

# CMS Redux

Color Management System Hardware and Software Gets More Sophisticated and, Often, Easier to Use

By Andrew Rodney

Many new products—hardware and software—have come to market in the past year that aid in producing accurate and predictable color on the desktop. The awareness among imaging professionals of the need to have a Color Management System (CMS) has been heightened by the new color architecture in Adobe Photoshop 5.0/5.5. Also, many new scanners, digital camera drivers and output devices expect users to deal with device profiles, which requires the deft use of CMS.

These profiles are descriptors of the color behavior of various devices in the imaging chain—monitors, scanners, cameras and printers—and are produced in a common, cross-platform format known as ICC profiles. All the products discussed in this article deal with creating, editing and applying ICC profiles for use in today's ICC-savvy applications, including Photoshop, QuarkXPress, Adobe InDesign and many others.

All the various devices used to capture, display and output color on the desktop handle color differently. Describing how each device handles color is key to ensuring consistent and predictable color output. This is primarily due to the fact that both RGB and

CMYK are device-dependent color models. The numbers provided in an RGB or CMYK file only describe a recipe for color, not how that color should, or will, appear either on a monitor or as ink on paper. Photographers increasingly are being expected to provide files in CMYK for output to press.

Additionally, many images files are published concurrently on press and on the Web. And there is never any assurance that some other output won't be required months or years after an image is initially printed to press or the Web. This newer workflow represents quite a change from the recent past and requires users to have a significant understanding of CMS.

Prior to the proliferation of high-quality desktop imaging, digital files usually were created by prepress shops using high-end scanners that produced output-ready files optimized for one kind of device. If that particular file were used with another output device, the quality of the color was often compromised.

Having one archive of a finished file for multiple output needs requires the use of a CMS and ICC profiles. It also means that files need to be archived in a color space that will allow the original file to be successfully converted using these profiles.

This usually means a wide gamut RGB file or, in the case of those working in Photoshop, the most appropriate RGB working space.

Virtually all CMS products operate in a similar fashion. Known color data is passed to the device to be profiled and some kind of instrument is used to read the color the device actually produces. This allows the software package to fingerprint the behavior of the device and create an ICC profile for use in the CMS. For digital cameras and scanners, a "known target" is scanned or photographed and then that data is imported into an application for evaluating the color the device captured from the known target. For displays, known colors are generated and sent to the screen, where a device called a colorimeter reads the colors displayed and first calibrates the unit to a known standard like Gamma 1.8, D65. Then it creates a profile describing the exact condition of the display. For calibrating output devices, often hundreds of color patches of known value are printed out and read by a device called a spectrophotometer.

The results in every case are an ICC device profile that can pass information onto the CMS about the device. Devices must remain consistent in performance to

remain faithful to their profile. Devices that drift or alter their behavior require constant process control and re-profiling.

Implementing a good CMS based on ICC profiles requires users to have a calibrated and profiled display. This is the absolute minimum requirement users have to undertake (see "High-End Monitors," on page 36).

Ideally, images that come from scanners and digital cameras have a profile that describes the color makeup of each device and can be archived or converted into the RGB working space picked within Photo-shop. Lastly, all output devices should have ICC profiles describing their behavior, which can be converted to specific output conditions.

## Updates

Last year I wrote about CompassProfile, ICC AutoFlow and VectorPro from Praxisoft, and a then-new product called WiziWYG. Since then, minor updates have been posted to these products, with a major new version of CompassProfile (Version 3.0) due to ship by the time you read this.

CompassProfile's main new capability will be a complete overhaul to how it creates CMYK output profiles with regard to black generation issues.

WiziWYG uses a flatbed scanner rather than a more expensive external spectrophotometer to measure color patches for creating output profiles.

A more robust version, WiziWYG Deluxe, ships with a Sequel V Colorimeter for display calibration and has some hooks for using two external hardware spectrophotometers.

WiziWYG Deluxe also ships with a lite version of AutoFlow for the Macintosh, which can be used for batch processing conversions of files using ICC profiles ([www.praxisoft.com](http://www.praxisoft.com)).

