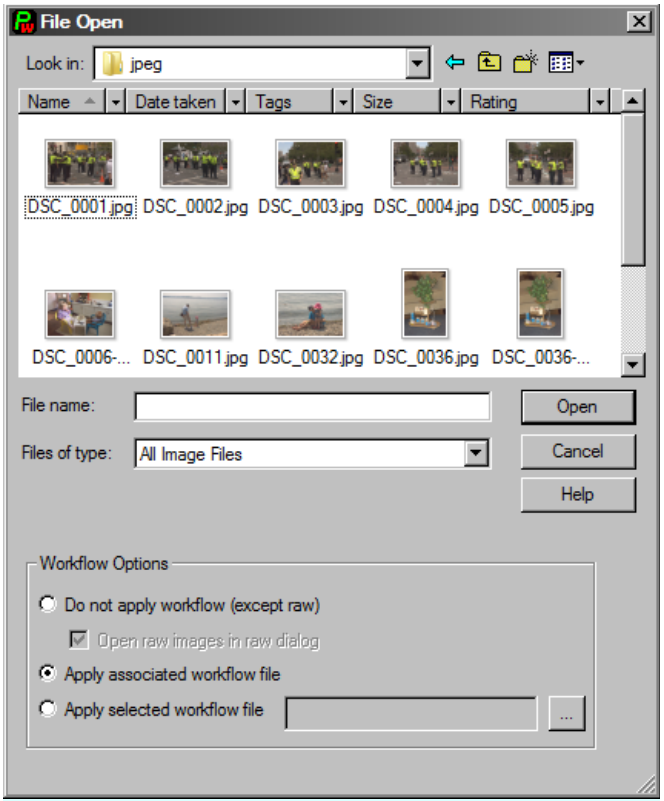
Select **Open** from the **File** menu or by clicking on the  tool bar button. The command displays the standard Windows **File Open** dialog box. Select the disk drive, directory, and file as you would for any windows file. Click **OK** to open the image.

You can also select open several images at once. To do so, highlight the images you want to open by using the standard windows Shift-Click or Ctrl-Click operations. Then click the **OK** button. Each selected image is opened in its own image window.

#### Workflow Options

These options allow you to apply workflow files in different ways.

**Do not apply workflow:** Opens the image file. For non-raw images, if a sidecar file exists it is ignored. Raw files that do not have sidecar files are opened in the Raw Dialog. If a raw file does have a sidecar file, the sidecar is applied to it and the image is opened in an image win-




The **File Open** dialog allows you to select multiple images, so you can open several images at once. It also lets you delete images and create new folders. Options in the bottom panel allow you to apply a workflow to the images you open.

dow. To force such raw images to be opened in the raw dialog, check the accompanying checkbox.

**Apply associated workflow file:** Applies a sidecar file associated with the image, if there is one and displays the resulting image. All the transformation steps of the workflow are displayed in history, where you can edit and reapply any transformation. If an image does not have an associated sidecar file, it is opened normally.

**Apply selected workflow file:** Applies the selected workflow file to one or more images. The workflow file can be in any folder. The same workflow file is applied to each of the images.

**Opening Raw Files (PW Pro only)**

Raw files are just that -- raw -- and so require processing before they can be opened. Thus when you open a raw file with the **Do not apply workflow** option selected, it is handled in one of two ways, depending on whether or not it has a sidecar file.

**Sidecar exists:** If the raw file has an associated workflow file (which, of course, contains the processing instructions for the file), the workflow file is applied and the raw file is opened in an image window. If you want to open a raw file in the raw dialog instead, check the appropriate workflow option.

**Sidecar does not exist:** The raw file is opened in the Raw dialog, ready for your adjustments. When the raw dialog is completed, a sidecar file for the raw file is automatically created and saved.

## Photo CD Images

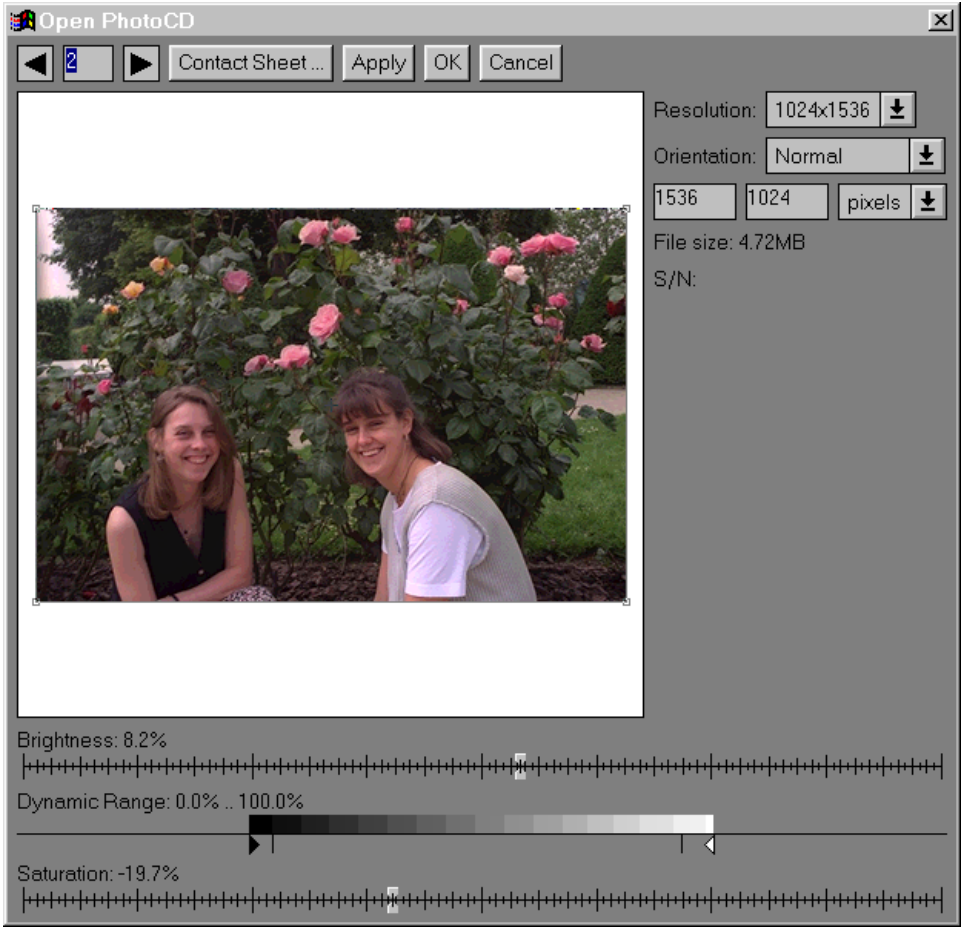
If the image is on a fully-compliant Photo CD disc, use the **Open Photo CD** command in the **File** menu to display the Photo CD dialog. See **Open Photo CD Dialog** for details. (Photo CD is supported in 32-bit versions of Picture Window only.)

## Open Photo CD Dialog

*(32-bit Picture Window only.)*

The **Open Photo CD** dialog lets you preview the images on a Photo CD disk, crop them and read them into a window. To use the dialog:

1. **Insert a Photo CD disc** into your CD drive and wait for the drive's ready light to come on.
2. **Display the Open Photo CD dialog.** Select **Open Photo CD** from the **File** menu. or press the  tool bar button. The Open Photo CD dialog is displayed. (See **Photo CD Dialog Controls**.)
3. **Select an image** by number or by clicking on it in the contact sheet. **Do not change discs while the dialog is active.**



4. **Crop the image**. Resize or reposition the cropping rectangle. This is simply a rough crop, so leave a little extra room around the periphery. You can crop the image more precisely later, if necessary.
5. **Set the resolution.** Use the file size readout to guide your choice. As a rule of thumb, you need at least 4 MB of data for an 8 x 10 print, 2 MB for a 5 x 8 print, and 1 MB for a 4 x 5 print.
6. **Adjust brightness, dynamic range, and saturation.** Adjust the white and black sliders for the best contrast. Adjust brightness and saturation for the best appearance.
7. **Click OK or Apply** to load the image.

## Photo CD Dialog Controls

The **Open Photo CD** dialog is a file open dialog designed specifically to work with the Photo CD format. The dialog has many special features including a preview, a cropping function, brightness, contrast, and saturation controls, and can display a contact sheet of all images on the disc.

**Contact sheet display**

You can choose an image by its image number or by displaying a contact sheet. The contact sheet shows all the images on the disc. You can select an image by clicking on it as soon as the image is displayed—you do not have to wait for entire contact sheet to be completed. To display the contact sheet, click the **Contact Sheet** button.

**Preview Window**

The dialog has a preview window which shows you the selected image. The preview displays any changes you make in the settings of the brightness, saturation, or contrast adjustments, showing you the results immediately.

It also has a cropping rectangle, letting you crop the image *before* it is read from the Photo CD. To crop the image, drag the edges with the mouse. You can also reposition the entire crop rectangle anywhere on the image by dragging the interior of the rectangle.

**Resolution, Dimensions and File Size**


On the Photo CD, each image is stored at several different resolutions, usually ranging from 128 x 192 to 2048 x 3072 pixels for most Photo CDs. (Professional Photo CDs, intended for larger film formats, can have resolutions of up to 4096 x 6144 pixels.) The dimensions refer to the number of pixels in the full image frame. The Photo CD dialog lets you select any of the resolutions available on your disc. A readout shows you the dimensions of your image and its uncompressed file size. These dimensions reflect the effect of cropping.

Set the resolution after you have cropped the image. Make sure the file size is large enough for your intended print size. As a rule of thumb, you need at least 4 megabytes for a full 8 x 10 inch print.

**Note:** Opening high resolution images can require a considerable amount of memory. (32 MB of RAM is desirable for full 2048 x 2076 images.) To reduce memory requirements crop the image as much as possible before opening it. Opening large images in the vertical orientation can be especially slow. A trick is to switch to a horizontal orientation to speed up loading and then use **Mirror/Rotate** to display the image in its correct orientation.

**Saturation and Brightness**

The dialog has sliders for adjusting saturation and brightness. The adjustments are factored into the conversion of the image from the native Photo CD format to RGB made as it is read from the CD. They can compensate for the occasional misadjustments made during initial scanning and preserve quality that can not be recaptured during later processing.

To adjust brightness or saturation, move the corresponding slider. The results of the adjustment are displayed in the preview window.

## Dynamic Range


The black to white scale represents the full possible range of brightnesses. The two small marks under the scale represent the actual brightest and darkest regions within the selected crop rectangle, excluding a 10% image border. (The border is excluded because it frequently includes an overscan area containing the slide mount or the space between film frames.)

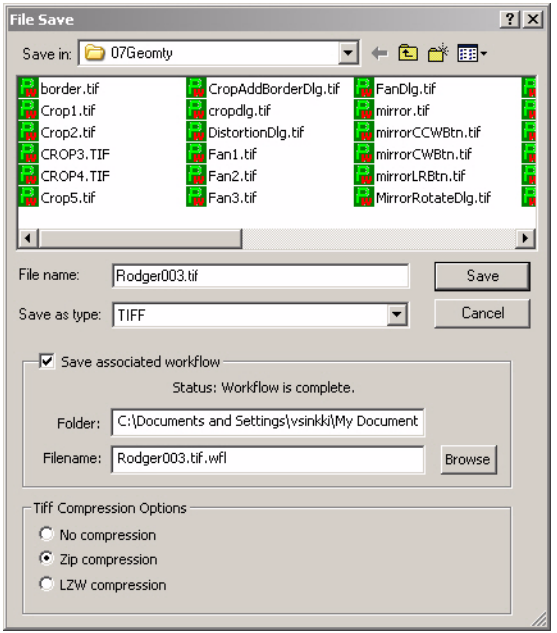
The adjustments you make are shown in preview window.

**White slider:** Adjusts the brightness of highlight areas. Usually moving it to the right edge of the scale is the best adjustment. However you can move it 'off-scale' to the right. this has the effect of lightening the midtones, at the expense of losing detail in some very bright areas.

**Black slider:** Adjusts the brightness shadow areas. Usually moving it to the left edge of the scale is the best adjustment. However you can move it 'off-scale' to the left. This has the effect of darkening the midtones, at the expense of losing detail in some shadow areas.

## Save As

To save an image on disk, select the **Save As** command from the **File** menu. (You can also select **Save As** using the tool bar by pressing the  button.)




The SaveAs dialog has three sections:

**Windows section** which lets you browse for the file folder and assign a name to the file.

**Workflow section** which you can use to save a workflow file with the image.

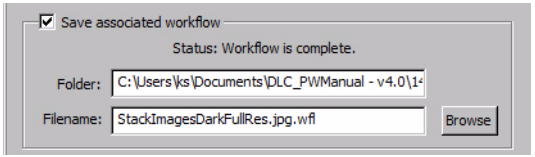
**File-type section** where you can specify additional options related to the file type you are saving.

### Using the Save As Dialog

1. **Select the file type.** The two most common formats are TIFF and JPEG. TIFF is usually used when the highest quality is needed or for 16/48 bit images. JPEG is used to save disk space or to display images on the web. See **Image File Formats** for information on all the available formats.
2. **Select the disk drive and directory.**
3. **Assign a name to your file.** The customary extension for the file type is provided automatically.
4. Select the workflow and file-type options (see below for more information.)
5. Click **OK** to save the file.

**Note:** The Save As dialog also lets you delete images and create new folders.

## Workflow Options




This section allows you to save a workflow file which records the transformations you performed on the image. To save the workflow, check the Save associated workflow checkbox. (If there is no workflow to save, the checkbox is grayed out.) This will enable the workflow folder and filename fields. By default, the workflow is saved in the same folder as the original image used to create the new image. The default name assigned to the workflow is the same as the original image with the .wfl extension appended. (Such an auxiliary file is called a sidecar file.) You can change these settings if you want. (Note, if the image already has a workflow by that name, it is overwritten. So change the name if you want to save more than one workflow for a particular image.)

The workflow section also shows the status of the workflow. Possible statuses are:

**Complete:** All transformations used to edit the image have been included in the workflow file. This includes any masks that were used and auxiliary images such as borders, filter images, etc.

**Incomplete:** One or more transformations are of the type that cannot be saved. Thus only a part of the workflow can be saved. Note that modifications to an image made by freehand tools cannot be saved in workflow files.

**No workflow:** No savable transformations were used on the image.

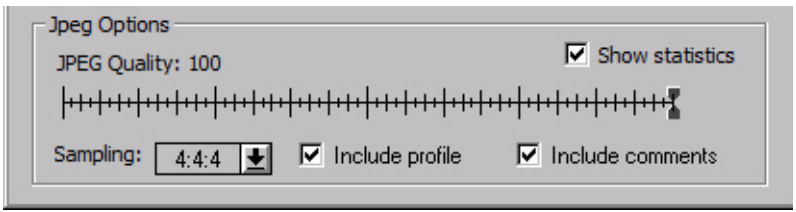
**Root image is not saved:** The original image against to which the workflow could be applied has not been saved.

Once you save a workflow file, you can apply it to the original image next time you open the image. This allows you to modify or extend the operations you performed the first time. To apply the workflow to the original image, see File Open.

### TIFF File Compression Options


When you save a file using the TIFF file type, you can choose to save the file using Zip compression or LZW compression to make the file more compact. These are both lossless compression formats, so they entail no loss of quality. However they cannot compete with JPEG in the degree of compression. You can also specify No Compression. **No Compression** results in the largest file. However, it is also the simplest and most universally-recognized format.

### JPEG File Options




When you choose JPEG as the file type Picture Window the file options section displays controls for setting quality, sampling, and profile and comment options, and an option to display statistics after the image is saved.

**Quality:** The quality slider lets you select a quality level from 0 to 100%. Higher quality levels are more faithful to the original image; lower quality levels yield better compression ratios.

Use a setting of 97% to achieve good compression (typically 4X to 10X) with little or no visible reduction in image quality. A setting of 90% or lower will compress the image significantly more but image quality will start to degrade. Settings lower than 90% will give rise to more visible artifacts.

To get a feel for the effects of different JPEG settings, save the same test image in an uncompressed format such as TIFF and in JPEG format. Then open both files in side-by-side windows and zoom in to compare the images in detail. JPEG artifacts are usually most noticeable along sharp boundaries between areas of contrasting solid colors.

**Color Sampling:** This control lets you select, if you are saving a color image, how much the color information is com-

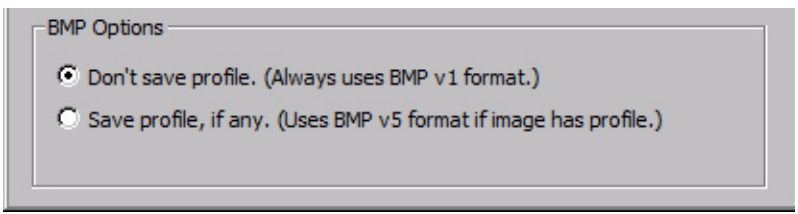
pressed. Since JPEG compression works by first separating the luminance (brightness) information from the chrominance (color information), each component can be compressed differently. For best quality, select 4:4:4; to achieve higher compression, select 4:2:2 or 4:1:1.

**Include Profile, Include Comments:** You can choose whether or not the ICM profile and file comments are included in the saved file. Generally you will want to include these. However, if you are creating the file for an environment where these elements are not used, such as a web page, you might want to exclude them to save space and produce the smallest file possible at a given quality setting.

**Show Statistics:** If you check this box, after the file is saved a window is displayed showing you the file size and compression ratio. The window also has the same the Jpeg options controls. This gives you the option of resetting the options and saving the file again, to make a different tradeoff between file size and quality. The file is resaved from the original image data, so resaves do not degrade quality in any way. Once you are satisfied with the settings, click the Done button and your last file save is preserved. If you do not want to display file statistics, uncheck Show Statistics.

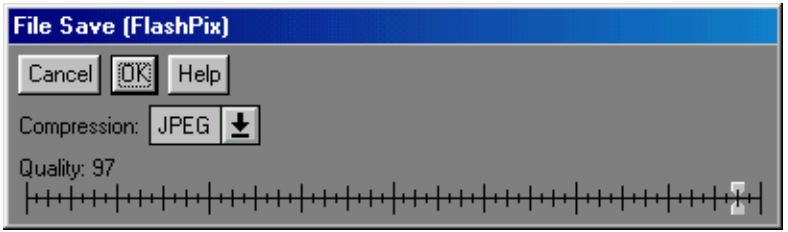
### BMP File Options

You have the option of saving or not saving the ICC profile with the file. If you do not save the profile, BMP version 1 is used. This is the most universal version. Otherwise BMP version 5 is used.



### FlashPix File Save Dialog

To save an image using JPEG compression:




1. Select the window of the image you want to save.
2. Select **Save** or **Save As** from the **File** menu. The standard Windows dialog is displayed.
3. **Select Flashpix as the file type.** Enter a file name and click **OK**. The Flashpix dialog is displayed.
4. **Set the Compression option.** You can save the file uncompressed or compress it using JPEG. If you choose JPEG compression, a quality slider is displayed. Set the quality. Higher quality levels result in greater image fidelity but lower levels of compression. 97% is a reasonable setting for archiving images.
5. Click **OK**. The file is saved.

## Reverting to a Saved Image

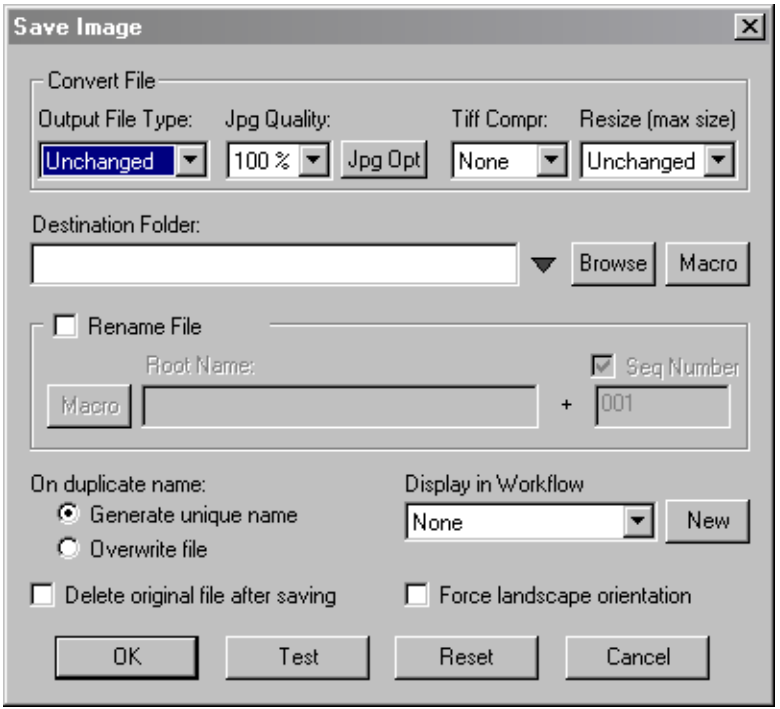
Sometimes you will want to abandon an image you have been editing with the freehand retouching tools and start over again with the file version of the image. Use **Revert** to reload the image as it exists on disk, undoing all the changes you have made. To use **Revert:**

1. Choose the image you want to restore.
2. Select **Revert** from the **File** menu. The image is overwritten by the file with the same name as the title of the selected image. The operation takes effect immediately.

**Note:** You cannot use **Revert** on images that are displayed in untitled windows since they have never been saved.

## Save As Widget

The Save As Widget is an alternate way to save files. In this technique, instead of specifying a path and filename literally, you specify it as a macro. The macro is then applied to generate the actual name under which your image is saved. The widget is also saved in history, as part of the operations performed on the image.

