User Guide Addendum

This document describes these features of ColorSynergy version 4.1 that are not documented in the ColorSynergy User Guide:

- Custom Photoshop Working Spaces
- Digital Camera Profiles
- Modifying CMYK Output Profiles
- Setting up the Color Overlay
- Sizeable Preview and Edit Dialogs
- Color Savvy ColorMouseToo! Series
- X-Rite DTP41 and DTP41T Spectrophotometers

CUSTOM PHOTOSHOP WORKING SPACES

ColorSynergy allows you to create a custom RGB working space for use with Photoshop 5. It can also evaluate existing standard RGB working spaces, thereby helping you decide which might be best suited to your needs. This can be a tremendous benefit to users who understand the principles behind Photoshop's color architecture. So first, let's get a little background.

Background

With the release of Photoshop 5.0, Adobe introduced a new color architecture utilizing a device-independent RGB working space. This working space does not generally represent the characteristics of any physical device, but rather, serves as a theoretical reference to which input, display and output are all connected. Although many people associate device-independence with one of the CIE color models, such as XYZ or Lab, Photoshop's working space is indeed device-independent, even though it is represented as RGB. How is this so?

A reference space is described within Photoshop as a relatively small set of numbers: the chromaticity coordinates of the red, green and blue reference primaries (six numbers), the gamma (one number) and the chromaticity coordinates of the reference white (two numbers). Totaled up, this is nine numbers. There are standard, public, mathematical equations that use these nine numbers to convert back and forth between RGB and CIEXYZ. Therefore, if you know the equations (and all color management software does), and you know the nine numbers, the RGB values are equivalent to XYZ numbers, or at least they are a simple formula away.

This concept is similar to expressing a velocity as miles per hour or as kilometers per minute. If you know the proper conversion equation, you could express 100 miles per hour as 2.68 kilometers per minute. Both refer to the same velocity—they are just expressed with respect to different references. This same velocity could be equivalently expressed as 147 feet per second, 533 rods per minute or even 268,800 furlongs per fortnight! It doesn't matter because they all mean the same thing.

If they are all the same, why did Adobe choose an RGB reference instead of Lab or XYZ, and further, why are so many different forms of RGB offered?

There are many reasons why RGB might have advantages over XYZ or Lab in digital imaging environments. First, the RGB color model is probably better understood than XYZ or Lab by most users. That alone is a pretty good reason, but there are others. Images are generally saved in files in standard file formats, such as TIFF or JPEG. Many of these formats cannot represent XYZ or Lab colors, although a few can. They can all save RGB colors. Furthermore, since most file formats save the color information as 8-bits per component, there is a limited number of unique colors available (some 16 million colors for an RGB image), and one would like to use these efficiently, with minimal waste. Although 16 million may sound like a very large number, experienced users know that they are quite precious when it comes to preserving subtle image detail and avoiding posterization defects. As a general rule, an RGB encoding makes better use of the limited number of digital values available than does, say XYZ or Lab.

Ok, if we concede that RGB may be more appropriate than XYZ or Lab, why are so many different flavors of RGB offered in Photoshop? Wouldn't life be simpler if we all used the same one? The answers to these questions bring us to the crux of why we bothered to write, and you bothered to read, this long-winded discussion of Photoshop's working spaces. Choosing the "best" working space for you is a very difficult task, and due to the lack of available tools, must be approached in a trial and error fashion. Here are the goals when finding the best working space:

1) First, you must decide what set of colors is important to you. If you are a photographer scanning prints and transparencies, retouching them, and outputting to a film recorder, the colors available on photographic materials would be of primary importance. If you also go out to print, you would additionally be interested in the colors available on a press.

2) Given the set of important colors, whatever they may be, it would be nice to have a working space that enclosed them all, since colors that lie outside the working space cannot be correctly represented. The first impulse might be to choose the largest one and be done with it. However, choosing a working space that is unnecessarily large would be wasteful of the 16 million colors that are available. Therefore, we want one that is large enough, but just barely so.

3) The size of a working space is not the only way to measure its suitability. Its shape is equally important. If you bought your child a baseball bat for a birthday gift and wanted to wrap it, you would first need a box that was large enough to hold it. But it would be even nicer if the box was long and narrow rather than shaped like a cube. The same holds true for your working space. You ideally want the smallest

and best shaped working space that just encloses your set of important colors.

Unfortunately, Photoshop users have no way to evaluate the suitability of working spaces, nor to create one of their own that meets their needs. It is a complex, three-dimensional problem that users are ill equipped to deal with. This is where ColorSynergy can help. It allows you to define a set of important colors, and then to find the mathematically optimal working space that encloses them. This working space is saved from ColorSynergy as an ICC profile, which may be imported into Photoshop 5. You can also compare the standard Photoshop working spaces with your set of colors to see which might be most suitable for you.

