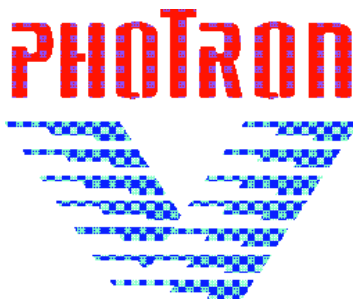


PRIMATTE S-100 for Adobe Photoshop 3.x/4.x

**Manual/Tutorial
Version 1.0
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1. Introduction

Primatte S-100 for Photoshop is a chromakey compositing plug-in. It allows the user to take a foreground image of any resolution, shot against a single color background, and replace that single color with similarly positioned background pixels. A greenscreen has been provided with this package to allow you to experiment with the technology. It is a good color background for most flesh tones. Primatte can be used with any color background with equal effectiveness.

Where Primatte is most effective is along the edges of the foreground objects and when you have transparent or semi-transparent objects in the foreground. Primatte allows you to keep such detail as wisps of hair, smoke, sheets of glass or water and many other objects that would be lost using conventional methods of keying. Using the patented Primatte Polyhedral Slicing Algorithm, the plug-in separates color space in a unique manner and blends edge objects transparently with blurred background pixels to give you the finest foreground/background blending available. It also is very effective at removing foreground 'bluespill', which is a word used to describe areas of the foreground that have absorbed color from the background during the shooting procedure.

2. Installation Information

System requirements

Any system configuration that supports the Adobe Photoshop application is sufficient for proper Primatte operation.

Installing Primatte from the CD-ROM

1. Insert the CD-ROM into the drive you want to install from.
2. Choose **Run** from the File menu in the Program Manager or **Run...** from the Start button in the Windows 95 interface.
3. Type d:\setup in the text box and click **OK**. If you're installing from another drive, type the drive letter for that drive instead.
4. The installer will search for the Photoshop plug-ins directory and ask you whether you want it installed there. It will also ask whether you need the Adobe Acrobat Reader installed. This application is necessary to display the on-line documentation. It will also ask for a directory in which to install the sample images included with the plug-in.
5. When the installation is complete, start the Photoshop application and follow the directions in **3. Starting the Primatte Functionality**.

PRIMATTE sample files included with the application:

Primatte.8bf - This is the PRIMATTE plug-in. It will be installed in the \Photoshop\plugins directory on your harddisk drive.

PrimPCPS.pdf - This is the document you are reading. It is in Adobe Acrobat format and can be read using the Adobe Acrobat Reader that was included on your installation disk (if it wasn't already installed on your system). It can also be accessed from within the Pri-

matte plug-in event window.

alex-fg.tif - This is a foreground image of a girl against a bluescreen (640x480 pixels).

alex-bg.tif - This is a background image of a street scene (640x480 pixels).

tabako-fg.tif - This is a foreground image of cigarettes in an ashtray (640x480 pixels).

tabako-bg.tif - This is a background image of a tabletop (640x480 pixels).

water-fg.tif - This is a foreground image of a small statue with water cascading on it (640x480 pixels).

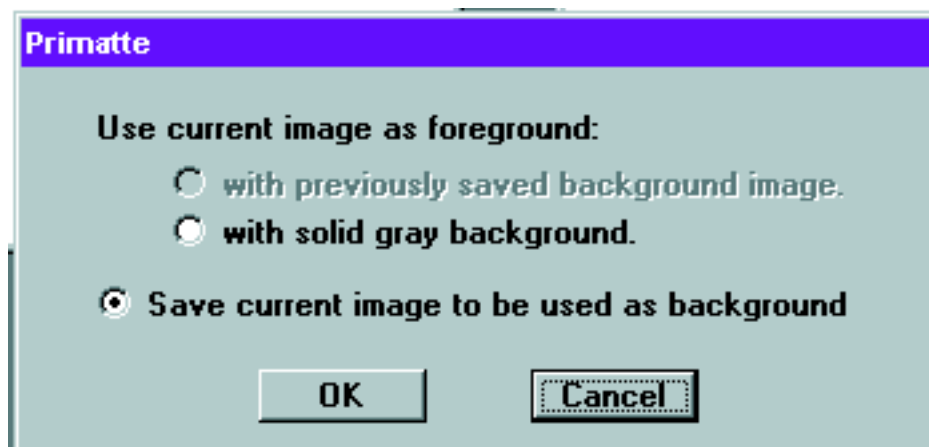
water-bg.tif - This is a background image of a clocktower (640x480 pixels).

3. Starting the Primatte Functionality.

- Start up the Photoshop application.
- Pull down the **FILE** menu and select **Open...**
- Find the desired directory, highlight the applicable foreground image and select **OPEN**.
- Again pull down the **FILE** menu and select **Open...**
- Find and highlight the appropriate background image and select **OPEN**.
- You will now have two images loaded and visible in the Photoshop window.