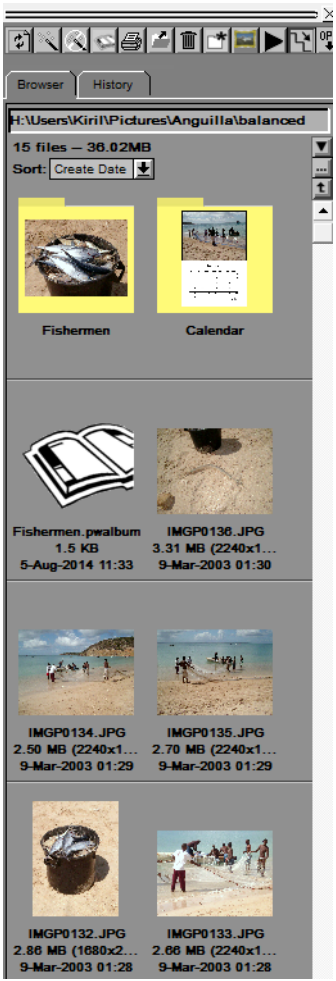



The advantages of this technique are:

- You can use the same settings to save any number of images. This saves on typing and, more importantly, makes it easy to establish a consistent folder structure and naming convention for your edited images.
- The widget's save parameters can be applied automatically. This allows the settings to be applied in a workflow to other images.

See **Save File Widget** for details.

**Note:** The sequence number feature is not relevant when the widget is invoked from the File menu. This is because the widget is invoked on a single image rather than on a series of images.




# Browse

**Browse** lets you view and select images visually, rather than by filename. Browse displays thumbnails of all images contained in any file folder you select. You can then open images by double clicking on them or dragging and dropping them into the main window. You can also drag and drop the images into the slide show window, the layout transformation, or into other applications that accept image files. Browse also displays folders. To open a folder and display its images, simply double-click on the folder.

Other features let you:

- Print the thumbnails as an index print.
- Automatically layout and print all or selected images.
- Delete image files. The delete function is handy to quickly eliminate transitional images you may have stored during editing, for instance.

The browse window is a docking window — you may dock it at any of the four edges of the Picture Window workspace. To dock it to a different edge, simply drag the window to its desired new location.

The Browse window has two tabs. The **Browser** tab displays image thumbnails within any file folder. The **History** tab selects a hierarchical display of all open windows.

**Browse Dialog**

**Printing an Index Print**

**History Display**

**Albums & Multi-Image Printing**

## Browse Dialog

To use Browse:

1. Select **File Browse** from the main menu or click the  toolbar button. The File Open dialog is displayed.
2. Select the folder you wish to browse and click **Select**. The Browse dialog is displayed. If this is the first time that you selected this folder, the thumbnails are filled in gradually as each image is subsampled. However, when you open the folder subsequently, the thumbnails are displayed quickly.

## Browse Dialog Functions

**Selecting a Folder:** To select a different folder, click the  **Select Folder** button. You can also move up to the previous folder using  button or to MyPictures folder by clicking  . The pathname of this folder can be set in File/Preferences. Finally, to create a new folder use  .

**Selecting Images:** Select images by clicking on them. The border is displayed in reverse to show that the image is selected. You can select any number of images. To select all the images, click the  **Select All** button. To cancel all selections, click the  **Select None** button.

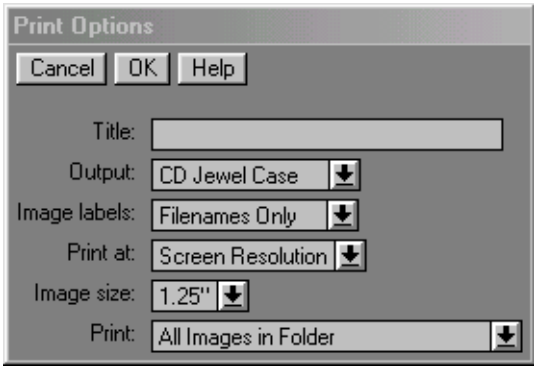
**Opening Images:** To open one or more images, select them and then click the  **Open** button. The selected images are each displayed in their own image windows. You can also double click on an image to open it.

**Deleting Files and Folders:** To delete all selected files and folders, click the  **Delete** button. The files and folders are deleted after confirmation. This function actually deletes the file/folder, bypassing the recycle bin. For folders, all the contents of the folder are deleted as well.

**Multi-image Printing and Albums:** Click  to create a photo album. You can use the album function to print selected images from the Browse display. You can choose automatic layout in any of a variety of sizes or manual layout to create free layouts. See **Albums & Multi-Image Printing** for more information.

**Sort order:** The  button toggles the present window sort between ascending and descending order.

## Printing an Index Print




You can print an index print showing thumbnails of all images. The print function lets you create index prints on letter-size pages or in a CD jewel case cover size. To print thumbnails of images:

1. Click the **Print thumbnails** button. The standard **Print Setup** dialog is displayed.
2. **Choose your printer,** set printer options as required, and click **OK**. The Print Options dialog is displayed.
3. **Select the desired options.** You can set the following:

   **Title:** Type an optional title to identify the printout.

   **Output:** Select full page, CD jewel case, or DVD case size. Full page uses the size of the loaded paper. CD Jewel case output is suitable for using as a jewel case insert. This is handy to identify the contents of an archival CD.

   **Image Labels:** Select how you want each image to be labelled. You can select a full label, filenames only, or no label at all. A full label includes a filename, date, and file size. (File size is omitted in the jewel case format.)

   **Print At:** Select the output resolution. Screen resolution is faster and the resolution is adequate for the smaller thumbnail sizes. Printer resolution results in higher quality but is slower because the files image must be reread.

   **Image Size:** Choose an image size that's consistent with the use you will make of the thumbnails. Choices range from 0.75 inch images to 2.5 inch images.

   **Print:** You can print just the selected images or all the images in a folder, or all images in a folder and its sub-folders.

4. Click **OK** to print.

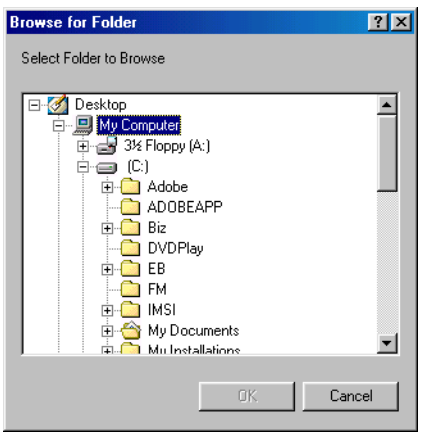
A Jewel Case Index Print

## Browse Options

To set options for the Browse display, click the 

button. The options dialog is displayed. Use this dialog to set:

- **Thumbnail Size:** You can set the image size to Tiny, Small, Medium, or Large.
- **Show Details:** Details refers to the filename and image size displayed for each image.You can display this information or suppress it. The savings in space lets you display a greater number of images.
- **Show Mats/Borders:** Selects the display of a white mat and border around each thumbnail. When this option is deselected, the thumbnails are displayed directly on a gray background.
- **Use Bold Font:** Annotates thumbnails using a bold font, for easier readability.
- **Save Browse Info in Folder:** Set whether or not you want the browse information to be saved in a file. Saving it in a file speeds up browser operation considerably, but uses a small amount of additional disk space. However, note that browse information cannot be saved on read-only devices such as CD-ROMs.
- **Show Create Date / Show Modify Date:** Sets which date is displayed below each image. Note when you set Sort by modify date or Sort by create date, the date shown below each thumbnail changes to match the sort date type. You can override this selection in the options menu.
- **Ascending Order as Default:** Determines the sort order (ascending or descending) of new Browse and Workflow windows. The choice does not affect the order of the images in the current window. Use the  button to toggle the present window between the two.
- **Use Treeview to Set Folder:** Uses a hierarchical treeview control (shown at right) instead of the file open control to display folders. This option is provided primarily for Windows XP users who store their images in the MyPictures folder. Selecting this option avoids the delay of building thumbnails in the file dialog.



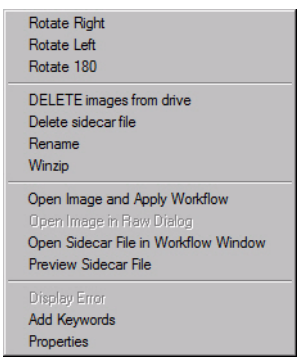
- **Ask for Folder on Launch:** When this option is selected, each time you launch Browse, a the Folder dialog is displayed, allowing you to set a new folder. When the option is not selected, Browse automatically displays the same folder it displayed last time, without asking.

### Sort By

You can display the images sorted by filename, file extension, create date or modify date. The exif create date is used, if available. Otherwise the windows file creation date is used. When you switch to Create Date or Modify Date, the date shown below each thumbnail automatically switches to show the create or modify date. You can override the date type in the options menu.

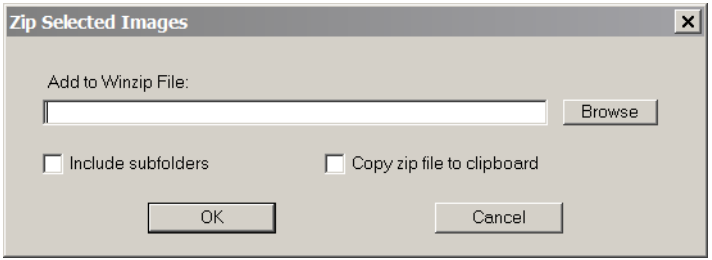
### Browse Right-Click Menu

The right-click has functions for rotating images, deleting them, and viewing and editing EXIF properties.




- **Image Rotation:** The browser (and file open generally) detects image orientation information when it is available in the file. When the orientation is wrong, you can rotate the image from the right-click menu. The rotation function doesn't just rotate the thumbnail but stores the new orientation in the image file. Thus this function works only on files that can be written.
- **Delete Images/Folders from Drive:** This is a very powerful command and should be used carefully. (For safety, a confirmation dialog is displayed before the command is executed.) The command permanently deletes all selected files and folders from the disk or other mass storage device. If a folder is selected, the folder and all subfolders and files it contains are deleted. This includes hidden and read-only files.

- **Rename:** Allows you to change the name of a file or folder.
- **Winzip:** Creates a compressed Zip file and adds all selected images to it. (If the Zip file already exists, the images are added to the existing file.) If folders are included in the selection, all files in the folder are added as well. If the **Include subfolders** option is checked all files in the folders' subfolders are also added.




If the **Copy Zip file to clipboard** option is checked, the zip file is placed on the clipboard. It can then be pasted into any application which accepts files by using the Paste command. You can use this function to easily attach images to an e-mail message. The Winzip feature requires that Winzip and Wzzip, the Winzip command line utility are installed on your machine. Please see the support section of www.dl-c.com for details.

## Workflow Options

Workflow files contain a record of how he image was processed and can be stored as sidecar files along with the image. If an image has such a sidecar file, a small workflow icon is displayed in the lower left corner of the thumbnail.

- **Open Image and Apply Workflow:** Opens the image and applies all the operations stored in the workflow file to the image. Only the final image is displayed. However, History contains all the intermediate steps, so that you can redo any step and reapply the changes to all the subsequent operations.

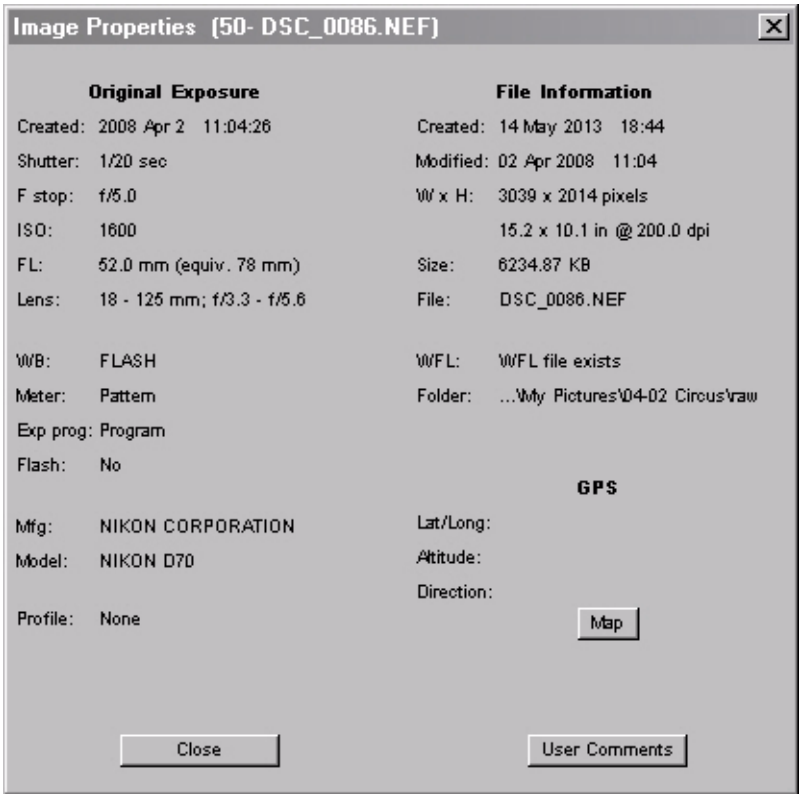
- **Open Image in Raw Converter:** Raw images which have workflow files are normally opened directly. This option forces the image to be opened in the raw converter instead, so you can edit its raw settings. Grayed out for non-raw images.
- **Extract Jpeg Image:** Extracts the jpeg image from a raw image. Grayed out for non-raw images.
- **Open Sidecar File in Workflow Window:** This option opens the sidecar in a batch workflow window so you can apply it to other images. The image in the thumbnail is not involved.
- **Preview Sidecar File:** This option examines the sidecar file and lists the operations it contains.
- **Delete Sidecar File:** This option deletes the sidecar file associated with the image. The image itself is not affected.
- **Properties:** Displays EXIF, GPS and file properties and allows adding user comments. See **Properties.**

## Properties

This dialog combines EXIF, GPS, file system and user IPTC comments. It can be displayed from:

- **Browser:** Right-click on a thumbnail and choose *Properties* from the menu.
- **Raw Dialog:** Click the *Properties* tab.
- **Image or Play Window:** Right-click on a thumbnail and choose *Properties* from the menu.
- **History:** Right-click on a thumbnail and choose *Properties* from the menu.
- **Window Menu:** Click *Image Properties*.

The dialog contains exposure information taken from the camera EXIF data, file information from the Windows file system and GPS data from GPS-equipped cameras.




### Mapping GPS Coordinates

Click the Map button to:

**Go to a map website:** Display the GPS location on a map, via a mapping site such as Google. (Google is the default; however you can use any site by setting the map URL appropriately.)

**Copy coordinates to clipboard** so you can insert them into a web browser or a document.

**Set website URL:** Set the URL of the mapping website you would like to use. You can insert the map coordinates anywhere in the string by clicking the Macro button.

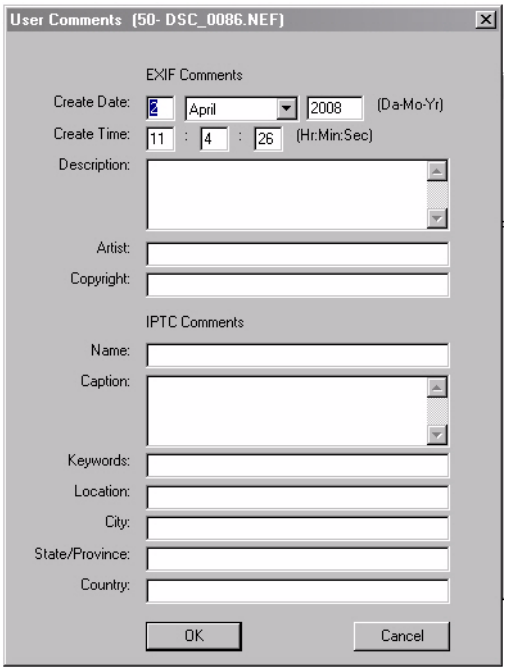
## User Comments

User comments are added by the user rather than recorded by the camera. The User Comments dialog displays comments and allows you to edit them. (Note editing is disabled if PWP cannot save the comments back to the image in a particular situation.)

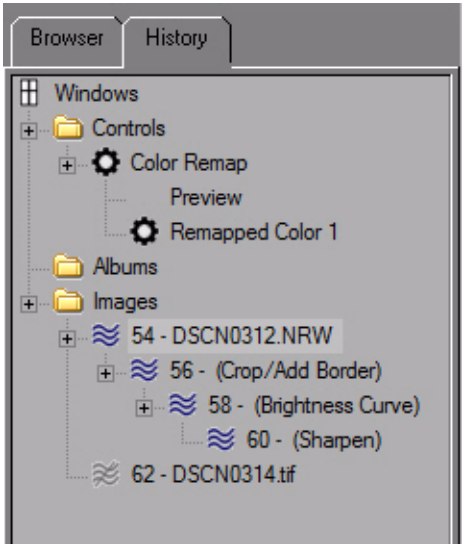
They are stored either as part of the EXIF or IPTC data.

The **Create Date and Time** field indicates when the image was exposed. It is usually filled in by the camera. However for scanned images or copied images, this date can be edited to indicate when the original was made. The field will accept partial dates to accommodate cases when the full date is not known.

The **Location** field can be used for a summary location or to copy and paste an address from a mapping application.



## History Display




The History display shows a hierarchical list of all windows open in the main Picture Window work area. It has three major categories—*Controls, Albums* and *Images*.

### Controls

Controls heads a list of all command windows, such as tool dialogs, transformations, their preview windows, color picker and other auxiliary windows. Double-click on the item to bring the window up to the top.

### Albums

*Albums* heads a list of all open album windows. Click on an album item to bring its window up to the top.

### Images

Images heads a list of all open image windows. They are arranged hierarchically, with the original image at the top of each hierarchy, followed by edited windows in the order they were created and indented to show the parent image. Each image item has:

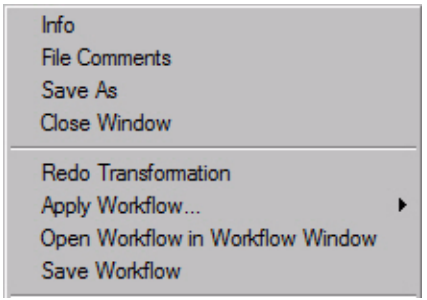
**Icon:** A blue icon indicates that a workflow widget is associated with this step. The widget stores the parameters of the operation which created the image. A icon indicates that no widget is available. When an image is opened it generally has no widget. (Raw images are an exception. Their settings are saved in a widget.) Some operations do not have widgets such as transformations like Composite which require more than one image for input, mask operations and others. Non-algorithmic operations, such as freehand tool operations also are not stored as widgets.

**Window Number.** This is the number of its image window. If no number is displayed, the window has been closed.

**File Name.** The name of the file, if the image has been saved.

**Operation.** The operation used to create the image. It is shown in parenthesis.

### Right-Click Menu




History allows you to operate on the images and their associated widgets in various ways. To do so, right click on an image item in history. Options are:

**Info:** Displays image and file parameters. Same as using the Window/Info menu command.

**File Comments:** Displays the file comments for the image. Same as using the Windows/File Comments command.

**Save As:** Displays the Save As menu and lets you save the image.

**Close Window:** Closes the image window.

**Redo Transformation:** Redisplays the transformation with its original parameters. You can modify the parameters and rerun it. After you click OK, a dialog gives you options to create a new output image or replace the current one. You also have the option of applying all downstream widgets to the image or altering only the selected operation.

**Apply Workflow:** This option allows you to apply the entire workflow, from the root widget through to the widget you have selected, to additional images. You can choose the images from the file menu or images that are open in Picture Window.

**Open Workflow in Workflow Window:** This operation lets you open the entire workflow, from the root widget through to the widget you have selected, in the workflow window. You can modify the workflow there, apply it to multiple images, and save it as a workflow file.

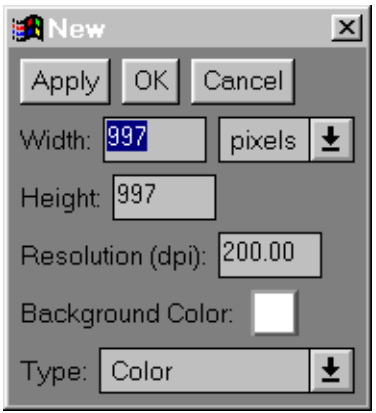
**Save Workflow:** This operation lets you save the entire workflow, from the root widget through to the widget you have selected, as a workflow file.

## New

New gives you a choice of creating a

- new blank image
- new album (see **Print Album**).
- new workflow (see **Creating Workflows**).

### New Image




New can be used to create a blank image of specific dimensions. The image can be later filled with text or a calendar, for instance.

To use New Image:

1. If you want the new image to be exactly the same size (in pixels as an existing image, select the image.
2. Select **New/Image** from the **File** menu. The **New** dialog is displayed.
3. Set the width, height, and resolution.
4. Select the type of image desired. You may select either **color** or **black and white**. (If you intend to use the image as a mask, it must be black and white.)
5. Select the background color (or gray level for black and white images). Click on the Background color button and use the **Color Picker** to select a color.
6. Click **Apply** or **OK** to create the new image.

## Scan – Reading Scanned Images

Picture Window supports the Twain scanner interface standard letting you use any of the many compatible input devices available. These include flatbed and hand-held scanners, scanners for negatives and transparencies, digital cameras, and video frame grabbers. The Twain interface allows the scanner manufacturer to supply a custom interface for reading images from the scanner in question. Since each one is different, we can give only general instructions here.

To read a scanned image,

1. Select **Scan/Select Source** from the **File** menu. It displays a dialog showing a list of all installed scanner drivers.
2. Choose your scanner from the list.
   (If your scanner is not in the list and you are running PWP/64, see **Scanning Using PWP/64,** below.)
3. Select **Scan/Acquire** from the **File** menu or click the  toolbar button.

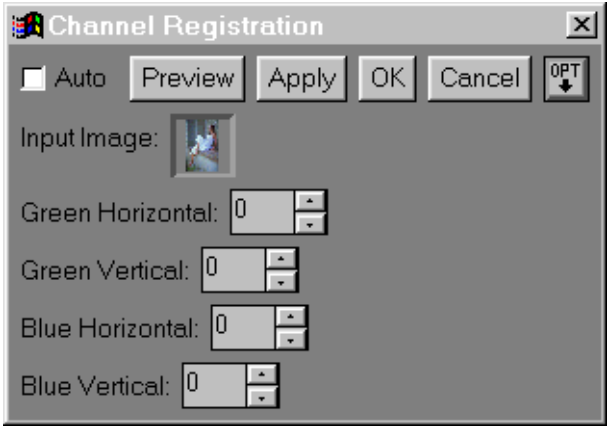
A dialog specific to your scanner is displayed. (See your scanner documentation for more information.) Use this dialog to make scanner settings and scan your image. The image is displayed in a new, untitled image window for editing.