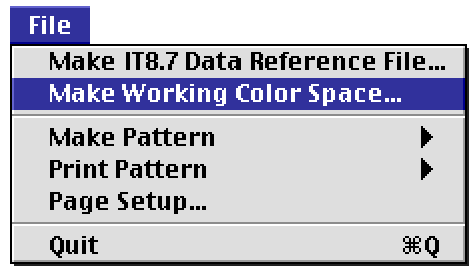
Creating the Workspace

ColorSynergy creates a custom working color space that minimally encloses a set of colors. The set of colors is drawn from any collection of ColorSynergy profiles and palettes. If you wish to include profiles or color palettes that were not created with ColorSynergy, you must import them first. If you wish to include the color measurements from an IT8 data reference file, you must first create a scanner profile from them, and then load the scanner profile. If you wish to include measurements from a color measuring instrument, you must first collect them into a ColorSynergy palette and then load that palette. If you have a database of colors, you may create a text file of measurements from it, import this text file as a palette and then load the palette.

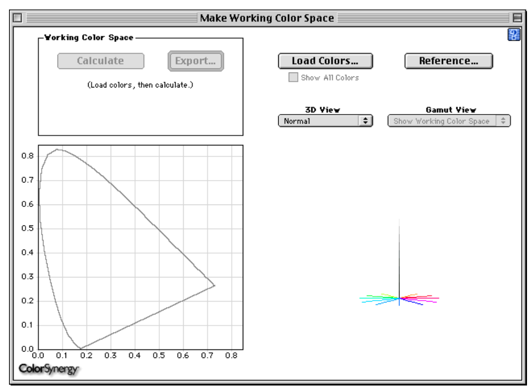
You can see that using these techniques, color sets may be brought into the working color space dialog from a wide variety of different sources. Palettes and profiles may be loaded in any combination, creating arbitrarily large color sets.

Here is the procedure you need to create a custom working space.

1 Select **Make Working Color Space…** from the **File** menu:

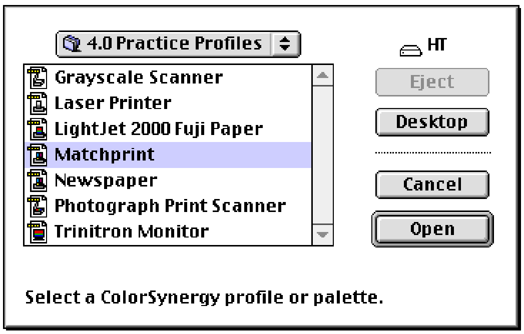


This will open the *Make Working Color Space* dialog:

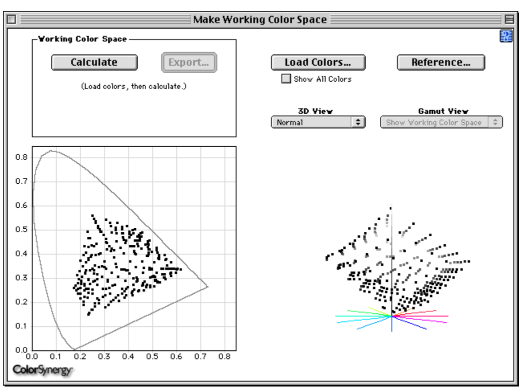


The lower left of this dialog shows a chromaticity diagram, upon which the loaded colors will be plotted. Gamut outlines will also be shown here. At the lower right is a 3D view of Lab color space. It may be rotated and stereoscopically viewed in a manner very similar to that used in the Gamut Viewer, described in *Chapter 3: Profiles, Gamuts and Color Spaces*. The panel at the upper left contains controls and information relating to the working color space. It is empty now because we have not yet loaded any colors. The upper right has the button used to load colors into the window, as well as a few other controls which handle the views.

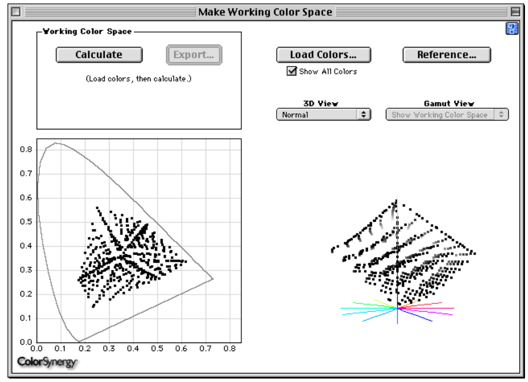
2 Before we can make a working color space, we must load colors that are important to us. To do this, click the **Load Colors…** button. This will bring up an open file dialog which allows you to open any ColorSynergy profile or palette. For this example, let's open a Matchprint output profile:



Opening this profile loads all of the 504 color measurements into the window. Each color is displayed as a black dot:

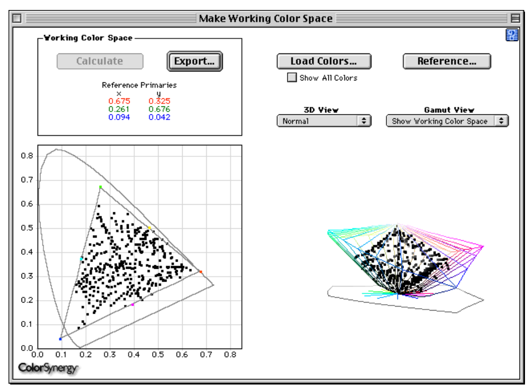


3 Actually, only the colors that lie on the outside of the gamut are shown. This is done to reduce visual clutter. If you really want to see all 504 of them, click the **Show All Colors** checkbox:



4 You may click the **Load Colors…** button again to add to your collection of colors. Add as many profiles and palettes as you wish.

