Photoshop 5.0's Color Management: Misunderstandings and confusions Part 1:
The RGB Set-Up.

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At the time of this writing, Photoshop 5.0 (now known as 5.0.2) has been shipping for nearly 10 months. Since the product shipped a great deal of excellent information from various sources has surfaced in aiding users in getting a handle on the Color Management features of Photoshop 5.0. I've spent considerable time on various internet lists and other on-line forums discussing many issues with users who are attempting to set up Photoshop 5.0's color management preferences and hope to understand what Adobe has accomplished with respect to the new workflow. I've seen a number of misunderstandings and some confusion about various issues and hence this article. I hope to go over some issues in the attempt to clear up some confusion that might not be been covered in my first article (Photoshop 5.0's Color Management; available for download at http://www.digitaldog.net).

It appears that no single area has caused more confusion than the RGB Working Space and the RGB Set-Up in Photoshop 5.0. If you have read my original article, I attempted to explain the "how's and why's" of using one of the hard-wired RGB Working Spaces supplied by Adobe in the RGB Set-Up.

Two common areas of confusion are the choice of a RGB Working Space and the role of the "Display Using Monitor Compensation" check box found in the RGB Set-Up. Another common confusion involves the Gamma settings of RGB Working Spaces.

<u>Confusion #1: Load the ICC profile of the display into the RGB Set-Up as a Working Space.</u>

I mentioned in my original article, RGB is a device dependent color space. There is little we can do about this, and yet Adobe did produce a rather clever way around this problem with Photoshop 5.0.

In previous versions of Photoshop the condition of your actual display was your Working Space (a better term may be Editing Space). The condition and idiosyncrasies of the display had a profound impact on the editing of all files in Photoshop. For whatever reason, everyone believed that *THEIR* monitor was somehow "correct" which of course wasn't the case. Users who adopted calibrated displays using hardware were in a somewhat better situation, but problems still existed. There are other reasons that these RGB spaces are poor choices for editing files. Chris Cox of Adobe recently responded to the topic on the ColorSync List* with this quote:

RGB editing spaces are simplified for a reason -- most RGB profiles/colorspaces are horrible spaces to edit in because of (pick all that apply):

1) Equal amounts of Red, Green, Blue don't give a neutral color
2) Equal adjustments to different tonal ranges result in different effects
3) 3D LUTs are slow to use for realtime display

Adobe realized that in order for color management to work, the display had to be taken into serious

account. They also realized that the vast majority of Photoshop users were not going to spend hundreds if not thousands of dollars to calibrate and profile their monitors. The latter isn't even possible for the vast majority of users on the Windows platform. What Adobe did was to separate the actual condition of all these monitors from the editing space; a major departure from other versions of Photoshop or for that matter any other imaging application. This could be accomplished if two issues were accounted for:

1. Users would have to adopt a standardized editing space that was completely independent of their individuals displays. By doing so, editing a file would not be based on the device dependent nature of the display.

2. Users would have to precisely describe the condition of their monitors. This would be accomplished by creating an ICC profile that reflected the condition of the specific display.

You will see how the RGB Working Space and the Display Using Monitor Compensation will solve many problems and how the two are solidly linked to each other.

