

Glossy Carbon Variable Tone

Black and White Inkset for Epson Printers

www.PaulRoark.com

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This project is taking the “Ebony Variable Tone” (matte paper only) approach to a glossy-compatible, “photo” carbon black based inkset. As such, all ink positions except for a light blue toner will be 100% carbon pigments.

The Epson 1430 printer is the focus of this PDF because it is my test bed and also used by many B&W photographers, but the basic inkset should work in virtually all Epson printers. My 7800 has now been loaded with this inkset, although in a different format, and runs very well.¹

After a number of different combinations of carbon and dilution base inputs were tested, the final glossy carbon inkset is based on the updated versions of the carbon and dilution base components that gave us very reliable inksets in the MIS “Ultratone” (“UT”) series of B&W inksets.^{2 3} The light blue toner ink I recommend for the top fine art and archival purposes is based on Canon Lucia Blue and Cyan pigments, diluted with the MIS Amber Base or generic base c6b. Currently this inkset is not available pre-mixed or pre-loaded in cartridges, but MIS has all the components needed, including a light blue toner based on MIS color pigments.⁴

Separating the single toner from the carbon allows us not only to vary the print tone from warm carbon to cool, but also to change or customize this ink easily. The basic format lends itself to upgrading the toner or carbon positions should better materials become available. I have also used a warm/sepia toner with this type of arrangement in desktop printers that allow easy swapping of inks.

Neither the carbon nor the Canon toner inks separate or settle faster than the OEM inks in the wide format carts, unlike my experience with blended color-carbon and older/original Ebony inks.⁵

¹ See <http://www.paulroark.com/BW-Info/7800-Glossy-Carbon-Variable-Tone-2016.pdf>. Exploring printing on glossy compatible canvas rolls for wide format printers is one of the specific goals of this project. I do not recommend canvas for either small prints or in the form of sheets. For the 1430 a number of sheet papers will be profiled, including “baryta” papers. Although the 1430 has an Epson driver compatible ink arrangement, the 7800 does not, as I need two MKs for my Arches watercolor printing – another paper that is not recommended for most uses and users.

² Regarding footnotes, when reading this PDF in a browser and then following a link to another web page (like the MIS web pages), the browser back arrow may not work to get you back to the PDF. To avoid this problem, download/save the PDF (Ctrl-S in Windows) and work from that, or copy the desired URL/link address and paste it into a new browser tab. This PDF is being updated regularly. So be sure you’re working from the latest copy.

³ The carbon and dilution base are listed on <https://www.inksupply.com/roarkslab.cfm>. The UT Photo carbon (PK) is at <https://www.inksupply.com/product-details/pn/UT-HEXPT-PK.html?printerID=0>, and the “Amber base” is at <https://www.inksupply.com/product-details/pn/ESC-BASEPT-UC.html?printerID=0>.

⁴ I assume the MIS toner will be about equal in lightfastness to the usual third party carbon + color inksets, which is fine for most uses. The toner sample I recommended to MIS uses the same profiles as the Canon-based toner.

⁵ MIS LK has done better than Epson K3 LK in my centrifuge testing. A six month old mix of the toner made with amber base (long enough for any slow reactions) matched the performance of a control Epson K3 LC in centrifuge testing. I still recommend agitating large, non-moving carts before turning on the printer if they have sat for 2 weeks. All pigments settle. However, with this inkset, no agitation beyond what one would expect of OEM Epson pigments is needed.

Having designed and used a number of different permutations of B&W inksets, this basic carbon plus light blue toner approach is the one that I believe gives us the best and simplest approach to B&W printing. While separate LM and LC inks can give more flexibility, particularly in the Lab A measure, I have found that few photographers can successfully control or profile these separate inks, and Lab B, not Lab A, is the primary variable in how warm or cool a print looks. Carbon's color is characterized mostly by having an elevated Lab B. By having the Lab A locked in via the toner blend, profiling is vastly simplified, and the most useful B&W print tones are within range.

While I call this a "glossy" variable tone, it is also matte paper compatible, assuming the appropriate K cart is installed. As such, it might end up a somewhat universal carbon variable tone inkset. While the flexibility of the new glossy compatible inkset may exceed that of the Eboni VT inksets, the Eboni carbon based inkset will remain the "best for the least" due to the wide availability of the inputs, including the generic dilution base I formulated, and the inherently lower clogging of a matte paper only inkset that needs no binder to glue the pigments onto matte paper.⁶ Also, Eboni MK takes less color toner to achieve a neutral tone on most matte inkjet papers.⁷ As such, I would not expect this glossy version to be quite as lightfast as the Eboni carbon inksets when toner is used to neutralize the carbon warmth. On the other hand, I do expect this inkset, when in its neutral-toned form, to outperform any other glossy inkset, mostly because it simply uses more carbon and less color inks to produce a neutral print. I do expect this combination to be able to match the stability of the traditional old silver print.

