True COLOURS

Colour profiles keep it real from screen to press

With the rising popularity of new lower-priced CTP platesetters and faster, better digital presses, many print shops are at or approaching a filmless all-digital workflow. This is generally good news, considerably reducing the time, effort and materials required for a typical print job. But unless you put in a little time and effort to colour-manage your new digital workflow you're likely to be in for some nasty surprises. Without film negatives and the conventional standard contract proofs they can generate—Chromalin, ColorArt, PressMatch—your jobs may have some serious and previously unnoticed problems when you see them on press, requiring time-consuming and expensive last-minute corrections.

While many common job problems—font-substitution, type re-flow, page-size errors, missing or low-res graphic files—can be spotted on a simple black-and-white proof, colour problems can be more difficult to spot. For this reason, proper colour management—from start to finish—is essential with a digital workflow system.

Leading companies in the graphic arts business, including Agfa, Adobe, Apple, Kodak and Microsoft, recognized this need and formed the International Colour Consortium (ICC) about ten years ago to deal with it. The answer they—and now more than 60 other companies—came up with is to map the gamut of each input, display and output device in a workflow, and, based on these gamuts, create device profile files that can be associated with each image as it passes through the system. The ICC format, now in version four, creates with "the right equipment and software" an ICC profile for these devices to describe their inaccuracies and limits. Quite often manufacturers will include canned ICC profiles for their devices on the software CDs.

Support for ICC colour management is built into all recent versions of both the Mac—Apple calls the Mac version ColorSync—and Windows operating systems, and also into recent versions of most leading software, like PhotoShop, Illustrator, InDesign and QuarkXPress.

Putting profiles to work

Let's work through an example, using presupplied profiles from Epson and Adobe. I'll use Mac OS/X 10.3 Panther and PhotoShop 7, as an example—which, for our purposes is identical to PhotoShop CS—but it works almost the same on Windows or Mac OS 9 as well as with PhotoShop 6. For this example, I'll use my trusty G4 PowerBook, a glossy photo print as my original, an Epson Perfection Photo 1670 desktop scanner, and a 13" x 19" Epson Stylus Photo 1280, six-colour proof printer. We'll assume that my image will eventually be run on coated stock on a typical sheetfed press.

Figure 1. Select profile in Displays control panel

First of all, I need to make sure my Mac is using the correct ICC monitor profile. Most laptops with built-in screens come with fairly accurate, standard profiles for their screens. Most monitor manufacturers also include a profile with their products as well. In my case, I tweaked the monitor to get it a bit more accurate for prepress work, but the standard profile Apple supplied was pretty close. In Mac OS/X 10.3 Panther, you tell the system what profile to use via the Displays control panel found in the System Preferences window on the Dock. Select the Color tab (Figure 1) and pick the monitor profile you want the system to use from now on in any ICC-compatible software. There is no need to change it unless you change monitors.

Next, I'll open PhotoShop 7 and make sure colour management is turned on and working correctly. Figure 2 shows the colour settings I often use in PhotoShop. These are found in the Color Settings box, under the PhotoShop menu. Notice I've selected a generic RGB profile—Abobe RGB 1998—and a CMYK profile for a typical North American standard sheetfed press with coated stock. These two profiles, and a number of others, come built into PhotoShop and other current Adobe software, and are chosen from the pop-ups here.

Figure 2. Suggested PhotoShop colour settings

Now, I'll scan my photo print using the Epson scanner and its PhotoShop plug-in scanner software. This software is capable of automatically attaching the scanner's supplied ICC profile to all the images it scans, and I'll use that feature to give me a raw RGB scan in PhotoShop that already has a profile that compensates for the scanner's gamut limitations, although they are relatively minor compared to the gamut limitations to come. If your scanner software cannot automatically attach an input profile, you can immediately assign one in PhotoShop, under Image… Mode… Assign Profile (Figure 3). Note that assigning—also called embedding or attaching—a profile to an image file, either while scanning or at this stage, does not actually change the colour data in the file, it just changes how it appears.