After scanning an image, you may discover it shows color fringes. This is probably due to misregistration between the red, blue, and green components of the scan. You can correct such misregistration using the **Channel Registration** dialog.

### Scanning Using PWP/64

If you are using the 64 bit version of Picture Window and your scanner is not in the list, it may be because your scanner uses a 32 bit driver. You must run the 32 bit version of Picture Window to use a 32 bit scanner. Select **Scan/Use 32 bit Drivers** to launch PWP/32.

## Channel Registration




Depending on your scanner, the three color channels of your image may be slightly misregistered. Misregistration usually manifests itself as a color fringe around elements in the image. For instance, if the red channel is displaced slightly to the left from the other two channels, objects will have a noticeable red fringe on their left edges and a cyan fringe (the complement of red) on their right edges. (Registration is seldom a problem with Photo CD scans.)

You can correct misregistration with the **Channel Registration** dialog. The dialog lets you shift the green and blue layers of the image with respect to the red layer. You can shift them in half pixel increments left, right, up and down.

To display the dialog, click on **Transformation** in the menu bar. Select **Color** and **Registration**.

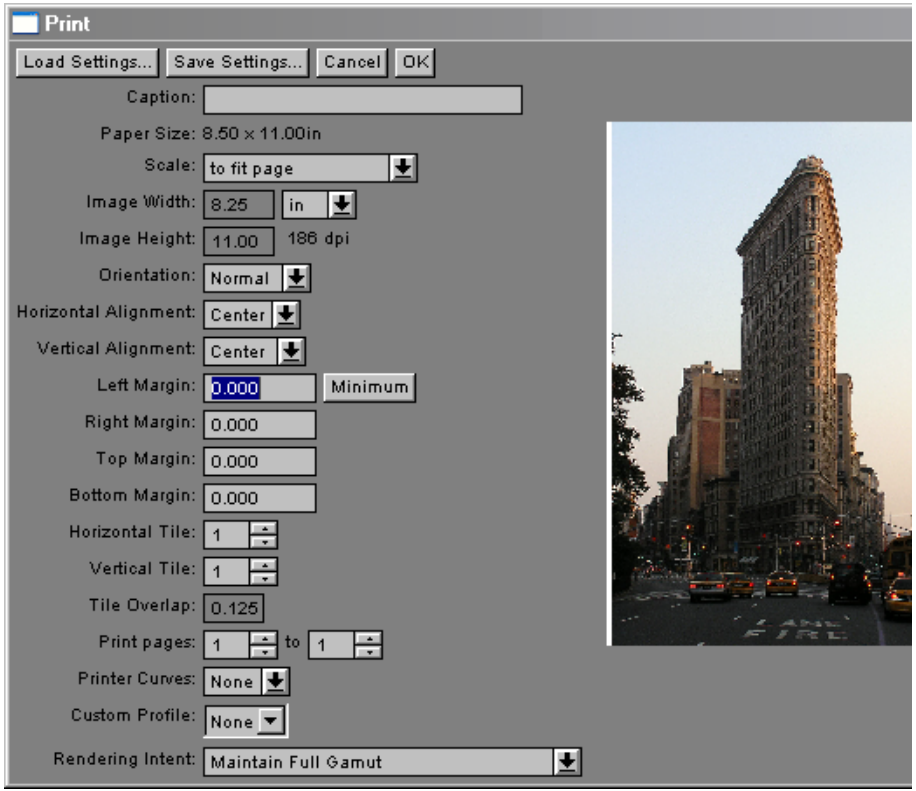
## Print

The **Print** function allows you to print images on any Windows-supported printer accessible from your system.

To print an image:

1. **Select the image** you want to print.
2. **Select Print** from the **File** menu. The standard Windows Print dialog is displayed. Make sure the correct printer is chosen.

   To select a different printer or change printer options such as page size, orientation, and other options your printer supports, Click **Setup**.
3. Click **OK** to display the Picture Window Print dialog.




4. **Crop the image.** You may print the entire image or crop it as desired. To crop the image, select the image window. Notice that a crop rectangle is displayed along the edges of the image. Drag the sides of the rectangle to position them as desired. You can also drag the corners of the rectangle or move the entire rectangle by dragging its interior.

5. **Make desired changes in the dialog.** Here is more information on the parameters in the dialog.

**Caption:** This text is printed in the upper left corner of the print. You can use it to identify the file, date and other parameters of the image.

**Alignment:** These two controls let you select how the image is aligned within the margins.

**Units:** The drop-down menu next to the image size readouts lets you choose inches, centimeters, or millimeters for all units displayed in the print dialog.

**Margins:** These four controls let you enter the left, right, top, and bottom margins in your chosen units. Use the dialog's preview window as a guide. To reset the margins to the minimum values for the chosen printer, click the **Minimum** button.

**Page Size:** Displays the size of the output page. If you are tiling, this is the full size of the output image, not just the size of an individual printer page.

**Image Size:** The size of the image, as it will be printed. To change the size of the image or its location on the page, use the **to fit page** Scale option and edit the margin settings or set the scale option to **custom** and enter the desired image dimensions.

**Scale:** Allows you to select how you want the image scaled. Choices are described below.

The **one to one** choice prints the image unscaled, centered between the margins. Its size is determined by the printer resolution. Each image pixel is printed as a single printer pixel.

**Fit to page** scales the image without distorting it, so that it is as large as possible in the area between the margins. In this mode you control the size and position of the image by adjusting margin settings.

**To image dimensions** prints at the size determined by its resolution (dpi) setting in the **Resize** or **Window Info** dialogs. The image is printed between the margins, aligned as determined by the **Alignment** setting. If this size exceeds the space between the current margins, the image is automatically scaled to fit.

**Custom** allows you to control the image size by entering dimensions into the Image Height and Image Width controls. If the specified size exceeds the space between the margins, the image is automatically scaled to fit.

**Orientation:** Turns the image on the page without using the printer's portrait/landscape control.

**Horizontal and Vertical Tile:** Allows you to make large images that span several sheets of paper. The horizontal and vertical tile controls set the number of pages wide and high the image will be. The maximum is 20 x 20.

A 3 x 2 page image.

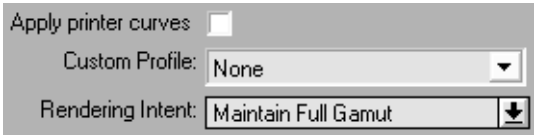
**Tile Overlap** sets the width of the strip that is repeated between adjacent tiles. The setting you use depends on how you expect to join the tiles. A very small overlap, of about an eighth of an inch (0.125) gives you some leeway when you trim the pages. It keeps the seam hidden even if the paper shrinks a small amount.

The **Paper Size** readout is updated to show the overall dimensions of the printable area. (Most printers do not print to the edge of the sheet so the dimensions will be somewhat less than the full page size.)

After printing is complete, trim the margins of each sheet and assemble them into a single image. You can mount them on mat board or tape them together to create a single large image.

**Print Pages:** This control is used if you are printing multiple tiles. It lets you select particular tiles for printing. The tiles are numbered from left to right. (For instance, the lower left tile in the example is page number 4).

6. **Set the Color Management options.** *(Picture Window Pro only.)* If Color Management is enabled and you are printing a color image, two additional controls are displayed in the print dialog for setting color management options.




**Printer Curve:** Printer curves provide an additional correction you can apply to printing to make the printer output closely match your screen display. This is a net correction and thus compensates for all factors including lighting under which the print is viewed. (ICC curves do not take display lighting into account.) Printer curves can also be used in black and white printing to control the tonality of blacks from blue-blacks through neutral to brownish-blacks. To create a printer curve, see **Monitor/Printer Curves**.

**Custom Profile:** Choose the printer profile appropriate for your printer and paper you are using.

**Rendering Intent:** The rendering intent controls how colors are translated from their current color profile to the printer's profile. The default setting, **Maintain Full Gamut**, translates by making the best use of the full range of colors available on the printer. It is the best choice for most pictorial purposes. **Preserve Saturation** matches color saturation when possible even if that introduces some inaccuracy in hue and brightness. **Preserve Identical Colors** and their White Point and Black Point variants favor color accuracy over making the best use of the available gamut. Use this setting for cases where absolute color matching is most important.

7. Click **OK** to print the image.

## Print Album

Print Album is an alternative way to print images. It is particularly handy for:

- printing several images on a page
- printing the same image in several sizes on the same page
- creating an album of several pages.

To print an image using this function:

1. **Select the image** window. Then select **Print Album** from the **File** menu.
2. The standard Windows **Print Setup** dialog is displayed. This gives you an opportunity to set the page size and other printer parameters. Make any settings and click **OK**.

   The image is displayed in an album page. By default, the largest standard panel size that fits on the current page is chosen. The image is sized to fill this panel without any cropping. You can accept this setting and print the image or you can use this as a starting point. You can control layout on the Album Properties **Layout Tab**. Here are some typical changes you might make:

   Click **Auto-crop** to fill the panel completely.

   Change the panel size to create additional panels on the page. You can then fill these panels with the same or different images. (Set the panel size to **Manual** for free-form layout.)

   You can also control the size and cropping of the image directly by manipulating it with the mouse directly on the album page. For instance, you can zoom the image using the mouse wheel and then pan and crop it as desired.
3. **To Print,** select the **Print Tab** on the Album Properties dialog. Set printer parameters and click the **Print** button. (See **Print Tab** for more information.)

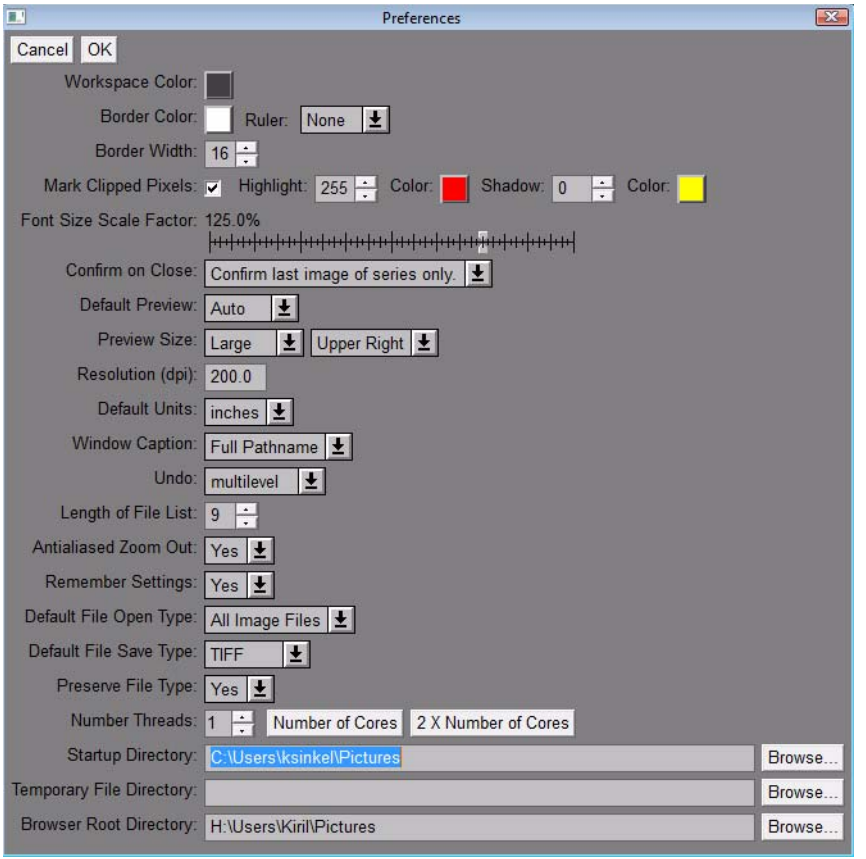
# Preferences

The Preferences dialog lets you customize various Picture Window operations to make them more compatible with the way you like to work.

You can make preference settings for a single session or you can save them so that they will automatically be in force for subsequent sessions as well.

To launch the dialog, select **Preferences** from the **File** menu.

Here are the parameters you can set:




## Workspace Color

This is the color of the workspace background against which images are displayed. Since it forms the background against which image windows are displayed, it is a good idea to set the workspace color to a relatively dark neutral gray. Generally, colored backgrounds should be avoided because they will distort the perceived colors of your images.

To set the workspace color, click on the color square and use the **Color Picker**.

### Border Color

This is the color of the border that is displayed around each image. By default, the border is white. This default, white, is highly recommended. It provides a reference, helping you judge brightness and detect color casts.

To set a different border color, click on the color square and use the **Color Picker**.

### Border Width

This is the width of the image border in pixels. A value of zero will eliminate the border entirely.

### Show Clipped Pixels

Clipped pixels (pixels that are at minimum or maximum brightness) can be highlighted. The preference item allows you to set the the highlight colors and whether or not the function is activated by default when you start-up Picture Window. The clipped pixel display can also be toggled on and off from the Windows menu or tool bar. (See **Show Clipped Pixels**.)

### Font Size Scale Factor

This slider increases or decreases the font size of most dialogs and transformations within Picture Window. (It does not affect Windows dialogs or messages or some PWP dialogs that use the Windows font.) A setting of 100% sets the PWP font size to approximately the same size as that displayed by Windows. Changes to the scale factor do not take effect until the next PWP session.

### Confirm on Close

This field specifies whether or not a warning dialog is displayed when an image window that has not been saved is about to be closed.

### Default Preview

This item specifies whether the default **Preview** setting in transformations is *Auto* or *Manual.* The *Auto* setting updates the preview window automatically each time a change is made in the transformation, giving you immediate feedback. The *Manual* setting updates the preview window only when you explicitly click the **Preview** button.

### Resolution

The resolution setting is the default image resolution that will be used when opening image files stored in formats that do not specify a resolution—such as Photo CD and JPEG. The default is 200 pixels per inch. It has no effect on the image itself; it is merely a conversion factor between pixels and inches.

### Default Units

Sets **inches**, **cm**, or **mm** as the default units where ever units are used. Resolution units always default to dpi, regardless of this setting.

### Window Caption

This setting lets you select whether you want to display **Full Pathnames** or **Filenames Only** in window titles.

### Undo

This setting affects the behavior of undo for the clone, paint, and miscellaneous retouching tools. You can select none, single level, or multilevel. Single level allows you to undo the previous operation only. Multilevel allows you to undo all the operations in a Tools session, one at a time. The more undo levels you set, the more strokes you can erase but at the expense of using more memory.

### Number of Threads

This setting determines the number of tasks that are launched concurrently for multi-tasked functions such as transformations and background processing for the workflow. By default, the number of threads is set to the number of processor cores detected in your system. You can change the setting to one if you do not want multi-tasking to be used. Conversely you may increase the number to create more concurrent processes, for instance if in performance testing you determined that performance could be improved with an increased number of tasks. The **Number of Cores** and **2x Number of Cores** buttons check your processor configuration and set the number of threads to their respective values.

### Antialiased Zoom Out

This setting controls whether or not the main image window is anti-aliased when it is zoomed out at magnifications of less than 1:1. (Anti-aliasing smooths the image, giving a more accurate representation of how it would look when the image size is reduced.) By default, the setting is *Yes*.

Note that since preview images are not anti-aliased, the preview will not match the main image window exactly unless anti-aliasing is turned off.

### Preview Size

Controls the initial size of the preview window when you run a transformation. (You can manually resize the window.) The options are **Small**, **Medium** and **Large**. Larger previews show more detail but are slower to compute and take up more space on the screen.

### Remember Settings

Most transformations and some commands can retain their settings within a particular Picture Window session. This behavior can be turned on or off via this setting.

### Length of File List

Specifies the number of files shown in the recent files list in the file menu.

### Default File Open Type

Specifies the file type that will be used in the **File Open** dialog.

### Default File Save Type

Specifies the default file save setting in the **File Save As** dialog.

### PhotoCD Directory

This field specifies the pathname of your Photo CD files. It is used by the **Open Photo CD** command. (Available on 32 bit versions of PWP only.)

Usually, you can leave this field blank and let Windows locate your CD-ROM drive automatically. However if you have more than one CD-ROM drive, if your CD-ROM drive is located on another system in a network, or if your Photo CD files are not on a CD-ROM (for instance, you may have copied some images to your hard drive), Windows will fail to find the Photo CD directory and will return an error message. In that case, you must provide the pathname to be able to access Photo CD images.

You can tell Picture Window where your Photo CD files are located and bypass the automatic search for local CD-ROM drives by entering the pathname of the directory containing the Photo CD **overview.pcd** file. This pathname must include the trailing back slash. For example, if you wish to access Photo CD files on disk X, enter "X:\" as the Photo CD directory. If you have copied Photo CD files to a directory on your hard disk and wish to access them from that directory, just enter the directory's pathname.

### Startup Directory

Enter the directory you use most often for storing images. This directory is used as the initial directory for the File Open and File Save menus. It is also used initially by the browser window.

### Browse Root Directory

In Browse, you can click the  button to set the browse folder to a user-selected starting point. By default, the starting folder is *MyPictures* for the current user. However, if you keep your pictures in a different folder, use this option to set the folder name.

## Color Management


The Color Management dialog groups all color management settings in one place. (If you are new to color management, see the **Color Management** white paper for a practical, in-depth discussion of this topic.)

**Color Management:** Determines whether color management is enabled. If it is disabled, all other settings are ignored.

**Color Engine:** Allows you to choose the active color engine from among the engines installed and registered on your system. The color engine is the software sub-system which performs color space conversions on behalf of the operating system.

Picture Window includes the open-source Little Color Management System (lcms). Selecting this engine adds the Gamut Alarm feature, showing areas of your image that are outside the gamut of the currently selected color space. For more information on the lcms engine, see **http://www.littlecms.com**.

**Working Color Space:** This option sets the color space used to display images. If your images are primarily intended for electronic display (such as use on web pages) select **sRGB**. If your images are primarily intended to be printed, you may want to use **Chrome 2000 D50** or **Chrome 2000 D65**. (D50 and D65 refer to white point temperatures

of 5000 and 6500 degrees, respectively.) See the white paper referenced above for a discussion of your options. If you are uncertain which color space to use, select sRGB.

**Assumed File Profile:** Many image files do not specify the color space used for the file. This setting specifies a default color space for files where this data is missing.

**On Profile Mismatch:** Specify the action to be taken when a file profile (or assumed profile) does not match the working profile. You can choose **Convert** to automatically convert the file to the working profile; **Don't Convert** to leave the image in its original data; or **Always Ask** or **Ask Only on Mismatch** to display the **Confirm Profile Conversion** dialog box. This dialog lets you determine how the conversion is made on a case by case basis.

**Assumed Scanner Profile:** Specifies a default color space for files that you acquire from your scanner or other TWAIN device.

**On Startup:** This allows you t set the monitor profile using the Windows system monitor setting or to ignore that setting. You should use the first option if your monitor calibration software updates the Windows setting.

**Monitor Profile:** Specifies the profile to which your monitor is calibrated. Choose **None** to display images without setting a profile.

**Monitor Rendering Intent: Generally it is not possible to perform an exact conversion of all colors from one color space to another.** Rendering intent specifies the end use for the image, allowing the system to make the best conversion. Select one of the following:

**Maintain Full Gamut:** Expands or contracts the source image to fill the full color gamut (range of displayable colors) of the monitor. This is usually the best choice for photographic images.

**Preserve Saturation:** Preserves color saturation at the risk of inaccuracy in other color parameters. This is usually the best choice for business graphics where vivid colors are more important than color accuracy.

**Preserve Identical Colors:** Provides the best color accuracy possible. This choice is typically used for displaying color swatches in which accuracy is the most important quality.

**Preserve Identical Colors and White Point:** Similar to the previous choice with the added condition that the white point is also preserved.

**Preserve Identical Colors and Black Point:** Similar to Preserve Identical Colors with the added condition that the black point is also preserved. This choice provides can sometimes provide the match when using printing services.

**Proofing Profile:** Specifies a profile of a device that can be simulated on the display. For instance, if you were preparing images for a newspaper that had a restricted color range, you could proof the images on your display as they would appear after they are printed. Naturally, the output device's color range (or 'gamut') would have to be more restricted than that of the monitor for simulation to be possible.

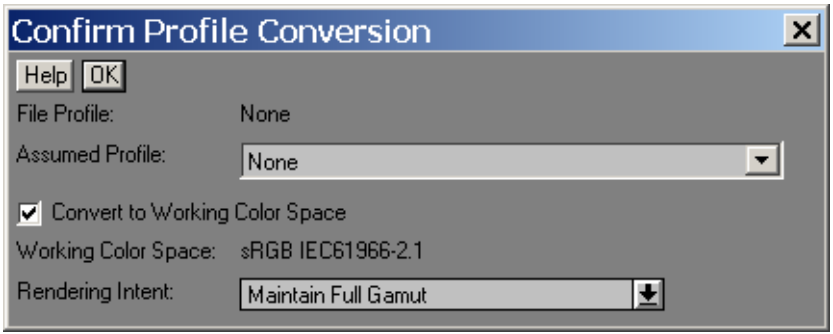
When you set a proofing profile, soft proofing Enable and Disable buttons  are displayed in the main toolbar. Use these buttons to turn proofing on and off as you are working.

**Proofing Rendering Intent:** The rendering intent used to convert colors for the proofing device. See **Monitor Rendering Intent,** above**.**

**Gamut Alarm:** Detects colors in your image that are outside the printer color space and displays them in the current Gamut Alarm Color. (Click on this button to reset the color.) To enable this feature, make sure **Gamut Alarm** is set to **On** and **Proofing Profile** is set to a profile.

The gamut alarm feature is available only if the lcms Color Engine is selected.

## Confirm Profile Conversion




This dialog box is displayed when you open a file that has no embedded color profile or whose embedded profile is different from the current working color space.