### MatchBox 4.0/ColorBlind Pro 4.0

New in ITEC Matchbox 4.0 are various bug fixes, mostly for Macintosh G4s running OS9, and some tweaks to the interface. A version called "Profiler Plus" allows Matchbox users to update the application so they can use any spectrophotometer. The standard package supports only the Color Savvy ColorMouse, a hand-held measuring device (\$450). Pricing for the Profiler Plus upgrade is \$49. A \$99 upgrade with a dongle (software security device) is available for the user who may wish to free up the serial port where the ColorMouse was once installed. Otherwise, the ColorMouse must be installed as a copy protection device as well as the measuring device.

Also new from ITEC is Version 4.0 of their higher end profiling package ColorBlind Pro (See PEI April 1997 for a full review). This update takes care of several bug fixes, adds support for new measuring instruments such as the Spectro-Cam, and improved connectivity for the Mac G4 running OS9. The update to ColorBlind Pro is \$19.95 for users with the previous version (3.6), or \$399 for all older versions.

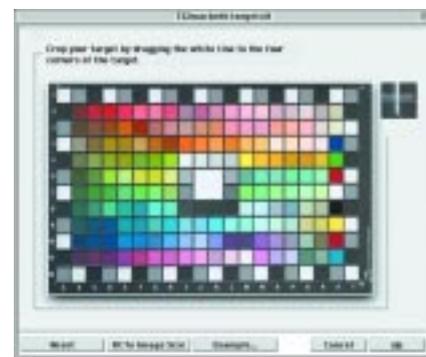
Prove it! monitor calibration and profiling software is now standard (see PEI December 1999 for a review on this product). There also have been some improvements to the interface for ColorBlind Edit, now at version 3.0, which is a product used to tweak ICC profiles or images. A new utility called OnTarget! is a small application that allows users to verify and check their scanner profiles. It will be included with the ColorBlind Pro package and available as a \$29 option with Matchbox 4.0.

### ProfileMaker Pro 3.1

I wrote a short piece on

ProfileMaker Pro back in February 2000 (see "The Art of Converting"). Since then I've been using this product more and more, and it continues to impress not only with its ease of use, but with the superb quality profiles it generates. GretagMacbeth just released Version 3.1, a minor upgrade that has some nice new features.

In the ProfileMaker module, a new area has been included to generate profiles for digital cameras. Naturally, it supports the new ColorChecker DC target created from the ground up by GretagMacbeth for profiling digital cameras. When bringing in either targets for digital cameras or scanners, ProfileMaker has one of the coolest and most useful features I've even seen in a such a product: The ability to actually skew a selection to account for a target that may not have been shot or scanned exactly square.



ProfileMaker Pro 3.1 can precisely crop a target, like the new DC Color Checker (above), and skew a selected target that has not been shot or scanned exactly square.

One can also crop the image exactly as needed in an application like Photoshop and click on the Fit to Image Size button, which will inform the software to automatically select the target from the edges. Also new in ProfileMaker is the ability to profile LCD displays.

Other features that make this package a winner are the ability to compare spectral readings of various devices and the ability to average

multiple readings into a single profile (which is especially useful).

In February, I discussed the lack of selective color tuning features in ProfileEditor 3.0, the module for editing output profiles. In Version 3.1, users can now selectively manipulate colors within colors to tune a profile. While the ProfileMaker Pro package at \$3,500 isn't inexpensive, this is one product for serious users that is worth every penny.

