

What everyone should know about working with digital imaging devices

Presenter: **Dan Reid**

Color is the most important aspect of digital imaging

- Having the best imaging devices does not guarantee faithful reproduction
- Each device and media combination render color differently
 - We select imaging devices and printing papers for their unique color appearance.
- To fully capitalize on your digital imaging investment you need a reliable means to calibrate and control color through the whole process



Why ain't it simple?

- Each manufacturer has varying support for color management (ICC profiles)
- Inadequate documentation from manufacturers supporting color management.
- Each OS and platform has varying support (or lack of) of color management.
- Manufacturers rarely utilize the color management architecture of the OS to the fullest.
- Training and education is best approach to resolving color miscommunication from device to device.

The problem

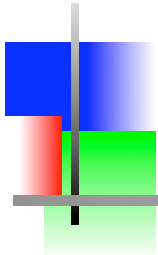
- Input devices (scanners, cameras) are always RGB
- Monitors (whether CRT or LCD) are RGB
- Digital printers use a different color model; typically CMYK or CMYKOG



RGB and CMYK are device dependant color models

- Sending the same file to different printers results in distinctly different looking prints
- Looking at the same image on uncalibrated monitors will also render an image differently on each display
- ICC profiles relate RGB or CMYK values to how a human responds to color using a LAB color model

LAB color model



- LAB color model was developed back in the 1930s by a French committee.
- Color model weighted by how we respond to color.
- We don't respond to color in linear uniform manner.
- LAB color model represents the range of colors that we typically can discern.



Keys to success in using color management

- **Consistency**
 - Consistency is only possible through monitoring the device objectively
 - Subjective analysis is not adequate
- **Calibration** *compensates* for non-linearity in color rendering
 - Compensates for plugged shadows and/or blown-out highlights, or distorted mid-tones
 - Compensates for deviation from optimum (linear) tonal distribution from dark to light.

ICC profiling

- **Characterization** describes the color rendering properties of the device or paper/ink/resolution combination.
- An ICC profile encapsulates the range of reproducible color.
- An ICC profile is only valid for the calibration conditions!
- Without calibration your ICC profile may become less useful in time. You can not validate if the device is responding the same as when profiled.



Profiling input devices

- Scanners are relatively easy in comparison to a camera.
- Scanners have a fixed light source while cameras record in a wide range of light sources.
- Camera profiling is definitely more challenging. Requires careful setup to create a useful profile of the camera's color rendering independent of lighting and exposure.

Camera profiles

- Greatest challenge in color management
- Variables in lighting and exposure
- Camera settings have profound impact on the suitability for camera profiling
- Keys to success are removing lighting and exposure from influencing ICC profile



Monitor profiling

- CRTs are glorified TV sets -- analog devices.
- LCDs have a light bulb that illuminates from behind.
- CRTs can be calibrated while most LCDs can only be characterized and not calibrated.

Printer Profiling

- Usually the most challenging.
- Digital printers use a subtractive color process (CMYK)
- Even still, the Epson print driver expects RGB and not CMYK input.
- Ideally you would profile an Epson printer as a CMYK device instead for the best quality output and proofing. Only possible with the addition of a RIP.



Inside scoop on the new Epson printers

- Why digital printers use light primaries
- The LT primaries are NOT dilute versions of the solid ink
- Does not increase color gamut instead smoothes the transitions in the mid-tones to highlight tonal regions
- Provides a continuous tone (photographic) look by blending the hard dots of cyan and magenta

LT black -- the key!

- LT black has solved the problem of achieving neutrality across the tonal scale
- Allows for subtle tones unobtainable before.
- Black can now be extended in the 1/4 and highlight regions without a “peppering” look



Ideal scenario/reality check

- Ideally you would use printer software that allows control of the mixing of the LT and solid primaries in addition individual ink restriction.
- Reality is the Epson print driver has pre-configured separation parameters for Epson papers and inks. If you stray from using their recommended media, predictable color is compromised.
- A Raster Image Processor (RIP) normally uses a color measurement device to optimize ink restrictions and dot gain curves for best color output.



Epson print driver

- The Epson print driver expects RGB input to convert to CMYK. CMYK input will be converted to RGB and then separated back to CMYK using predefined settings.
- Profile as RGB devices (even though they print with CMYK inks) when using the Epson print driver.
- Select the “No Color Adjustment” option to get repeatable output. Other options analyze the input data and perform “auto” color correction before separating to CMYK -- no consistency.



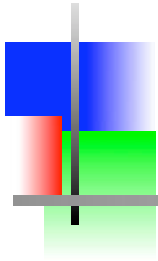
Epson custom settings

- You can pre-configure printer options including “no color adjustment”
- Save different paper settings as unique names for easy selection later when printing.
- Advanced control of total ink limit



3rd party papers and inks

- Select printer resolution based on paper's ability to resolve fine details. Some papers are not smooth as in canvas and watercolor paper masking higher screening resolution.
- Try a couple of “media” paper options to determine the best image quality and inking.
- Optional ink adjustment can further refine too much or little total ink coverage to prevent over inking.



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