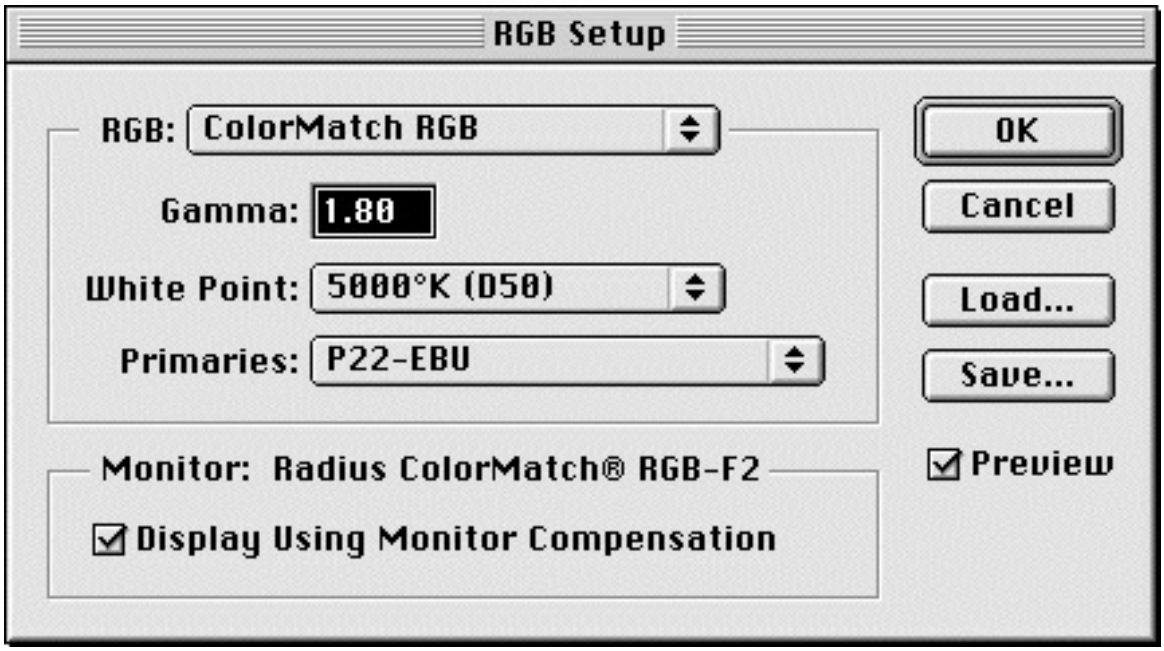
By uncoupling the "Editing Space" from the actual monitor, Adobe needed to come up with one or more editing spaces for users to pick. In Photoshop 5, we got 9 different options to chose from and these spaces would to selected based on the kind of output we intended to produce. The spaces are not based on any individual monitor but rather specifically adopted spaces found throughout the industry. A good example is ColorMatch RGB. Radius had been manufacturing the PressView calibrated displays using hardware Colorimeter's for years. Once a PressView user calibrated their displays to what Radius called "ColorMatch RGB" all such displays were said to be perceptually identical. That meant that all users who calibrated their PressViews to the same standard (ColorMatch RGB) would see the same file appear the same way on all PressView monitors. Here, the editing space *WAS* ColorMatch RGB as we know it in Photoshop 5.0. Users of PressViews and other similarly calibrated displays like those from Barco, the Mitsubishi SpectraView, the LaCie 21/108's with colorimeter or other 3rd party displays calibrated using hardware to Gamma 1.8, D50 were working in an editing space that closely or identically matched ColorMatch RGB. The other RGB Working Spaces (sRGB, Wide Gamut RGB, etc.) were similar in that these editing spaces were not based on individual monitors but rather a "standard" description of a monitor/editing space. This is opposite to the individual user that had his or her monitor in whatever condition the display happened to be set to either right out of the box or after the user fiddled with the controls on the display. The problem here is that these displays were uncalibrated, and worse, files created in this fashion were saved in an ambiguous, non defined RGB editing space. This made it almost impossible to share files with others and expect those users to have any idea of what the files actually looked like on the original display. In addition, those that made RGB to CMYK conversions were getting different results because the conversion was based on the description of the monitor (if one existed) in the Monitor Preference file required in older versions of Photoshop. While RGB cannot truly be device independent, many are calling the RGB Working Spaces in Photoshop 5.0 Quasi-Device Independent because they are not based on a single device. In addition, none of the kinks and idiosyncrasies of individual devices are found in these standardized RGB Working Spaces. In Photoshop 5, when a user makes a conversion to either CMYK or to a RGB output space, the conversions can be identical on multiple machines thanks to the standardized RGB Working Space.

If you are following me so far, you should now get the idea that it is a very bad idea to attempt to

load a monitor ICC profile as your RGB Working Space. The monitor profile you make using either Adobe Gamma or a 3rd party hardware device describes the unique condition of your display; those kinks and idiosyncrasies. Why would you want to edit in such a space? It defeats the entire approach to using these Quasi-Device Independent RGB editing spaces.

Confusion #2: Turn off "Display Using Monitor Compensation."

The monitor profile plays a critical role which brings us to Display Using Monitor Compensation (DUMC for short). Just because all users in one web design firm pick the same RGB Working Space such as sRGB, or a Prepress shop adopts Adobe 1998, it doesn't mean that all these users will see the same image identically on multiple machines. Photoshop needs to be informed about the specific condition of each display which are all different from each other. By using Adobe Gamma or a 3rd party hardware device to calibrate and more important, profile the monitor, we now have an ICC profile that describes the condition and unique kinks and idiosyncrasies for each display. DUMC produces an on the fly conversion from the RGB Working Space (sRGB or Adobe 1998 in these two cases) to the monitor. This insures that ALL users perceptually see the same image despite the condition of their display. DUMC compensates for the kinks and idiosyncrasies as the name implies! Let's say we have two users who are in this design firm and one has a new display the other an older display. The older display is darker and bluer by a factor of 5 (this figure is used for illustration only, I simply made up a value). The ICC profile that describes this display knows the condition of this display and the fact that the display is dark and blue by a factor of 5. DUMC will use this information to correct the on-the-fly conversion for this monitor by a factor of -5 so that the kinks and idiosyncrasies are compensated for. Both users see the same image perceptually because both users have the same RGB Working Space (sRGB or Adobe 1998 in this example) and both users have ICC profiles that describe the unique conditions of each displays. Naturally for this to work, DUMC must be on! There are very rare situations when a user would want to turn off DUMC. Keep Display Using Monitor Compensation on.



