Color Scanning

By Dan Remaley

I am a big Edward Demming fan, and his comments about process control are right on. Mr. Demming said when errors in production occur, " it's the process, not the people!". So lets control the process! To follow a chronological order, color scanning is first, followed by proofing, platemaking and presswork.

At some point you are going to need access to Photoshop for the two exercises I am explaining in this article. It shows differences that are difficult to communicate with only words. If you haven't requested my FREE Process Control Reference piece – the time is now! It is in digital form at www.gain.net, under 'process control>user guides'.

Color scanning has changed dramatically since the invention of the electronic color scanner. The early color scanners were expensive and required a lot of training. The new flatbed scanners, with the use of Adobe's Photoshop, are more user-friendly. This change has been difficult for the industry, the fundamentals of color separation have been abandoned and new people and techniques are adapted every day. Consider this, a Hell or Crossfield color scanner sold for around $200,000. These scanners had nothing to 'view' color, no color monitors, no color screens, nothing. The only 'viewer' was a small screen with measurements of density and dot area, with nothing to actually 'see' the color image. Now we have color monitors and preview screens. Has the quality of color been better, or worse than before? I'll let you decide!

These early color scanners, came complete with a series of transparencies made with different emulsions, Kodak, Fuji, Agfa etc. These images were scanned, proofed and evaluated for color, and 'custom values' were entered into the scanner for a benchmark.

Following this principal, PIA/GATF has introduced a series of photos available as prints, transparencies or digital RGB. These photos are high key, low key, flesh tone, saturated color and neutrals. These are excellent to set up and monitor your scanner's ability to capture and repeat color settings. By scanning and proofing these images you can decide if your scanner settings are correct and can be measured over time, monthly, weekly etc. These common images can be tracked for changes in the scanner or proofing process.The process of color separation is to provide images that can be reproduced in your color reproduction system – your printing press.

The fundamentals of color scanning are 1-tone reproduction, 2-gray balance and 3-color correction. The ideal way to set up the tone reproduction curve is to print a test target like PIA/GATF's test form, or a similar form that can tell us how the press prints under a 'standard' condition. What is a 'standard' condition? In my mind, it's a set of numbers (like SWOP) that has a numerical setting with a measurable tolerance and defined reference. Another 'standard' condition may be your own specification, written, with known values, for density, dot gain etc. If you haven't established your specifications, use SWOP as a reference guide.

A little secret, most scanners and Photoshop settings use SWOP numbers for the RGB to CMYK conversion. The numbers for press are as follows-

Density Yellow 1.00 Magenta 1.40 Cyan 1.30 Black 1.70

Dot gain at 50% (TVI) Yellow-18 Magenta-20 Cyan-20 Black-22

Tone reproduction is the ability to reproduce an original as accurately as possible within the restrictions of your color reproduction system. A simple example is a B&W

halftone printed on newsprint, the original has a density range from 0 to 2.0 but newsprint cannot reproduce that wide of density range. Newsprint's maximum density is around 1.20, in order to reproduce this original we compress the shadow tones and adjust the midtones to make a smooth transition. This applies to process color on a sheetfed or web press as well. The dot gain adjustment is also a function of tone reproduction. With known dot gain values we can customize Photoshop for our in house conditions, or we can select SWOP from the pull down menu settings.

EXERCISE #1 Just so you understand what is happening in the Photoshop settings, select newsprint from the (color settings) pull down menu, then select an RGB image, and convert it to CMYK. Save this CMYK file. Now set Photoshop (color settings) for SWOP coated and select the same RGB image, and convert to CMYK. Bring both images (newsprint & SWOP) to the screen and notice the 'weight' reduction between these images SWOP is 20% in the midtone and newsprint is 30%, the newsprint separation has more 'weight' removed for the print condition (it appears lighter). Under 'custom' you could set it for any amount of gain to match your print condition. The last thing in tone reproduction is setting the 'total ink' limit, the darkest area of color cannot exceed a total of 240% (for newsprint), 320% For SWOP. Meaning the total percentage of Y-M-C-K cannot equal more than 320%