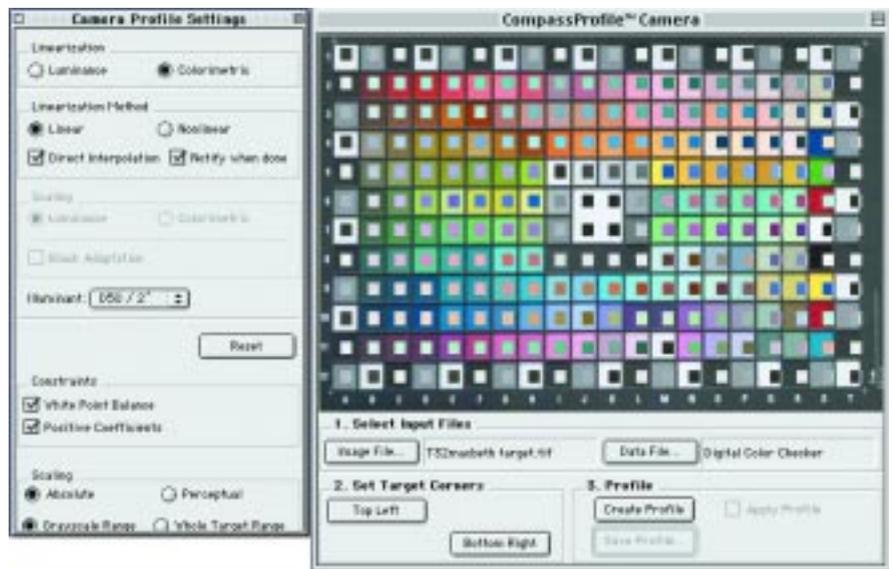
GretagMacbeth also sells a complete hardware/software CMS package called the iProfile Bundle. Priced at \$9,500, it includes the Spectrolino SpectroScan (a fully automated spectrophotometer with a removable unit for hand-held measurements or display profiling), ProfileMaker 3.1, ProfileMaker 3.1 Digital Camera module, and flat panel holder for Spectrolino.

## New Software Products

### CompassCamera

Praxisoft is the second company to come to market with a product that is squarely aimed at those needing to make profiles for digital cameras using the new Gretag-Macbeth Digital camera checker called ColorChecker DC. Those familiar with Praxisoft's module for making scanner profiles, CompassScanner, will be right at home with the virtually identical interface of CompassCamera. Making a digital camera profile couldn't be simpler; you shoot the target, import the TIFF file into CompassCamera, load the Target Description File (TDF) and click the Build Button.

The software does have a number of options for controlling the way a profile is generated. For example, users who wish to keep the highlight values of the target set to



In Praxisoft's CompassCamera, the target has been imported into the application. Once I assign the crop on two corners of the image, the software places squares over each patch so I can be assured that the target is being read correctly.

a range they have picked in the camera capture software can click on the Colorimetric radio button to ensure subsequent photographs run through the resulting profile retain their highlight clipping value.

While the version I tested was still in beta, the color of digital camera files was greatly enhanced and more accurate, thanks to the custom profiles it created. CompassCamera will be available as a stand-alone application with a supplied GretagMacbeth digital camera target for \$700.

### MonacoPROOF 3.0

MonacoPROOF is a full-featured software product that can create ICC profiles for scanners, digital cameras, monitors and output devices. Version 3.0 is the newest release and sports a simple, Wizard-like interface similar to Monaco's entry level product, MonacoEZcolor. Monaco has done an excellent job with this new interface in making a product so simple to use that the well-written manual is rarely necessary.

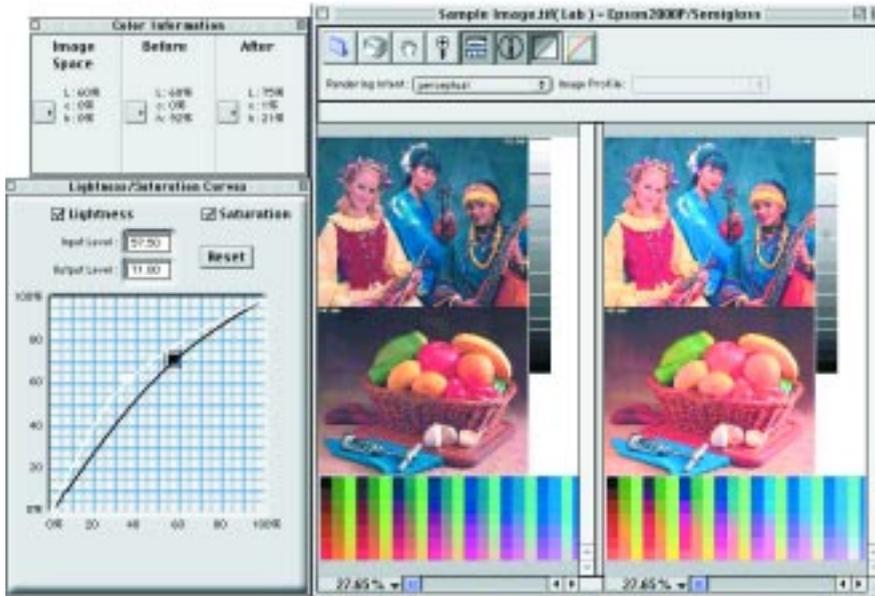
When using MonacoPROOF to calibrate and profile the display, the

