

“Ebony-6”

100% Carbon Pigment Black and White Printing For Many Epson Printers

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11-25-08

Ebony-6 is a monotone, black and white inkset composed of MIS Associates' Ebony carbon matte black ink, along with five dilutions of it. The inkset produces extremely smooth, 100% carbon pigment prints on matte papers. The prints can range in tone from relatively neutral to warm, depending on the paper used.

Ebony-6 will appeal to those who want very stable fine art prints. With no color inks in the inkset, profiling is easier, while fading and color ink artifacts, including metamerism and tone shifts cease to be concerns.

Most Epson printers can use this inkset. The older Epson large format printers like the 7500, with their relatively large dots, print slightly cooler than the newest printers with very small dots. Older Epson large format printers can be great values for B&W carbon pigment printing.

A variety of printing procedures or workflows can be used, including the Epson driver and QTR.

A. Background – Lightfastness and Tonal Stability

Maximum image stability – lack of fading and tone shifting – is and should be a primary goal of high quality B&W printing. While color pigments used in inkjet printers today allow color images that exceed the life of most wet process color prints, they are not up to the stability expected of B&W silver prints. The use of color pigments in the vast majority of B&W inkjet printing systems will inevitably cause the prints to shift tones as the color pigments fade at different rates. As such, these prints cannot be expected to be as stable as the traditional silver prints. High quality carbon pigments do have the stability to challenge the silver prints, and B&W images composed of nothing but very stable carbon should satisfy the most demanding B&W print connoisseurs. See <http://www.paulroark.com/BW-Info/R1800-Lightfastness.pdf> for general information relating to carbon pigment lightfastness.

The 100% Ebony “3-MK” workflow for the Epson R1800 (written up in the February 2008 issue of Shutterbug magazine) was the first neutral-printing, 100% carbon pigment inkset that was able to also achieve what most would consider photo quality smoothness due to that printer's very small 1.5 picoliter

droplet size. (See <http://www.paulroark.com/BW-Info/R1800.htm> for more information on the R1800 “3-MK” printing approach.) An Eboni “black only” approach using QuadToneRip also works well on the 1.5 picoliter Epson 1400. However, even on these 1.5 picoliter printers, some graininess is still visible upon very close inspection when only 100% Eboni MK is used. The dilute carbon inks in Eboni-6, however, make extremely smooth prints on all printers.

The Eboni black only approach does not work well on printers with larger drop sizes. This includes most Epson printers and all large format printers. Dilute inks are needed for good smoothness in most printers.

Most dilute carbon inks are too warm to make neutral B&W prints. Eboni-6, however, combines the neutral Eboni carbon pigments with a dilution base that retains most of that neutrality on many papers, while printing quite warmly on others. As such, by selecting different papers one can achieve print tones that cover a significant range of tones used by fine art printers.

B. Ink Positions

There are 6 densities of ink in Eboni-6. The placement of the inks, by MIS abbreviated designation, is as follows (with a note as to approximate density of the ink):

K = Eboni (The standard MIS Associates carbon matte black ink)

C = EB6C (Similar in density to the standard MIS UT dark gray density)

LC = EB6LC (Similar in density to the MIS UT Light Carbon density)

M = EB6M (Similar in density to MIS K4-LK)
(K2 printers use this ink in both the LK and M positions.)

LM = EB6LM (K3 printers also use this in the LLK position.)

Y = EB6Y (A very light “LLLLK”)

The density order, from most to least dense is: K, C, M, LC, LM, and Y.

Be sure to **remove the tab** (usually yellow) **on MIS cartridges** that block the air intakes before installing the cartridges.

For the Epson 2200 – 9600 (K2 printers) or 2400 (and other K3 printers) the notes on densities above indicate what inks to use in the LK and LLK positions.

See <http://www.paulroark.com/BW-Info/Eboni-1800.pdf> for the unique ink order used for the R1800 printer.