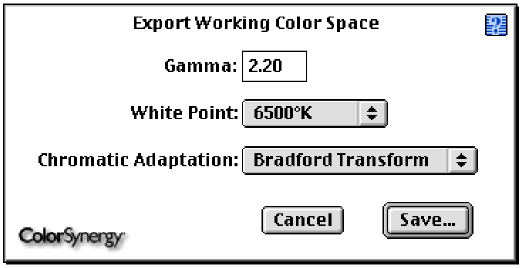
5 At any time, you may compute the optimal working color space by clicking the **Calculate** button. After a little thinking, ColorSynergy will display the working space both graphically and numerically:



By viewing the chromaticity diagram and the 3D model, you can see that all colors of the set lie inside the working color space.

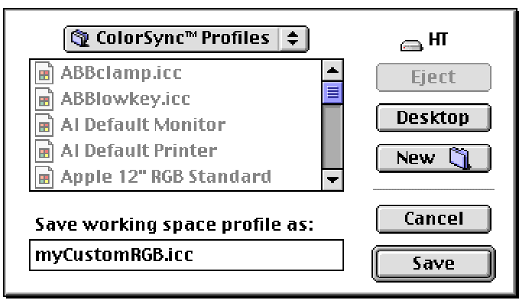
6 When you are finished loading colors, you may export the working color space profile as an ICC profile for use in Photoshop. To do this, click the **Export…** button, which will allow

you to specify the gamma, white point and adaptation method:



Recommended values are initially shown by default. Unless you have a compelling reason to change any of these, we suggest you leave them alone.

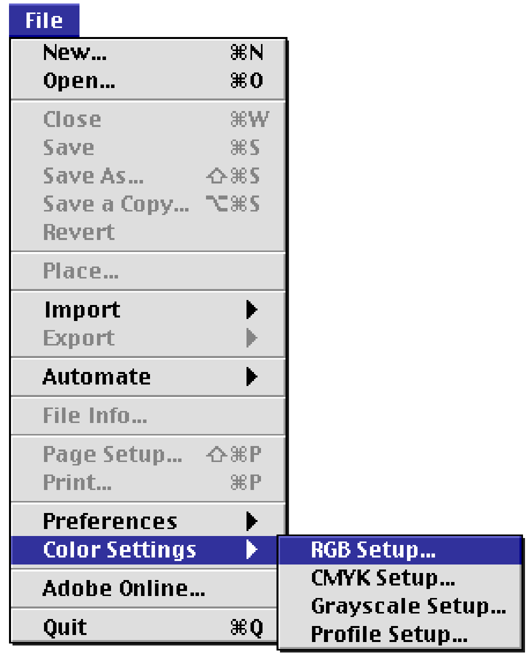
7 Click the **Save…** button to save the ICC profile:



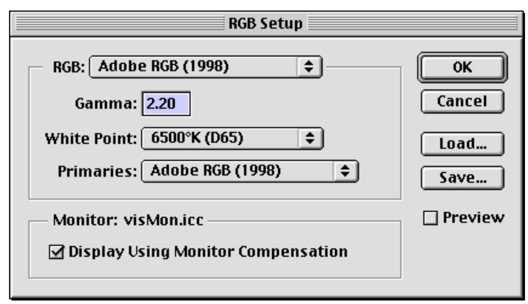
Installing the Working Space in Photoshop

After a working space profile has been made, you should install it in Photoshop. Here's how, using Photoshop 5.0.2 as an example:

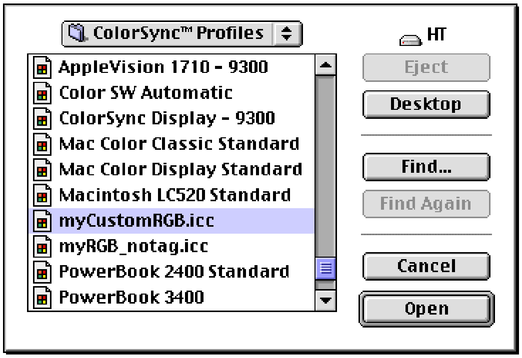
1 Select **RGB Setup…** from the **File/Color Settings** command:



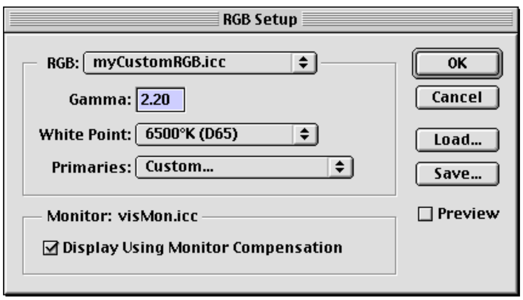
This opens the *RGB Setup* dialog:



2 Click the **Load…** button, which brings up an open file dialog:



3 Find the working space profile you made with ColorSynergy and open it. It will now appear in the *RGB Setup* window:

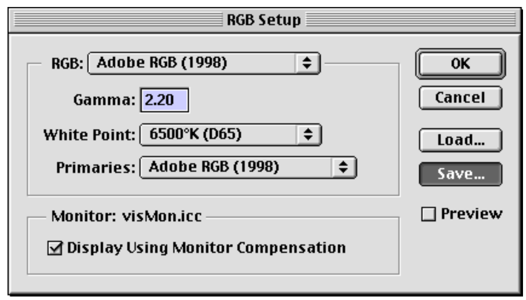


4 Click **OK** to finish. The custom working space you made is now installed into Photoshop and will be used for color conversions and embed-ding just as one of the standard Photoshop spaces.

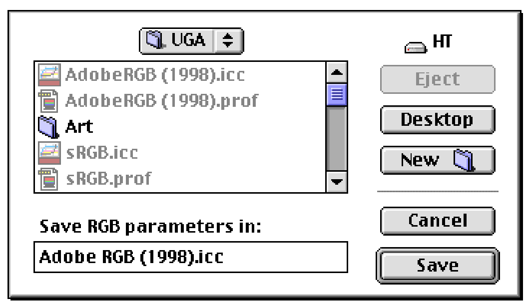
Evaluating Default Working Spaces

Another important aspect of the Photoshop working spaces is deciding if one of the default spaces is suitable for your needs. If it were, then perhaps you could just use one of the standard spaces and not need to make a custom one. Unfortunately, there are no tools available that allow one to evaluate these standard spaces against your color set. ColorSynergy brings that needed tool by allowing you to load in a *reference* profile, which typically, but not necessarily, would be one of the standard Photoshop defaults. By viewing your color set in relation to the reference profile, you may easily see how well suited the reference is to your needs. Here's how it is done:

1 From Photoshop's *RGB Setup* dialog, select the working space of interest and then click the **Save…** button.

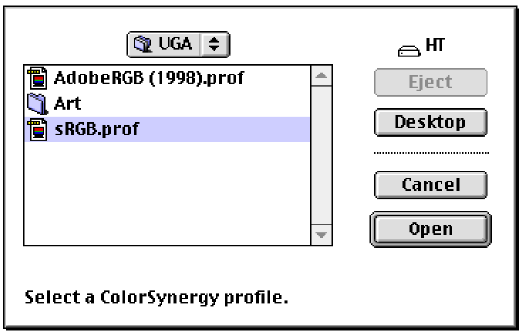


2 You will now be asked to name the ICC profile that is about to be written:



3 In ColorSynergy, you should import this ICC profile into ColorSynergy's native format (be sure to select Bradform adaptation). Profile importing is described in *Chapter 14: Importing Profiles*.

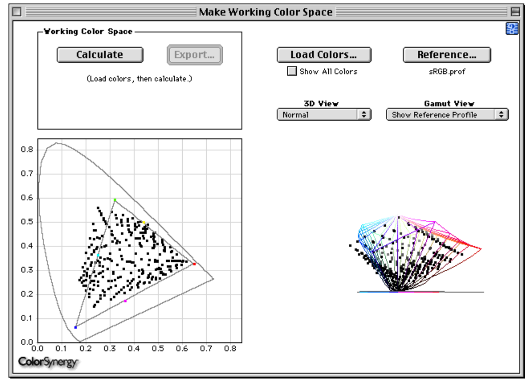
4 In the *Make Working Color Space* dialog, load your color set using the **Load Colors…** button as described earlier. Then, to compare these colors against the Photoshop working space, click the **Reference…** button and select the profile you imported in step 3 above (or any other profile for that matter).



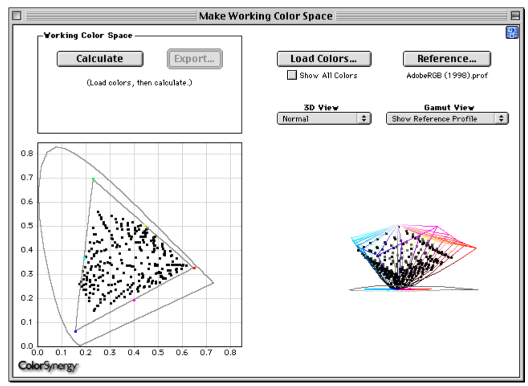
Select a profile, in this example the sRGB working space profile.

5 In order to see the gamut of the reference profile, you must set the **Gamut View** pop-up menu to **Show Reference Profile**:

Our color set in this example is the Matchprint profile. By rotating the sRGB gamut around a little, we can see that many of the cyan colors lie outside the sRGB gamut. This particular example is a well known limitation of the sRGB working space to those users working in print.