**File Profile:** The profile in the file you are opening or "None" if there is no embedded profile.

**Assumed Profile:** If the file has no embedded profile, this control displays the current assumed file profile (as set in the File/Color Management dialog box). If you know that the file actually has a different profile from the assumed one, override this setting and select a different profile.

**Convert to Working Color Space:** This checkbox lets you choose whether or not you want to convert the file to the working color space. In most cases this should be left checked as it is unwise to try to combine files that are not all in one of the standard working color spaces.

**Working Color Space:** The name of the currently selected working color space profile, as set in the File/Color Management dialog box.

**Rendering Intent:** The rendering intent used when converting to the working color space. If **Convert to Working Color Space** is not checked, this setting is ignored. In most cases, it should be left set to **Maintain Full Gamut**.

## Monitor/Printer Curves

Printer Curves* allows for better matching between an image as displayed on the monitor and output on the printer than is normally possible through normal color management. One of the biggest problems with current color management systems is that they assume prints will be viewed under optimal lighting conditions which include a rather high level of illumination with a view light of known spectral qualities. Unfortunately real world viewing conditions often fall well short of this ideal situation. In particular, prints viewed in low or moderate light look very different from how they look in bright light. There is a significant loss of shadow detail and a general sense that the prints are "too dark" when compared with the way they look on the monitor. In addition, the color temperature of the viewing light may also make the print look too yellow or too blue or take on some other color cast. To deal with these issues, Picture Window lets you create compensation curves which are applied during printing to make the printed output match the image displayed on your monitor.

### Creating Monitor and Printer Curves

Creating the compensating printer curves is straightforward. You need to make a test print. The test print can be either of a test image like a gray scale chart or of the actual photograph you want to print. Here is the basic procedure:

1. Adjust your test image in Picture Window until it looks like you want to.
2. Print the image using the paper, printer settings and color management settings you will use for the finished print.
3. Compare the printed image with the monitor display. The printed image should be viewed under the lighting conditions you will use to display it. Frequently this is simply normal room lighting, so usually no special precautions are needed. However if you will view it under bright museum-type lighting, make sure the extra lighting does not spill onto the monitor and wash it out.
4. With the print and the monitor side by side, use the **Monitor/Printer Curves Dialog** to adjust the monitor display until it closely matches the print. Save the curve.
5. Print the image again setting **Printer Curve** to the new curve . See **Monitor and Printer Curves**

## Monitor/Printer Curves Dialog

Use the Printer Curves dialog to create compensating curves that will make the printed output match the image on your display. This is a complete correction and takes all variables into account, including ambient lighting. Here is the procedure:

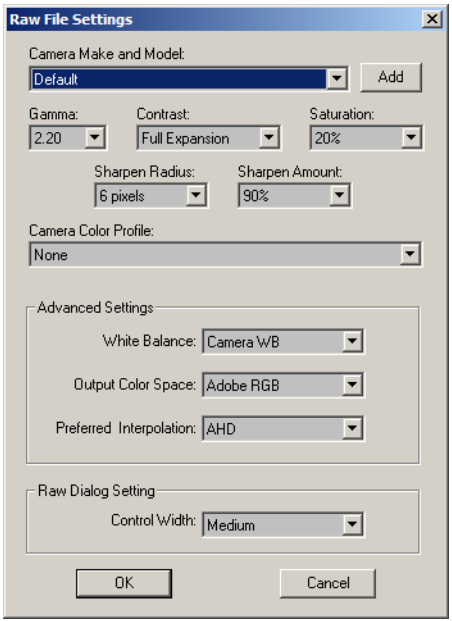
1. **Select a test image.** The image can be a test chart or the photograph you want to print. To use a test chart, click the Test Image button. It will open a grayscale test chart image. The test chart is recommended if you need to do color correction. If the colors in your test print are satisfactory and only brightness levels need to be adjusted, a photographic image can be used as well.
2. **Print the test image.** Use the paper, printer settings, color profile settings and rendering intent you will use for your final print. Make sure **Apply Printer Curves** is ***NOT*** checked. Print the test image.
3. **Open the Printer Curves** dialog by selecting Printer Curves from the File menu.
4. **Arrange your screen** so that the test image is visible next to the Printer Curves dialog. Place the print next to the monitor and light it to simulate final viewing conditions as closely as possible. Make sure that extraneous light does not spill onto the monitor and wash it out.
5. **Select the number of control points** you will use by setting the Grid dropdown at the top of the dialog. For most purposes a 4x4 Grid setting gives you sufficient control.
6. **Adjust brightness** by dragging each of the control points up or down until the displayed image matches your test print.
7. **Adjust colors.** Click on the color buttons below each test point. Adjust the color cast so that it matches the cast in the gray scale patch.
8. **Save the Curve**. To use the curve for printing, **Save As** and save the curve. The curve is saved as both a monitor and printer curve and is now avaialble in the **Printer** and **Album Print** dialogs. Note that the printer curves are strictly valid only for paper, printer and color management settings you used to create the curves. You can create any number of curves for various media and settings which you use.
9. **Complete the dialog.** Close the dialog window

## Raw Settings

The RAW Settings dialog lets you set default and camera-specific gamma, contrast expansion and a profile.

Here is the procedure to make the settings.

1. **Select File/Raw Settings** from the main menu to display the dialog.
2. Select the camera make and model whose settings you want to specify. Select **Default** to specify the settings for cameras not specifically covered. If the camera is not in the list, click the **Add** button to add the camera. (Add Camera Dialog.)
3. Set the default parameters for the chosen camera, using the descriptions below as your guide. Click OK to save the setting and dismiss the dialog. You can also Cancel to make no changes. If you want to make settings to additional camera, choose another camera and make the settings.




### Raw Settings

**Preferred Interpolation:** The interpolation technique chosen mainly affects the appearance of fine structure in the image, analogous to grain shape in film photography. Please note that for some camera types only one of the techniques is available. In that case, the available technique is used regardless of the setting. The choices are VNG, AHD, Fuji Xtrans 1 pass and Fuji Xtrans 3 passes. AHD is the default for most cameras. The default for Fuji cameras with the Xtrans sensor is the 1 pass option. The 3 pass option is available if artifacts bcome problematic.

**Gamma:** This is a measure of the shape of the brightness curve with a gamma of 1.0 indicating a linear curve. However, since our vision is non-linear, higher values of gamma result in more natural-looking images. The default setting is 2.2, the Windows standard.

Gamma affects the darker and middle tones most. You can reduce the gamma setting if you find they look too bright or increase it if they are too dark.

**Contrast Expansion:** Raw images have greater dynamic range than most photographic subjects require. This means that many images tend to look flat. Thus contrast expansion is usually required. You can set expansion to none, moderate and full. Picture Window determines the exact amount of expansion separately for each image to prevent clipping.

**Saturation:** Sets the initial color saturation value. Boosts of 15% to 25% are recommended.

**Sharpen Radius:** This sets default sharpening. Most raw images need a small amount of sharpening to counter the softening effects of demosaicing. A radius setting of 4 to 6 pixels is recommended.

**Sharpen Amount:** Controls the amount of blending between the sharpened and unsharpened image. Values of less than 100% reduce the harshness that is sometimes associated with sharpening. This control allows you to use the 'diffuse sharpening' strategy in which you use a high sharpening radius (>30 pixels) and a large degree of blending (amount setting of around 20%).

**Camera Color Profile:** This allows you to specify a custom color profile for your camera that will be used during raw conversion. A profile generated for the camera and compatible with the lighting conditions can potentially improve color rendition. However, a profile is not required to use raw.

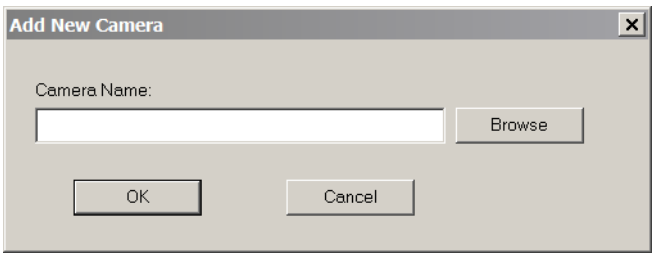
**Output Color Space:** The color space to which the final image converted from the camera's native color space. Conversion is based on calibration values for the specific camera make and model and refined using the camera color profile, if one is supplied. Usually the output color space is set so it is the same as the working color space, as set in Color Management Settings. Three standard color spaces, listed in order of increasing color gamut, are available. They are sRGB, Adobe RGB, and Wide Gamut. There is also a Camera Space option. If this option is set, the color space adjustment is bypassed and the output image RGB values are unadjusted raw camera values

### Raw Dialog Settings

This setting affects the dialog display -- it does not affect the processed images.

**Control Width:** Sets the width of the control area of the Raw dialog to better match low and high resolution monitors. You should set the width to a value that is comfortable for your display. The setting takes effect the next time you invoke the Raw dialog -- it does not affect any Raw dialogs currently displayed.

## Add Camera Dialog



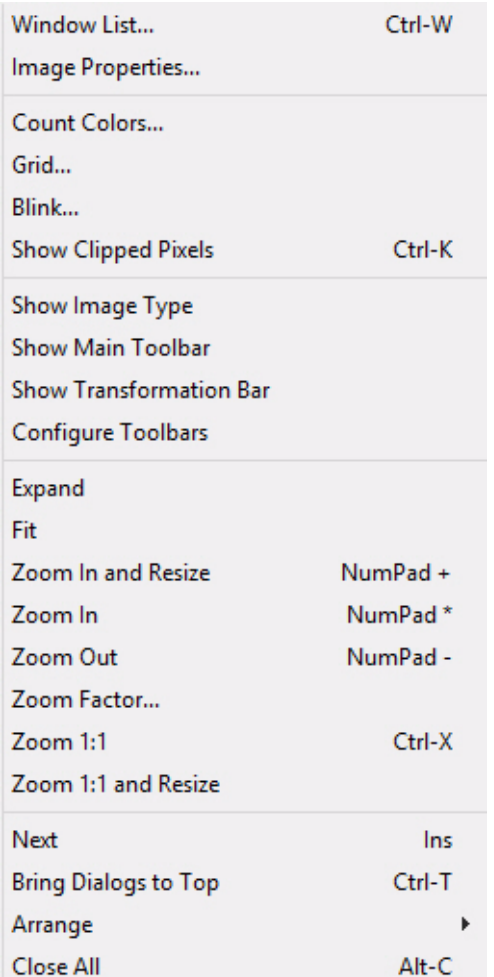

Cameras are added by selecting a raw image created by the camera. This is done to ensure that the camera's name and model are specified exactly as they appear in the metadata in the image file.

1. Click the Browse button. the file open dialog is displayed.
2. Navigate to any RAW image taken by the desired camera.
3. Select the image and click OK. The camera make and model is extracted from the image. (The image itself is not opened.)
4. Click OK to return to the Raw File Settings dialog and make settings for the new camera.

Raw settings information is stored in the Windows Registry.

# Window Menu

The **Window** menu has a number of convenient functions for controlling window size and magnification, getting information on the image, comparing images, and arranging windows. The menu also lists all existing windows by name, giving you a quick way to display a window that is minimized or hidden under other windows.




**Window List**

**Image Properties**

**Click OK to close the Blink dialog.**

**Grid**

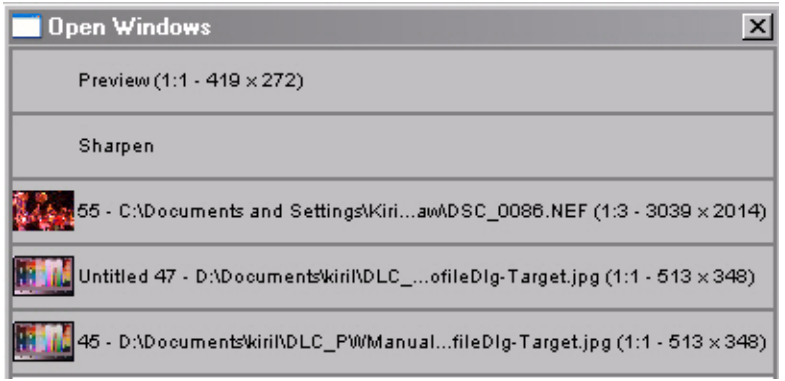
**Blink**

**Show Clipped Pixels**

**Toolbar Functions**

**Size and Magnification Functions**

## Window List



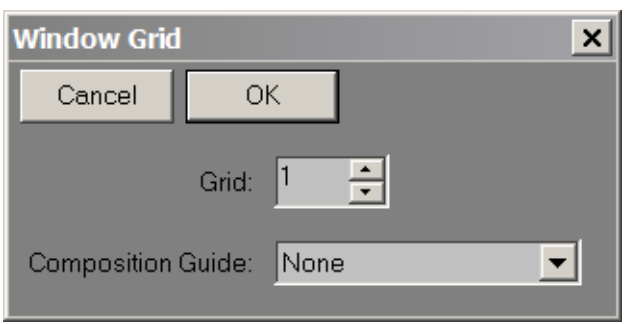

The Window List shows all windows in the main work area of Picture Window. A thumbnail is displayed for image windows.

**Bring to Top:** To bring a window to the top, click on it in the Window List.

**Close:** To close a window, right-click on the item in the Window List and select **Close**.

**Properties:** To display the file properties of an image, right-click on the image item in the Window List and select **Properties**.

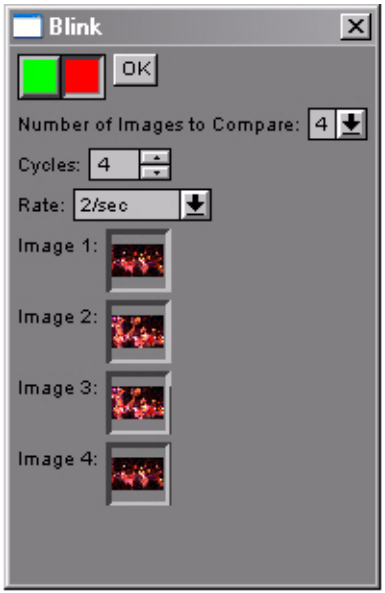
## Grid




Displays a grid over the image. You can choose an evenly spaced grid by setting the number of divisions in the Grid control. Alternately, you can choose one of the **Composition Guides**. The grid can be used to check that the image horizon is level or to determine the positions of elements in the image. You can also use the grid for positioning elements of a composite image and as an aid to composition.

This grid function just displays a grid lines on the image—it does not become a part of the image. To actually add a grid as an element to your image, use the **Grid** transformation.

## Blink

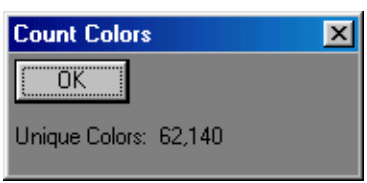



Blink lets you compare two images by superimposing them and rapidly switching between them. Features that are the same in both images appear fixed while those that are different blink.

To use blink:

1. **Select an image.** Select **Blink** from the Window menu.
2. Set the number of images you want to compare. Then select each additional image. Click on the image button and select an image from the pop up menu.
3. **Cycles.** Set the number of comparisons. (The blink dialog is hidden during comparisons.)
4. **Set the blink rate.** You can also select **Manual** to control sequencing manually.
5. **Start the blink display.** Click the green button to start blinking. Images are aligned by their top left corners. (In manual mode, click the **Next** button to sequence through the images.)
6. Click **OK** to close the Blink dialog.

## Count Colors



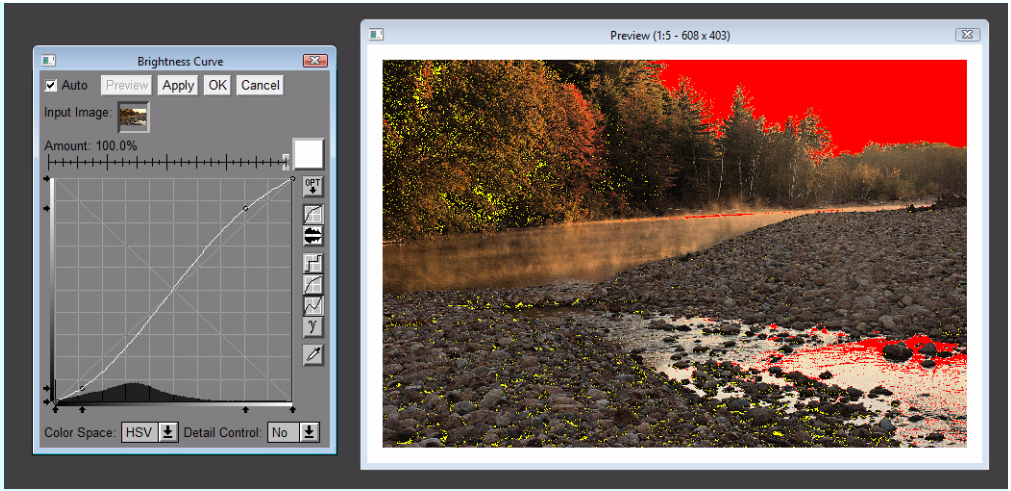

To count the actual number of unique colors in an image:

1. **Select an image.**
2. **Open the Count Colors dialog.** Select **Count Colors** in the **Window** menu. (if you want to cancel the process, click **Cancel** next to the Progress bar.) The number of colors is displayed. Click **OK** to close the window.

## Show Clipped Pixels

This function displays pixels that have a maximum or minimum intensity in a solid color. The function can help avoid over-setting brightness controls in any transformation which controls brightness and contrast. For example in the image at right, the brightness controls should be backed off slightly.

Show Clipped Pixels can be toggled on and off from the Windows menu or by clicking the  toolbar button




In the example at right, red pixels are at maximum brightness and yellow pixels are at minimum brightness. (The colors can be set in File/Preferences)

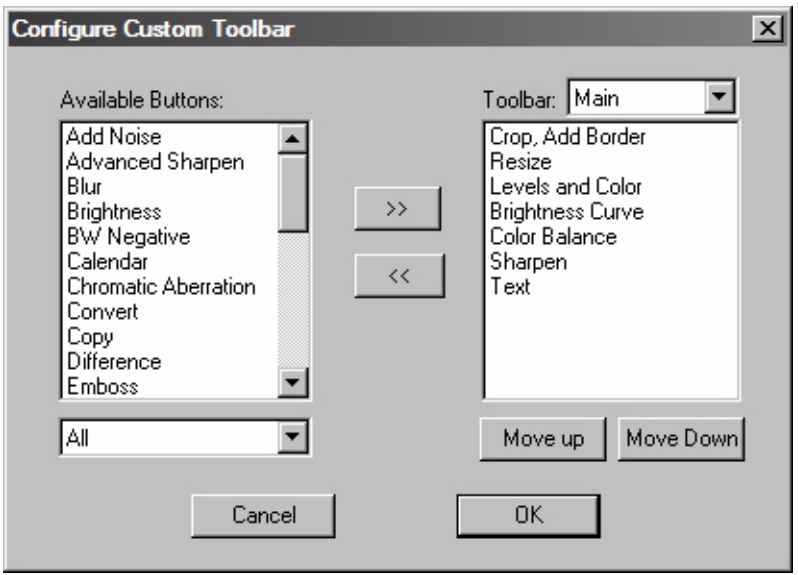
# Toolbar Functions

## Show Toolbar

The **Show Main Toolbar** and **Show Transformation Toolbar** options toggle the display of the toolbars on and off. You can also customize the buttons in each toolbar using the **Configure Toolbar** command.

## Configure Custom Toolbar

The Configure Toolbar dialog lets you add toolbar buttons to the main toolbar and to create a separate custom transformation toolbar. To create or modify a toolbar:




1. Choose **Configure Toolbars** from the Window menu. The **Configure Custom Toolbar** dialog is displayed.
2. Set the **Toolbar** dropdown menu to the toolbar you want to create/modify. The buttons in the toolbar (if any) are displayed in the right listbox. You can add buttons, remove buttons or rearrange their order.

   To add buttons, select the buttons you want to add in the left listbox and click **>>**.

   To remove buttons, select the buttons you want to remove in the right listbox and click **<<**.

   To arrange the order, select the buttons you want to reorder and click **Move Up** or **Move Down**.
3. Click **OK** when you are satisfied with your changes.

## Size and Magnification Functions

As you work with an image, you will want to change its magnification. Picture Window lets you change the magnification or reduction factor. Note that these functions only affect the display of the image—they do not change the image itself.

When you first open an image, it is displayed at the largest size that will fit in the Picture Window workspace without cropping. You can then use the magnification functions to make it larger or smaller. Because these functions are used so frequently, most of them have a tool bar button in addition to a menu choice. Clicking the tool bar button is equivalent to selecting the function from the menu. The functions are described below.


**Zoom Out to Fit Screen:** Makes the window as small as necessary to just fit the image and its border. This is usually used after an image has been manually resized.


**Zoom In and Expand:** Enlarges the image to the next larger magnification factor and resizes the window, if possible. This is probably one of the most-commonly used window functions.


**Zoom In:** Enlarges the image to the next larger magnification factor but does *not* resize the window.


**Zoom Out:** Decreases the image size to the next smaller magnification factor and resizes the window.

**Zoom Factor:** Displays a dialog you can use to select any magnification or reduction factor.

**Zoom 1:1:** Zooms the image to 1:1, or one screen pixel per image pixel. The size of the image window is not changed.


**Zoom 1:1 and Resize:** Zooms the image to 1:1. Expands or shrinks the image window according to the space available.

In addition to the magnification functions discussed above, Picture Window also has a **Magnifier Tool** and a **Zoom Tool**. These are more convenient when you want to magnify a particular feature rather than the overall image.

## Arranging and Closing Windows

Windows tend to accumulate, overlapping and hiding each other. One way to display a hidden window is to use the **Window** menu. It lists all active windows by title. To display a window, just select it from the menu. The menu also has several other functions to help you manage windows on the screen. They are:

**Next:** cycles through the windows on the screen, bringing the "next" window up to the top of the screen. Frequently this function is the most convenient way to bring a hidden window up to the surface. Next is also available on the tool bar. Click the  button until the window you need is surfaced and activated.

You can cyle through the windows with the **Ins** shortcut key or cycle in the oppisite directon using **Shift Ins**.

**Bring Dialogs to Top:**  Brings all the dialog windows to the top. Use this function to expose any transformation or tool dialogs that are 'buried' beneath image windows.