To order the inkset from MIS, go to <http://www.inksupply.com/eb6.cfm>. For the 1400, pre-loaded carts are available at <http://www.inksupply.com/product-details.cfm?pn=EB6-1400-SET>

Note that **flushing** the printer is **required** before switching from an UltraChrome inkset to Eboni-6. Eboni-6 and UltraChrome inks should also not mix on the parking pads. As such, rinse them before installing and do not have UltraChrome inks in the same printer as Eboni-6.

Note regarding **wide format** printers and CIS/CFS units: All pigments settle with time. I have observed settlement with the middle dilutions of this inkset that is a bit faster than average. As such, agitating carts and CIS units is even more important than usual. This should have no impact on desktop printers with individual carts because they are agitated routinely when during printing, and even with this characteristic, Eboni-6 is the most reliable inkset I've used in my 7500.

I'm moving to a "**Eb6-YK**" approach that only uses the Y (2%) dilution and the 100% Eboni K. Both of these inks are quite stable. They are also the most neutral of the inks. With printers like the 1400, one does not need the middle dilutions for smoothness. – Y and K are enough. For K2 printers (4 pl drops) the midtones have a grain pattern that I find very acceptable in wide format, but it's too rough for 8x10. This approach does require QTR and cannot be printed with the Epson driver. However, it also simplifies the system while providing more flexibility with respect to tones and papers. See my latest CIS at <http://www.paulroark.com/BW-Info/Eb6-YK-CFS.jpg>

C. Printing Workflow Options

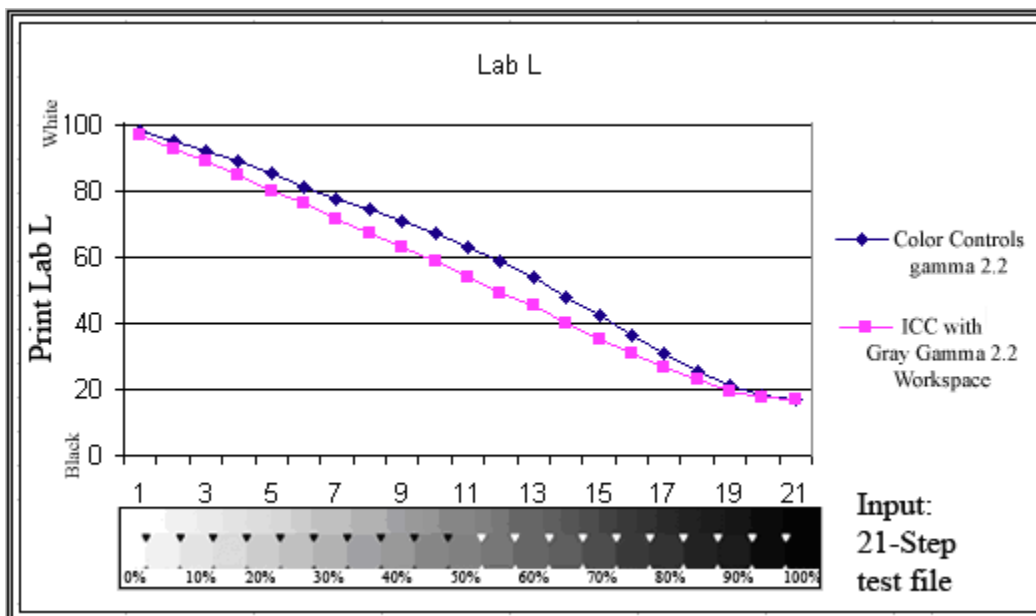
While the ultimate in control will come with a rip like QuadToneRip ("QTR"), I find the Epson driver with an ICC made with QTR's "Create ICC-RGB" is the one I prefer and use most. Many will find that using just the controls in the Epson driver provide sufficient control. Below are several options with respect to workflows. In all cases, a grayscale file is used, not a color, RGB file.