If we load a different working space profile, say Adobe RGB (1998), we see that this space is very close to containing all Matchprint colors:

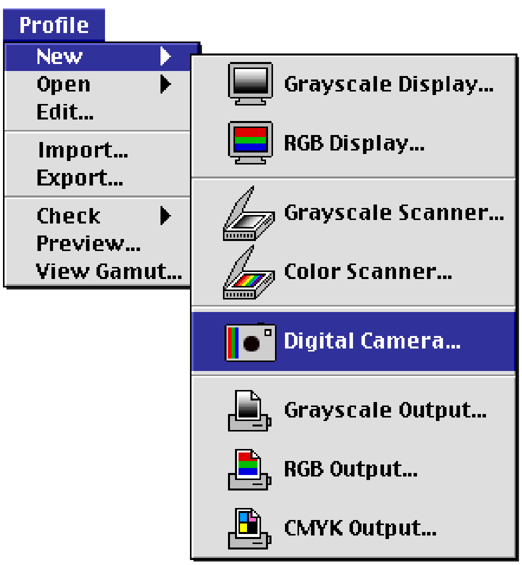


This suggests that perhaps Adobe RGB (1998) might be a better choice for images targeted for press.

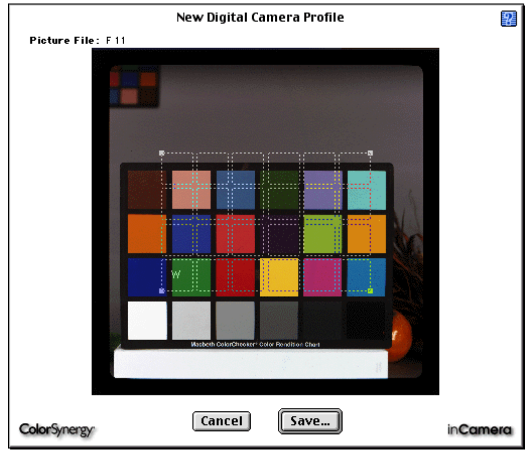
DIGITAL CAMERA PROFILES

The procedure for making a Digital Camera Profile includes identifying the Macbeth ColorChecker Chart in a picture that was taken with your digital camera. Prior to version 4.1, a rectangular marquee was used. A template of the Macbeth ColorChecker chart is now used, allowing more flexibilty in the selection of the chart, accommodating cases where the chart was rotated or had some perspective distortion when the picture was taken.

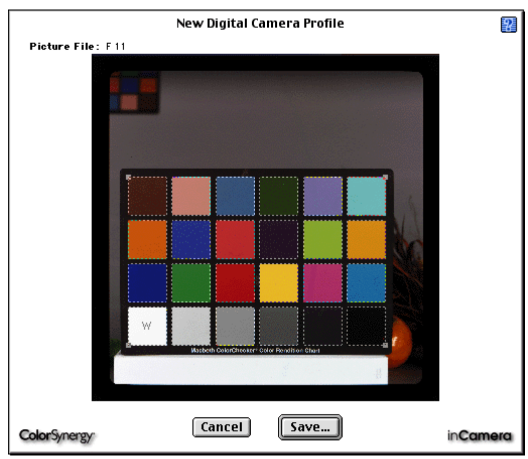
1 Select **New** in the **Profile** menu and then choose the **Digital Camera…** option:



When you have opened a digital camera picture that contains the Macbeth ColorChecker Chart, a representation of the image and a template will be displayed:



You should move each of the four corner handles until the template is aligned with the Macbeth ColorChecker Chart in the image, with the 'W' positioned over the white swatch. The template will be used by ColorSynergy to determine the exact position of each color swatch.

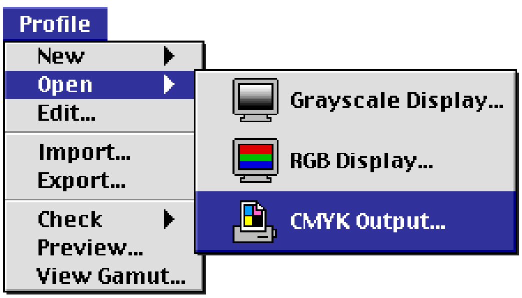


After you have positioned the template so that it is aligned with the Macbeth ColorChecker Chart, continue by clicking the **Save...** button to save the profile.

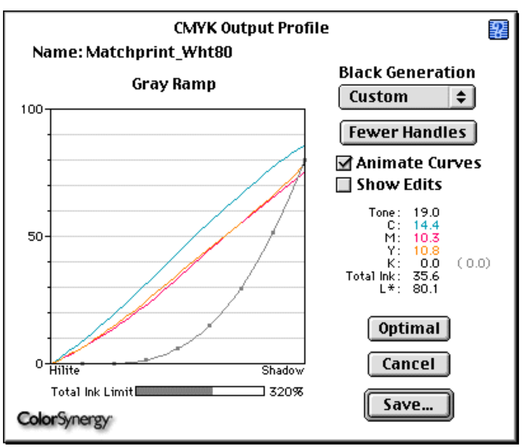
MODIFYING CMYK OUTPUT PROFILES

If you have used the Profile Editing tools to edit the inputs of a CMYK output profile, setting the black generation parameters can be confusing. It is now possible to control whether the edits are enabled during this process.

