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PRINTER PROFILING

tom schroeder
color specialist, REI

Profiles

- A file that correlates device color values with corresponding device-independent color values that represent what color people actually see
- Contains information about the three main variables that describe the behavior of a device:
 - Gamut –the range of colors the printer can reproduce
 - White Point – the color and brightness of the media
 - Ink characteristics – the color and purity of the inks
- Includes the tables that the Color Management Module (CMM) uses to transform from one space to another through the Profile Connection Space (PCS) in the three different rendering intents (colorimetric, perceptual and saturation)

Why Should We Profile?

- Profiles tell the CMM how to produce the right numbers to represent a particular color on any given device
- Profiles help the CMM show us on our display or another device how that device will render the color *before* it is printed
- Profiles are the map that shows us the possible “color destinations”
- **The capability to preview different color results before they happen is one of the most valuable things that color management does for us**
- This allows us to use inexpensive devices like monitors and inkjet printers to simulate the behavior of very expensive ones like printing presses so we can make corrections beforehand

Things To Keep In Mind

- The profile software cannot cover every possible ink combination so it must use interpolation
- Profiles cannot make devices print or display colors that are not possible by that particular device
- The profile is only as accurate as the measurements that were used to create it
- Most devices change behavior over time, so we must make sure the device is behaving optimally before we profile and then afterwards we must make sure it continues to behave in the same way in order to maintain the validity of the profile
- Choose a measurement instrument that is supported by your profiling software
- Measurement instruments do not adapt to paper brighteners, so if the media you are profiling uses these a UV filter is recommended
- A white backing will not alter the measurement readings as much as black

Calibration vs. Profiling

- Calibration is the process of bringing a device back to a target or desired state (in effect, *changing* it's behavior) in order to maintain consistent behavior and enabling the profile that describes it to remain accurate
- Profiling is the process of recording the behavior of a device *without* making any changes to its behavior
- Both processes involve sending a target of known color values (a stimulus) to a device, measuring the color that results (the response) and then feeding the results into an application that can calculate the differences

Creating A Printer Profile

- **Stimulus and response**
 - The profile software measures a stimulus in the form of known RGB or CMYK values printed for the measuring device to read
 - The measurement of each patch's LAB values is the response
- **Adjustments**
 - Size of ICC profile to be created
 - Perceptual Gamut Mapping
 - Grey Rendering
 - Ink Limits
 - Black Generation
 - Under Color Removal (UCR)
 - Grey Component Replacement (GCR)
 - Black Start
 - Black Width

The Adjustments

- **Size of ICC profile to create**
 - The recommended option is Large
- **Perceptual Gamut Mapping**
 - The recommended standard is LOGO Classic
 - It offers the smoothest transitions with a slight saturation trade-off
- **Grey Rendering** (if applicable)
 - The recommended option is to use Paper-Color Grey, which will render neutral colors that appear neutral in midtones and shadows
- **Ink Limits**
 - Controls the total amount of ink being laid down onto a specific media; this setting can vary greatly but is typically higher (in the range of 320–360%) for coated media and lower for uncoated media
 - If the ink limits can be set in the RIP, it is generally easier to do so there than applying them in the profile

The Adjustments *(Continued)*

- **Black Generation**
 - This will depend on press or device output conditions
 - UCR (Under Color Removal) – uses only black in just the neutral and grey areas of an image; used to control total ink and therefore dry time
 - GCR (Grey Component Replacement) – replaces a certain amount of CMY with the equivalent black in all colors; used when color shifting is inherent, where a maximum setting forces the most black into CMY builds and helps to ensure better grey balance at the cost of some saturation loss
 - Black Start – the point away from the highlights where black ink is first introduced; a good starting point is 30-50% (the lower the number, the better the grey balance but a resulting decrease in saturation)
 - Black Shape – the rate at which black ink is introduced as the color gets less saturated; recommended to leave at default
 - Black Width – the strength of the GCR that dictates how far from the neutral axis black ink is introduced into CMY combinations; recommended to leave at default