1. Epson Driver – "Color Controls" Checked, No ICC

Most Epson models will print reasonable well with the following driver settings: paper type = EEM, Matte Heavy Weight, or Watercolor; 1440 or Best Photo; and high speed un-checked. Driver gamma setting 2.2 usually results in the most evenly distributed, best looking prints. The sliders might be able to improve the

image, but I leave them at the default neutral (0) setting. Matching how the image looks on the monitor is usually the primary goal.

The black curve below shows the Lab L (luminances) for the Epson 1400 with the Epson driver “Color Controls” checked and gamma set to 2.2. These settings are in the “Advanced” driver “Properties” box. A 21-Step test file is printed and the test patches from the paper white (0%, #1, below) to the 100% black (#21) are measured with a spectrophotometer. The red curve shows the ideal distribution where an ICC is used and the working space is Gray Gamma 2.2. As the graph below indicates, printing with only the Color Controls checked in the printer driver, with no ICC, may result in a print just slightly lighter than the ideal print from a gray gamma 2.2 workspace.



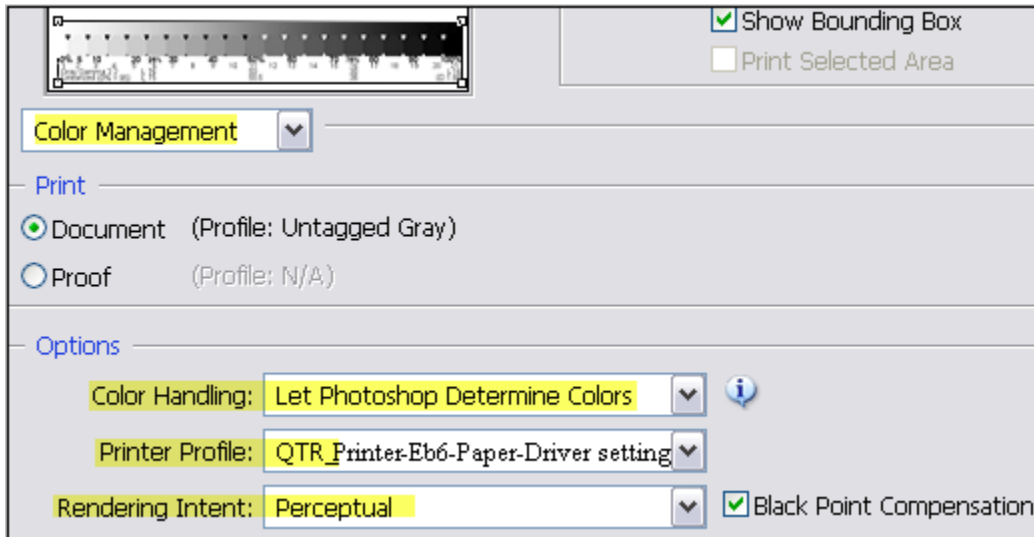
2. Epson Driver – ICC in Print Preview

The use of an ICC in the Photoshop or Elements Print Preview has significant advantages. Grayscale ICCs are easy to make using QTR’s “Create ICC.” This program is part of the QTR download. To download this program, go to <http://www.quadtonerip.com/html/QTRdownload.html>

An ICC “color manages” the workflow, in the sense that the monitor will automatically give a good match to the print’s relative densities. (ICCs can also be used to “soft proof” the print tones, but that is beyond the scope of this article.)

Briefly, ICCs are made with Create-ICC by printing a 21-step test strip and taking the Lab L or density readings from that test strip to, in effect, tell the printer how to match the monitor.

ICCs are made for specific printers, papers and inksets, and the printer drivers must use the same settings as were used when the original test strip was made. As such, I recommend that the name of the ICC include not only the printer, inkset and paper name, but also the key driver settings. The Print Preview screen-grab below shows how the names are set up. For the driver settings, “NCA” would indicate the “No Color Adjustment” driver setting. In many drivers one first checks “ICM” before the “No Color Adjustment” setting is visible. An ICC that includes “CC22” would indicate that one should use “Color Controls” with the gamma set to 2.2.



