

Making a B&W ICC with a Scanner

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Using Roy Harrington's "Create ICC" program (see <http://www.quadtonerip.com/html/QTRiccprofile.html>) and reasonably good flatbed scanner, very good ICCs can be made that can then be used in printing B&W images with a number of B&W inksets. These ICCs work only with Photoshop or Photoshop Elements (sometimes referred to collectively as "PS") and the Print Previews of those image editors.

For this exercise I'll use an Epson Expression 1600 flatbed scanner. It is probably similar to a number of others.

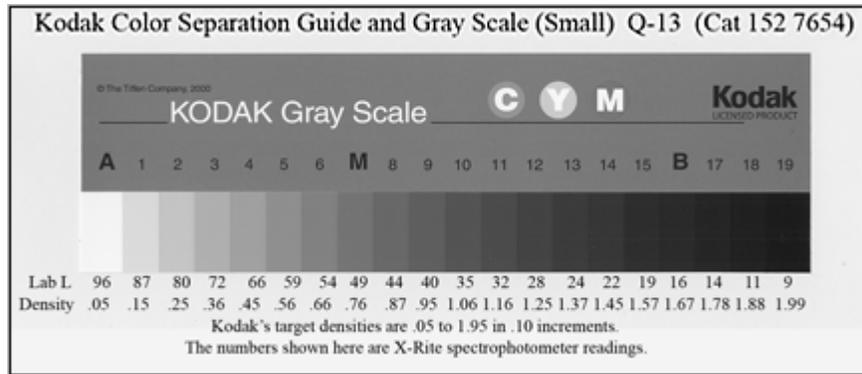
Note that while the use of a spectrophotometer is the ideal way to make these ICCs (I use the DataColor/ColorVision PrintFixPro spectro), the profiles I've made from my flatbed scanner so far are visually equal to those printed with ICCs made with a spectrophotometer.

Why use an ICC? It takes advantage of our systems' color management tools and does a better job of matching the monitor to the print than a non-color-managed workflow (with the possible exception of a very well made custom dot gain curve in full PS). Additionally, prints can be made more consistent among different printers and papers. With this procedure, almost anyone will be able to profile a new paper for B&W printing.

Calibrating the Scanner

The first step is to calibrate the scanner with a known test strip or reference standard. The basic idea is to find known white and black reference points to set the highlight and shadow settings on the scanner, and then use a midtone gray of known value to set the scanner gamma.

While there are a number of alternatives that can be used for reference standards, the most widely available standard test strip is probably the Kodak "Color Separation Guide and Gray Scale." The small ("Q-13") version of it has a Kodak catalog number of 152 7654 and is available at larger photo stores for under \$20. It has 20 steps from density .05 to 1.95 in .10 increments. Below is a scan of mine with the densities and Lab L values measured with a spectrophotometer.



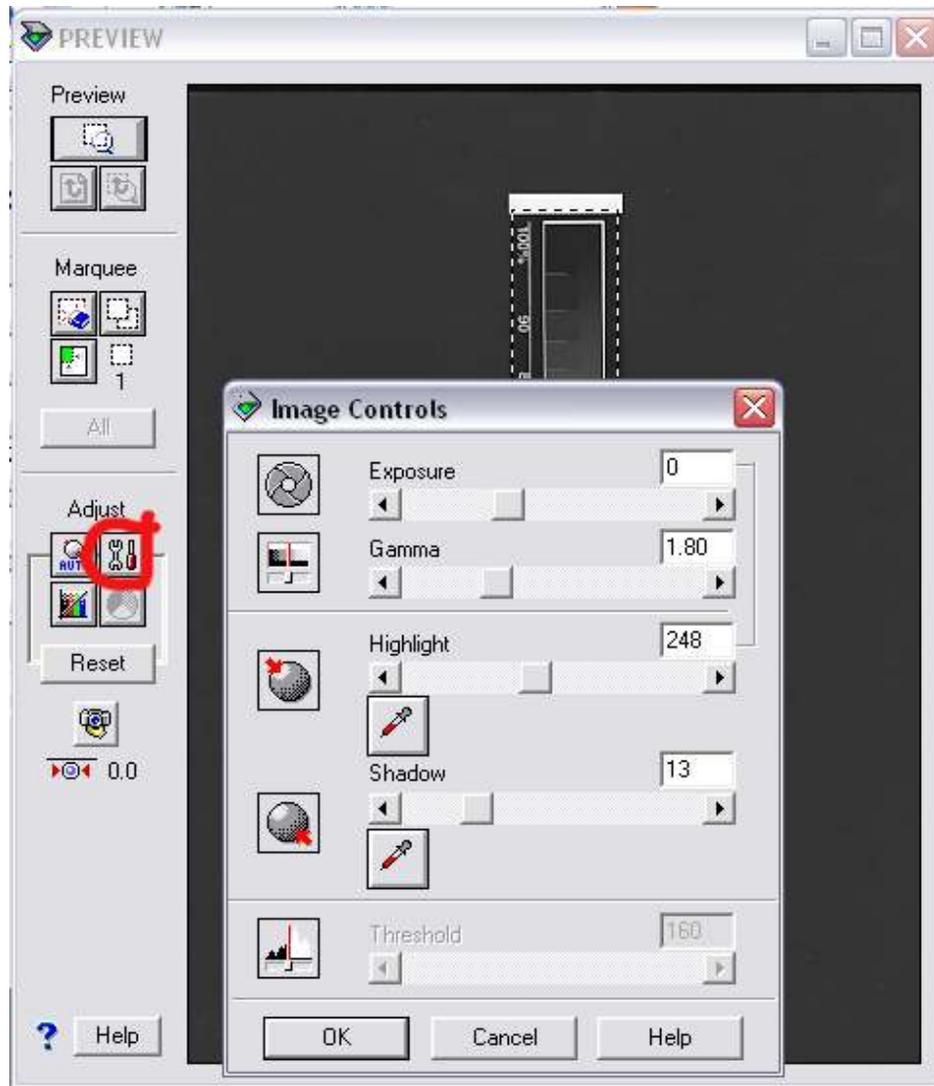
Kodak recommends using the calibration points it has marked at A (the white point, density 0.05 or Lab L 96), B (the black point, Kodak target 1.65 or Lab L 16.5, mine measured 1.67 and L 16) and M (middle gray, Kodak target 0.75 or Lab 49, close to Lab 50, the standard 18% gray card). A and B are typical paper white and maximum black densities for a matte paper print.

