

# ImageXpress UnTechnical Bulletin

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COLOR MANAGEMENT

## Digital Camera Color Issues



Keeping it simple. . . color management means making a picture LOOK the same every time it is seen. . . on computer monitors, over the internet, or on paper. Color management issues can be confusing, and quite difficult to understand.

Before the advent of desktop publishing, the topic of color management was reserved for a small group of highly-educated color scientists and very experienced color separators. Now anyone producing color files must have a basic understanding of the topic. It is the purpose of this series to shed accurate, non-technical light on basic color management issues.

### Profiles

A profile is simply an evaluation report. There are several kinds of profiles: input, monitor, and output. Each is a color performance evaluation of a unique device. Profiling assesses the capabilities of a single device so that color pictures captured by (or sent to) that device will address those capabilities, compensate for its inaccuracies, and portray color images as accurately as possible.

### The Importance of Consistency

Traditional “Input” profiles are wonderful correctional tools for scanning devices. The word *scanner* used here covers everything from slide and transparency scanners, to flatbed scanners, to drum scanners.

As stated in our “Input Profiles” bulletin. . . scanners differ in their ability to “see” colors and tones. Some see quite well, some don’t. One thing for sure. . . all scanners need “glasses” to one extent or another to correct for small errors in their visual perception. These electronic glasses are called “input” profiles.

Studio digital cameras are nothing more than portable scanning devices. Think of them as *scene* scanners as opposed to *photographic* scanners. The image capture principle is the same as *photographic* scanners. . . light reflected from a subject is measured and recorded by an array of CCDs.

Of course there are other significant differences, like variable distances between the lens and the subject, and adjustable lighting, but all-in-all, studio “digicams” are just contortionist scanners.

### Consistency is a Dependable Thing

There is common a characteristic about all scanning devices that makes “profiling” a reliable system of input color correction. That common characteristic is light source consistency. Every scanning device enjoys a (reasonably) stable input light source.

Even digital cameras with all their flexibility can still be profiled. Studio lighting *intensity* may vary, but the *color temperature* remains constant.

### Inconsistency is a Nightmare

If your desktop scanner introduces a slightly different color shift with every scan; and a picture scanned at five different times produces five different results, don’t bother with the profiling process, get rid of the scanner.

Profiling only makes sense when performance is consistent and results are repeatable. You can’t nail Jello to a tree, and you can’t profile inconsistency.

### The Truth, and Nothing but the Nasty Truth

The horrifying scenario above unfortunately describes location shooting with a digital camera. Existing light changes “color temperature” many times a day.

While this is hardly good news, it's not reason to fall on your sword either. We *do* have good news though. We have developed a tried and true system that can color correct any image captured in any lighting condition.

The system is based on the fact that digital camera images are affected by two unique issues, and therefore a two-stage correctional process needs to be employed. One stage handles any inherent CCD color inaccuracies and the other compensates for existing any lighting variances.

### Same Old Same Old

The CCD array in the camera most likely has the same problems as other scanning devices. . . it can't see all colors accurately (gamut limitations), and it has trouble distinguishing color detail in shadow areas (signal/noise confusion).

This requires an ICC profile generated under known lighting conditions, and is a one-time fix.

### The Real Problem

The volatile existing (outdoor) light problem is not a camera problem at all. It is an environmental problem. As the (scene/location/time of day) changes, the illumination "color temperature" changes, and every change requires a unique correction.

In this sense, color is a relative thing. Pictures taken with known lighting produce well-behaved blacks, whites and grays. But when the lighting conditions change, whites don't necessarily stay white, shadows appear colored, and neutral grays shift accordingly.

This part requires a gray balance target capture and a correction curve generated for each scene.

### Stage One- ICC Profile

First thing to do is build (or acquire from the manufacturer) an ICC profile of the camera using balanced (daylight) strobe lighting. This is the profile to assign to every image produced with the camera. This step will correct any inherent inaccuracies presented by the camera CCD array.

### Stage Two- CC Curve

Now shoot a target (Macbeth ColorChecker or Kodak Q-60) at the beginning of each session. No matter what the lighting conditions, shoot the target.

After the shoot, when you want to process the images, open the target in Adobe Photoshop and build a curve to adjust both linearization (the process of making sure the image steps systematically through the dark-to-light stages of the wedge) and gray balance (making certain that each step actually measures neutral gray). This is a procedure that, while a bit involved, will absolutely guar-

antee that images captured under less-than-ideal conditions will produce color-balanced and (dare we say) color corrected images.

This is not an "automated system of intelligent color cast removal" (as if there is such a thing). This is, however, a completely reliable method of measuring the existing (reflective) light and systematically correcting it for neutrality and linear gradation (techno-terms for color and contrast controls).

The complete (PDF) procedure can be read/downloaded from our website at <ftp://ftp.scanprep.com/scanprep.com/docs/CustomCurves.pdf>. Even though this procedure was developed for use within ScanPrepPro, the method works quite well manually also. After building your correction curve, save it to apply to every image captured in that same lighting.

To use the curve in Adobe Photoshop, simply open an image captured under the lighting condition and select "Curves" from the Image/Adjust menu. Click the "Load" button, find the curve you created, and click "OK." Your image will be automatically transformed to compensate for the errant lighting condition. Your blacks will now be black, your whites will be white, and all gray tones will be balanced to neutral tones. What a concept!

The real magic is that once the blacks, whites and grays are balanced, all the other colors will be automatically corrected, and you'll look like a genius.

### An All-Too-Easy Calibration System

While this bulletin discloses the need for producing your own correction curve, and the downloadable instruction sheet shows how to build it, you should be aware that we are developing a fully automated system to produce color correction curves with a click of the mouse.

This system is being designed and manufactured by ImageXpress, and consists of a precision patch target and a curve generation utility. The ATEC (All Too Easy Calibration) system will be available for both the Mac and Windows platforms.

Two versions of ATEC will be available, digital camera, and reflective desktop scanner. The digital camera target measures 13" x 3" while the scanner version is 8" x 2".

Preliminary pricing for the system:

- Digital Camera \$ 59.95
- Reflective Scanner \$ 49.95
- Combination (both) \$89.95

### Using Custom Curves ScanPrepPro

ScanPrepPro provides an easy way to use color correction curves. Any correction curve saved into the Custom Curves folder of ScanPrep's Preferences Folder/Curves folder, and then selected from ScanPrepPro's Custom Curve menu, will be applied to each image automatically during processing.