Gray balance is the heart and soul of color reproduction, throughout the process. In scanning gray balance means that all areas of the scan are neutral in color, highlight, midtone, and shadow. This is very important, because any color correction will be misguided if correct gray balance is not achieved in the beginning. In order to establish good gray balance we again refer to the press and its print condition, without a press run, here are the numbers according to SWOP), these can be entered into the eyedropper tools in Photoshop-

	Cyan	Mag	Yellow	Black
Highlight	5	3	3	0
Midtone	60	50	50	15
Shadow	95	90	90	80

For B&W the numbers are-
Highlight - 3% Shadow – 95% (for coated stock)

Your numbers may be different depending on your press condition and process, but these are great starting points.

Color correction is the reduction or addition of color in overprint areas, or color areas that are a problem in the original. All color correction must be done after gray balance is achieved.

The judgement of the separation should be made on a color calibrated monitor and/or the dot percentage values in the Photoshop information window.

Our methods must be accurate and consistent for measurable color reproduction. Images supplied from digital cameras require the same methods for faithful, quality color reproduction. With digital photography there isn't anything to "compare" or reference, no color print or example. An item called a MacBeth color checker is an excellent item to photograph in your first exposure to quantify the lighting and camera exposure. It has

color patches that are referenced to a Lab value, therefore we can indeed know what the original color is to look like.

Now that we have established our standards and tolerances, it's time to 'help' the process along, the use of GCR! GCR stands for Gray Component Replacement, or the subtraction of yellow, magenta, and cyan in all tri-chromatic colors and replace them with black. It can be done as a percentage (i.e. 70% which equals the total amount of black replaced) on a high end scanner, or in Photoshop as light, medium, heavy, or maximum. There are many advantages to using GCR, it 'hides' some of our color reproduction problems.

1-(are the owners listening) we use less of the expensive colored inks and more of the (less expensive) black ink.

2-the black contains nearly all the detail, (the colors become more or less saturated) so mis-registration is less noticeable.

3-we have less color shifts at press because the values of Yellow, Magenta or Cyan are moved away from the midtone (where color shifts rapidly), Black now becomes very important. It has a full tone value from highlight to shadow with lots of midtone areas compared to a traditional separation black that has a "ghosted" or "skeleton" black. When the black changes at press the photo's become 'lighter' or 'darker' but not ' color casted'. Smaller presses with limited controls, and web printing benefits greatly from a GCR separation.

Application of GCR is the last step, after all gray balance, tone reproduction and color correction has been completed.

EXERCISE #2 - To help understand this method, set Photoshop (color settings) (under custom) for maximum GCR, open the same RGB image we used before and save it as CMYK with maximum GCR. Now open the (CMYK) non-GCR image, and compare the black channel of the GCR image, note the 'full' tone of the black printer! The most dramatic difference is in the color channels, lets bring both Magenta printers to the screen, visually and with the eyedropper too,l we can examine the noticeable difference between these images, note the very little Magenta in the GCR image! If there is less of this color at press then it can't shift as rapidly as the other (non-GCR) image. While you're here, compare the Cyan and Yellow as well.

If these GCR images were supplied to the pre-press department they can't be 'color corrected' because of the absence of Y-M-C values. Similarly, they cannot be adjusted or corrected at press! This brings about a whole new discussion in color reproduction! Can you "color correct" at press? Do you want to "color correct" at press?

My position is that I supplied the press with the best color rendition of the original, with correct gray balance and color correction. When scanning I know that any change in gray balance affects ALL the colors, the same is true at press.

If we increase magenta at press to improve flesh tones, for example, we will ruin grays, blues and purples! In conclusion, we have defined the process, measured the attributes and confirmed the output. Now even with different images we will be able to repeat the process and control it!

A correctly made color proof is the most accurate method for color analysis, that's our next step in the process control system.

Dan Remaley welcomes comments, questions or private inquires. Those who contact him via e-mail can receive a PDF of Remaley's Process Control Reference Guide. For a printed sample, send your mailing address

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