A Photographer's Guide #1: Color Management for Digital Imaging

By Mike Borum

What is color management, anyway?

Printing predictable color from a digital image file requires a systematic approach to capturing, viewing, adjusting and printing color. Color management, in a broad sense, is any system designed to accurately translate color from one device's color space to that of other devices.

Why don't I need color management when I use film?

You do need it and you have it but it's hidden in the background. Color management is built into a film's sensitivity characteristics so it can record color predictably under common light conditions like daylight & tungsten. Labs then process the film to the manufacturer's standards by using the right chemistry and sensitometric control to continue the color management chain. The darkroom technician uses photo papers that are engineered to print color from the negative or transparency accurately. This completes the color management chain.

The photographer's involvement with color management, until now, has usually been limited to setting exposure and choosing light filtration.

What's a device's color space?

Every imaging device (camera, scanner, monitor, printer) and film has a color range/accuracy capability inherent to its design. The range of colors a device can interpret, and its accuracy, define the device's own color space.

Devices that use light for imaging operate in an RGB color space. Devices that use inks for imaging operate in a CMYK color space.

Example: An artist working with a child's box of only six crayolas could name that range of colors the "Six Crayola" color space. The artwork would be limited to the colors available in the box. Whether used singly or in combinations, the six crayolas would severely limit the artists' ability to accurately reproduce natural colors. Those six colors and their combinations are the device's color space.

Each digital device also has its own color space and its own limitations. There are also big differences in the way different devices capture, display and reproduce color.

What's a poor, confused (and fed up) photographer to do?

ICC device profiling has emerged from many earlier systems as an excellent, very practical color management system to control color from image capture through

viewing to printing. Photoshop 7 is fully ICC profile "compliant" and makes ICC profiling much easier to use for opening, viewing and printing image files accurately.

I get great prints from my Epson without any special color management efforts. Why should I bother with it?

Many people don't. If you can print every size and quantity you need, don't need consistency from week to week and don't need to provide accurately reproducible files to anyone else, there's no reason to use custom color management. Stick with what you're doing, which probably includes a lot of trial and error testing if you're need very accurate results.

HOWEVER: No one else will be able to reliably get the results you get from your image data files because you're working within your own color space, defined by the combination of your own camera (or scanner), your own monitor and your own printer (with its paper-ink combination). No one else can view or print your files exactly the way you do because no one else has your exact equipment combination. WORSE: you can't view or print your own files consistently because your equipment will vary from day to day, week to week. No matter how good or how expensive it is, it will drift.

ALTERNATIVE: Good color management based on ICC device profiling gives you "portable" color. That means you can take your color managed file to anyone who's also color managed and get consistent, predictable results.

Okay, already! I get the point. Tell me more.

ICC profile based color management requires that every device in the imaging chain (camera or scanner, monitor and printer) have an ICC device profile available to Photoshop.

Many manufacturer's now provide generic profiles with their scanners and printers that are a good step in the right direction but a custom profile for your particular device is usually much better.

Monitors are calibrated, then profiled, using an electronic colorimeter and software that runs on your computer. Calibration and profiling should be rerun weekly because even the best monitors change with time and age. Equipment and software cost varies from about $250 up to $900 with a very good setup available for about $400.

What is an ICC device profile?

An ICC profile is a small piece of software that "characterizes" a device's color capabilities so that color from it (or going to it) can be accurately converted from the previous device in the imaging chain.

ICC device profiles are created by scanning, printing and measuring standardized color targets and specialized software to determine a device's color capabilities. This is done *after* the device has been properly calibrated.

Briefly, how does it work? How does ICC profiling help to display and print the image file more accurately?

The first time an image's data file is opened in Photoshop, the ICC profile of the scanner or camera is selected as the source of the image. Then the data is saved into a standard RGB working color space like sRGB, Adobe1998, ColorMatch, ProPhotoRGB, etc. If the monitor has been calibrated and profiled, Photoshop will be able to interpret and display the colors in the data file correctly. The image can be viewed accurately (soft-proofed) in the color space of a specific printer by using Photoshop's custom proofing feature and selecting the printer's ICC profile as the output for the data.

Properly done, this works extremely well and it's not very difficult. Adobe has done photographers a major service by pushing color management into the mainstream with Photoshop 7. Learning color management is now very important to serious photo artists.

What can I do without ICC profile based color management?

Thankfully, a lot. If simple, good quality prints will suffice and color portability, consistency and repeatability are not important you don't need ICC profile based color management. The average snap-shooter relies on a local minilab for their prints and is generally pleased with the result.

But more advanced shooters are control freaks either from choice or from professional necessity and welcome the chance to remove the variable of the darkroom technician's judgment from the printing equation. Giving a lab like Chromatics a color-managed digital file for printing places control of (and responsibility for) the color in the print back in the hands of the photographer.

But REMEMBER, garbage in yields garbage out. Conversely, great files in yield consistent, predictable, professional quality images out.