setting of contrast and brightness is adjusted visually rather than using a measuring instrument. (The product also supports monitor profiling with a sequel colorimeter, the MonacoSENSOR, which sells for \$249.) For scanner and digital camera profiles, the product ships with a reflective IT8 target, and users who wish to profile film scanners can purchase a transmissive target from Monaco for \$40 for 35mm format or \$100 for 4x5 film.

One very nice feature in MonacoPROOF 3.0 is the optional linearization procedure used when making output profiles. Several packages on the market have this provision, and it is very useful for dealing with output devices that need to be linearized (calibrated) prior to profiling.

MonacoPROOF has a pretty robust profile viewer that allows users to inspect the gamut of the profile three-dimensionally in real time by clicking and dragging on the image. MonacoPROOF contains a simple-to-use profile editor called MonacoTWEAK that allows users to alter saturation and density.

MonacoPROOF 3.0 sells for \$1,495 and runs on Macintosh. A



Before and after windows in MonacoPROOF showing the application of a curve to alter saturation and density, plus the effect of a nice densitometer.

Windows version was expected to ship about the time you read this. Monaco's high-end product, Monaco-Profiler, has far more controls and options for those needing this additional power. It sells for \$4,250 and is targeted mainly at expert users at large printing companies ([www.monacosystems.com](http://www.monacosystems.com)).

### Color Vision

Color Vision offers a set of plug-ins for creating or editing profiles that do not require scanning a special target.

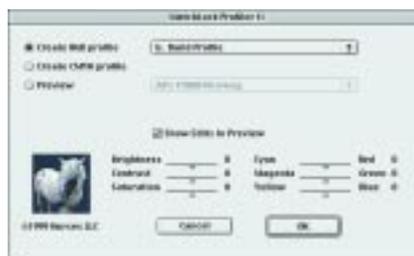
To create an ICC profile with any of the Color Vision Profiler plug-ins, you print out a target and scan it back into Adobe Photoshop, which then "feeds" it to Profiler using the Automate command.

Profiler RGB (\$199) creates RGB or CMYK output profiles. A series of six sliders allows for control over brightness, contrast saturation and other tones. It also offers a unique RGB soft proof capability that aids the user when tuning RGB profiles with the supplied sliders. Since Photoshop 5 has no provisions for showing a soft proof for output to

an RGB device, this additional feature in Profiler II ensures WYSIWYG editing capabilities.

Profiler CMYK (also \$199) provides controls for very specific black generation parameters when building a profile. There are controls for numerically dialing in dot gain, black ink limit, total ink limit and UCA. This product is designed for professional users who need to specify exact settings when creating CMYK profiles for printing to a press or similar device.

In addition to these, Color Vision sells two profile-editing plug-ins. Color Vision Doctor (\$99) contains the same six sliders noted above in Profiler RGB as well as that very useful RGB soft proof tool. Color



The sliders inside of Color Vision Profiler RGB can change saturation, brightness and color when creating a custom profile.

Vision Doctor PRO (\$299) is the ideal tool for profile editing because it utilizes the most powerful editing tool known to man: Adobe Photoshop. The filters are actually automate commands inside of Photoshop. When tuning, users edit while Doctor watches and reconstructs the edits on an existing loaded profile using an action first created in Photoshop ([www.colorcal.com](http://www.colorcal.com)).

## Hardware

### Color Vision MC-7

Color Vision's latest profiling hardware, the MC-7, is a very affordable colorimeter (\$199 USB, \$299 serial). The MC-7 is an eight-sensor, seven-filter colorimeter that can calibrate and profile a display. According to the company, the MC-7's all-digital detection design uses seven long-pass wavelength edge filters to produce more accurate readings than typical three- or four-channel colorimeters. The new design allows more measurements over the visible spectrum, thus more closely matching the sight of the human eye.

The actual device is quite compact and "sticks" to the monitor firmly, ensuring that it will remain in place during the calibration and profiling process.