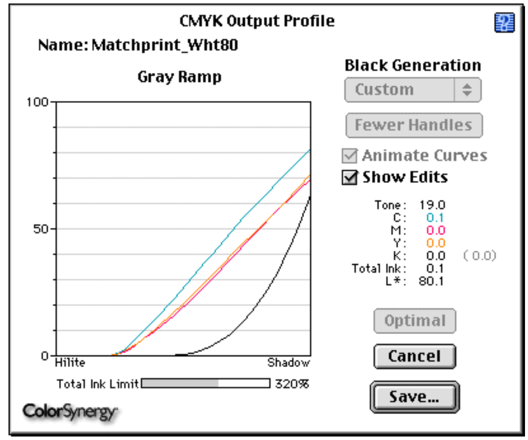
1 Select **Open…** from the **Profile** menu, then choose **CMYK Output…**



2 If you open a profile that includes input edits, you will see the new **Show Edits** checkbox. By default, the curves are drawn as if the profile had not been edited:



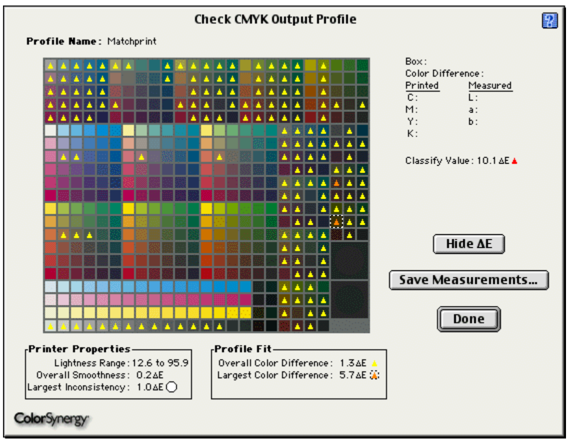
3 If you check the **Show Edits** checkbox, the CMYK curves will be re-drawn, showing the effects of the edit. In this example, the profile includes an edit that has lowered the white point to an L* value of 80:



In this mode, you cannot change the black generation parameters, but you can see the effects of the input edit in combination with the current black generation parameters.

Setting up the Color Overlay

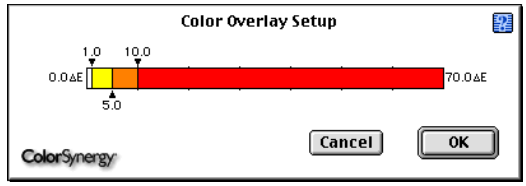
A transparent region has been added to the Color Overlay that is used throughout ColorSynergy to represent color differences and distances. Prior to version 4.1, even the smallest color differences were represented by some color in the overlay. Providing a transparent region unclutters the display, making it easier to see the larger color differences that you are probably more interested in, as in this example of checking an output profile:



The size of the transparent region is controlled in the Color Overlay Setup dialog.

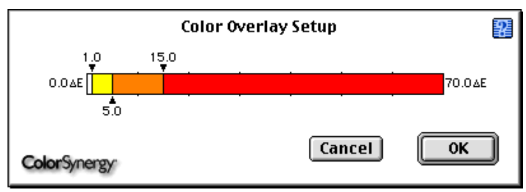
1 Select **Color Overlay…** from the **Setup** menu:

This will bring up the *Color Overlay Setup* dialog:



The Color Overlay control contains a horizontal measuring bar, much like a ruler, that is divided into four regions: one transparent, one yellow, one orange, and one red. The bar measures units known as **ΔE** (delta E), which precisely express the *perceptual difference* between any two colors.

2 Above and below the bar are three adjustable triangular handles, which you can click and drag either right or left to set the color coding thresholds to suit your needs.



The *leftmost* arrow *above* the bar is initially set at 1.0 ΔE. It defines the upper boundary of the transparent region, the region of image colors that are in gamut or so close to being in gamut that they will not be shown in the color overlay. The arrow *below* the bar, which is initially set at 5.0 ΔE and which defines the upper boundary of the yellow region, indicates colors that lie just out of gamut. The *rightmost* arrow *above* the bar, which is initially set at 10.0 ΔE and which defines the upper boundary of the orange region, indicates colors that are moderately out of gamut. Finally, the red area along the bar defines the broad region from 10.0 ΔE to 70.0 ΔE, an area that would be widely out of gamut for any profiled device.

3 Clicking directly on a color region within the bar will display the current Color Picker, enabling you to choose a new default color for that region. You cannot change the color of the leftmost region. That region of the overlay will always be transparent.