**Arrange** lets you arrange all the open windows in various ways. When you click on Arrange, a popup menu (right) with further choices is displayed.


Choose **Cascade** to lay out the windows so their title bars are visible. Choose **Tile Horizontal** or **Tile Vertical** to arrange the windows so the whole window is visible. These functions display all windows, including those that have been minimized.

Finally, if you have minimized some windows you are not actively using use **Arrange Icons** to arrange the icons so that each is visible. You can then display the desired window by double-clicking on the icon title bar.

Note that you can also display a selected window from the **Browse** dialog's **History Display** tab.

**Close All:** closes all windows. Note that unless you have set **Confirm on Close** to **yes** in the Preferences dialog, the operation is performed immediately.

# Edit Menu


The Edit menu contains the **Undo**, **Copy** and **Paste** functions.

## Undo

**Undo** reverses the action of the last cloning, painting, or miscellaneous tools operation you performed. A single operation includes all changes made during a single mouse-down sweep.

For **Undo** to be active, the undo setting in **File Preferences** must be set to single-level or multilevel. If you have set it to **multilevel**, you can undo additional operations by selecting **Undo** again.

## Undo All

This command reverses the action of the last session of cloning, painting, or miscellaneous tools operations you performed. For **Undo All** to be active, the undo setting in **File Preferences** must be set to multilevel.

## Copy and Paste

You can copy images from Picture Window to other applications or from other applications to Picture Window via the Windows clipboard.

> **Note:** You don't need to use the clipboard to make a copy of an image within Picture Window. Instead, use the **Copy** command in the **Transformation-Geometry** menu.

### Copy

To copy a Picture Window image to the clipboard:

1. Select an image window.

2. Select the **Edit** menu and click **Copy**. The image is copied to the clipboard in both the DIB and DIBV5 formats. DIB (**D**evice **I**ndependent **B**itmap)is a standard Windows format.

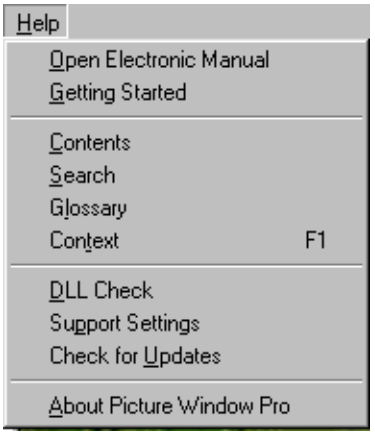
### Paste

To paste an image from the clipboard into a new Picture Window image window select the **Edit** menu and click **Paste**. A new image window is created and an image from the clipboard is copied to it. Note, that if the clipboard is empty or does not contain an image in DIB format, the Paste selection is grayed out.

## Resize and Copy

This command first resizes the image to the size you specify and then copies the resized image to the clipboard. The function may be used to quickly create manageable-sized copies for inserting into email messages and word processing dcuments.

# Help Menu




The Help menu localizes all the **Documentation** and **Support Functions** of Picture Window. Here is what you can expect to find:

## Documentation

Picture Window has a full help system plus a complete on-line manual and an extensive set of white papers focused on specific topics. The help system, on-line manual and white papers are all available through the Help menu using the following commands:

**Open Electronic Manual:** Displays the electronic manual. There are two options:

**From Local Environment:** Choose this option if you have the Picture Window CD or if you have installed the manual on your hard drive. (The version distributed on the CD has the highest graphic quality.)

**Via the Web:** Choose this option if your copy of Picture Window was downloaded. Picture Window will automatically connect to the Digital Light & Color web site and access the manual.

The manual provides descriptions of all Picture Window functions and includes many examples and ideas for enhancing images. It also provides access to white papers. Each white paper offers an in-depth discussion of a particular digital imaging topic.

**Getting Started:** Displays the Getting Started topic in the help system.

**Contents:** Displays the Help Table of Contents.

**Search:** Displays the Help search menu which lets you search for any topic in the help system. (Search does not cover the white papers or Picture Window manual. To find topics there, click Open Electronic Manual and navigate from the initial display.)

**Glossary:** Displays a glossary of digital imaging and photography terms.

**Context:** Displays the Help topic for the currently active transformation or tool.

## Support Functions

**DLL Check:** Picture Window uses a number of shared library files (called DLLs in Windows parlance). Sometimes installing another imaging application may result in writing over a DLL with an earlier, incompatible version. This dialog checks all the DLLs Picture Window uses. It produces a detailed text file that flags any incompatibilities and recommends action to resolve them. The text file can be opened and read in Notepad or a similar editor.

**Support Settings:** This dialog box lets you modify certain internal Picture Window settings to help diagnose problems wit the help of Digital Light & Color technical support. Under normal circumstances, these settings should not be altered as a degradation of Picture Window functionality could result. Please do not modify any of these settings unless instructed to do so by Digital Light & Color support personnel.

**Check for Updates:** This function connects you to the update section of the Digital Light & Color web site so that you can download a patch release, when one becomes available. Watch our web site for announcements.

**About Picture Window:** This function lists the detailed Picture Window version number. It also shows the current display settings, swap file size, and, for the Pro version only, any hardware color correction tables available on your video card.

## Important Folders

### Picture Window Program Folder

The default install folder for the Picture Window executable and all dlls is c:\Program Files\Digital Light & Color\Picture Window x.0 where x is the version number. On 64 bit machines the 32 bit version is installed under c:\Program Files (x86). Note that you can set a different folder during the installation process.

### Application Data Folder

Most template and configuration files are stored in the Applications Data folder. The path to this folder in recent versions of Windows is usually **AppData\Roaming\Digital Light and Color\Picture Window**. These files include default definitions, template files for Album and Layout, and standard workflow files.

The Applications Data Folder is also the home of the Picture Window Manual, white papers and sample images. If you install using the Picture Window CD, documentation and sample images are installed automatically. If you installed via download, please note that the documentation and Picture Window itself are two separate downloads. Both are available on our web site (www.dl-c.com) in the Downloads section.

### Temp Folder

Picture Window requires access to a temp folder for short-term file storage during normal operation. By default, it uses c:\temp for its temporary folder. However, you can set a different folder using the **Preferences**.

### Pictures Folder

By default Picture Window uses MyPictures (or Pictures on some Windows versions) as the default for storing images. You can set a different folder using the **Preferences.** You may want to change the setting if you use an external hard drive for your images.

# 17. Making Slide Shows

Picture Window updates the traditional slide show for the computer age. It allows you to easily create slide shows that can be viewed with a web browser. The slide show can include any number of images, titles, and fairly long text descriptions. You can even add narration, music, or ambient sounds, if you like. Once you create the slide show, you can copy it to a floppy disk, e-mail it, upload the slide show to a web site or view it directly from your local hard drive.

# Slide Show Features

The slide show can display slides one at a time or as a set of thumbnails.

Here are some of the features of Picture Window slide shows:

**Captions:** You can add short captions to the slides. Use these to identify the image or to add a short comment. Captions are displayed beneath the slides. (See **Using Macros** for details on how to use macros to specify captions.)

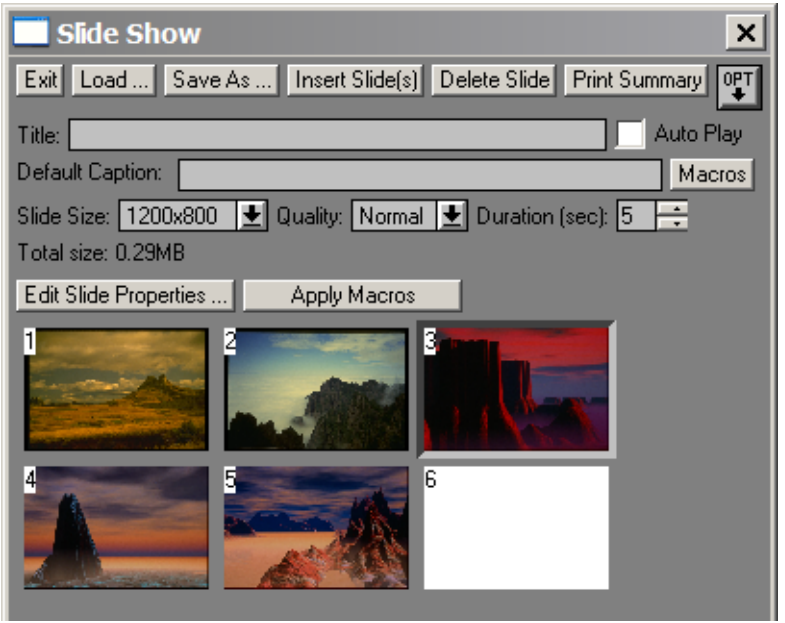
**Descriptions:** These are longer than captions (up to 32,000 characters or about 5000 words) and are displayed below the title. Use them to tell the story behind the image or record any other kind of detailed information.

**Sound:** Add music, narration, or ambient sound to your slide show. Any WAV or MP3 file can be used.

To record your own sounds, you need a sound card with a microphone or line input. You can also convert audio CDs to WAV and MP3 files. (However, be careful not to distribute copyrighted material without permission.) Software for converting to WAV or MP3 formats is available commercially and in shareware form on the web.

**Text and Background color:** You can specify black or white text and a light or dark background. The backgrounds are textured and use an image file (either darkbg.gif or lightbg.gif). To change the background, substitute the file with one of your own, perhaps created using the **Texture** transformation.

# Making a New Slide Show




To create a new slide show:

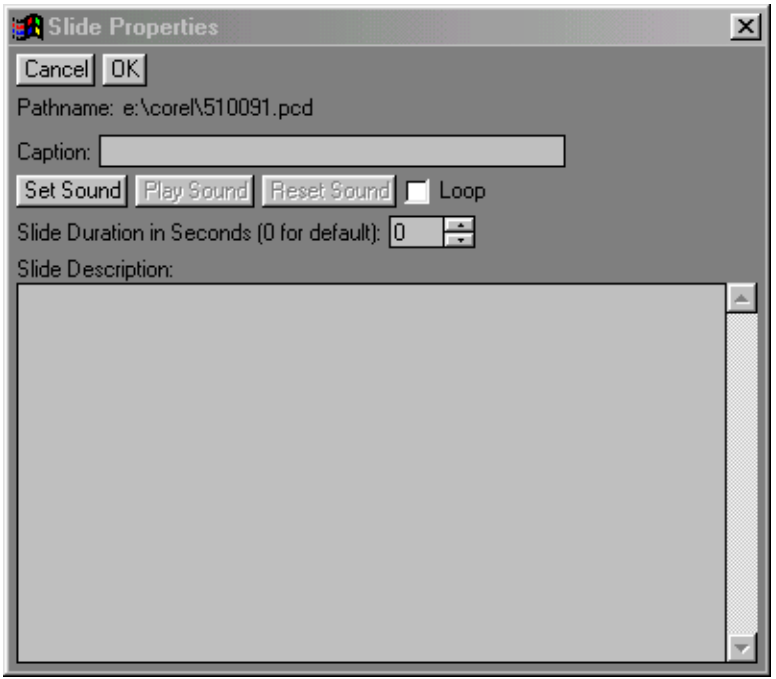
1. **Select Slide Show** from the **File** menu. The Slide show dialog is displayed. Initially, it shows a single blank slide. As you add slides, a new blank slide is always added to the end.
2. **Set the Slide Size, Quality, and Duration**. Set the values for the next slide or group of slides. (See **Click Exit to terminate the dialog.**)
3. **Set the Default Caption**, if desired. You can enter text and macros to define a caption for each slide. (A caption is constructed for each slide as it is added to the slide show. See **Using Macros.**) You can subsequently edit slide captions to add any slide-specific information.

   If you edit the default caption after you have already added slides, click **Apply Macros** to apply it to existing slides.
4. **Select the desired slides.** There are two ways to select the image:
   - Double-click on the blank slide window and select the slide file from the **Open File** menu. The image is displayed. (If you wish, you can select multiple files.)
   - Drag the desired image from the Browse window. It is inserted in front of the selected slide.

5. **Rearrange the slides as desired.** You can rearrange the slides into any order you want. Simply drag and drop the slides to insert them into their desired locations.

   **Hint:** To see more slides at a time, you can resize the slide dialog window or choose a smaller slide size from the Options menu. (Click the **OPT** button  to display the menu.)

6. **Edit the Slide Properties. To** add sound, a caption, or a description to a slide, select the slide by clicking on it. Then click the **Edit ...** button. The **Slide Properties** dialog is displayed. All the settings are optional. You can:




   a. **Add sound.** Click the Set Sound button. Pick a *.wav* or *.mp3* file from the file menu and click OK. Click the **Play Sound** button to hear the selected sound. (The play button launches whatever external program is associated with the *.mp3* or *.wav* file. Picture Window does not have any sound playing capabilities of its own.)

      To clear the selected sound, click the **Reset Sound** button.

      Check the **Loop** box to play the sound continuously while the slide is displayed. If the box is not checked, the sound plays once and then ends.

b. **Add a caption and/or description.** Captions and descriptions are displayed beneath the slide.

c. **Set a different duration** for this slide. A setting of 0 indicates that the default duration set on the main slide dialog should be used. If you want a different setting for this slide change the 0 to the desired duration.

7. **Set the slide show options. Click the OPT** button 

to display the menu. You can set the following options:

   **Text and Background Color:** Choose White text and a dark background or the opposite.

   **Help File: A help file can be provided with the slide show. The slide show user can access it by clicking on the ? button in the slide show.** Select **Local Help File** if you want a help file (help.html) to be automatically copied to each slide show. Select **Global Help File** if you will provide a shared help file. The shared help file should be placed into a directory with the slide show's main HTML file.

   You can determine how help is displayed to the user. Select **Help in new browser window** to display help in a pop-up window, allowing the slide show to still be seen behind it. Select **Help in same browser window** to display the help in the main slide show window.

   **Table of Contents:** If you have multiple slide shows, you may want to provide a master table of contents page allowing the user to select a particular slide show. Select **Table of Contents** from the options menu to automatically include a button in the slide show that returns the viewer to the table of contents page. (The button is placed on the slide show's thumbnail screen.)

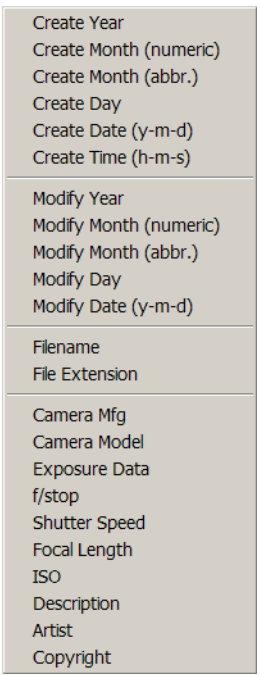
   The table of contents can be just a simple HTML file with links to each of the HTML slide show pages. You create the TOC outside of Picture Window. The file must be named toc.html and must be located in the same directory as the main slide show HTML pages.

8. **Save the slide show.** Click Save As. The File Save dialog is displayed. Assign the slide a file name. The name is used for the master HTML page. A subdirectory of the same name is also created. It contains all the images, sounds, and

other information. (To copy the slide show or upload it to a web site, you must copy the HTML file and the entire subdirectory.)

You are given the option to preview the slide show.

9. Click **Exit** to terminate the dialog.




## Using Macros

Macros allow you to specify information slide-specific information in slide captions without having to actually type it into each caption. Available macros include create and modify dates in various formats, the filename, and EXIF information. Dates are expanded according to the date information in the original slide file. For create dates, the EXIF date is used if available. Otherwise the Windows file create date is used. Modify dates are always Windows file modify dates. The filename is the name of the original slide file.

To enter a macro, click the **Macro** button next to the **Default Caption** field. The macro menu is displayed. Choose the macro you want to use. Repeat to include additional macros. You can also add text.

As each slide is added to the slide show, the default caption is expanded and used as the slide's caption. If you subsequently edit the default caption, captions of existing slides do not change. If you want to apply the edited default caption to the existing slides, click the **Apply Macros** button to modify existing captions.

## Slide Size and Quality

You can set the display size and image quality of the slides.

**Size:** The size of the slide, in pixels. If the display size is smaller than the actual size of the image, the slide file is automatically resized. If the display size is larger than the image, the image is not resized. (You can use the Resize transformation to enlarge the image, at some loss of apparent image quality.)

**Quality:** Slides are compressed using JPEG compression. The quality setting determines how aggressively the slides are compressed. Lower quality levels save space but reduce the detail visible in the slides.

If you are concerned about unauthorized copying of your images, you can use a low quality setting to discourage it.

The size and quality settings determine how the original image file is converted when it is copied to the slide file. Thus these settings do not change for slides already included in the show. To change the size or quality of a slide you have already included, remove the slide from the slide show, set the size and quality to the desired new value and add the slide to the show again.

# Editing an Existing Slide Show

You can also make changes to an existing slide show.

To edit a slide show:

1. **Select Slide Show** from the **File** menu. The Slide show dialog is displayed.
2. **Load an existing slide show.** Click the **Load** button. The Open File dialog is displayed. Select the main HTML page of an existing slide show. The slide show is read from the disk and thumbnails of all the slides are displayed.
3. Edit the slide show. Make the desired changes to the slide show. You can add, remove, or rearrange slides, and change the sound and text. You can also reset the slide show options in the options menu.

   **Note:** To change a slide's size or quality, you must remove the slide from the slide show, edit the settings and then add the slide to the show again. Make sure you have access to the original slide image file before removing the slide from the show.
4. **Save the slide show.** Click Save As. The File Save dialog is displayed. Assign the slide a file name. The name is used for the master HTML page. A subdirectory is also created. It contains all the images, sounds, and other information. You are given the option to preview the slide show.
5. Click **Exit** to terminate the dialog.

# Distributing Your Slide Show

You can distribute your slide show in several ways:

- On a compact disc (CD)
- Send it via e-mail
- Display it on your web site

## File Structure

It helps to understand the file structure of the slide show before you attempt to distribute it.

A slide show consists of a root html file. The file's name is the same as the name you assign to the slide show and is located in the folder that you saved the slide show. That folder also contains a subfolder which in turn contains all the rest of the slide show's files. The subfolder has the same name as the slide show. The slide show contains resized copies of the image files, so it is completely independent of the original images.

### Changing the Background

The subfolder also contains the files for the slide show background (named darkbg.gif and lightbg.gif. If you want a different background, simply replace the light or dark file with a gif of the image you want to use for the background. The background is tiled, so the image need not be large.

## Distributing the Slide Show

To distribute the slide show via CD or your web site, copy the *slideshow*.html file and the *slideshow* folder to the CD or web site. Launch the slide show by displaying *slideshow*.html. To send the slide show via e-mail, zip the slide show files using the preserve folder information option. Then send the zip file as an e-mail attachment.

# 18. Converting Raw Files

Raw image files produced by digital cameras have the least amount of in-camera processing and contain the greatest amount of information. However the data is in a raw format and needs further processing to produce a usable image. Raw files are frequently compared to negatives and their processed output to the finished print. While the analogy is not perfect, it does capture a useful idea -- that a raw file plus the application of some effort can lead to a better result than simply accepting the camera's automatically processed jpeg file. *(Raw support requires Picture Window Pro.)*

**Converting a Raw Image** This section gives you a strategy for converting an image and making the most efficient use of the controls at your disposal.

**Raw Sidecar Files** These files are created each time you complete the raw dialog. They record all the parameters needed to adjust the raw image.

**The Raw Dialog**

**Color Tab:** Contains adjustments for white balance and color saturation. A color histogram of the red, blue and green channels lets you see if your adjustments are clipping any of the channels.

**Gray Tab:** The gray tab is used to set the exposure, shadow, midtone and highlight brightness, and dynamic range. It also has options to recover lost highlights and set gamma.

**Sharpen/Noise Tab:** The tab is used to sharpen the image, control the noise reduction, and for pixel repair functions. Sharpening and noise reduction are best judged at full magnification. The Sharpen/Noise tab incorporates a 1:1 detail image you can use for reference. You can also display a larger detail in place of the preview.

**Property Tab:** This tab displays EXIF file comments, GPS data a file information.

# Converting a Raw Image

To convert a raw image, simply open the raw file. You can do so from the thumbnail in the browser, from the File/Open menu or by dragging the file into Picture Window. If this is the first time the file has been opened in Picture Window, it will automatically open in the Raw dialog.

**Note:** If the image has been opened previously, it is opened in a regular image window by default. However you can force it to open in the Raw dialog. If you are using the File Open dialog, set the **Raw Dialog** checkbox. If you are opening from the Browser, right-click on the image and choose **Open Image in Raw Dialog**.

## Raw Dialog Initialization

When a raw image is first opened in the Raw dialog, the best available source of default settings are used to initialize the dialog. Here is the priority given to each possible source of initialization data:

- A widget selected by the user, if the dialog is launched using a raw widget.
- The sidecar file for the image, if one exists.
- The image parameters of the last raw image edited, if the image was taken by the same camera model. This makes it easy to adjust a string of similar images.
- The Camera Default settings last set by the user, if available. (When you are adjusting a raw image that you feel is typical, you can record the adjustments as a Camera Default. You can create one default setting for each digital camera you use. To set Camera Default click the Options button  .)
- The Raw Settings. These are default settings defined in the **Raw Settings**. You can define a set of defaults for each camera model you use. Unlike the previous initializations, raw settings only defines a few parameters. The rest of the parameters are simply set to their zero or neutral values.

The source of initialization is displayed at the bottom of the dialog's **Color** tab

**Resetting the Raw Dialog**

You can reset the Raw dialog at any time to the **Camera Default**, to **Raw Settings**, or to any stored workflow file that contains a Raw widget. To reset the Raw dialog, click the Options button  and select the desired reset option.

## Raw Sidecar Files

When you complete the Raw dialog by clicking OK or Apply, the your settings are saved in a sidecar file in the same folder as the original raw image. (The sidecar filename is the same as the raw filename, including extension, with the extension .wfl appended.) If you open the raw file later, the settings in the sidecar file are automatically applied to the image. The original raw image of course is not modified.