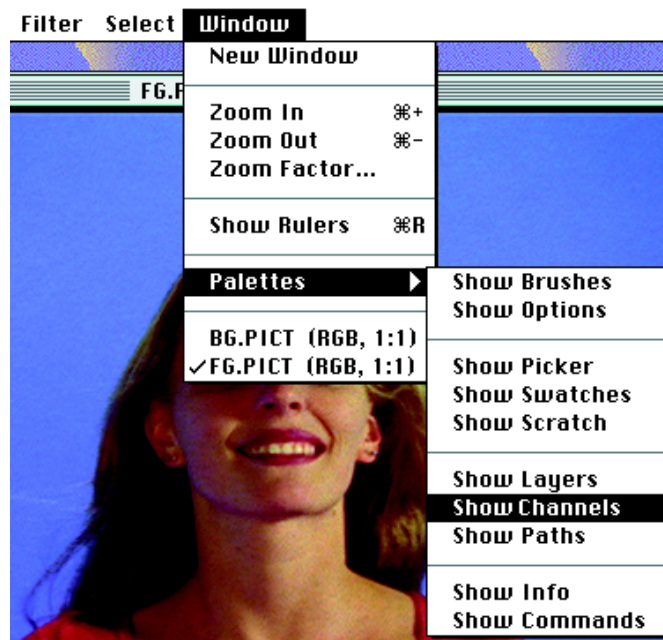
NOTE: For Primatte to work properly, the two images have to be the same size. You can check the size of an image by highlighting the image and going into the **/IMAGE** pull-down menu and selecting **Image Size....**

- Highlight the background image by clicking anywhere on the image window.
- Pull down the **FILTERS** menu and select **COMPOSITE** and then slide over and release the mouse button on **Primatte...** This will bring up the following window.



- Select **Save current image to be used as background** and click on the **OK** button.

NOTE: If you want to save the matte view of your completed composite in the alpha channel of your final composite image, you must do the following additional step. Select or highlight the foreground image. Pull down and select the Photoshop /Windows/Pallettes/ Show Channels option.



- This will display the following window...

