

Digital Imaging Part 3: Accurate Input

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[Digital Imaging - Part 1](#)

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Most people feel that the basic principles of ICC color management are not too difficult to understand. Each device in our imaging workflow produces color differently; color management corrects for those differences by utilizing profiles that describe the color behavior of each device. The result is consistent, accurate color as images move from input to output. However, applying that understanding in the real world - in scanner drivers and Photoshop's color settings - leaves people feeling bewildered.

In *Digital Imaging Part Two*, I introduced some of the basic concepts of ICC color management and its significance in achieving consistent, accurate color in a digital imaging workflow. In this month's article, I'll show you how to begin putting ICC profiles to use by examining three ways to achieve accurate image input.

Before Getting Started

One of the minimum requirements for implementing a reliable workflow is to have a properly calibrated and profiled monitor. Ideally you will use a hardware-based profiling package, such as Monaco EZColor with MonacoSensor or ColorVision PhotoCal or OptiCal with the Monitor Spyder. If you do not have a hardware-based package, then the next best choice is to use Adobe Gamma, which is installed with Photoshop 6 and Photoshop Elements. Adobe Gamma is a wizard-like applet that will lead you through the process of creating a monitor profile. The accuracy of profiles built with Adobe Gamma depends heavily on the profile used as a starting point. Most monitors should come with a generic ICC profile that you can use for this purpose. If not, you will have to pick one of the preinstalled profiles that come with Windows or Mac OS that matches your display as closely as possible.

It is not an absolute requirement to have custom profiles for each of your input devices, but it certainly helps. Some scanners come with generic profiles that can work reasonably well. If you own Monaco EZColor or some of the more expensive profiling packages, you can build custom scanner profiles that usually do a better job than generic profiles (Mac users have more inexpensive options besides EZColor, such as ProfileCity's ICC Scan).

Most digital cameras do not implement any kind of color management and are difficult to profile except under controlled-lighting situations. However, there are a number of profiles available on the Internet for some of the most popular cameras that work reasonably well, and a few cameras are now available that offer a choice of standard working spaces for image output. In the absence of a profile for your input device, you will have a few options for getting your images into a color-managed state. I'll delve into that a little further in a moment.

Before getting started, be sure you have set up your Photoshop working space and the various options for handling image profiles. With version 6, Adobe consolidated all of Photoshop's color settings into a single dialog box, making configuration simpler than before. To open the Color Settings dialog in Photoshop, select Edit > Color Settings. For the purpose of this article, I will use Adobe RGB (1998) as my default RGB working space (we're not concerned with any of the CMYK, Gray or Spot settings). In addition, I want Photoshop to prompt me when I open images that do not have an embedded profile or a different profile than my working space. Rather than check-off all the options individually, I can select U.S. Prepress Defaults in the Settings drop-box, which has all of the options I want (Figure 1 on [Illustrations Page 1](#)). Click OK to activate the settings.

Input Method 1: Manage Color During the Scan

Before we can do anything with an image we have to get it into the computer, and just as important, get it into the color management system. The standard workflow most people are familiar with is to use the scanner's eyedroppers, levels and curves tools to optimize color and contrast as much as possible during the pre-scan. If your scanner's software is ICC compliant, or at the very least, implements some notion of color management, the image will be displayed on-screen using your monitor profile to offer an accurate preview.

Once the image is to your liking, the scanner's software driver converts the image to a standard working space during the final scan and saves the image as an 8- or 16-bit TIFF. If your scanner does not embed the working space profile in its output, Photoshop will recognize this when you open your image and prompt you with the Missing Profile dialog. Simply select Assign Working RGB if your Photoshop working space matches the one you chose in your scanner's color management setup and click OK.

Input Method 2: Manage Color After the Scan

The above method works well enough, but most scanner drivers offer small image previews, a limited choice of color spaces for output and color correction tools that pale in comparison to Photoshop's. My preferred method for scanning slides is to output the raw, high-bit RGB data ("high-bit" is anything greater than 8 bits-per-channel), then apply my scanner's ICC profile and convert the image to a standard working space when I open the image later in Photoshop. This way, I capture the maximum amount of image detail my scanner is capable of delivering and achieve accurate color while freeing myself to use Photoshop's vastly superior tools for performing all tonal and color corrections. I also save time and reduce the likelihood of damaging my precious film because the scanning process has been reduced to the absolute minimum (insert a slide and scan). For this to work, your scanner software should be able to output uncorrected 48-bit TIFF files (most can) and you must have an ICC profile for your scanner.