One advantage of using glossy carbon instead of the MK as the starting point is that a light sepia tone is now within reach on glossy papers. One of my best known projects locally was a historical photo printing project that used nothing but these basic carbon inks on Museo Silver Rag. Some of those images were displayed in outside, glass cases for several years with no obvious visual changes.

The glossy carbon can make relatively neutral looking (delta Lab B = 3) 100% Arches carbon print. Uncoated paper is not as much warmer with this glossy carbon than with Eboni.

⁶ The glossy carbons appear to be "normal" with respect to clogging. The only clog I've had is in a 1430 that was left unused for over one month in hot weather. It needed several cleaning cycles to get back to a perfect nozzle check pattern.

⁷ It appears matte black carbon particles are usually larger than the glossy compatible carbon particles, which are made very tiny to facilitate a very smooth, glossy finish. Unlike matte inkjet papers, Arches uncoated watercolor paper prints nearly the same with either dilute Eboni or dilute PK.

Ink Arrangement for the 1430⁸

Y = Toner (25% Canon Blue and Cyan Lucia pigments,⁹ 75% base¹⁰)
(Or use the MIS pre-mixed version.)¹¹

K = Eboni MK or 100% Photo Carbon black (PK) (Most PK is blended and not 100% carbon.)

LM = 9% Photo Carbon (PK) (MIS “Ultratone” was K4-PK)¹² (remainder 91% amber base)¹³

LC = 15% Photo Carbon

M = 30% Photo Carbon

C = 50% Photo Carbon

For most B&W K3 printers, I believe using the LM and M as the LK and LLK is the best setup. I have my k3 printers set up with a unique ink distribution that is only advantages for Arches watercolor paper, which I do not recommend for most users.

The 50% PK is useful in maximizing the dmax. It is probably too strong to be in the LK position.

Mixing of these inks can be by weight or volume.

For those who want an easy setup and no mixing, the MIS LLK and LK can be used in both the LM-M, and LC-C channels, and the MIS light blue toner can be in the Y position. While different profiles are needed, this type of “EZ” ink arrangement was used successfully in hextone printers for years.

Printing Characteristics¹⁴

At the warm end of the scale (100% carbon on glossy paper) the print tone is light sepia, with a Lab B increase from the paper base of about 13 units. With the Epson driver at its defaults, the print tone on

⁸ As noted previously, all inputs except for the Canon pigments are linked to MIS’s “Roark’s Lab” page, at <https://www.inksupply.com/roarkslab.cfm>. Note that this is not my page, and I do not receive any royalties from it. I allow the use of my name as long as it appears to help pull together the materials I find useful.

⁹ If mixed all at once, the formula is as follows: 13.75% Canon Lucia Blue (PFI-106B), 11.25% Canon Lucia Cyan (PFI-106C) Canon Lucia Blue (PFI-106B) and Cyan (PFI-106C) are the inks used in Canon’s iPF6300 printer. The inks are widely available. See, for example , <https://www.itsupplies.com/Canon/Canon-imagePROGRAF-iPF6300/iPF6350>). To drain Lucia tanks, I just poke holes in the soft plastic with a clean awl – one high on the side for air to enter and one near the bottom on the side for the inks to pour out of into a 4 oz. bottle. I do this over a sink. For details on the color pigments, see also <http://www.paulroark.com/BW-Info/3880-Eboni-Variable-Tone.pdf> at page 4 and following. Fade test samples for the Eboni based variable tone are at <http://www.paulroark.com/BW-Info/8-week-neutral-v2-v-silver-sel-50-hr.jpg>. Essentially the neutralized carbon + toner compares favorably to a wet process silver print. The final inkset here will be tested in the future, but there is little doubt that the results will be the same. The carbon is so solid the strength of the toner is the only real issue. PK and base are WJ1122 & WJ824.

¹⁰ See <https://www.inksupply.com/product-details/pn/ESC-BASEPT-UC.html?printerID=0> for the amber base. If the Canon-pigment-based toner is mixed with generic base c6b there will be some bronzing on glossy paper, but it may be less likely to clog. I now use the generic base. See <http://www.paulroark.com/BW-Info/Ink-Mixing.pdf> at page 5. Do not mix the MIS PK with the generic base.

¹¹ The MIS made toner, which uses MIS color pigments, is at <https://www.inksupply.com/roarkslab.cfm>, bottom of the page. My tests indicate it uses the same profiles and looks identical to the Canon based toner.