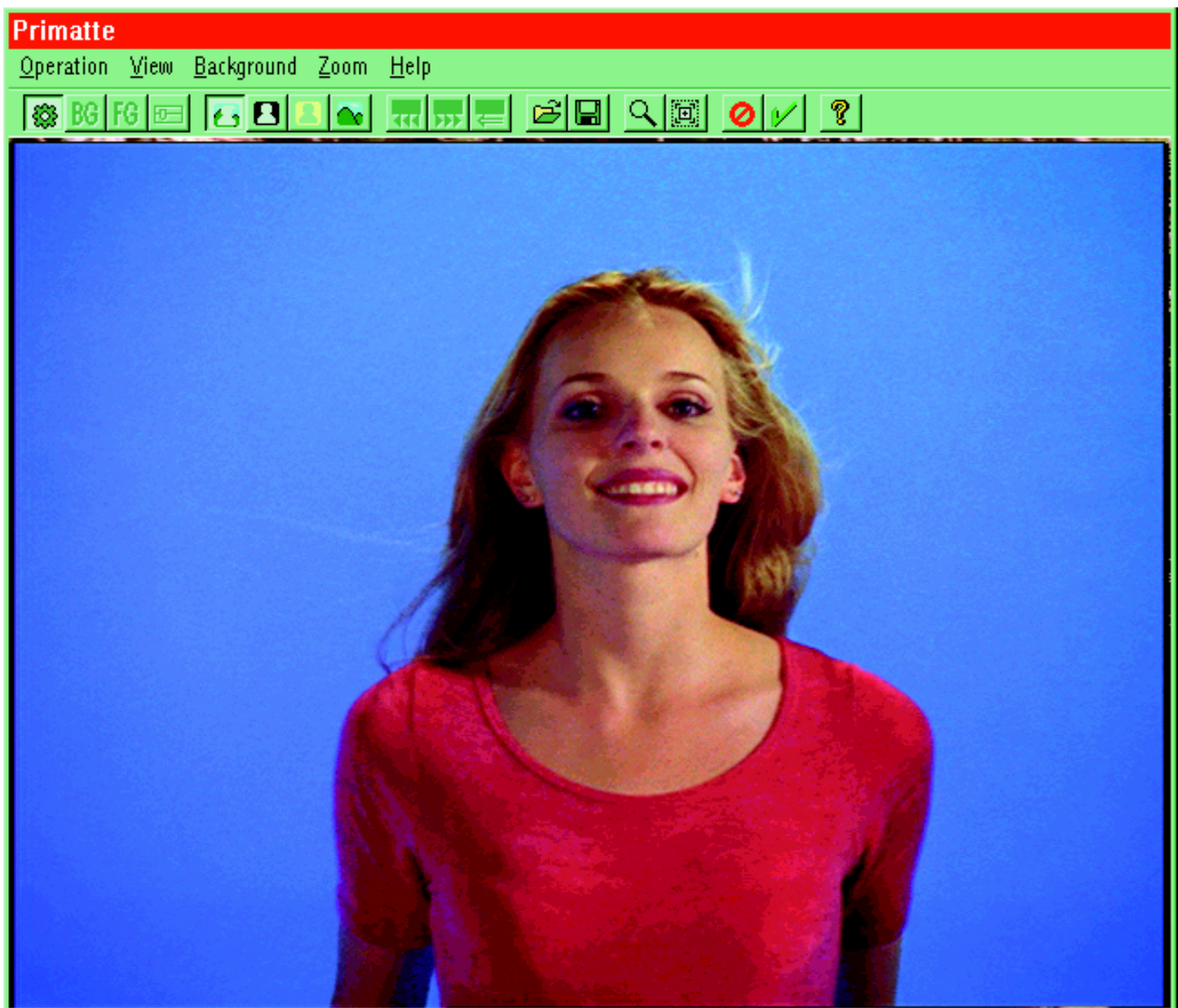


- Hold down the SHIFT key and click on the #4 box at the bottom of the window.
- The #4 area of the window should now look like this...

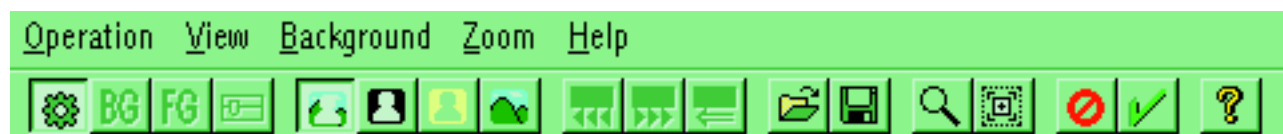


- After doing the composite, this #4 or alpha channel will contain the matte view.
- Highlight the foreground image by clicking somewhere on the image window.
- Again pull down the **FILTERS** menu and select **COMPOSITE** and then slide over and release the mouse button on **Primatte...** This will again bring up the 'image select' window.
- Select **Use current image as foreground: with previously saved background image** and click on the **OK** button.
- This will bring up the Primatte event window.

4. The Primatte Interface.







- The Primatte Window has an toolbar across the top. All of the icon features are also available as pull-down menu items. Let's take a break to look at the icon buttons in the Primatte interface and briefly see what each of them does before we continue with the tutorial.





- The first four icon buttons on the left constitute the four basic operation steps that comprise the process of using Primatte. Let's take a look at those steps and what each of


them do:


- This is the **Auto Setup**  mode selection button. It is the first step in the Primatte chromakey process and usually does 95% of your work for you. After selecting this button and while viewing the **Composite** view, you use your mouse and cursor to select a sample of the background color. This is a blue or green color in the case of the sample images provided with Primatte, but it could be any color. This functionality is also available under the **Operation** menu.
- This is the **Select Background**  mode selection button. After changing the view to **Matte**, you use this mode to select and clean up any noise in the background area of the foreground image. This noise could be from film grain, video noise, irregular background color or several other causes. This functionality is also available under the **Operation** menu.
- This is the **Select Foreground**  mode selection button. While still viewing the Matte, you use this mode to specify color regions in the foreground that are 100% foreground. When you see dark areas in the foreground image area, they will register with the program as transparent regions. To make them appear as solid foreground, you must point and click on these dark regions while in the Select Foreground mode. Pointing and clicking on them will make them white in color and, therefore, 100% foreground. This functionality is also available under the **Operation** menu.
- This is the **Tune Colors**  mode selection button. While viewing the Composite view, you use this mode to specify color regions in the foreground that have 'bluespill' and suppress them. This functionality is also available under the **Operation** menu.

The next four buttons represent the options in the **View** menu:

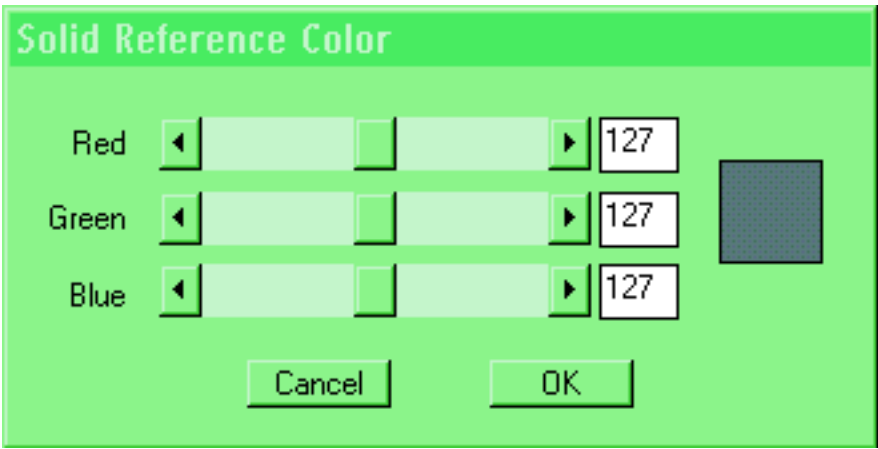
- This is the **Composite**  view button. When selected, this displays the current results of the foreground/background blending in the Primatte display window. It is also the viewing mode used in the Auto Setup and Color Tuning modes discussed above. This functionality is also available under the **View** menu.
- This is the **Matte**  view button. This changes the window view to display the 'key' or matte data. This is a 256 color image with all degrees of foreground image

transparency displayed as shades of gray between white and black. Black represents 100% background and white is 100% foreground. This functionality is also available under the **View** menu.

- This is the **Foreground**  view button. To see the original foreground image in the Primatte display window, press this button. This is useful for checking to see if there are color changes or discrepancies between the final composite image and the original foreground image. This functionality is also available under the **View** menu.


- This is the **Background**  view button. To see the original background image in the Primatte display window, press this button. This functionality is also available under the **View** menu.

NOTE: There is also a **Background** pull-down menu option. This is used to select the type of background imagery used for “blending” colors during the Tune Colors phase of the Primatte process. This means that when Primatte is getting rid of blue reflections on the foreground object, it ‘blends’ colors from this special background image to replace the blue. If you have a person in the foreground with blue on her cheeks and she is being placed on a reddish background, Primatte uses red to replace the blue. This makes the foreground object look more natural in the new setting. The three choices are **Direct**, **Defocused** and **Solid Color**. **Direct** uses the original background image, **Defocused** uses a slightly defocused or blurred version of the background image and **Solid Color** lets you select a single color to use instead a modified background image. If you select **Solid Color**, you must also choose the fourth option in the menu, **Select Color**. This will present you with a **Solid Reference Color** window that allows selecting the desired color.





The image shows a dialog box titled "Solid Reference Color" with a light blue background. It contains three horizontal sliders for Red, Green, and Blue. Each slider has a left arrow, a central square, and a right arrow, with a numerical value box on the right. All three sliders are set to 127. To the right of the sliders is a small square color preview window showing a dark gray color. At the bottom of the dialog are two buttons: "Cancel" and "OK".



The next group of three buttons are the **Undo** options:

- This is the **Undo**  button. After you have started to use the plug-in, this will let you 'undo' the last change made to the composite. This plug-in supports up to 100 levels of undo depending on the amount of harddisk space is available. This functionality is also available under the **Operation** menu.

NOTE: This option only undoes the Primatte operations. It will not undo View changes or other plug-in operations.

- This is the **Redo**  button. After you have started to use the plug-in, and have 'undone' one or more changes, this will let you 'redo' the changes. This functionality is also available under the **Operation** menu.
- This is the **Reset**  button. After you have started to use the plug-in, this will let you reset all changes made to the images and return you the original configuration. This functionality is also available under the **Operation** menu.



NOTE: Under the **Operation** pull-down menu there are two other related choices; **Mark Settings** and **Return to Mark**. At any point during the compositing process, you may choose **Mark Settings**, which essentially sets a 'bookmark' at that point in the process. Selecting **Return to Mark**, returns you to that point. This useful if you have invested some time in setting up the image to a certain point and then want to experiment by making some radical image changes in different areas to test the results.

- This is the **Load Settings**  button. After you have completed a composite or at any stage of compositing, you can save the current parameter set in a file. clicking on this icon brings up a standard Windows file save dialog box and lets you name it and specify a directory and hard drive on which to store it. This functionality is also available under the **Operation** menu.
- This is the **Save Settings**  button. If you have previously saved a Primatte data set, you can load it and have it be automatically applied to the current image by clicking on this icon. This functionality is also available under the **Operation** menu.




NOTE: Also under the **Operation** pull-down menu there are two other related choices; **Load Settings** and **Save Settings**. At any point during the compositing, the user can save the current parameters to their harddisk or load previously saved parameters by using these two operations. Selecting either of them will bring up

standard Windows file load/save dialog windows allowing the user to select the desired directory and harddisk.

The next two buttons represent the options in the **Zoom** menu:

- This is the **Zoom In/Out**  toggle button. It switches between zoom mode and operational mode. After you select this button, your cursor changes to the 'zoom cursor' and you may click on the left mouse button to zoom in on your image. The location of the cursor determines where the zooming will occur. Holding down the Alt key on your keyboard reverses this process and zooms out one level for each left mouse button click. You may zoom in or out a maximum of 4 times (2x, 4x, 8x and 16x). Clicking on the right mouse button cancels the zoom mode and returns the image to it's original size.
- This is the **Zoom Cancel**  button. When you click on this button, your display returns to the original image display size.