So, with my scanned image open in PhotoShop, I'm already making use of two ICC profiles: an input profile from the scanner and a monitor profile. These give me a more accurate view of this raw image. Now we're going to bring in a third profile to simulate on-screen how this image will print. This will let me work with the image in soft-proof mode, giving me a lot better idea how my changes will affect the final image.

To do this, I go to View… Proof Setup… Custom (Figure 4) and chose the profile for my final printing conditions in the Profile pop-up. Because I had chosen U.S. Sheetfed coated as my default CMYK working space in Color Settings above, it appears here automatically, but I could choose another one from the pop-up if this image was going to a different press with different paper. Put this dialogue box away and make sure that Proof Colors is checked under the View menu. From now on, I'm working in soft-proof mode and my monitor is simulating the effect of my press conditions, so I can trust it quite a bit. Again, by turning on this proof mode we are not changing the actual file itself, just how it appears on-screen. Of course, any processing work we do with the tools and dialogue boxes in PhotoShop will change the file.

Let's say I now want a proof of this RGB image on my Epson six-colour inkjet printer, making it simulate the look of the final CMYK press sheet. To do this trick, I'll use a fourth profile for a moment—one

Figure 3. Assign an input profile in PhotoShop

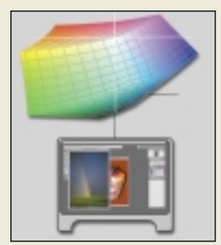
Figure 4. A third profile is for final print specs

The colour gamut

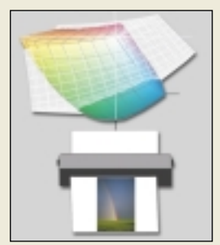
The gamut of a device is its range of colours it can produce. In the diagram below the 3-D plots illustrate the gamuts of a monitor—scanner and camera gamuts are even bigger—a six-colour inkjet proofer and a high-quality CMYK sheetfed offset press running coated stock. Notice how they get dramatically smaller as you move through the prepress and printing process, even with a good sheetfed press and coated stock. Millions of colours that you can capture with a scanner or see on a computer screen cannot be printed on a typical colour press.

The incredible shrinking gamut

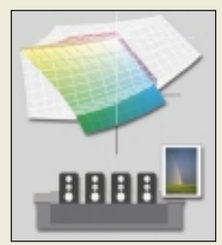
Bigger — Smaller



Typical RGB monitor gamut. CRT or LCD types. (Shown as a white outline on the others) CRT or LCD types



Typical 6-colour inkjet proofer gamut. (CMYK + LM&C, matte paper)



Typical sheetfed printing press gamut. (CMYK coated stock)

By Bob Atkinson

of the ones that came with my Epson 1270 printer. I go to File… Print with Preview… and make sure the Show More Options box is selected (Figure 5). Choose Color Management from the pop-up here and for Source Space I select Proof. Because I chose sheetfed coated in the Proof Setup above, it automatically puts it in here, assuming that you want your proof prints to simulate the same thing as the monitor. Finally, under Print Space (i.e: what I'm printing to at the moment), I go to the Profile menu and chose one of the canned profiles that came with the Epson printer. Now I can hit the Print button and the printer will simulate the final press sheet for me. As you can see, in this dialogue box I use two profiles: one to tell PhotoShop how the final press will affect my image and another to let Photoshop use my inkjet printer simulate these effects. Very handy.

Figure 5. See CMYK look with fourth profile

When I'm ready to go down from RGB into the final CMYK mode so that I can do the final adjustments to the image, I can use my chosen press profile one more time. But first, I'll make a backup copy of this RGB file, in case I want to use it later under other printing conditions. That done, to separate the image into CMYK while adjusting it as necessary for my press conditions, I go to Image… Mode… Convert to Profile (Figure 6) and choose US Sheet-fed coated in the Profile pop-up in Destination Space. Hit OK and it converts the image from RGB into CMYK, taking into account the effects of the press. Now I can do my final colour adjustments and sharpen the image before saving it as a TIFF or EPS and passing it along to my page layout file.