Note that whether “Black Point Compensation” is checked or not does not appear to make any difference. Elements does not even have the option.

When one makes an ICC the use of a spectrophotometer to read the test strip is ideal, but one can also use a flatbed scanner for this purpose. See http://www.paulroark.com/BW-Info/Making_B-W_ICCs.htm for some tips on using Create-ICC with a flatbed scanner. I use a ColorVision Print Fix Pro spectro.

3. Epson Driver – ICC Made with “Create ICC-RGB” & Photoshop Image Adjustment Curves

The Epson driver workflow that gives the most control and smoothest results uses an ICC made with QTR’s “Create ICC-RGB.” This type of ICC can have a Photoshop image adjustment curve embedded in it that can “partition” the inks, putting only the lightest inks in the highlights. This workflow also results in a high bit depth pipeline from file to printer – a unique ability that no other popular B&W workflow allows.

The 7500 and similar older large format printers do show some dots when closely examined if the Epson driver with no partitioning curve is used. A Photoshop

image adjustment curve can also result in somewhat more neutral printing. Profiles for the 7500, 2200, 220, and 1400 for Premier Art Smooth BW and some other papers are at <http://www.paulroark.com/BW-Info/Eboni-6-profiles.zip>

For the more modern printers a simpler, mild partitioning curve that essentially just separates the RGB curves makes a very good and flexible approach. These same Photoshop curves appear to work for many papers and printers.

PS image adjustment (*.acv) curves for the 7500, 220, and 1400 are included in the Zip file. The 1400 curve using NCA results in the most neutral prints on the 1400 and perhaps other printers.

See http://www.paulroark.com/BW-Info/Embedding_Photshop_Curves_in_ICCs.pdf for information on embedding curves in ICCs.

See <http://www.paulroark.com/BW-Info/Eb6-C6-curves.pdf> for more on the Photoshop curves used in making ICC profiles with QTR's "Create ICC-RGB" program.

4. Printing with QuadToneRip (QTR)

QTR provides the most control and flexibility. In my old 7500, for example, omitting either the lightest (LLLK) or second darkest (Eboni-C) inks still allows it to print well. So, there is redundancy that might be used to extend the life of an old printer.

QTR also allows a more precise black ink limit setting. This allows one to achieve a slightly higher dmax than the Epson driver with some printers and papers.

D. Papers & Print Tones

The print tones produced by the Eboni-6 inkset range from near neutral to warm, depending on the paper used. In general, the maximum Lab B value (yellow-blue axis) indicates the warmth of the print. The higher the Lab B value, the warmer the print will appear. The difference between the paper tone and the maximum midtone Lab B also affects the sense of warmth, as the eye tends to do an automatic white balance on the paper white or other white reference (like the mat board). The maximum Lab B values have ranged from slightly negative to about six with matte papers.