The next three buttons represent some other options in the **Operation** menu:

- This is the **Cancel**  button. Pressing this closes the Primatte Plug-in Display Window, exits the plug-in, deletes all chromakey data generated and returns you to Photoshop. This functionality is also available under the **Operation** menu.
- This is the **OK**  button. Pressing this closes the Primatte Plug-in Display Window, exits the plug-in and applies the Primatte composited image to the Photoshop foreground image. This will make the Primatte window close and you will notice that the foreground image window has been replaced by the composited Primatte image. This functionality is also available under the **Operation** menu.
- This is the **Help**  button. Pressing this brings up the Adobe Acrobat Reader and displays an on-line version of this tutorial/manual.

NOTE: There is also a **Process** pull down menu with an option called **Save matte to alpha channel**. This automatically saves the matte information into the alpha channel on the final image. **Save matte to alpha channel** is only available if the incoming foreground image has at least one additional channel (besides R, G and B), and if the user has activated (or highlighted) all the channels in Photoshop before invoking Primatte. If there is more than one alpha channel, Primatte will write to the first one.

5. How to use Primatte



Continuing the tutorial, we will now use those buttons and controls to make a composite using the sample images we have already loaded and passed to the Primatte event window.

- Ensure that the **Auto Setup**  button is pressed in.

NOTE: **Auto Setup** is the initial default. The other three buttons are disabled (grayed out) until **Auto Setup** has been performed. Position the cursor in the bluescreen (or what ever color was used for your chromakey background) area, near the foreground object and click the left-hand mouse button down and let it up. This completes the **Auto Setup** mode. Optionally, you may hold the left mouse button down and while holding it down, sample a representative range of blue pixels by sliding the cursor around the blue area. Do not let the cursor touch the foreground image pixels. Let off of the mouse button and the software will automatically calculate the initial compositing parameters based on an average of the pixels sampled. Which method you use is a matter of technique. Some images give a better result with a single pixel sample and others work better with a large sample.

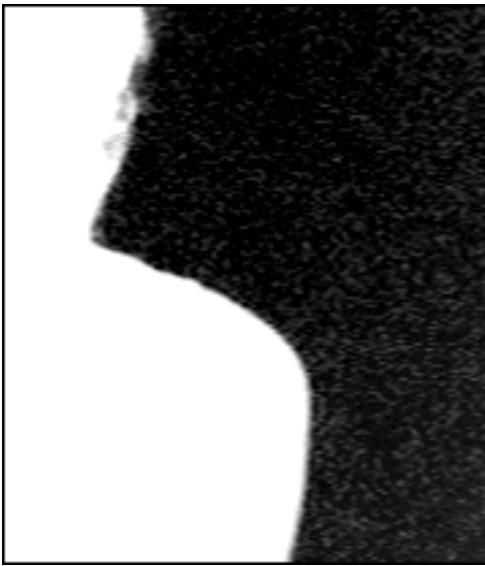
TIP: If the foreground image has a shadow in it that you want to keep in the composite, do not select any of the bluescreen pixels in the shadow. If you sample the shadow bluescreen pixels, the shadow will not appear in the final composite.

TIP: When clearing background noise from around loose, flying hair or other foreground/background transition areas, be careful not to select any of the pixels containing hair color. Leave a little noise around the hair and you can clean it up later in the **Tune Colors** mode.

- Select the **Matte** view  button and then set the Primatte Operation Mode to the **Select Background** mode by pressing the **Select BG**  button.

- This presents you with a view of the matte image or key being generated. If there are any white regions in the dark, bluescreened area, it is noise and must be removed. Position the mouse over these areas and while pressing the left-hand mouse button, sample these noise regions. When you let up on the mouse button, Primatte will calculate and clear the noise. Repeat this, as necessary, to clear all noise from the background


areas.