SIZEABLE PREVIEW AND EDIT DIALOGS

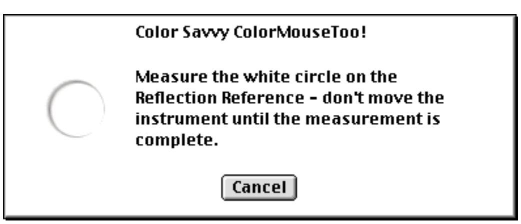
You can now use standard window controls to change the window size when you are Editing or Previewing profiles. Increasing window sizes will also increase memory requirements, so you may find that you need to increase ColorSynergy's memory size. You can do this by quitting ColorSynergy, then selecting the Get Info item from the Finder's File menu and finally changing the preferred size field and re-launching ColorSynergy.

COLOR SAVVY COLORMOUSETOO! SERIES

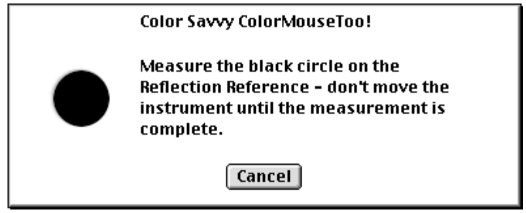
Problems with the interface to the CM2S Spectrophotometer have been fixed in version 4.1.

There has also been a change in the calibration procedure. Color Savvy now recommends that the white calibration be done before the black calibration.

When you begin a measuring session with a ColorMouseToo! instrument, you will notice a delay of several seconds while the instrument is initialized. Then you will be asked to do the white calibration:



Be sure to leave the instrument positioned over the white circle until the measurement is complete, at which time you will be asked to do the black calibration:



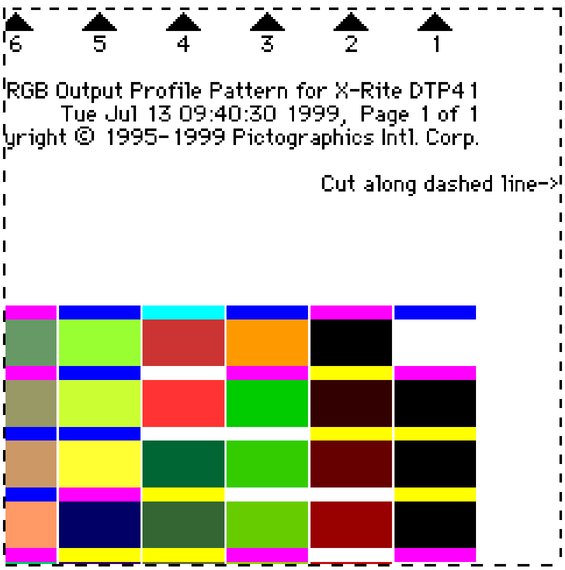
Again, be sure you don’t move the instrument until the calibration dialog disappears, indicating that the calibration process is finished.

At this point, you may proceed to make color measurements as you did with earlier versions of ColorSynergy.

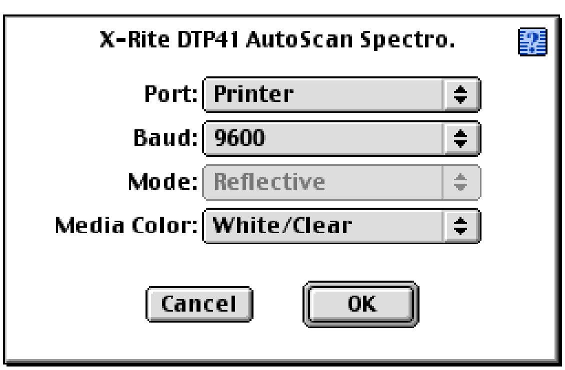
X-RITE DTP41 AND DTP41T SPECTRO-PHOTOMETERS

Test Patterns

Improvements have been made in the test patterns that are used for these strip reading instruments. The most noticeable difference is that the dividing lines between color swatches are now colored rather than black and white:



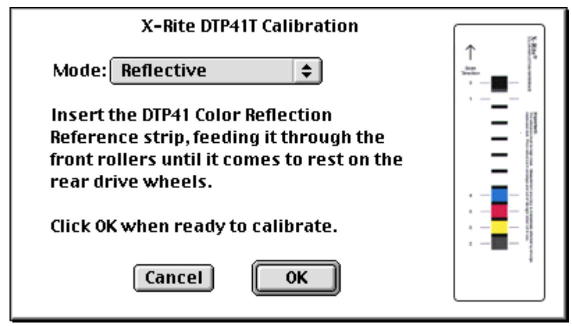
Due to this change in the dividing lines, the **Test Pattern Dividing Lines** slider is no longer useful and has been removed from the DTP41 setup dialog:



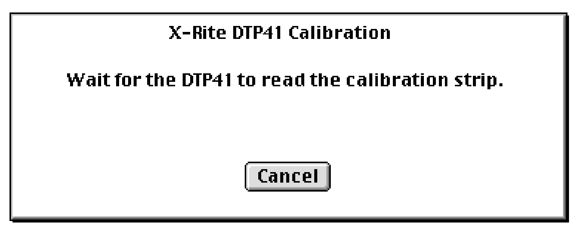
Note that because of these differences, test patterns that were made with earlier versions of ColorSynergy cannot be measured with version 4.1. You must re-print your test patterns in the new format.