The Target

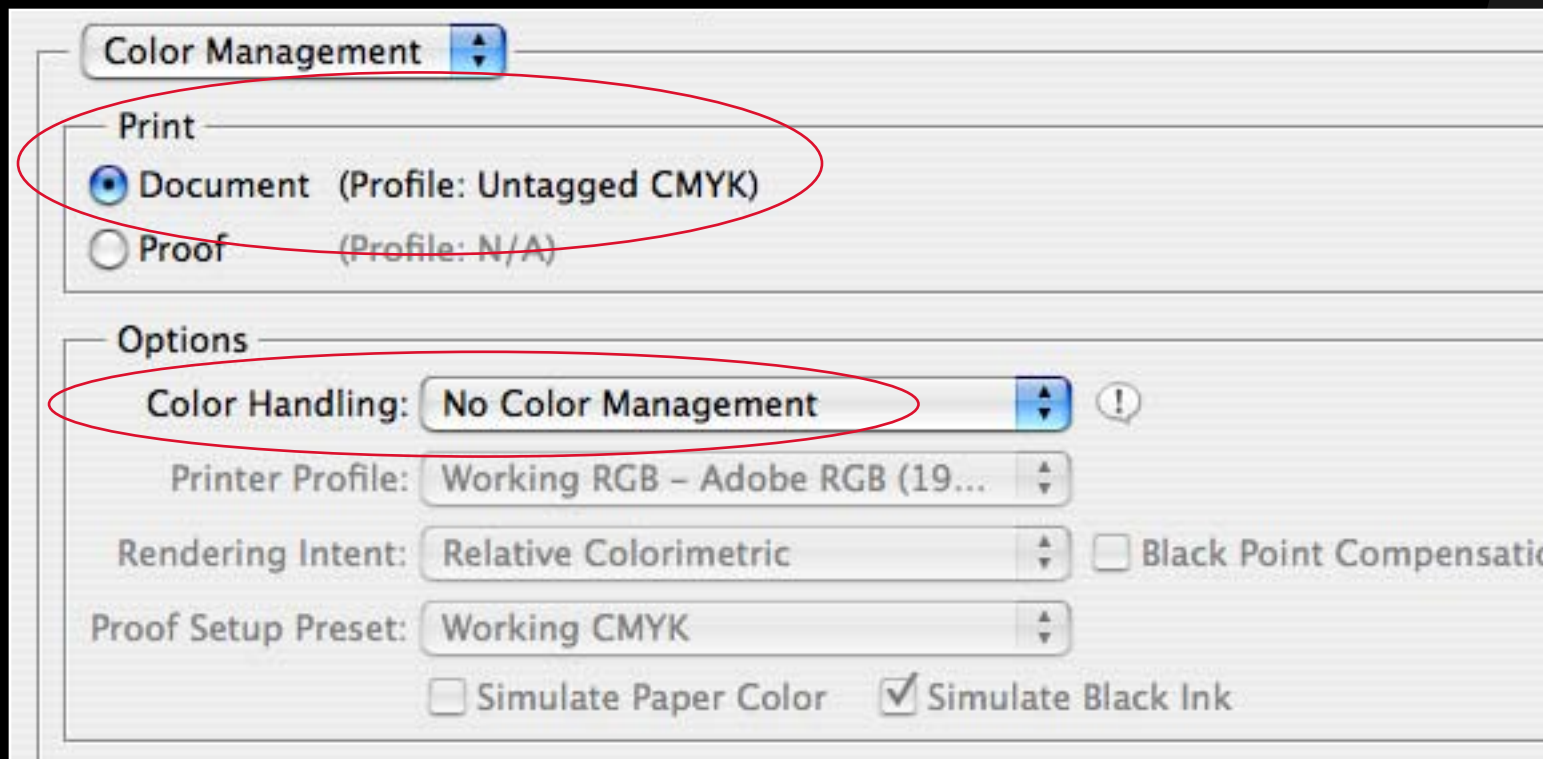
- Profiling software typically includes several different target files for creating the profile
 - The IT8 and ECI2002 targets are industry–standard and contain a sufficient number of patches for most profiling applications
- For inherently variable printing devices, you may want to consider measuring multiple targets and averaging the data
- The profile should not contain an embedded profile as shown below:



- When printing the target from Photoshop, select the Untagged document profile as the Print Space and “No Color Management” from the Options as shown on the following slide:

The Target *(Continued)*

- Photoshop's Print With Preview dialog:



Profiling RGB Inkjets (i.e. non-PostScript RIP printers)

- Two things to consider before profiling:
 - Media settings – be certain to use the Media, Ink, Mode, Resolution, etc. settings you will be using when printing the target
 - Inkjet prints take a little while to “cure” before they can be measured
- Create the first profile using the default settings provided by the profiling software, then examine a target image with skintones, neutrals, darks and lights using the soft-proofing function of Photoshop to examine the profile
- Name the profile with a descriptive name that will make sense to you

Profiling CMYK Printers (i.e. PostScript RIP printers)

- Calibrate the printer *before* printing the profiling target
- As mentioned previously, if the RIP allows for ink limiting, set it there and then leave the ink limiting (if applicable) at 400% in the profiling software
- Generally choose the profiling software's default settings at first and refine only if you feel it is necessary

Profiling Printing Presses

- If you have a contract proofing system and you can successfully match your press to the proofer, consider profiling that using the ink limits and black generation you can hit on press
- If you use a variety of paper stocks and find it prohibitive to profile each one, consider profiling a middle-of-the-road stock, then using that for RGB-CMYK separations and applying plate curves to account for different dot gains
- Decide whether to calibrate to either standardized (i.e. SWOP, GRACoL, FOGRA, etc.) or optimized (press-specific) behavior and do that before printing the target
- Select a dozen or so press sheets from the beginning, middle and end of the press run to measure and average the data
- Use the ink limits you established during the stabilization phase, then make profile iterations using different black generations