Before Background Noise Removal






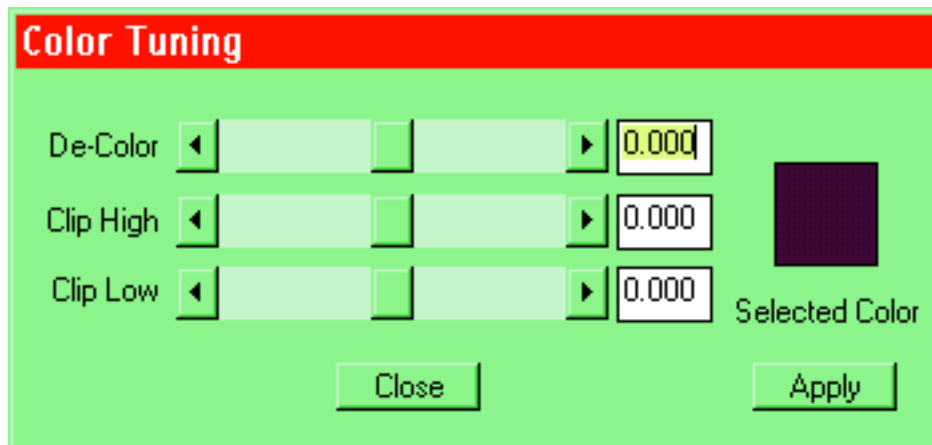
After Background Noise Removal

NOTE: If it is necessary to zoom in on a particular region, click on the **Zoom In/Out**  button on the Primatte icon bar. Then position the magnifying glass cursor onto the area you wish to zoom up on. When you have zoomed into the interested area, click again on the **Zoom In/Out** button and your cursor will again return to the Select Background arrow cursor. This technique should be repeated, as necessary, until all noise is removed from the background areas.

- Set Primatte to the **Select Foreground** operation mode by pressing on the **Select Foreground**  button. Using the same technique as for **Select Background**, continue sampling the dark pixels in the foreground area until the foreground area is as white as possible.




- Select the **Composite** view  button.
- Select the **Tune Colors**  mode selection button. You have now completed the first three stages of a **Primatte** composite and you should have a composited image ready for fine tuning.
- Using the **Zoom In/Out**  button, zoom into an area that has any bluespill reflections.
- Deselect the **Zoom In/Out** button.
- Position the cursor on a bluish area of the foreground image and click the left mouse button down and up. The **Color Tuning** window will appear.



NOTE: Primatte will have registered the color you selected in the 'Selected Color' color chip on the right side of the **Color Tuning** window. This color chip can now be modified by the tuning sliders (De-color, Clip High and Clip Low). For most images, the **De-color** slider is all that is required to remove any remaining bluespill.

- The more to the right the slider moves, the more of the background screen color (in this case, blue) will be removed from the sampled pixels. The more to the left the slider moves, the more the color in the color chip will move toward the original foreground image's color. As you move the slider, the sampled color in the color chip changes in real time, accordingly. When you have the color you want in color chip, release the mouse

button and click on the **Apply**  button Primatte recalculates the adjustments and automatically updates the image on the monitor. Repeat this technique as necessary to eliminate all remaining bluescreen regions from the composited image.

TIP: Move the **De-color** slider to the right until the blue tinge just starts to disappear and then back it off to the left a little before clicking on the **Apply** button. Primatte works better if you make several small samples to the blue edges rather than a single major one.

- You can use the other two sliders in the same way for different key adjustments.


- **Clip Low Slider:** The **Clip Low** slider controls the matte softness for the color which is closest to the background color. For example, you can save lost rarefied smoke in the foreground by selecting the color in the **Tune Colors** mode and moving the **Clip Low** slider to the left.

- **Clip High Slider:** The **Clip High** slider controls the matte softness for the color which is closest to the foreground color. For example, if you have thick and opaque smoke in the foreground, you can make it semitransparent by moving the **Clip High** slider to the right after selecting the pixels in the **Tune Colors** mode.

TIP: If the foreground image changed color dramatically during the fine tuning process, you can recover the original color by selecting an area of the off-color foreground image and moving the **Clip Low** slider slightly to the left.

TIP: If these final operations have changed the final compositing results, you may have to choose the **Matte** view option in the Primatte window and again choose **Select Foreground** or **Select Background** to clean up the matte.

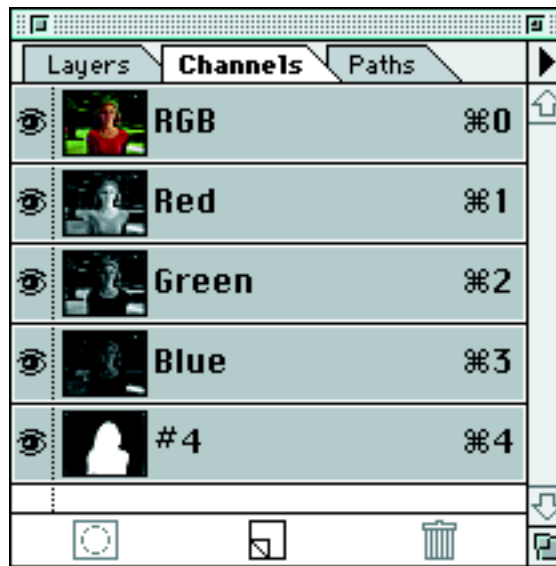
- When you have completed these procedures and have a good composite, click on the

OK  button in the Primatte window icon bar to accept the Primatte data settings and close the Primatte event window.