(Other possible reference guides for calibrating a scanner are listed at <http://www.paulroark.com/BW-Info/Other-reference-guides.pdf>.)

These are the procedures I've used to calibrate my scanner with the Kodak Q-13 reference guide:

Place the Q-13 Guide on the scanner glass vertically so that the same part of the scanner CCD reads the entire test strip. I recommend placing black paper behind the test strip to reduce scanner flare.

Have the scanner make a low resolution, 8-bit grayscale preview, select the test strip, and go to the manual Image Controls box (circled button on the Epson 1600).



In the Image Controls box the default exposure is 0. I left that as is. The other three active controls will be used to match the scanned image to the known test strip values. It will take several iterations of scanning, measuring the test strip in Photoshop with the eyedropper, adjusting the settings, and repeating the scan and measuring.

In PS, the measurements are done with the eyedropper size set to 5 pixels and the information palette (Window>info) options (More>Palette Options) set so that one of the Color Readouts is HSB Color (Elements) or Lab (full Photoshop). With the HSB method, the value we're interested in the B (brightness) value. With Lab we look at Lab L. HSB B is not exactly the same as Lab Luminance, but over the relevant range, it is close and will result in good ICCs.

To even out the readings and eliminate some of the noise, use Gaussian Blur on the scanned test strip. With my test strip scanned at 72 dpi, a blur radius of 2 pixels evened out the patches without eliminating the needed separation lines.

For the white point, adjust the scanner Highlight setting until the measured Brightness or Lab L value of the paper white (Kodak A point) is 96.

The Shadow setting should be adjusted to get the black point – Q-13 B – to HSB Brightness = 17 or Lab L = 16.

After the above adjustments, the Gamma setting needs to be adjusted to match the known middle point. For Kodak Q-13 point M would be set to obtain an HSB B = 45 or Lab L = 49.

After all have been set, do another scan and re-check the readings to see that adjusting one didn't affect others. These settings should be written down, because they should reasonably calibrate the scanner for all papers. In the future you can manually set the scanner to these settings before scanning the printer test strips.

Feedback from some others who have used this procedure suggest that that Epson scanners are often close to the model I have (Expression 1600), that the above settings might work fine as is.

Note that scanners may drift with time and other variables.

Making the ICC Input Data File

Once the scanner is calibrated, the first step in making an ICC profile is to print a 21-Step test strip. I have several of these posted on the web. See <http://www.paulroark.com/BW-Info/21-Step.jpg> or <http://www.paulroark.com/BW-Info/21-Step-black.jpg>. The settings in the printer driver need to be the same when the ICC is used as when it was made. As such, note these settings, which should probably also be noted in the ICC name.

I generally recommend using the highest resolution or quality level, including having "High Speed" un-checked. For good matte papers, the paper type is usually Matte Paper, Heavy-weight or Epson Enhanced Matte (aka Ultra Premium Presentation Paper Matte). It might be worth printing 100% black patches with several paper type settings and then finding which is the darkest by scanning them all at the same time. Be sure they are all very dry. I use a hair drier to speed this process. However, the depth of black on matte papers often increases slightly overnight.