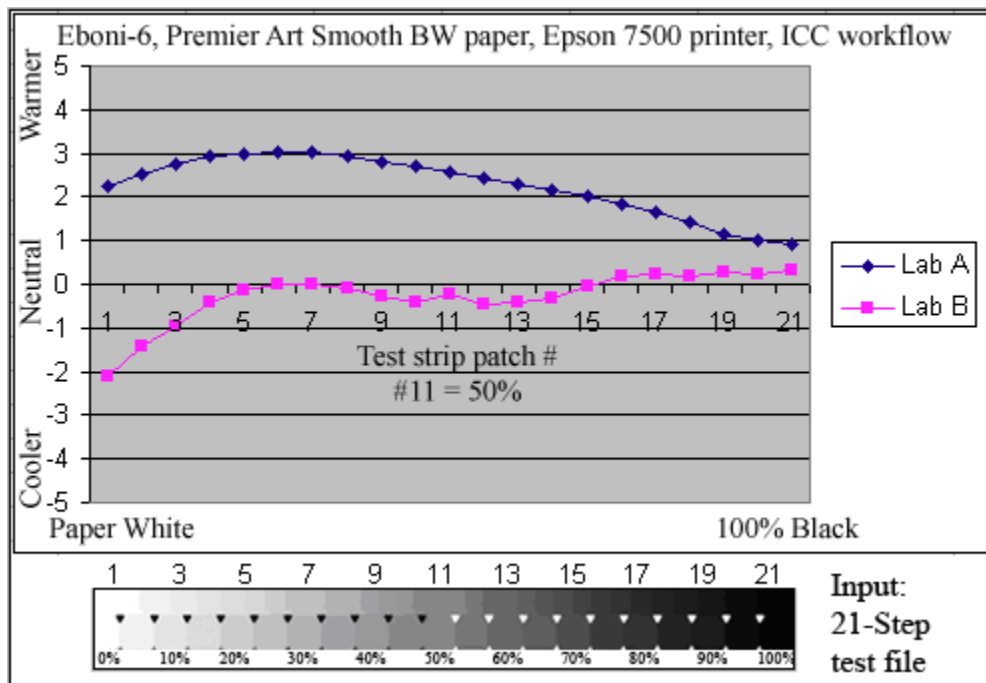
Lab A also affects tone, but it is essentially set by the paper and remains relatively constant. A slightly positive Lab A (red/magenta) is generally preferred

to avoid the print taking on a green tint; thus all of the papers show this characteristic to some extent.

1. Neutral Prints

The Premier Art Smooth BW Fine Art paper has the most even and neutral image tone I've found with this inkset. There are several different weights of this paper. See http://www.premierimagingproducts.com/pm_smoothbwfineart.php

To objectively compare paper tones, graphs (Excel charts) of spectrophotometer Lab readings from 21-step test strips can be helpful. Below I use them to compare a variety of papers.



The graph above shows the tones for a 21-step test strip of Premier Art Smooth BW when printed with Ebony-6. In this case an Epson 7500 printer driver was used with an ICC inserted in the Photoshop Print Preview. The ICC contained an embedded Photoshop curve that makes the print smoother than if just the Epson driver alone is used. Because larger drops print slightly cooler, the rise in the Lab B with the 7500 is very low. This rise will increase somewhat with newer printers with smaller droplets.

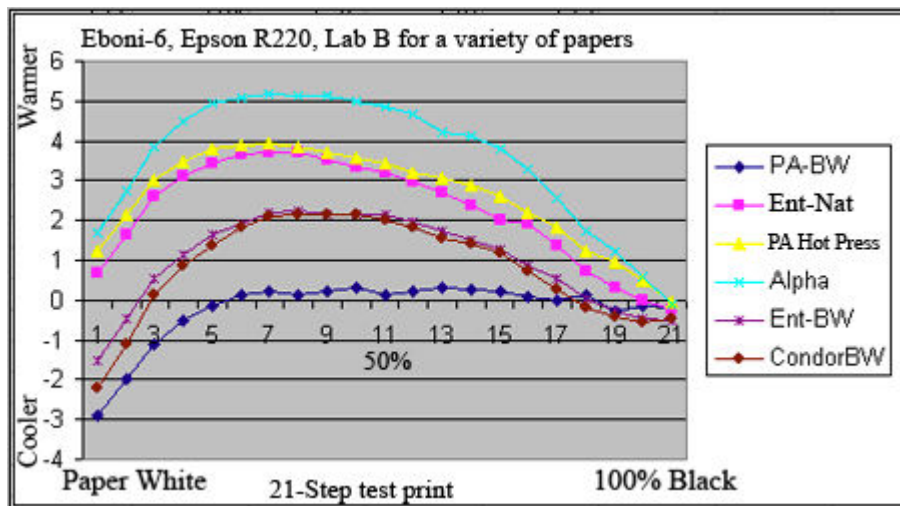
Other papers that print with relatively neutral print tones include Hawk Mountain's Condor BW, Moab Entrada BW, and Brightcube Eclipse. These print with a Lab B range from -2 to +2 with most Epson printers.