- This will remove the Primatte event window and return you to the original foreground and background image windows. However, you will notice that the image in the foreground image window has been replaced with the final composited image that was on the Primatte event window.

- Also notice that if you selected **Save matte to Alpha** in the **Process** menu and had opened the fourth channel prior to starting the Primatte event, you now have an alpha

channel that will be saved with the image.



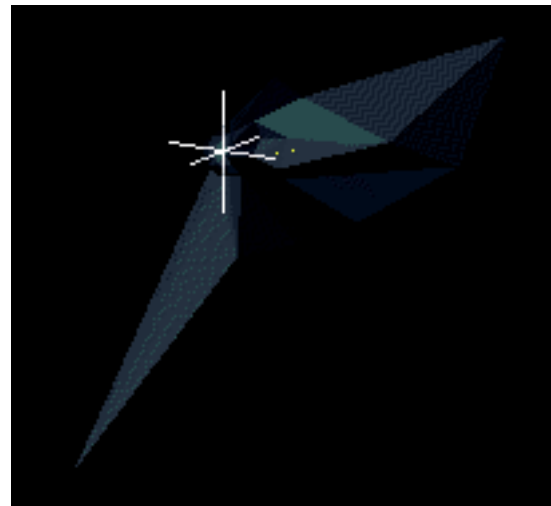
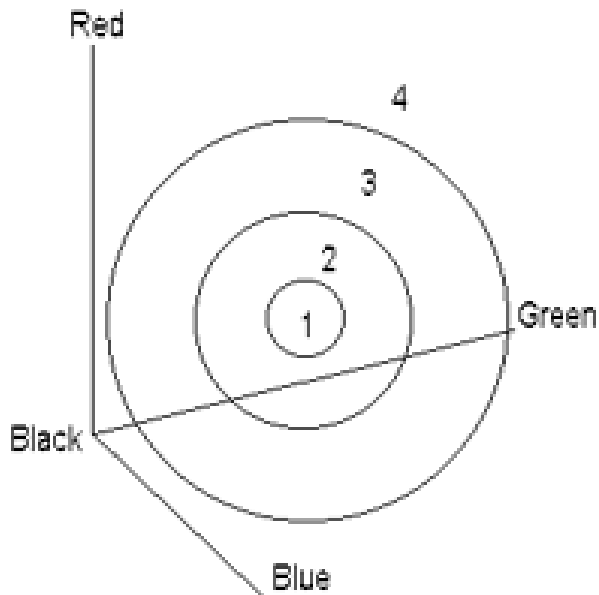
- You must now pull down the Photoshop **File** menu and select **Save As...** When the standard Windows 'Save As...' file dialog appears, select a new name for the composited image and hit the **OK** button.

6. The PRIMATTE Algorithm

The patented Primatte Polyhedral Slicing Algorithm is at the heart of the Primatte plug-in. To use Primatte most effectively, it sometimes helps to understand how the algorithm works. This is a brief explanation, to get a more extensive understanding, please contact P.E. Photron for a Primatte White Paper which explains the algorithm in more detail.

Basically, Primatte separates all of the colors in the foreground image into four separate categories. It does this by creating a 3D RGB color space for the foreground image and building three polyhedrons, one within the other to separate the colorspace into four cat-

egories.



A small polyhedron

While the polyhedrons are displayed as circular shapes in this drawing, in reality they each have 128 surface facets that can be distorted into many different shapes to accommodate each unique foreground image. An example of what the small polyhedron can look like is above on the right.

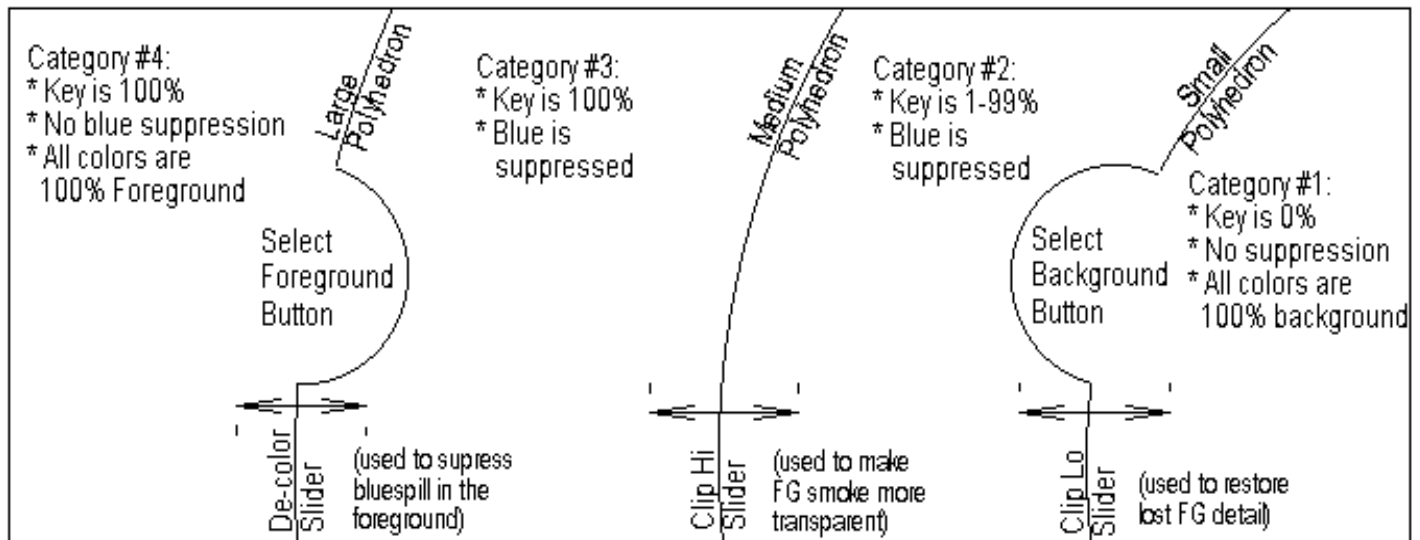
Category #1 is the small polyhedron and contains all of the pixels in the foreground image designated as 100% background. This means these colors in the foreground will be replaced completely with pixels from the background image.