My specific workflow is as follows. First, I disable all color management options in my scanner's driver. The specific settings will be different for each model, but my scanner's Preferences dialog is shown in Figure 2 on [Illustrations Page 1](#). In addition to these settings, I make no tonal or color corrections before the scan (the Levels and Curves controls are disabled). Once I have scanned and saved an image, I will open it in Photoshop (I prefer to use the scanner driver as a stand-alone program rather than as a TWAIN Acquire module or Photoshop plugin). The image from my scanner does not have a device profile embedded, so Photoshop's Missing Profile dialog will appear asking me what to do.

If I choose "Leave as is," the image will look extremely dark. This is the raw, uncorrected data from my scanner. Instead, I will select Assign Profile, pick my scanner's profile from the drop-down list, and check the box to convert to working RGB (See Figure 3 on [Illustrations Page 1](#)). When I click OK, Photoshop will use my scanner profile as the source profile, then convert the image to Adobe RGB. The result is a much more useable image, with good color, tone and contrast (See Figure 4 on [Illustrations Page 1](#)).

Once I've made final tonal and color corrections, I will save the image, choosing to embed the Adobe RGB profile. Photoshop won't prompt me with the Missing Profile dialog the next time I open the image.

Input Method 3: Unprofiled Device

The above method works extremely well when you have a good input profile for your scanner, but what about when you're working with images from a digital camera? Very few digital cameras today offer color-managed output, and good camera profiles are hard to come by. Even if you do find a profile for your camera, it's unlikely it will work well for every image.

Faced with this situation, you might think that digital cameras just can't be color managed, but that's not the case. There are two ways to get an untagged image into your color-managed workflow when you have no device profile. You can apply a standard working space in Photoshop's Missing Profile dialog and hope it looks good, or you can use a substitute input profile - your monitor's profile - before converting to your working space.

You might notice that images from your digital camera look pretty good when previewed with your camera's image conversion software or an image browser. Usually this software is not ICC compliant and simply sends the image data directly to the screen. When you open an image in Photoshop and apply your working space in the Missing Profile dialog, the image suddenly has a magenta cast or looks over-saturated or under-saturated. This is because you have imposed a color space on the image that doesn't match the camera's native color.

An alternative method which I find effective is to apply your monitor profile to the untagged image when you open it in Photoshop, then *convert* to your standard working space. (The conversion is important. Don't leave your image tagged with your monitor profile.) You are effectively saying, "I like how the colors looked when viewed in my monitor's native color space, so that's the color definition that I want to use for this image" (See Figure 5 on [Illustrations Page 2](#)).

Figure 6 ([Illustrations Page 2](#)) shows a Bonaparte's gull photographed with a Canon D-30. If I open the image in Photoshop and apply Adobe RGB without doing any conversion, the blue sky and the gull's feet are over-saturated. Applying sRGB instead results in less saturation, but now the sky has shifted towards magenta. In the third version, I applied my monitor profile first, then converted to Adobe RGB. Color and saturation are well balanced and much closer to the scene I remember when I made the

photograph. (All of the images have been converted to sRGB for viewing on the web, but may not look exactly as intended due to the lack of color management support in most web browsers.)

The downside to this technique is that you are potentially clipping your camera's color gamut to that of your monitor. This is not a problem for most consumer digicams and even high-end digital SLRs output images with a gamut similar to sRGB, which is modeled after the average monitor. The upside is that you gain consistent and manageable color from your camera. It won't work for every image, but it is a viable alternative when one of the standard working spaces doesn't fit. An accurate monitor profile is critical to achieve best results.

Accurate Output

Now that you've got your images into a color-managed workflow, you're ready to make some prints. In the last article, I said I'd write about soft proofing and how to use output profiles to make accurate prints. Unfortunately, I've run out of space in this issue, but since this is now a semi-regular column, I promise to cover those topics next time. In the meantime, please send ideas for digital imaging topics you'd like to see covered to editor@naturephotographers.net.

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