Perhaps because of their relatively higher Lab A values, these papers print with a slight “selenium” tone that appeals to me as a former printer of selenium-toned silver prints. For relatively neutral-tone prints, the above papers are my top recommendations.

Note that a mat board like Light Impressions “Gallery White” has a Lab B = 3. When displayed in these over-mats with no paper-white margin showing, the eye, in effect, uses the mat board as a white reference. The above papers will look quite neutral, with relatively cool highlights that appear to be brighter than the mat. This tends to pull the eye into the picture.

2. Relative Print Warmth

The Lab B characteristics of a paper largely determine how warm it prints. Below is a graph of the Lab B values for a variety of papers, all printed with an Epson R220 loaded with Eboni-6.



The papers, above, all print with a Lab B curve that is similar in shape. However, with different degrees of whiteness of the paper base, and relatively corresponding maximum Lab B values, they cover a range of image tones. The lower curves are relatively cool while the top ones are warmer. This group has a split tone between the paper white and maximum Lab B value of about 3 to 4.

Lab A values have been omitted because they are similar among the papers and from paper white to black.

The papers graphed above are as follows, from the coolest to warmest and grouped where the papers print with almost identical tones:

Premier Art (“PA”) Smooth BW – the coolest paper shown;

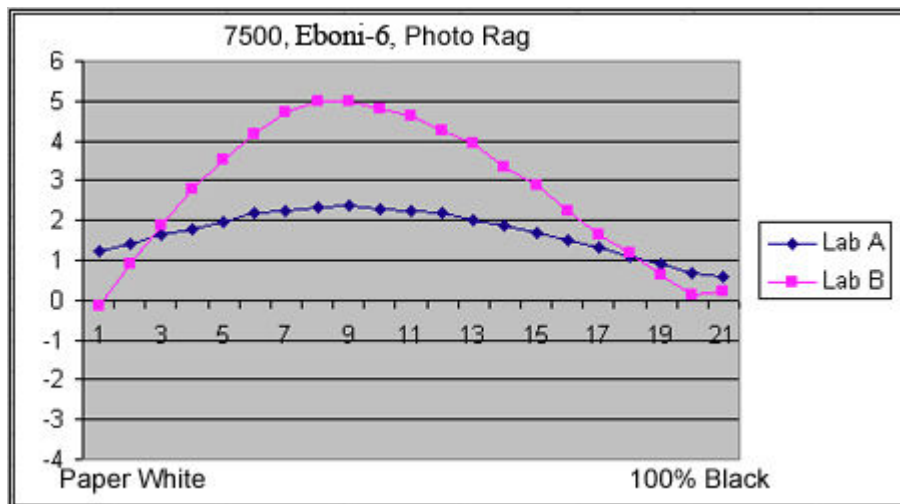
Moab Entrada BW and Hawk Mtn. Condor BW;

PA Hot Press (205 & 325) and Moab Entrada Natural –
Medium warm, non-OBA papers;

MIS Alpha (similar to PermaJet Alpha and Innova Soft Texture).

3. Paper with Warmer Split Tones

Papers can vary significantly in the extent to which they have a split tone between the paper white and maximum Lab B values. Photo Rag, Enhanced Matte, and a number of other papers print with a split tone of about 5. This gives the image more warmth and also may give a sense of higher dynamic range because the tonal differences as well as the luminance values helps to separate the image elements.



One way to describe a paper tone in this system is simply by noting the paper white and maximum Lab B. For example, the bargain non-OBA paper Red River Aurora Natural has a paper white of 0.4 and a maximum Lab B = 4.8.

I tend to use cooler papers with low split tones like Premier Art Smooth Bright White for landscapes where there are clouds or snow, and use the warmer papers with more split tone for southwestern scenes. Many prefer warm tones for images of people.