Category #2 is the region between the small polyhedron and the medium polyhedron. These foreground pixels are designated as the transition pixels between the foreground and the background. These pixels are where Primatte blends the original background pixels with the foreground. Wisps of hair and smoke pixels are in this region.

Category #3 is between the medium and large polyhedrons. These pixels are 100% foreground, but have bluespill suppression applied to them. This is for pixels in the center of the foreground object. You want the bluespill suppressed, but you don't want background pixels blended in.

Category #4 is reserved for 100% foreground pixels that are unchanged from the original

image.



The sliders do not increase the entire circumference of the polyhedron, They just bulge or dent it in the particular color region that you selected prior to moving the sliders. After you have selected a bluish pixel in the Tune Colors mode and are moving the De-color slider, you are bulging the large poly and moving the selected color region from Category #1 to Category #2. This will leave the region as 100% foreground, but suppress the blue tinge. As another example, when you are in the Select Background mode, every time you designate a region of white noise, the small poly enlarges slightly in that direction (as shown in the above drawing) and makes those pixels 100% background. All foreground colors must reside in one of the four categories.

6. Troubleshooting Guide

Problem: I don't get the /Composite/Primatte option when I pull down the Filters menu.

Possible Solution: Check to see that Primatte.flt is installed in the \Photoshop\plug-ins directory.

Problem: After the composite is complete, I have some stray pixels in the background area that are not 100% background. I select Matte view and the pixels appear to be completely black. How can I get rid of these?

Possible Solution: In the Tune Colors mode, click on one of these pixels and then move the Clip Low slider to the right a little bit. This will move those pixels closer to the original background color.

Problem: After doing the 'fine tuning' procedure on a bluescreen image, I get a yellowish

tint on the foreground object in the final composite. How do I fix this?

Possible Solution: You may have done too much decoloring in the Tune Colors stage. It is best if you do several small incremental changes rather than one large decoloring. To recover from this problem, you can use the De-color slider. Select a section that includes the yellowish color and move the slider to the left a small amount. This should restore the original color to the yellowish area. You may have to go back in and do some more fine-tuning, but this time select only the pixels that contain some background color and make them small areas. Adjust the slider to the left only a small amount. You can also go to the Select Foreground mode and click once on the yellowish pixels. This should also make the yellow go away.

Problem: I get a red halo around the foreground object after compositing.

Possible Solution: This could be because of non-linearity in the foreground image color distribution. For PRIMATTE to deliver the best results, the foreground image should not have any pre-processing done to it. This leaves the edges of the image with a linear color distribution and allows PRIMATTE to do an excellent composite. If the foreground image was pre-processed, the soft-keying will produce a false-color processed foreground and result in a 'halo' effect.

Possible reasons for having a non-linear color distribution:

- 1) Edge enhancement filtering (a detail filter in the video camera) may have been applied to the original foreground when it is scanned from film. [Solution] Re-scan the film without filtering.
- 2) Poor filtering in the D1 4:2:2 to RGB decoding process. [Solution] Use a higher quality D1 decoder.
- 3) Inappropriate picture gamma value. [Solution] Change the RGB gamma (or Red gamma only) and save it. Use this image to composite in Primatte. After using Primatte, apply the inverse gamma value to recover the original picture tone.

7. If you still have a problem...

Please contact our technical support department at:

Phone: **800-486-2674** or

Phone: **408-454-9100**

FAX: **408-454-9600**

E-mail: **maxsupport@photoflex.com**