The Create-ICC program requires that each step in the input data from the 21-step scan must have some positive density difference. So, if the ramp is posterized, find settings in the driver that avoid this.

Note that where I often see the problem with posterization is in the 90 – 100% range. In another PDF I discuss who to use Create ICC-RGB and a Photoshop curve to optimize the dmax of the printer as well as take care of posterization in the deep shadows. See <http://www.paulroark.com/BW-Info/Fine%20Tuning%20the%20Dmax.pdf>

After the test strip is dry, scan it with settings determined above and with a black paper behind it to cut flare. Then, in PS smooth out the scan with blur or the dust-scratches removal filter, and use the eyedropper at 5 pixel size to read each of the 21 patches. As the eyedropper is moved around the patch if the value changes, I estimate an intermediate or average value. Note that the ICC program can handle decimal points if an intermediate value appears appropriate.

The “Create ICC” program uses a simple text file that is on your computer’s desktop to input the density values. The following can be used to make a Template data file as a convenient starting place.

Gray	Lab_L
0	97
5	91
10	88
15	84
20	81
25	78
30	74
35	69
40	65
45	61
50	57
55	52
60	48
65	43
70	37
75	33
80	29
85	25
90	22
95	19
100	16

Note that Create ICC will work even if the columns are not labeled and even if the gray level information is omitted. That is, just a simple list of the readings (Lab or Density) separated by a return appear to work fine.

Take the PS eyedropper readings and enter them into a text file similar to the example above. Elements users will have to substituting the HSB Brightness readings for the Lab L values.

Save the file with the printer, inkset, and paper names noted as well as the critical driver settings. I put the printer name first (e.g., "C88") so that all of the ICCs for that printer will be listed together. "QTR" will always precede the ICC name you enter. As such all of these types of ICCs will be together in the list that will appear when you go to use them.

Making the ICC

Of course, the first step here is to go to Roy Harrington's QTR website and download the "Create ICC" program. Go to <http://www.quadtonerip.com/html/QTRdownload.html> and select the appropriate version. The Create ICC program is part of the overall QTR (Quad Tone Rip) set. The Create ICC program will be installed in the Eye-One folder initially (c:\Program Files\QuadToneRip\Eye-One) and needs to be put on the Desktop after installation (copy and paste, or drag the icon).

The program works by simply dragging the icon for the input data text file (that was saved to the Desktop) to the icon for the Create ICC program. As long as the data is acceptable (no flat spots, etc.), the program produces an output data text file and an ICC with the same name that was used for the input text file. Don't change the ICC name.

If you like the results of this program, be sure to pay Roy the \$50 shareware fee.

Using the ICC

In general, one simply inserts the ICC into the printing workflow in the Print Preview in PS. With the usual default settings and a monitor that has at least been calibrated with the Adobe Gamma or other free, manual calibration procedure, the print should have a good grayscale ramp that reasonably matches the monitor's display.

How to put the ICC in the correct folder -- Windows XP

ICCs are put in the following Windows XP or Vista folder:
c:\windows\system32\spool\drivers\color\

I recommend you highlight and copy this c:\ ... \color path and make a folder shortcut on your desktop that allows you to simply drag the ICCs to the shortcut to put it into the correct folder location. This is the procedure to make such a folder shortcut.

1. Right click on the Desktop (anywhere on your computer monitor where no icon appears and when no program is running there).
2. On the menu that appears, highlight "New."
3. On the new menu that appears, click on "Shortcut."
4. In the space where it asks you to type in the location, copy & paste, or type in the full path:
c:\windows\system32\spool\drivers\color\
5. Click on the Next button. "Color" should appear in the box. You might want to also add "ICCs" to this name so that it reads, "Color (ICCs)."
6. Press "Finish" and a folder icon should appear on your Desktop. This is a shortcut to the proper folder.

To use this, simply drag the ICC icon that has been saved to the Desktop over to the Color (ICCs) shortcut folder icon. The ICC icon should be transferred to the proper folder.

Note that if Photoshop Elements has already been opened, it will not "see" the new ICCs until the Color Settings box (Edit>Color settings) is opened and closed.

Location of ICCs in different OSs

Mac OS 9.x: -- Systems Folder/ColorSync Profiles

Mac OS X -- User Library/ColorSync/Profiles

Windows 98/M --: \Windows\System\Color

Windows NT/2000 or XP upgrade from NT/2000 --
\Winnt\system32\spool\drivers\color

That's it for now.

Enjoy,

Paul

www.PaulRoark.com