**Note:** If the raw image is located on write protected media, like a CD, no sidecar file is created.

## Strategy for Making Adjustments

The Raw dialog has many adjustments and at first they can be a bit overwhelming. Here is a systematic way to go about it:

1. **Adjust Color.** Your first goal is to get good color balance. Once the colors are balanced, boost the saturation for the amount of color you want. Saturation values of 40% or more are typical.
2. **Adjust Brightness and Contrast.** Next click the Gray tab and adjust brightness and contrast. Observe the histogram as you --usually you want it spread across the full tonality range but without clipping at the ends. Use Highlight Recovery to recover detail in important bright areas if they are over-exposed.
3. **Adjust Sharpness and Noise Reduction.** Your image should now have good color and tonality. However it will probably be a bit soft. If it was taken in low light at a high ISO, it may also be noisy. The 1:1 detail view is designed to help you judge image quality as you make adjustments. To center the detail on a particular feature of the image, click on the feature. You can also enlarge the area shown by the detail by selecting **Large** at the bottom of the tab.

# The Raw Dialog

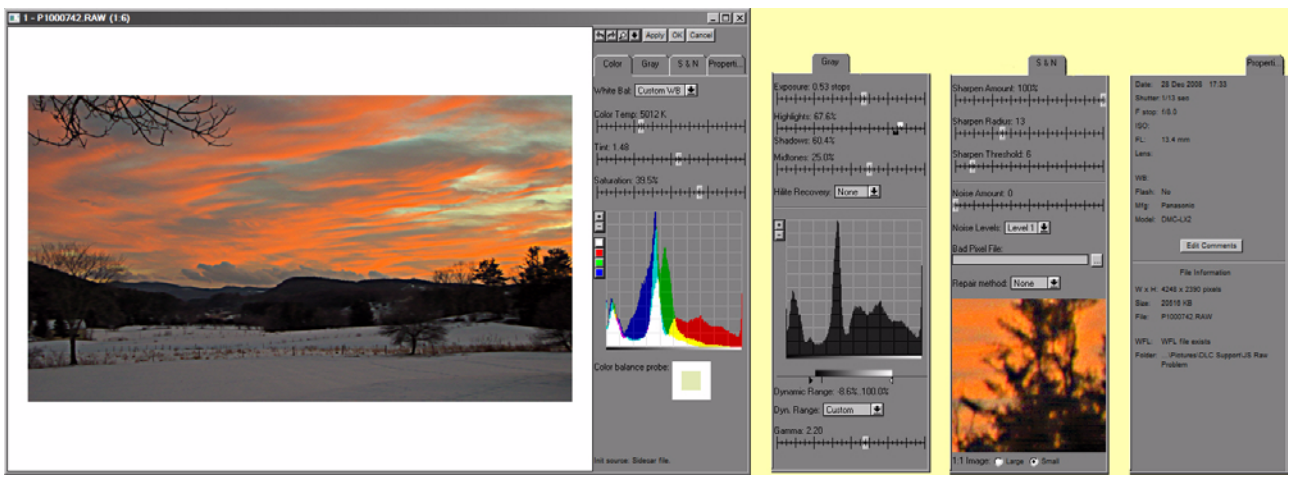
The Raw dialog is used to make adjustments to raw images and to then convert them to a standard 48 bit RGB image format. Its main controls are arranged on four tabbed panels:

**Color Tab:** Contains adjustments for white balance and color saturation. A color histogram of the red, blue and green channels lets you see if your adjustments are clipping any of the channels.

**Gray Tab:** Contains adjustments for exposure, shadow, midtone and highlight brightness, dynamic range and gamma. A luminance histogram is displayed for guidance. Highlight recovery restores over-exposed areas in many cases.

**Sharpen/Noise Tab:** Contains controls for sharpening, noise reduction and bad pixel repair. A 1:1 detail of the main image is displayed for guidance. The detail can be enlarged to fill the entire preview area.

**Property Tab:** Displays key properties such as camera, lens and exposure information and file size and layout. By clicking the edit button, you can add a description, copyright and artist information which will be stored as EXIF in the output file.



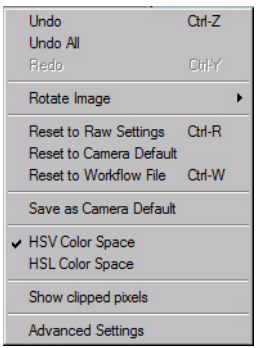
## Undo, Redo and Magnification

Undo, redo, magnification, and options.

**Undo, Redo:** You can undo any setting by clicking the **Undo** button and return to the setting using the **Redo** button. All settings from the time the dialog was launched are remembered.

**Magnification:** The preview image magnification is initially set so the entire image can be seen This button allows you to enlarge the image up to a magnification of 1:2.

## Options Menu




To display the Options menu, click the Options button 

**Undo, Redo and Undo All:** These are the same as the Undo and Redo buttons.

**Rotate Image:** Let's you rotate the image in 90 degree increments and flip it right-left and up- down. The rotation is stored in the sidecar file and the image is subsequently opened with set rotation.

**Reset to Raw Settings:** Reinitializes to values defined by Raw Settings. (See Initialization, above)

**Reset to Camera Default:** Reinitializes to typical values for this camera, as set by the **Save Camera Default** menu choice.

**Reset to Workflow File:** Allows you to choose any workflow file and reinitializes the dialog to the values in the file. The workflow file must contain a Raw widget.

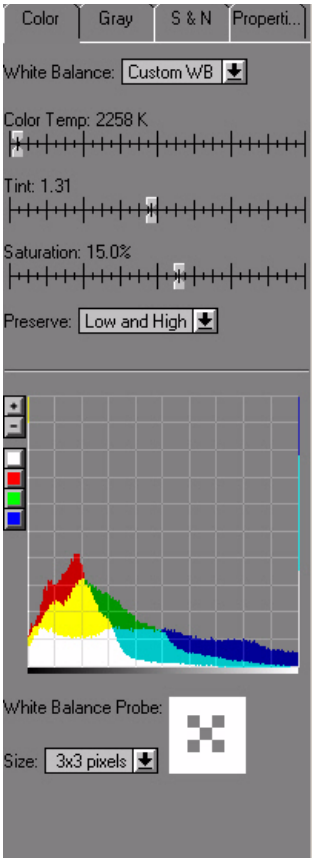
**Save as Camera Default:** Saves the current settings as the default setting for this camera and overwrites any previously saved camera default settings for this camera. These settings may be used during initialization. (See Initialization, above.)

**HSV/HSL Color Space:** Sets the definition of luminance used by the shadow, midtone, highlight and dynamic range controls. HSV is usually the best choice. HSL is useful in creating high key effects which simulate very bright sunlit scenes.

**Show clipped pixels:** Shows any pixels that a clipped as a result of dialog settings in a distinct color, so you can visualize the impact of the adjustments. This function does not display pixels that were clipped in the camera during the exposure or by setting the exposure control on the Gray tab.

**Advanced Settings:** Displays the Advanced Settings dialog. This dialog allows you to set the Interpolation Method, Output Color Space, and Camera Color Profile for this particular image. The default values for these parameters are set in the **Raw Settings**. Please see that dialog for details.

## Color Tab




The color tab is used to set the color balance and color saturation of the image.

### Color Balance Settings

Color Balance can be set by

- selecting a fixed White Balance
- adjusting the Temp/Tint sliders
- using the Color Probe.

These controls are simply different ways of attaining the same result, so you can use whichever controls are most convenient in a particular situation.

### White Balance Pulldown

This control gives you a choice of the following color balance options:

**No White Balance:** The raw image is simply converted to RGB. No white balance adjustment is applied. In this mode, the Temp and Tint sliders have no values.

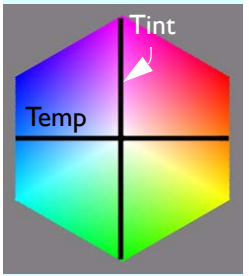
**Camera White Balance:** The white balance is set according to the camera setting made when the image was taken.

**Auto White Balance:** Picture Window analyses the highlights in the image and sets a white balance to make them neutral.

**Custom White Balance:** Indicates the white balance is set manually via the Color Temp and Tint controls or the Color Probe.

**White Balance Presets:** Presets include tungsten, sunlight, overcast, shade, fluorescent, and flash. These are intended to provide starting points for setting the Color Temp and Tint controls.

When you choose one of the above options, the Temp and Tint are reset automatically.



Temp and Tint axes on the color hexagon.

### Temp and Tint Sliders

The Temp and Tint sliders allow you to control color balance along the two axes of the perceptual color plane. Temp controls balance from blue to red and is most important in adjusting to different light source color temperatures. Tint controls color balance along the perpendicular axis, from green to purple. The sliders are most useful to make fine adjustments in balance, once you have gotten close using either the White Balance pulldown or the probe.

### Color Probe and Probe Size

The Color Probe is the third way to set balance. You click on any point in the image which should be neutral. Picture Window adjusts the image to neutralize any color cast in that point. if probe size is set to a low value, the probe can be quite selective, so you should hunt around, clicking on nearby points until you get the best result. On the other hand, use a high value of probe size to average over a larger area. The Temp/Tint controls are reset based on the point selected and the White Balance pulldown is set to Custom.

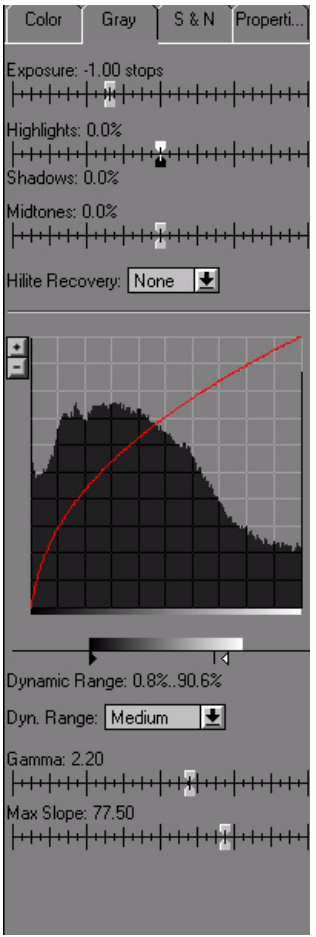
### Color Saturation and Preserve

Color saturation is set with a slider control to whatever value makes the image look best. (Some images may require substantial saturation boost.) Set Preserve to **Low** to keep highlights and shadows neutral. Set it to **Low and High** to also prevent high-saturation areas from being boosted too much.

### Color Histogram

The color histogram is provided for guidance. It can be set to display each of the RGB channels individually or all three together and has several levels of magnification. Though this is very image dependent and by no means a hard and fast rule, for many images balance improves as the individual red, green and blue peaks in the histogram converge.

## Gray Tab




The gray tab is used to set the exposure, shadow, midtone and highlight brightness, and dynamic range. It also has options to recover lost highlights and set gamma.

**Note:** The brightness adjustments use either the HSV or the HSL color model. (HSV is the default, HSL is less.) The HSV/HSL setting is accessed via the **Options** button.

**Clipped Pixels:** To display clipped pixels as you are adjusting the curve, select **Window/ Show Clipped Pixels** from the main menu or click the .button in the main toolbar

### Exposure

The exposure control mimics the effect of changing exposure in the camera. It is applied before gamma correction, while the image values are linear. ***Exposure is generally not compatible with highlight recovery or Full Range dynamic range.*** If you use either of these settings, you should set exposure to 0.

**Under-exposed images:** The Exposure control is particularly handy if you have underexposed the image *and* the highlights are not at full brightness. In that case, increase Exposure until the highlights are at full brightness on the histogram.

**Over-exposed images:** The Exposure control is not very useful in cases where the highlights are clipped since it cannot restore the clipped information. In such cases, set Exposure to 0 and use Highlight Recovery instead.

**Properly-exposed images:** Set Exposure to 0. If you want to lighten a well-exposed image use the brightness controls, not Exposure. Lightening using the Exposure control will clip the highlights of a full-range image.

Of course, no postprocessing adjustments can truly compensate for incorrect exposure settings, so it is still best to make the correct exposure settings in your camera.

### Highlight, Shadow and Midtone Adjustments

The highlight and shadow sliders control the shoulder and toe of the brightness curve. The highlight slider can be set higher to give your highlights a bit more sparkle or lower to subdue the highlights. The shadow slider can be set higher to open the shadows. On the other hand, if the shadow areas contain little detail, you may want to darken them and increase the apparent contrast of your image by moving the slider to the left.

The midtone slider controls brightness of the midtones and has little affect on the highlight and shadow area. Generally, you should make sure that your dynamic range is adjusted before adjusting midtones.

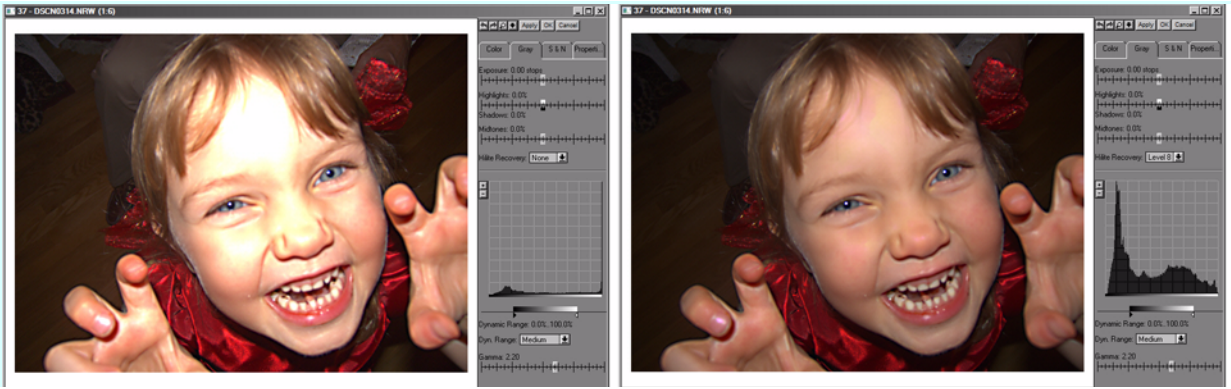
## Highlight Recovery

This control is for use when highlight detail has been lost because of over-exposure in highlight areas. (Typically the right end of the histogram is truncated, showing that highlights were clipped.) Highlight Recovery works when only one or two of the RGB channels have been clipped while the remaining channels are not clipped. The recovery process darkens the entire image to make room at the high end and then attempts to reconstruct the image by inferring the values of the clipped channels from the unclipped channel and surrounding, unclipped areas. To apply recovery, set level to 1 through 8. Higher levels increase the search radius (and processing time) for well exposed pixels used for inferring the values of blown pixels. To save on processing time, use the lowest level that gives complete recovery.

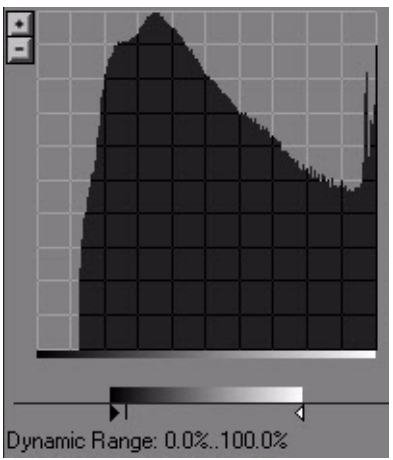
**Highlight Recovery:** The clouds in the left image are overexposed and appear as featureless white blobs. By applying highlight recovery (right image) detail within the clouds is recovered, restoring their natural look.

Notice that to make room in the brightness scale, the image's middle tones had to be darkened. This happens automatically when highlight recovery is applied.

**Flashburn:** Highlight recovery is also useful for correcting flash burn. Note how recovery restores a clipped histogram to a normal one.



After setting Highlight Recovery, you may need to readjust brightness and dynamic range controls. Do not use the **Full Range** when using Highlight Recovery.




### Dynamic Range Sliders

This control sets the extremes of the brightness range and compresses or expands the brightness values of the image to fill the range. Use the histogram to make sure you are not inadvertently clipping the shadows or highlights. For more information see the Dynamic Range description in the **Levels and Color Dialog**.

The 0% point on dynamic range slider corresponds to full black and the 100% point to full white. Usually full black and white are at 0% and 100% on the histogram. However, if a camera profile is used, it may redefine these points to any other values (including reversed). If the profile does redefine them, the histogram will appear to be out of sync with the dynamic range. For instance, if the profile defines black as 10% density (see figure) that density will correspond to the 0% setting of the black dynamic range slider and moving the slider further to the left will not create denser pixels.

### Dyn. Range Preset

This preset lets you apply automatic dynamic range expansion to images based on their actual histograms. You can apply three levels of expansion -- No Change, Medium and Full Range. Picture Window will calculate the actual expansion, apply it to the image and adjust the dynamic range sliders accordingly. (The Custom setting means dynamic range is manually set using the sliders.)

The principle reason to use the preset rather than set the slider values themselves is that the setting is adaptive. When the setting made for this image are applied to other images, the other images are adjusted to based on their actual brightness values.

> **Note:** Do ***not*** use Full Range if you are using Highlight Recovery or if Exposure is not set to 0.

### Gamma

Gamma compensates for the non-linear way in which the eye perceives brightness. Generally it should be adjusted to the gamma of the display device. The standard gamma for Windows systems is 2.2.

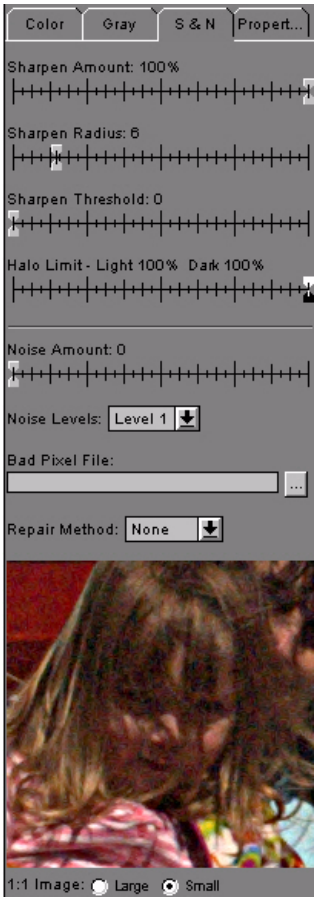
### Max Slope

The gamma curve (shown in red over the brightness histogram) has a very high initial slope. The max slope control allows you to limit the amount of boost given to very low brightness areas which are most susceptible to noise. This noise is random and tends to cast a haze over the entire image so reducing it results in a crisper image with better color. The default value of 77 degrees is generally optimum. However feel free to experiment with other settings.

### Histogram Display

A brightness histogram is displayed for reference. You can increase or decrease the sensitivity of the histogram display by clicking the plus or minus button next to the histogram. The histogram is refreshed after each adjustment, so that it always shows the values for the current output image. It is calculated after all changes have been applied to the image, including a camera profile if one is specified.

## Sharpen/Noise Tab




This tab is used to sharpen the image, control the noise reduction, and for pixel repair functions. Sharpening and noise reduction are best judged at full magnification. The Sharpen/Noise tab incorporates a 1:1 detail image you can use for reference. You can also display a larger detail in place of the preview.

### Sharpening

Unsharp mask sharpening is used. The controls are:

**Sharpen Amount:** Blends the sharpened and unsharpened image in the proportions set.

**Sharpen Radius:** This is the principle control for the degree of sharpening.

**Sharpen Threshold:** This control lets you avoid sharpening areas of low detail, such as areas of the sky or smooth surfaces. Sharpening such areas typically just exaggerates noise without adding a sense of sharpness to the image. When the threshold control is set to zero, the entire image is sharpened. As the control is advanced areas of higher and higher detail are excluded from sharpening. Finally, large threshold values cause the sharpening to be applied only to very strong and sharp edges.

**Halo Limit:** This control has two sliders for limiting light and dark halos. Halos are artifacts of sharpening and can appear as light or dark areas around boundaries in the image, particularly as you increase the radius. If you notice such a halo, reduce it by moving the appropriate slider to the far left until the halo is no longer noticeable. Limit settings of 5 - 10% are typical. (Setting controls to 0% results in zero sharpening, so set the controls only as low as necessary to make halos imperceptible.)

When sharpening, observe your effect in the magnified view in the lower part of the dialog. Set the image area to be magnified by clicking on that area.

### Noise Reduction

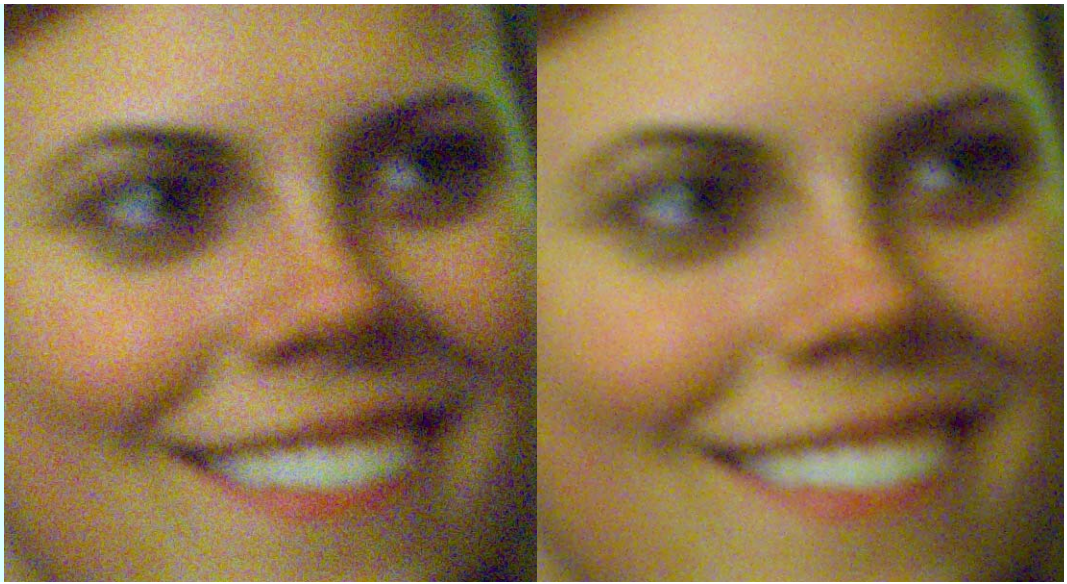
This function reduces the amount of noise evident in an image. The controls are:

**Noise Amount:** Controls the amount of noise reduction. At zero, noise reduction is turned off. As the control is advanced the amount of noise reduction increases. However noise reduction also tends to soften the image, so this control should be set for the best compromise between noise reduction and sharpness.