Color Vision offers several different bundles of software with the MC-7. For \$199, the MC-7 ships with easy-to-use PhotoCal monitor calibration and profiling software. PhotoCal has a Wizard-like interface that appears as a calibrator plug-in in the Macintosh Monitors and Sounds control panel, or as an application Wizard in Windows.

For users who wish more features in the software, there is a bundle with Optical 2.5 for \$399. Optical has many more professional-

level controls, such as a feedback window that provides specific information on the state of the display both before and after calibration, and a set of curves for fine-tuning the display color.

The Color Vision RGB Suite (\$299) contains the mc7/PhotoCal system plus the Color Vision Profiler RGB. This would allow you to use Profiler RGB for creating input and output profiles and the MC-7 hardware with PhotoCal for the most control over the display calibration. Color Vision is also marketing the Color Vision CMYK Suite, which includes the mc7/OptiCal 3.0 system and Profiler CMYK (\$499).

The MC-7 is no speed demon compared to other colorimeters, but the results appear to be on par. One issue with the MC-7 is a small gap between the sensor and the screen requiring that you shield the unit from ambient light (or calibrate in a darkened room). Color Vision has created a light baffle to retrofit existing units. At this price, it's hard not to justify the purchase of a colorimeter for any user who is serious about color.

## Spectrocam

The new Spectrocam from Spectrostar is just too cool! Here's the Swiss Army Knife of measuring devices for building profiles. At \$999, this true spectrophotometer is affordable and measures the



Spectrostar Spectrocam

complete visible spectral range of 380nm-750nm. This small mouse-like device can be used to measure strips of color patches at blazing speeds. You simply insert the Spectrocam into the opening in the adapter, place the opening over a strip of color patches and manually move the Spectrocam over the row. It measures each patch multiple times and averages the readings into one.

Once you get the hang of smoothly moving the unit over a strip of patches, a process that takes only a few seconds, you'll find this is one of the fastest tools for creating profiles. Users can specify how many samplings per patch the Spectrocam should read to average as the device can take 35 per second. The default is 16 samplings per patch and, amazingly enough, the unit knows where one patch starts and ends and just figures out how to measure each patch as you slide the unit over the row. The Spectrocam can also be used to take single readings of patches or any object outside the computer.

The Spectrocam also can be used as a colorimeter to calibrate both CRT and LCD displays. With a very clever hook-like adapter, you can hang the Spectrocam over an LCD without having the actual sensor damage the delicate LCD display. This is one of the first devices on the market that can actually be used to read both types of display.

Since the Spectrocam uses a pulsed Xenon daylight flash source, it isn't affected by UV interference found in some papers. The unit actually flashes much like a strobe when taking measurements. I made several output profiles using several products and found the Spectrocam did an excellent job of accurately measuring color.

The only downside is that the unit is so new, new that not all major profiling packages support it directly,

but that is changing. ColorBlind 4.0 currently has support for the device and the software that ships with the Spectrocam allows measurements to be taken and exported as text files for importation into profiling products that accept this data method, like CompassProfile, Monaco Profiler, and ProfileMaker ([www.spectrostar.com](http://www.spectrostar.com)).

## ColorControlStation

The ColorControlStation from Color Savvy is a very clever idea. The engineers at Color Savvy took an existing HP inkjet printer, removed the ink heads, and replaced them with a colorimeter. Like an inkjet printer, you move paper in and out of the unit and the colorimeter head moves across the paper taking automatic readings of color patches.

Ingenious. The ColorControlStation is really aimed at people who must profile their devices regularly, who simply can't spend the time to manually measure color sheets.

I was able to test the ColorControlStation with Praxisoft's CompassProfile, which is currently the only product that directly interfaces with the hardware. I did have some difficulties with thicker brands of inkjet paper occasionally jamming. The time to read a sheet of patches isn't earth shattering, but considering I was able to walk away while the unit did all the dirty work, this doesn't seem to be an issue. The resulting profiles I generated using 512 color patches within CompassProfile were excellent. ColorControlStation (USB or serial) is \$2,250 and comes with a two-year warranty ([www.colorsavvy.com](http://www.colorsavvy.com)).

ColorSavvy also manufactures the ColorMouse (\$450), which can be used with WiziWYG Deluxe. ◀

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