As you can see, I made use of four profiles as I worked with this image: one monitor profile, an input profile from my scanner, a final press profile, and one from my inkjet printer. With these I was able to always see an accurate simulation of the final printed image on both my screen and on my proof printer. I was able to process the image in PhotoShop to get the best image I could, being confident that what I was seeing is what I will get on press and also generate proof prints that matched the final product. That is what a colour managed workflow is all about.

Note that other programs, including InDesign, Illustrator and QuarkXPress also support colour management and can be set up to provide dependable views of how the whole page will print, including photos from PhotoShop and colour graphics created in these programs themselves.

Create your own ICC profile?

The example above was done with typical canned profiles. How do you make these non-Adobe profiles available to ICC-compatible software? In OS/X put them in the Library/ColorSync/Profiles folder. If you have any ICC-compatible software running in Classic mode, also put copies of all profiles into the System Folder/ColorSync Profiles folder.

For many users, all you'll ever need are the canned profiles. But sometimes you may want to create your own. Perhaps you have an old scanner, monitor or printer without profiles. Perhaps you want to create profiles for your own shop's presses with typical paper stocks to use internally and pass along to your clients. Or you have special output conditions like silk-screening or flexo printing. Creating ICC profiles is a bit time-consuming and requires some more expensive equipment and software, but the results can make a big difference in productivity and reduced waste.

Typically, it's done by presenting a device with a large set of known standard colours—sometimes several hundred—measuring how the device captures, displays or outputs these colours and using specialized profile-creation software to generate a profile based on these differences. Scanners, for example, will be given a high-quality target print or transparency with swatches of many standard colours, and the image they create from this original will be compared to the correct colour values of the real thing. A monitor will be profiled by giving it a signal with standard colours and then measuring what the monitor is actually producing with a colorimeter, a small device that accurately measures the colours on a monitor. A proof printer, or printing press, can be profiled by outputting a large series of known colour swatches on it and measuring—usually with a spectrophotometer, a more expensive device that measures colour on paper very accurately—the actual colours you get. In each case, the differences between what the device was presented with and what the device actually produced will be noted in the profile created for that device, so they can be compensated for along the way. ■

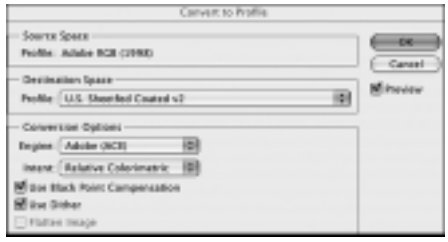


Figure 6. Adjust CMYK in Destination Space

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COLOUR bundles

Several companies offer the hardware/software combinations needed to generate profiles for scanners, digital cameras, monitors, proof printers and presses, including colour management giants X-Rite and Gretag-Macbeth. While the price tag may seem high, just compare them to the costs of the old contract proofing systems. Here are some good bets.

X-Rite / Monaco Bundle: DTP 41 Spectrophotometer for reading colours from paper prints, Optix XR Colorimeter for reading colours from a monitor, Monaco Profiler Platinum software and Monaco EZColor software
Cost: about $6,400. This package makes profiles for input devices, CRT or LCD monitors, and RGB or CMYK proof printers or presses and it includes all the scanner or camera targets you'll need.
■ www.monacosys.com

Gretag-Macbeth Eye-One Publish Bundle: Includes a clever G-M combo semi-automated strip-reading spectrophotometer with attachments that reads from both prints and monitors, along with the Eye-One software.
Cost: About $3,800. It creates profiles for scanners, CRT or LCD monitors, RGB or CMYK proof printers or presses, and includes all the targets you'll need.
■ http://usa.gretagmacbethstore.com