**Noise Level:** This controls the radius over which noise reduction is calculated. Higher levels improve noise reduction but also increase computation time. When you set this control make sure to also advance the Amount control to a value greater than zero.

**Noise Reduction:** The images on the right and far right are details before and after the application of noise reduction.

In this case, the noise amount was set to maximum and the noise level was set to 8.



Adjust noise reduction by referring to the magnified image. The principle behind noise reduction is averaging -- so noise reduction has an inherent softening effect. Thus the best setting will be compromise between adequate noise reduction and acceptable sharpness.

### Bad Pixel Correction

Digital camera sensors may contain pixels which are either 'dead' (they always show up as black) or 'hot' (they always show up as white). The raw converter can interpolate the image from surrounding pixels to fill in for such bad pixels. It works from a bad pixel file which you prepare for your camera. Please see **Bad Pixels** for more information.

### Using the Magnified Image

Setting sharpening and noise reduction controls is best done by referring to a full size (1:1) image. The Sharpen and Noise tab shows a small section of the image magnified to 1:1 at the bottom of the tab.

To expand the area of view and display the image in the main window of the raw dialog, select the Large radio button. The 1:1 image is refreshed each time you adjust the controls. When the large 1:1 image is displayed, you can select the area magnified by clicking on the a point in the thumbnail.

For greatest fidelity, the 1:1 image is fully processed. That means that the detailed pixel structure you see in the image is identical to that of the final image. (On the other hand, to improve responsiveness, some processing steps are skipped in creating the Preview image.)

## Property Tab


This tab contains exposure information taken from the camera EXIF data, file information from the Windows file system and GPS information from GPS-equipped cameras. The tab contains two buttons:

**Map:** Use this button to send the GPS coordinates to a mapping web site to get geographic data on the location. See **Properties** for more information.

**Add User Comments:** Use this button to add EXIF and IPTC comments to the image. You may edit EXIF create date, description, artist, copyright and IPTC name, caption, description and location/address fields. See **Properties** for more information.

# 19. Matting and Framing

## Mat and Frame

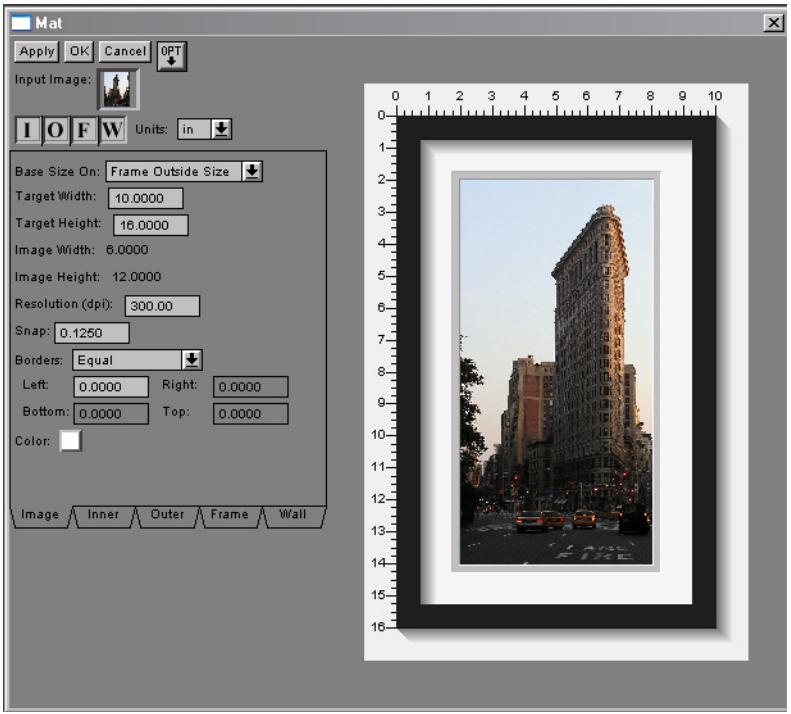
This transformation lets you explore many framing and mat options and arrive at a design which displays your image to its best advantage. You can experiment with single and double at designs and with different colors and textures. You can also choose among a variety of frame profiles and vary frame width to best suit your image. Once you have come up with the best design, you can use it in a variety of ways:

- **Pre-visualize conventional framing:** You can use your design to cut the mats and make the frame. The transformation can print out the dimensions and other parameters of your design.
- **Print image with mat:** You can print our your image together with the textured mats in your chosen colors and place them into a frame.
- **Post 'framed' images on web:** You can output the matted and framed image, save it as an image file, post it on a web site or use it in illustrations. If you set the wall color to your web page background color, the frame shadows will appear to be cast on your web page.


The Mat and Frame Dialog

Creating Your Own Frame Profiles

# The Mat and Frame Dialog




To use the Fame and Mat dialog, select the image you want to frame and then click **Transformation/ Mat and Frame** from the main menu. The dialog is displayed.

### I O F W Buttons

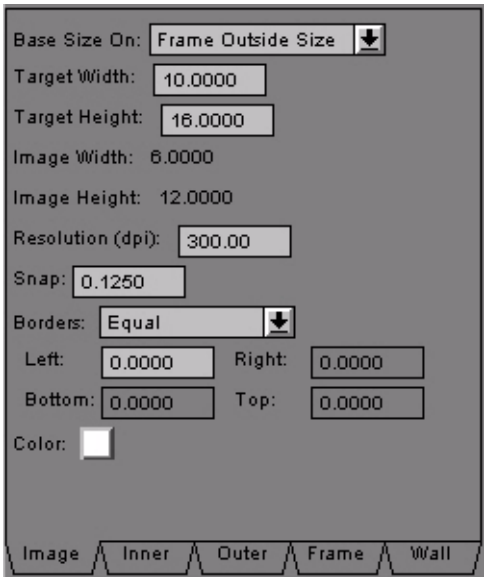
These buttons control the components which will be included in your final image. **I** and **O** control the inner and outer mats. **F** controls the frame and **W** controls the wall. Depress the buttons for the components you wish to include.

### Tabs

The dialog has a tab for setting each component. (You can also display a tab by clicking on the desired component in the preview image.) Start with the Image tab to set the overall size and other global parameters.


Image Tab
Inner/Outer Mat Tabs
Frame Tab
Wall Tab
Options
Creating Your Own Frame Profiles

## Image Tab




The image tab controls the overall dimensions of the final framed image.

### Cropping the Image

You do not have to frame the full image. If you want to crop it, select the original image window and adjust the crop rectangle in the window.

### Base Size On

The Base Size On control is very important and should be set before adjusting mat and frame widths. It determines how the dimensions of the various elements in the output image are computed, giving you the flexibility to deal with a variety of situations.

### Target Size

This size of the item selected in **Base Size On**. Unless this is the image size (or mat opening), the image size will be smaller.

### Image Size

This setting uses the dimensions of the input image (computed from its size in pixels and dpi setting) to fix the size of the image. The output image is then built out from the input image by adding mats, frame and wall of specified widths. Use this setting when you need the input image to be reproduced at a specific size.

### Fixed Image Width/Height

This setting scales the image width (or height) to a fixed value and computes the image height (or width) based on the proportions of the input image cropping rectangle so as to preserve the image aspect ratio. Use this setting when you need the image to be a specific width or height (e.g. 8") and you want to preserve the proportions of the image.

### Mat Opening Size

This setting fixes the dimensions of the innermost mat opening. The image dimensions are computed by subtracting the image border widths from the mat opening size. Use this setting when you need to place an image inside a frame with a given mat opening, for example when using a prefabricated frame and mat with an 8"x10" opening. This setting will cause the input image to be cropped as necessary to fit the mat opening.

### Frame Opening Size

This fixes the dimensions of the frame opening. The image dimensions are computed by subtracting the mat and image border widths from the frame opening size. Use this setting when you want to place an image inside a frame with given inside dimensions, for example when the final framed image needs to fit into a prefabricated frame (frames are generally sold based on the size of the opening). This setting will cause the input image to be cropped as necessary to fit the mat opening.

### Frame Outside Size

This fixes the dimensions of the outside of the frame. The image dimensions are computed by subtracting the frame, mat and image border widths from the frame outside dimensions. Use this setting when you want to place an image inside a frame with given outside dimensions, for example when the final framed image needs to fit into a particular space on the wall. This setting will cause the input image to be cropped as necessary to fit the mat opening.

### Width/Height/Resolution

These controls let you specify the desired image size as selected by the **Base Size On** setting (see above). The width, height or both may be grayed out if they are computed automatically from other data and cannot be modified. The **Resolution** setting determines the resolution of the output image. The number of pixels in the output image is in turn determined by the physical dimensions of the output image divided by its resolution. All elements of the image are resampled as necessary to create an output image of the desired resolution.

### Snap

The Snap setting determines the increments in which width and height settings are modified when dragging frame, mat, border or image widths/heights in the preview image (see below).

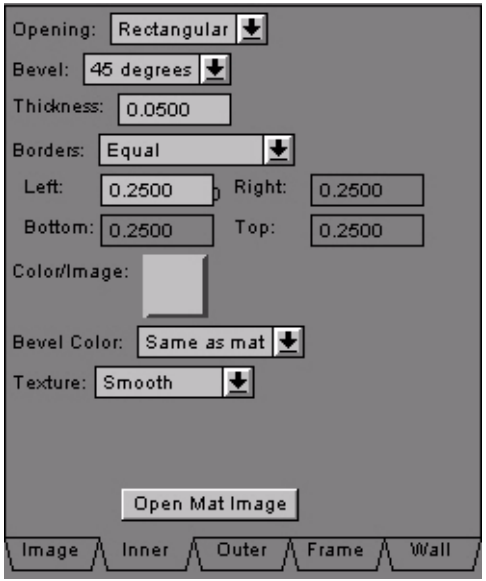
### Borders/Left/Right/Top/Bottom/Color

The Borders setting determines whether the image borders will all be equal, will be equal except for the bottom border or will be unequal.

The Left/Right/Top/Bottom controls let you enter the desired border widths using the current units. To frame an image without borders, set all four border widths to zero.

## Inner/Outer Mat Tabs

This tab selects the properties of the inner and outer mats.




### Opening

This control determines the shape of the mat opening. The options are **Rectangular** or **Oval** (elliptical).

Bevel determines the angle at which the mat is cut. The options are 45, 60 or 90 degrees. The bevel angle determines how much of the mat interior is visible around the mat opening.

### Thickness

This control sets thickness of the mat in the current units. A typical 6-ply mat is about 0.05" (1.6 mm.) thick. To eliminate the bevel and its drop shadow entirely, set **Thickness** to *0.0*.

### Borders/Left/Right/Top/Bottom

The Borders setting determines whether mat widths will all be equal, will be equal except for the bottom border or will be unequal.

The Left/Right/Top/Bottom controls let you enter the desired mat widths using the current units.

### Color/Image

The Color/Image setting determines the color or pattern of the mat. You can select a solid color, a any open color image or black and white image. Images are tiled to fill the mat. Patterns for mats can be created using the **Texture** or **Wave** transformations. In addition, a small library of images suitable for tiling is available by clicking the **Open Mat Image** button.

**Solid color:** Specify the color using the **Color Picker**. You have the option of applying a texture that is applied to mat. If a texture is specified, you also have the option of adjusting its **scale factor** to vary the granularity of the texture.

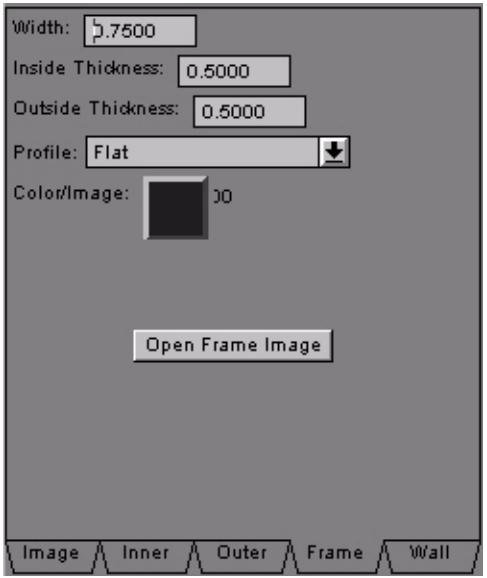
**Color image:** The image is tiled to cover the entire mat. Adjust the **scale factor** to determine the tile repeat size.

**Black and white image:** The image is tinted with a color you specify and then tiled to cover the entire mat. Adjust the **scale factor** to determine the tile repeat size.

### Bevel Color

The Bevel Color setting determines the color or pattern of the mat bevel. This can match the mat color or be a different color. For instance, some mats are black the inside.

## Frame Tab




This tab selects the properties of the frame.

### Width

This control lets you set the frame width in the current units. The frame width must be the same for all four sides.

### Inside/Outside Thickness

These controls set the inside (or outside) thickness of the frame in the current units. The frame thickness is used to display drop shadows on the mat (wall).

### Profile

The Profile setting lets you select from a built-in set of frame shapes.

### Color/Image

The Color/Image setting determines the color or pattern of the frame. You can select a solid color or images of frame profiles. Profile images are tiled to construct the frame. A small library of images suitable for tiling is available by clicking the **Open Frame Image** button. (You can also photograph a frame and extract a repeating segment to create your own tile images.)

**Solid color:** Displays the **Color Picker** letting you set the frame color. For this option, use **Profile** to set the frame shape.

**Color image:** the selected image is tiled to cover the entire frame. Use **Scale to Fit/Tile** to adjust the repeat size.

**Black + white image:** the selected image is tiled to cover the entire frame. Use **Scale to Fit/Tile** to adjust the repeat size. Click **Tint** to set a tint color.

### Scale to Fit/Tile

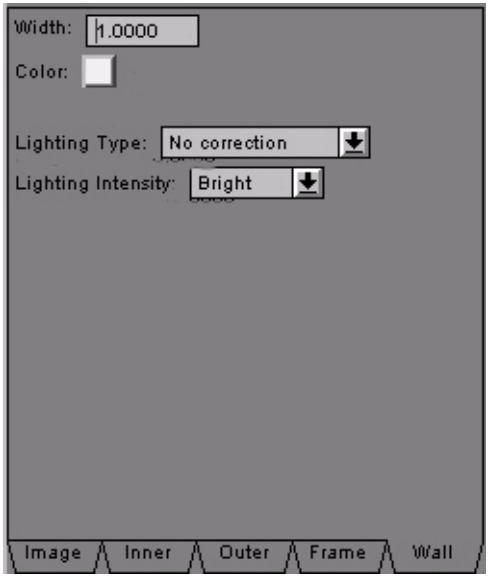
**Scale to Fit**: the frame image is scaled so that its width exactly fills the width of the frame.

**Tile**: the frame image is tiled as necessary (with an adjustable scale) to fill the entire frame.

**Note:** When a color or black and white image is specified, it is taken to be a repeating section of the left edge of the frame. This image is then tiled vertically as necessary to create the entire left edge of the frame. The tiled image is then rotated and reflected as necessary to generate images for the other three edges of the frame. Although it is not required, when an image is used, the profile should normally be set to **Flat** to avoid undesired shading effects.

## Wall Tab

This tab selects the properties of the wall displayed behind the frame and the lighting conditions.




### Width

This control determines how the dimensions width of wall area displayed behind the frame.

### Color

This control determines the wall color. If you are preparing the image for the web, set the wall color to your web page background color. This will make the frame shadows appear to fall on your web page.

### Lighting Type

This control lets you adjust the color temperature of simulated lighting.

### Lighting Intensity

This control lets you adjust the brightness of simulated lighting.

## Options

### Reset All

Resets all parameters to their defaults.

### Reset Crop Rectangle

Resets the crop rectangle to the full image.

### Show Rulers

Shows or hides rulers.

### Load

Resets the current parameters from a previously-saved parameter file

### Save As

Saves the current parameter values to a parameter file.

### Print Specifications

Prints the sizes of all components. The printout can be used to prepare conventional mats and frames.

## Creating Your Own Frame Profiles

You can create your own frame profiles, like the frame shown at right.

To do so:

1. Photograph a section of the left side of the frame. Light should be directed from the top left to give relief to the frame texture and to correspond with the shadows created by the Mat and Frame transformation. Include enough of the frame vertically to cover more than one repeat of the frame pattern.

The full frame was constructed from this kernel image.

2. Open the image in Picture Window Edit it to remove any distortion and square it to the edges of the image. Then crop to exactly include the left and right edges horizontally and exactly one repeat of the pattern vertically. It should tile seamlessly with itself. (You can check by using the Tile transformation.) It should look like the image at left.

3. Save the image as a TIF file in the Picture Window Applications Data folder under the **Frames and Tiles\Frames** subfolders. It will then be accessible from the Mat and Frame dialog along with other frame profiles.

# 20. Build Scanner/Camera Profile

Using a custom profile helps ensure accurate color and tonal reproduction when you scan photographic prints or transparencies or take photographs with a digital camera.

A custom scanner profile can take the guesswork out of scanning and give you accurate results every time without having to adjust curves or make color corrections.

Custom profiles for digital cameras can help you reproduce color accurately, but to make this work you must use the same lighting and camera settings (exposure, saturation, contrast, white balance, color space etc.) when photographing the test target as when photographing the subjects for which you want to use your profile. This makes digital camera profiles most useful for studio work, duping transparencies, photographing objects or artwork using a copy stand, table top or catalog photography, or other situations where lighting and exposure are carefully controlled.

## Summary Procedure

1. Scan or photograph a calibration target to create an image of the target. See **Photographing/Scanning Calibration Targets.**
2. Open the resulting target image in Picture Window. Create a profile using the File/Build Scanner-Camera Profile function. See **Build Camera/Scanner Profile Dialog**
3. Use the profile with images created by the camera or scanner you calibrated. See **Applying a Profile.**

**Note:** For a variety of reasons, no test targets are available for color negative film and it is not practical to use color negative film in a color managed environment.

## Photographing/Scanning Calibration Targets

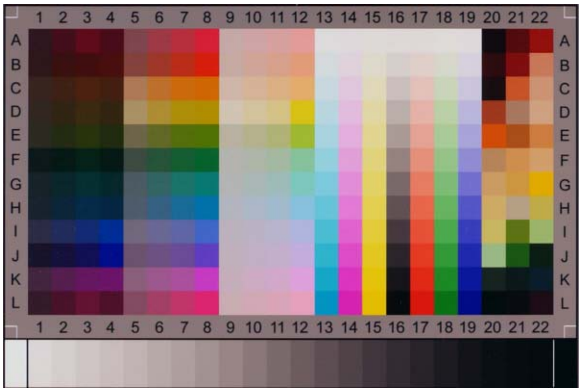
### Test Targets

The test target is key to making a scanner or digital camera profile. Picture Window Pro currently supports six types of test targets as described below.

Test targets are fragile and should be handled with care and kept clean. Avoid touching the color patches, keep your target it in its sleeve when not in use, and store it in a safe, dry dust-free location. Do not leave a transparency test target on a light table for any length of time as it may fade.

## IT8

IT8 (also called Q-60 by Kodak) test targets have been an industry standard for quite a few years, and are manufactured by several sources including the major film suppliers: Kodak, Agfa and Fuji. They contain a large number of gray and color patches, are reasonably priced, and readily available in both print and transparency film versions from a number of suppliers. IT8 targets generally come with a reference file that contains precise measurements of each color patch made with a spectrophotometer-you will need this reference file to create your profile. IT8 targets are a good choice for profiling transparency and flatbed scanners.

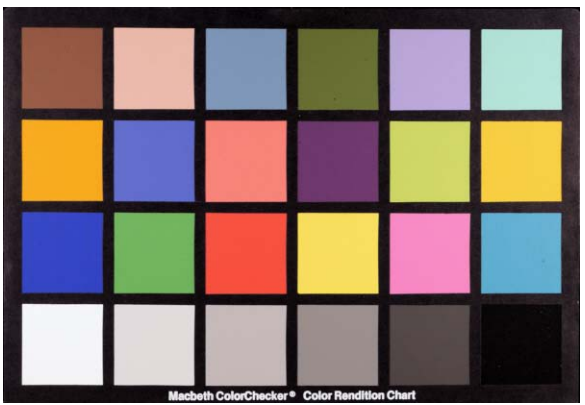



**IT8 Target**

The rightmost three columns of the IT8 target are manufacturer-dependent and are not used in the profiling process.

## Original ColorChecker

The original ColorChecker has been around for many years. While you can make a scanner or camera profile using it, a target with more color patches will produce better results. ColorCheckers are available in a large 9"x12" version and in a handy miniature version which is very convenient for field work.




**Original ColorChecker**

The ColorChecker SG (SG stands for semi-gloss) is a target designed especially for profiling digital cameras. One nice feature of this target is that there are redundant white patches around the edges and in the center that can be used to check for non-uniform lighting. The SG replaces the now discontinued DC. The SG also contains an approximate copy of the original ColorChecker color patches embedded just above and to the right of the center.

**ColorCheckerSG**

ColorCheckers are made by applying specially prepared relatively permanent pigments to a rigid cardboard backing. For this reason custom reference files are not required as there is relatively little variation among targets. The rigid backing makes ColorCheckers easier to handle and lets them stand up by themselves. In addition, the pigmented surfaces are less shiny than printed IT8 targets and thus photograph with fewer reflections.

For these reasons, ColorCheckers are a good choice for camera profiling. Wolf Faust also makes a letter-size IT8 target printed on matte paper with a rigid backing that is considerably less expensive than the ColorChecker SG.

ColorCheckers — originally produced by Macbeth — are now made by X-Rite (www.xrite.com) which purchased Gretag after they purchased Macbeth. They are commonly available from suppliers of photographic or prepress equipment.

## HCT

The HCT from Hutcheson Consulting (www.hutchcolor.com) is the ultimate test target for high end scanners. It has more than twice the number of patches as an IT8 and comes in a variety of formats and media. Like the ColorChecker SG, it has redundant white patches around the edges and in the center to check for uneven lighting.