Calibration Procedure

There have also been changes in the calibration procedure. If you are in **Reflective Mode**, the calibration procedure begins with this dialog:



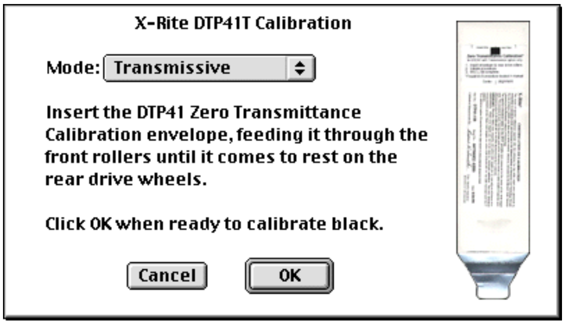
At this time, as with previous versions of ColorSynergy, you must insert the DTP41 Color Reflection Reference into the front of the instrument, with the arrow pointing toward the instrument, and centering the strip of color swatches (not the arrow) on the alignment mark on the instrument. Push it in until it rests against the drive rollers, and then click the **OK** button. This dialog will appear:



The DPT41 will hum for a moment, then pause briefly and then hum a second time while it begins to pull the Color Reflection Reference. If the

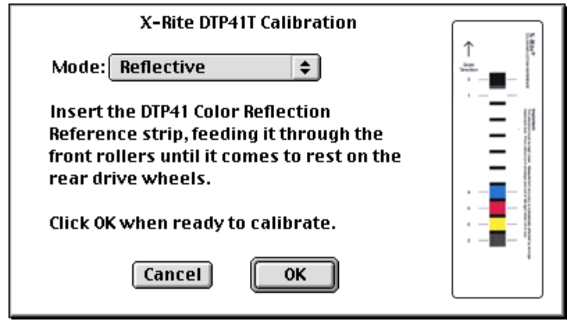
Reference does not begin to move when the second hum starts, give it a little nudge.

In **Transmissive Mode**, a black calibration is now required. The transmissive calibration procedure begins with this dialog:

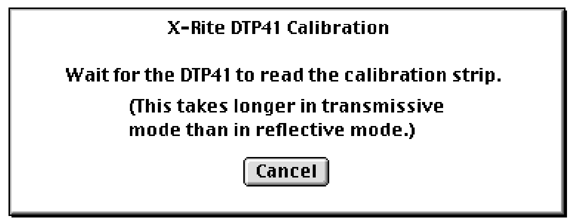


Remove the Reflection Reference from its card-board sleeve, and insert the bottom end of the cardboard sleeve into the front of the instrument, aligning the black color swatch with the alignment mark on the instrument. Push it in until it rests against the drive rollers, and then click the **OK** button. This dialog will appear:

You will hear the instrument hum several times during this calibration. When the black calibration is complete, this dialog will appear:



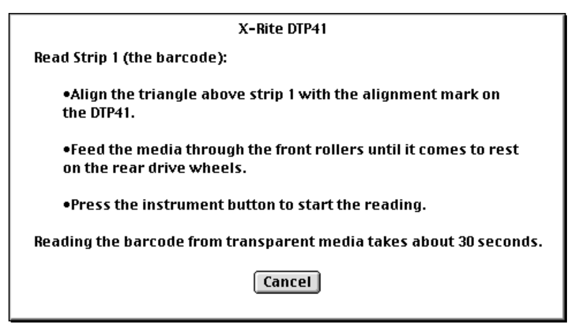
As described earlier for reflective mode calibration, insert the Color Reflection Reference into the instrument, and then click **OK**. This dialog will appear:



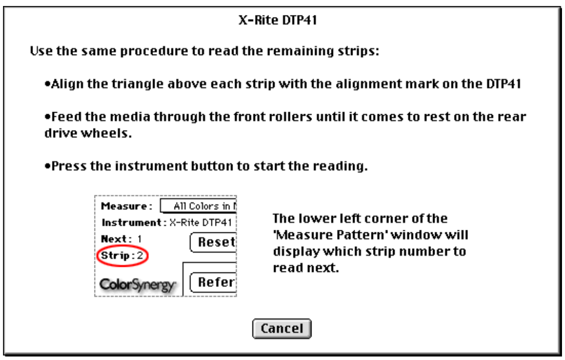
This calibration takes slightly longer in transmissive mode that it does in reflective mode. The instrument continues the calibration procedure for a time after the Reference strip has been read.

Color Measurement Procedure

The calibration procedure is followed by reading the bar code strip. Reading this strip takes longer in transmissive mode than in reflective mode, but the same procedure is followed in either case:



Insert the test pattern print into the instrument, aligning the small black triangle above strip 1 with the alignment mark on the instrument. Push it in until it rests against the drive rollers. Press the instrument button on the DTP41, and as the strip moves through the instrument, help to guide it so that the alignment mark remains in the center of the strip. Remove the paper from the back when the entire strip has been read. The following dialog will then describe how to use the same procedure to measure the remaining strips:



Continue this process until all strips have been measured.