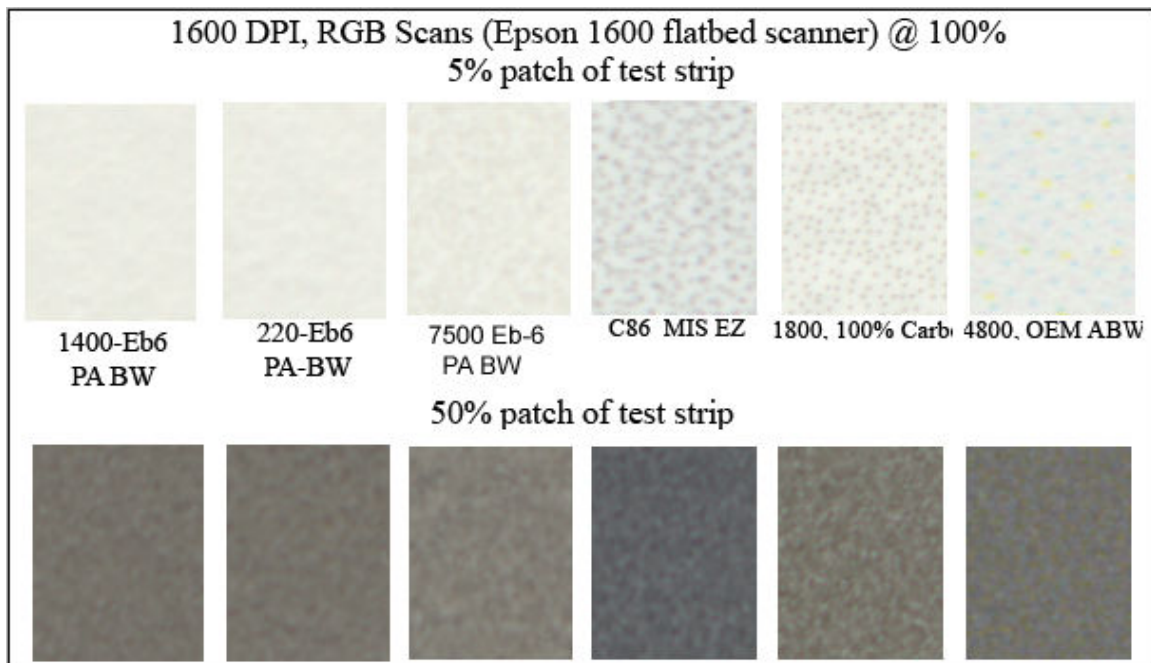
The warmest print with the maximum difference between the paper white and warmest midtones may be Ilford Galerie Gold Fibre Silk. As a “glossy” paper, it must be sprayed after it is printed to avoid the Eboni from rubbing off. It has a paper white Lab B = -0.6 and prints with a maximum Lab B=9+ and a dmax (maximum black density) of 2.2 after being sprayed with Premier Art Print Shield.

It makes a beautiful warm glossy print with a satin type finish. The image is sufficiently protected by the Print Shield that it can be displayed without glazing. On the other hand, spraying prints is not something I recommend.

The very bright papers like Premier Art Matte BW will have a range from Lab B = -5 to +2.

E. Image Structure Comparison

The 1600 dpi (flatbed) scans shown below give some objective information about relative smoothness.



The test patches shown above are, on the print, only 1.75 mm high. So, to get a better idea of smoothness, adjust your viewing distance from the monitor. On my monitor the images are 35 mm high. So, if the normal print viewing distance is 14" (according to Kodak), I'd have to view my monitor from a bit more than 23 feet away to adjust for the magnification shown here.

The bottom line is that the Eboni-6 inksets with the lightest inks have extremely smooth highlights and midtones – even on the old 7500. On modern printers the inkset prints virtually dotless.

A 100% carbon pigment printing workflow, like the one discussed here, probably makes the most stable inkjet images possible with today's technology. The carbon pigment prints may be even more archival than the old wet-process silver prints due to the buffered paper base that has not been subjected to the harsh processing chemicals of the old wet darkroom processes. It is where I think fine art B&W printing should be.

Paul

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