Because it has so many patches, even tiny variations in lighting or errors in the reference file can create artifacts in profiles created using this target. For this reason it is only recommended for use with high end scanners, and you will likely get better results profiling digital cameras or consumer/prosumer scanners with an IT8 target.

**HCT Target**

## Digitizing Your Test Target

Before you can create a scanner or digital camera profile, you need to scan or photograph your target. Careful workflow when capturing this reference target image is critical and is a little different for scanners and digital cameras.

Scanners have the advantage that their light source is built in. The light source, in addition to having a carefully selected color spectrum, is generally very uniform across the scanning area. For this reason, you should not need more than one scanner profile. On the other hand, the improvement in color accuracy from a custom scanner profile will in most cases be subtle.

For cameras, there are many possible sources of illumination, each with its own spectral characteristics. A single scene may easily include several light sources such as sunlight, blue skylight, overcast skylight, as well as different kinds of artificial illu-

mination. Adding to differences in illumination are various camera settings which affect the color and contrast of the image, such as the white balance setting. Finally, post-processing such as raw file conversion can greatly affect the way images look.

There are two basic approaches to camera profiling - creating a generic camera profile or creating a special purpose profile tailored to specific conditions.

The idea behind a generic profile is create a single camera profile that provides consistent color from the camera. Using such a profile, images will still look different under different lighting conditions or camera settings. For example a photograph taken under tungsten lighting or at sunset will look orange compared to the same scene photographed in daylight. Although tricky, creating generic camera profiles is possible, but they have limited utility.

The goal of special purpose profiles is to compensate for the varied effects of illumination, camera settings and post-processing, and to render a scene as it would appear under standard viewing conditions. Applications for this kind of custom profile might be studio portrait or catalog photography, photographing artwork for reproduction, documenting archaeological objects for a museum, medical/dental photography, or forensic photography.

First, make sure your test target is clean. If you are using a flatbed scanner, first clean the scanner glass; if you are using a film scanner, give it a blast of compressed air. This will save time later retouching the image. It is also a good idea to let your scanner warm up as the lighting may change color slightly right after you turn it on.

Set your scanner software to make no automatic adjustments to the color, contrast or brightness of the image. Also, make sure any scanner color management and autoexposure settings are turned off. Scan using the maximum bit depth your scanner supports. Some scanners can produce 48-bit color scans (16 bits per channel) while others, even if they internally scan at more than 8 bits per channel can only save 24-bit color images (8 bits per channel). You will get better results profiling with 16 bits per channel than with 8. Select a scanner resolution that yields at least 1000-pixels across the longer dimension of the part of the image covered by the target. The profile generated from the scan will only be valid for subsequent scans made using the same identical bit depth, color, contrast and brightness settings you use to scan the target, so

make sure you record this information for future reference. If you are profiling a transparency scanner, you will get slightly more accurate results if you use a test target made from the same film type you will be scanning. The differences are subtle, but worth taking into account if you want the most accurate possible results.

If you are profiling a flatbed scanner, if you can, place a sheet of black paper, cardboard or velvet behind your test target covering the entire scanner bed. This helps reduce brightness variations resulting from flare light reflected from the white underside of the scanner lid.

Once you have captured a good image of your test target, retouch it as necessary using the speck removal or cloning tools to clean up any dirt or scratches as non-uniformity in the color patches can lead to errors.

Finally save the file in TIFF format with a name that includes the type of scanner or camera, any custom settings, and the date.

Make sure you record any scanner settings that affect the color or tonality of images since you will need to use the exact same settings for subsequent scans if you want the profile to remain valid.

### Digital Cameras

First, make sure your test target is clean. The profile you create will only be valid for the exact lighting conditions and camera settings in effect when you photographed the target. A camera profile created with the correct white balance setting for the light illuminating the test target will however be more or less generic for the camera. Getting a good image from a test target is a lot harder with a digital camera than with a scanner.

When creating special purpose profiles, first set up your lighting and, at the beginning of a session, photograph the target placed where the subject will be located. Then, using the same camera settings photographs your subject. When you are done you will be able to create a profile from the target image to correct the rest of the images.

Here are some of the variables that can affect a camera profile:

### Uniform Lighting

The entire target must be evenly lit. Photographing the target under sunlight or an overcast sky is a good way to get uniform lighting. It is harder to get uniform lighting indoors or with a flash. Try to avoid placing the target near bright objects that may be reflecting light onto the target. Due to their spectral qualities, using fluorescent lighting should be avoided if at all possible.

### White Balance

When creating a generic profile, the color temperature of the light illuminating the target should be consistent with the white balance setting of your camera. If you use a copy stand with tungsten lights, make sure you use the corresponding white balance setting on your camera. If you shoot outdoors, it makes a big difference if the target it is in the sun or in the shade, if it is overcast, or if it is near sunrise or sunset. Generally raw files are unaffected by a camera's white balance setting so you will need to set the white balance in the raw converter.

Reflections

Avoid reflections from the target. In particular, do not use an on-camera flash as it will produce a hot spot in the center of the image. Also try to place the target where colored light will not reflect onto it from nearby objects.

### Distortion

If the image of the target is too distorted, there will be problems reading some of the color patches. A little care when photographing the target will save a lot of trouble later. If necessary, keep the target flat by taping its corners to a flat surface, but be careful not to get tape near any of the color patches. Line up the camera with the target so the image is rectangular, and center the target in the viewfinder. Avoid using wide angle zoom settings as they are prone to barrel distortion unless you are prepared to remove it in subsequent processing. Don't try to fill the frame with the target as this will produce more distortion than using just the central area. This will also minimize any light falloff in the corners of the frame.

Try to get around 1000-2000 pixels across the target. Don't save the image as a JPEG unless this is the only available option. If possible save as a raw file

### Exposure

The image of the test target needs to have suitable values for the darkest and lightest patches. The lightest patch should come out slightly darker than pure white and the dark patch a little lighter than pure black. Try bracketing your exposures and select the one that keeps the gray patches centered in the tonal range.

RAW file processing
If you are using raw files, then make sure all the settings in your raw converter are set so as to make as few changes as possible to the image.

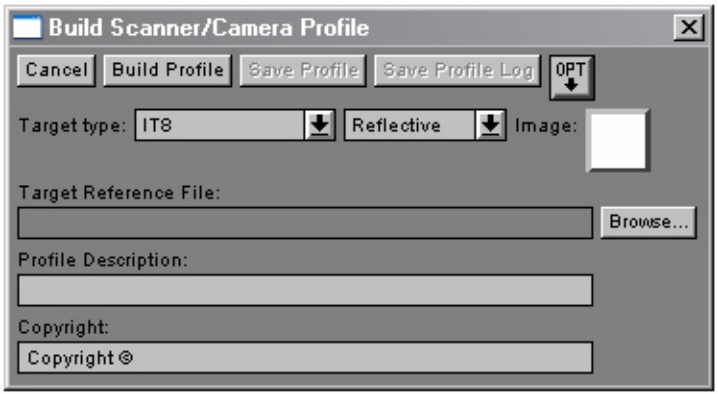
### Clean-up

Once you have captured a good image of your test target, use the speck removal or cloning tools to clean up any specks in the patches.

### Save the TIFF file

Finally save the file in TIFF format (preferably 48-bit color) with a name that includes the type of scanner or camera, any custom settings, and the date.

## Build Camera/Scanner Profile Dialog




Armed with your target image file, you are ready to create a profile. Start Picture Window Pro, open the target image, and select **Create Scanner/Camera Profile** from the **File** menu.

### Target Type

The Target Type control lets you select the type of target you are using (IT8, ColorChecker SG, ColorChecker DC, ColorChecker or HCT). If you select one of the ColorCheckers, the Target Reference File control is automatically filled in as reference files for these targets are built into Picture Window Pro.

### Reflective/Transmissive

While this setting does not affect computation of profile data, it does set a flag in the saved profile that indicates if the profile was made from a reflective (paper) or transmissive (film) target.

### Advanced Options

Clicking on the Opt button displays the options menu. The available options are described in **Advanced Options**. In most cases the best results will be obtained with default settings.

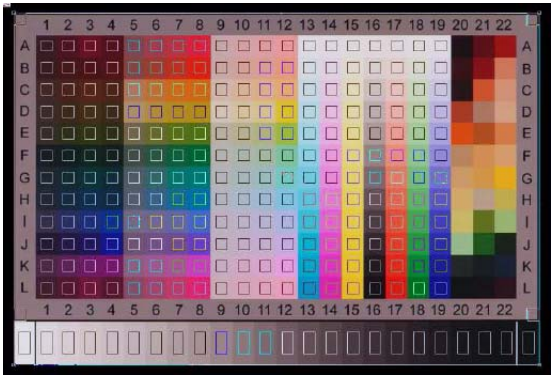
### Target Image File

This control selects the image of the target which you captured with your scanner or camera. If a color image was selected when you started the command from the File menu, the image will already be selected. Or you can select it later or change images.

Once you select a target image, an overlay is displayed superimposed on its image window indicating the locations of the gray and color patches. It is important that you select the correct Target Type (see above) so the overlay matches the target image.

Before proceeding, align the overlay with the patches in the target image. You can adjust the overlay by dragging its corners, edges, or its interior.

A target image file must be selected before you can build a profile.




**Overlay:** Adjust the overlay to locate the patches in the selected target. Note the target may have a color cast. It will be corrected by the profile.

### Reference File

If you are using an IT8 or HCT target, click the Browse... button and select the reference file for your target. It is important to use the correct reference file. The target should be labeled with a batch or serial number that identifies the corresponding reference file. Picture Window Pro comes with a collection of reference files that were available at the time the software was released, but if you have a more recent target, its reference file will probably not be included. In this case there should either be a reference file that came with the target or you should be able to download one. The following are locations on the internet from which you can download reference files for certain test targets:

- Kodak: ftp://ftp.kodak.com/gastds/q60data
- Wolf Faust: http://www.targets.coloraid.de

- HCT: http://www.hutchcolor.com/HCT_data.htm

By default Picture Window Pro looks for reference files in the following folder:

C:\Users\username\AppData\Roaming\Digital Light and Color\Picture Window\Reference Files

If you copy your reference file to one of the subfolders of the above folder, the Browse button will take you to the right place. Otherwise you can simply navigate to the folder where the reference file is located.

### Profile Description

The description you enter will be embedded in the profile you create. Most color management applications - including Picture Window Pro - identify profiles by their description and not by their filename, so be sure to enter enough information in the description so you can recognize your profile later. At a minimum you should include the make and model number of your scanner or camera. You might also want to include the date and any special conditions under which the target image was created or the image was processed.

While technically legal within a profile description, using the characters "/", "\" and ":" is not recommended as they are illegal within a filename. When you eventually go to save your profile or profile log, the default filename is derived from the profile description.

You must specify a profile description before you can build a profile.

### Copyright Notice

A copyright notice is optional. You may choose to include a copyright notice if you need to establish legal ownership of the profile you are creating or to limit its distribution rights. A standard copyright notice looks like this:

Copyright (C) YEAR NAME - All Rights Reserved

where YEAR is the year the profile was created and NAME is the name of the entity claiming ownership of the profile.

### Building the Profile

Once you have entered all the necessary information, click the Build Profile button at the top of the dialog box to compute the profile and display the results.

If everything is OK, the profile is computed and a summary of the results is displayed on the right hand side of the dialog box.

If errors were detected while computing your profile, Picture Window Pro displays an error message (see **Error Messages**). The most common problem is misalignment of the overlay or some other problem that makes one or more of the color or gray patches non-uniform. If this occurs, problem patches will be identified with an X on the overlay when you click OK to dismiss the message.

Initially, the results displayed consist of a standard CIE diagram illustrating the approximate color gamut of your scanner or camera as a white triangle. For reference purposes, the sRGB color gamut is also displayed as a dark gray triangle. A small circle is also displayed corresponding to each color patch in the target.

Using the tabs below the diagram, you can switch the display from the scanner gamut to the gamma curves that linearize the scanned data (see below) or to the profile log. It is a good idea to check the gamma curves to make sure they are smooth since kinks in the curves indicate problems with the gray patches in the target. If this occurs, you may want to check one of the Smooth Gamma Curves menu items in the options menu and rebuild the profile. If the target image is clipped, there will usually be some kind of glitch at one end of the curves or the other.

To save your profile, click the Save Profile button and select a pathname for your profile. By default, the profile is saved in your system profile folder so it can be used by other programs.

Clicking the Profile Log tab displays various useful details about the profile. To save this information as a text file, click the Save Profile Log button and select a pathname for your report.

## Applying a Profile

Once your profile has been created and saved in the system profile folder, it is ready to use. There are two ways to use a profile to color correct images:

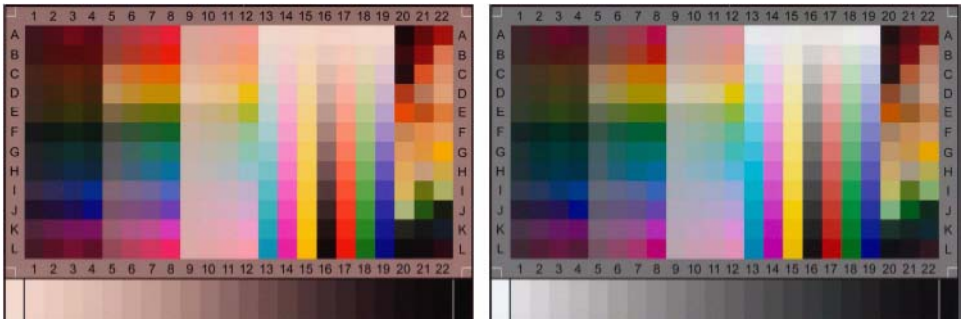
### The Change Color Profile transformation

The most straightforward way to apply a scanner or camera profile to an image that has been captured under the same conditions and workflow as the target image is to use the Change Color Profile transformation. First select the image you want to correct, then select Change Color Profile from the Transformation/Color menu. Next specify the scanner or camera profile as the Input image color profile.

If you are going to process the image further, it is important to convert it to the working color space so its RGB data will be converted to standard values that can be combined consistently with other images. In this case, set Change to Image Data and Profile Setting. Then select the desired output color space - generally this will be the current working color space as the Output image color profile. Click Preview to preview the results and click OK to complete the operation.

If you are just going to store the file for later use and want to defer the decision about what color space to convert the image to, you can just set the profile without converting to another color space by leaving the Input image color profile setting alone and setting Output image color profile to the scanner or camera profile. Then set Change to Profile Setting Only and click Preview or OK.

Whichever option you choose, you should see a color shift between the input and output images reflecting the corrections made by the profile, as shown in the example below.



This example shows a photograph of an IT8 target taken on a copy stand with halogen lights (thus the orange cast). On the right is the same image corrected using a custom profile created from the target image.

### Opening raw files

To set a camera profile for opening raw files, first open a raw file from the camera for which the profile was created. In the open raw file dialog box, click on the down arrow button (in the top row of controls) to bring up the raw options menu and select Advanced Settings from the drop down menu. Finally, select the camera profile as the Camera Color Profile.

## Reading the Profile Log

The profile log is a text file containing detailed information about the profile you just created. The information in the log is organized as follows:

**Date:** the date the log was created.

**Target Type:** the type of target used to create the profile.

**Description:** the profile description.

**Copyright**: the profile copyright notice.

### Red, Green and Blue Primaries

Estimated CIE XYZ and CIE xy values for the red, green and blue primaries are given. The CIE xy values define the vertices of the gamut triangle displayed in the chromaticity diagram. The white point for scanner profiles is always specified as D50.

The reported primary values are estimates and not direct measurements as there is no way to create a test target with pure red, green and blue color patches-consequently the values may not be accurate and should only be used for making relative comparisons between different scanners. While scanner primaries are included in the scanner profile, they do not affect conversions from the scanner color space to the working color space as this is done using lookup tables.

### Dmin and Dmax RGB values

These are the measured RGB values of the darkest and lightest gray patches in the target on a scale from 0.00% (black) to 100.00% (white).

For scanners, the Dmax value should be a little above 0.00% and the Dmin should be a little below 100.00%, indicating that none of the gray patches has been clipped. Since the darkest patch generally reflects (for flatbed scanner) or transmits (for a film scanner) some light, its measured value will usually not be 0%. Similarly, the lightest patch will absorb some light and its measured value will not be 100%. This is perfectly normal and not a cause for concern. If you are seeing values of 0% or 100%, this means that you are losing some shadow or highlight detail and need to rescan.

For digital cameras, the situation is more complicated since an outdoor scene may include deep shadows that are darker than the darkest target patch or highlights lighter than the lightest patch. For studio photography, this should be less of a problem as the range of densities of the target should be representative of subject brightness values.

### White, Gray and Black RMS Non-uniformity

These are measures of the variability of the redundant white, gray and black patches scattered around the target (ColorChecker SG, ColorChecker DC and HCT only). Values greater than 5% to10% indicate uneven target illumination.

### Gray and Color Uniformity, and Delta E

These tables list the RMS uniformity, and Delta E for each gray and color patch in the target.

If the uniformity error for a given patch is large (> 5%), this indicates that the image of that patch may be noisy, stained, include specks or be uneven for some reason.

The regression error indicates how far the measurement of a given patch differs from the predicted value based on the regression model. A large number (> 5) may indicate some nonlinearity in the scanner, a problem reading the patch, uneven target lighting, problems with the spectral properties of the scanner light source, or simply an inconsistency between the target and the reference file. These inconsistencies can arise from variations among individual targets in a batch, aging of the target, dirt on the target, or abrasion of its surface. In some cases, regression errors are reduced considerably when creating a custom reference file by measuring all the patches with a spectrophotometer, or by using a different target with a more accurate reference file. This means that errors may be a result of target inconsistency and not scanner nonlinearity. For this reason, Eliminate All Residuals (see **Advanced Options**) is turned off by default since there is no point in modeling errors in the reference file. If you are using a custom measured reference file, you may want to select Eliminate All Residuals to increase the accuracy of the profile. In this case, Picture Window Pro still reports the regression errors from the regression model even though these are all reduced to zero in the final profile.

Even if your target has a few regression errors in the 5-10 Delta E range, this does not mean there is anything significantly wrong with the profile your created as the regression process averages the response over all the patches and normally still produces very accurate results even if a few errors are large.

Errors larger than 10-20 Delta E may indicate a some kind of problem with the input image, reference file, target or scanner.

The Delta E values represent the color differences between the values predicted by the regression model and the reference values expressed in standard CIE Lab ?E units

## Error Messages

This section lists error messages listed alphabetically and explains what they mean and what you can do about them.

### Cannot profile negative images

If the brightness of the gray patches is reversed, then likely you are attempting to create a profile using a negative image which is not supported.

### Illegal reference file: <pathname>

Before reading a reference file, Picture Window Pro does a few tests to see if it is a valid file and that it was made for the type of target you have specified.

### Non-uniform target illumination detected

Some targets include redundant white, gray and black patches in various locations intended to be used as a check for non-uniform target lighting. Picture Window Pro examines these patches and issues this warning if it finds significant variation among these extra patches. If you are profiling a digital camera, this may indicate that the target was unevenly lit when you

photographed it. If you are profiling a scanner, it may indicate that the scanner light source is not uniform over the scanning area.

One of more gray patches not in increasing brightness order. Target lighting may be uneven.
Picture Window Pro examines the gray patches in the target to make sure the measured brightness of each progressively lighter patch is higher than the previous patch. If any of the values is out of sequence, this may indicate that the target was unevenly illuminated or the target image is noisy. For targets such as the HCT which has many very closely spaced gray patches, this is not uncommon. If you are getting this warning, try selecting one of the Smooth Gamma Curves options in **Advanced Options** to reduce noise in the gray measurements.

### Regression error

The regression process performed to model the scanner's response has failed. Normally this means there is a serious problem with the target image file or the reference file. If both files are OK, you can try changing to a different regression model (see **Advanced Options**).

### Some gray or color patches are non-uniform.

Bad patches will be identified with an X when you click OK.
Picture Window Pro samples the central part of each color patch at 441 different points and averages the results. It also computes the standard deviation of the measurements and displays this error when that values exceeds a preset threshold. Generally patches may be non-uniform if the target image has dust specks or if the image is unusually noisy. If the image is basically OK, you can increase its uniformity by applying a median blur to it or by using retouching tools to clean up the image.

## Advanced Options

This section describes the options available in the options menu.

### Regression Type (Linear / Quadratic / Cubic)

Picture Window Pro can perform linear, quadratic or cubic regression to model the behavior of the input device. If the test target has a sufficient number of color patches and the reference file is accurate, cubic regression will produce the most accurate results. The ColorChecker target has too few patches to perform cubic regression. When this target is selected, quadratic regression is used if you specify cubic.

### Residual Handling (Eliminate All Residuals)

Normally a profile's color lookup tables are generated by using a linear, quadratic or cubic model of the response of the scanner or digital camera. In most cases, the regression model, especially cubic regression, closely approximates the measured color response. You can check how well the model fits the data by looking at the Delta-E errors in the profile log. If all or nearly all the values are small (mostly less than 2.0-3.0 possibly with a few outliers less than about 5.0), the regression model is an good fit to the measured data. If some values are larger, this means that the values in the reference file are inaccurate for the target or that the scanner or digital camera has characteristics that are not accurately modeled.

When you select Eliminate All Residuals, Picture Window Pro applies a nonlinear model to the residual errors from the regression model when creating the profile. This distorts the color lookup tables in the profile so they precisely match all patches in the target to their corresponding reference values, but can introduce artifacts in the profile if the regression errors are due to inconsistencies between the target image and the reference file or if you are using a target with a small number of patches.

### Smooth Gamma Curves

When Smooth Gamma Curves is selected, the sequence of measured gray patches is smoothed. This can be helpful in reducing wiggles in the gray curve that can occur if you are using a target such as the HCT that has many closely spaced gray patches. Select the smallest amount of smoothing (None, Light, Moderate, or Heavy) that produces a curve without kinks. Smoothing is not recommended for targets such as the ColorChecker that have a small number of widely spaced gray patches.