Be sure that the Display Using Monitor Compensation check box is on as seen here.
Also notice that just above the check box is the ICC profile of my monitor (Radius ColorMatch) which is being accessed from the profile loaded in the ColorSync Control Panel. Load your monitor profile as the using the "System Profile" popdown in that control panel.

Many users have stated that they get “better” previews with DUMC off or will report that when DUMC is on, they get a strange looking preview. This would lead me to suspect that there is something fundamentally wrong with the ICC profile that describes the condition of the display, or these users have the RGB Working Space and the actual file mismatched. Therefore, when a user reports that they are getting better results with DUMC off, something, somewhere isn’t right and it’s time to investigate the various color preferences or the quality/accuracy of the ICC display profile. Be sure the correct ICC profile for the display is being use. In the RGB Set-Up you will see the ICC profile that is loaded in the ColorSync control panel just below Display Using Monitor Compensation. Make sure the correct monitor profile is loaded as the System Profile in the ColorSync control panel and hence shows up in the RGB Set-Up.

What may not be obvious is that with Photoshop 5.0, the ICC profile that describes the condition of the display is more important than the actual calibration of the display thanks in large part to Display Using Monitor Compensation. This is only true for Photoshop 5 today. Calibration for visually editing images is still a lofty goal for other applications although the approach Adobe has taken with Photoshop makes much better sense.

Confusion #3: Match the Working Space Gamma and the monitor Gamma.

Confusion #3 concerns the gamma of your RGB Working Space and the Gamma of your display. Many users confuse the two and either attempt to change the Working Space Gamma or the Display Gamma to match. The two figures for Gamma are only related by virtue of the word “Gamma”! A Working Space and a monitor may and often will have different Gamma settings. While there is some debate about the proper and appropriate gamma setting for your display, I seriously advice you *NOT* to alter the RGB Working Space Gamma! For one, anytime you alter ANY of the settings in one of the hard wired RGB Working Spaces, you now have a “Custom” RGB Working Space. Unless you really know what you are doing, you do not want to create a Custom RGB Working Space. This will insure that trading files with other users will become more difficult. As I mentioned in my first article, all files saved out of Photoshop should, in almost all cases have an embedded ICC profile that describes the condition of the file. RGB files will have the RGB Working Space embedded in saved files when the Profile Set-Up is properly configured. If you create a custom RGB Working Space, that profile will be embedded in that file. Unless you save out that Custom ICC profile and supply it to other users who are not in possession of that custom profile, they will get a Profile Mismatch when they open the file. These users will not be able to deal with that file as intended without the custom profile being available to them. The analogy I find useful is that of using a Page Layout application with fonts that are not installed by system software. If you provide a page layout file without the proper fonts, the formatting is altered when the file is opened. In fact most page layout applications will warn you when you open a file that was made with a font that isn’t currently installed on your system. This is just like the Profile Mismatch in Photoshop 5.0! Therefore, custom RGB Working Spaces can be used if necessary but the ICC profile should be supplied to the intended users unless you expect to have the other user convert the file into yet another RGB Working Space (which is unlikely and often unnecessary).

In closing, pick an RGB Working Space based on the kind of work you intend to produce and embed that profile in all your saved files. Make sure you have DUMC on and make sure you have a good ICC profile describing the characteristics of your display loaded in the ColorSync Control Panel but not as an RGB Working Space. If you follow the recommended workflow suggested by Adobe and you have good profiles, your monitor to print matching will be excellent. In addition, the proper use of the RGB Working Space will be used for doing any mode changes (RGB to CMYK/RGB to RGB) as well as other transformations using Profile to Profile.

*A great source of information about color management can be found on Apple's ColorSync list. http://webx.lists.apple.com/webx?14@^1297@.ee6b358.

** There are actually 10 spaces but one, Simplified Monitor RGB isn't device independent like the other spaces since it's based on editing with the monitor ICC profile a user creates. This space is tied directly to the individual monitor hence it's not a very good option for an Editing Space.

Comments or corrections needed for this or any other article are welcome and appreciated.

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