¹² See <https://www.inksupply.com/product-details/pn/UT-HEXPT-PK.html?printerID=0>, <https://www.inksupply.com/product-details/pn/UT-HEX-4-PK.html?printerID=0> or <https://www.inksupply.com/roarkslab.cfm>. This is sourced from STS Inks, and is the closest to the original PK that we have used for years with great success. It is 100% carbon.

¹³ <https://www.inksupply.com/product-details/pn/ESC-BASEPT-UC.html?printerID=0>

¹⁴ Profiles are & will be posted at <http://www.paulroark.com/BW-Info/GlossyCarbon-Profiles.zip> .

Epson Hot Press Natural is close to neutral for the first half of the scale (a Lab B rise of 1 unit), and then cool in the shadows. With Photoshop curves, ICCs or QuadToneRip, the range covers an excellent range of warm to cool with complete and easy control of tonal distributions, including split toning that cannot be done with the “Advanced Black and White” controls used for the Epson OEM approach.

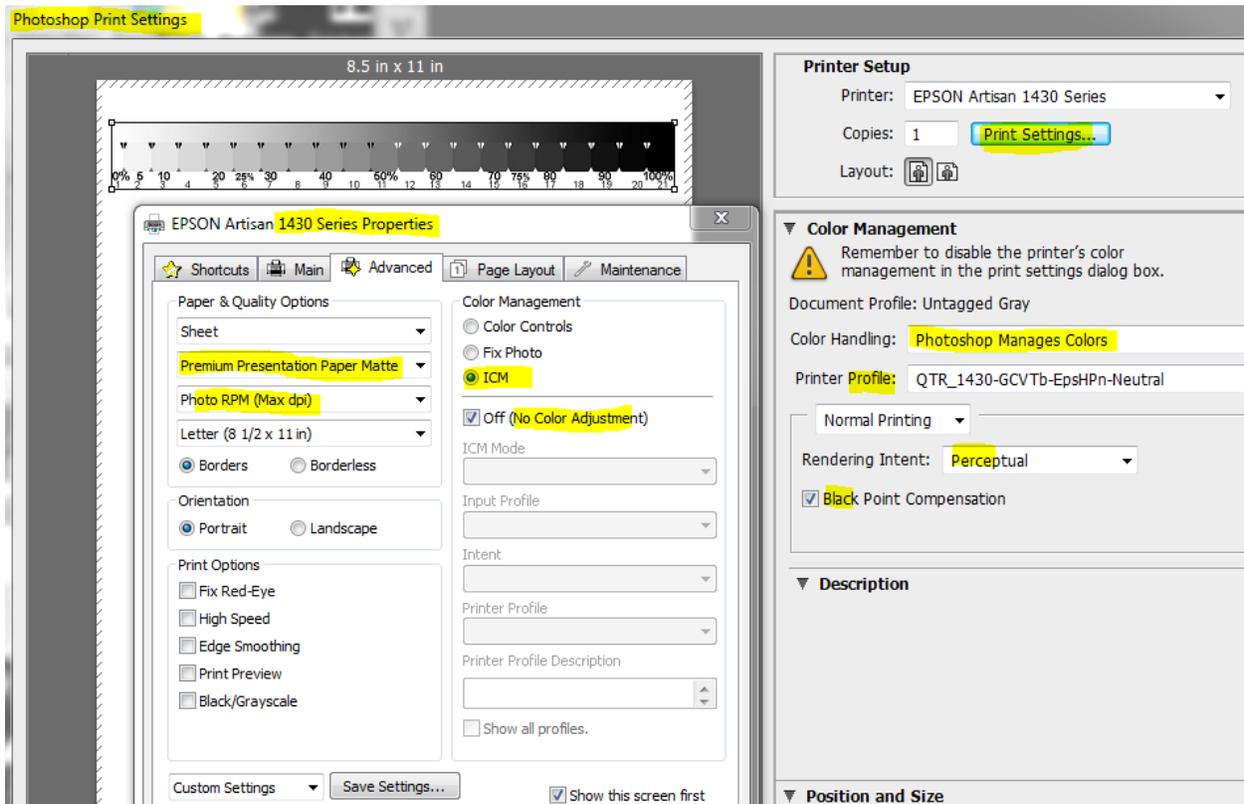
Epson Driver, Matte Paper – Eboni MK in the K position

Epson Drive set to Color Controls, Adobe RGB and Gamma 2.2

I generally do not find that Color Controls give the precision of control I prefer. However, they are accessible and easy. As a starting point, I would recommend moving the sliders as follows: Cyan +25, Yellow +10 or more, and Brightness -3 or more. This gives a light print that is medium warm with some compression of the deepest shades.

ICM-No Color Controls -- including ICCs with Embedded Photoshop Curves

When printing through the Epson driver and using ICCs, the settings I used to make them are shown below. The same settings must be used when printing with them.

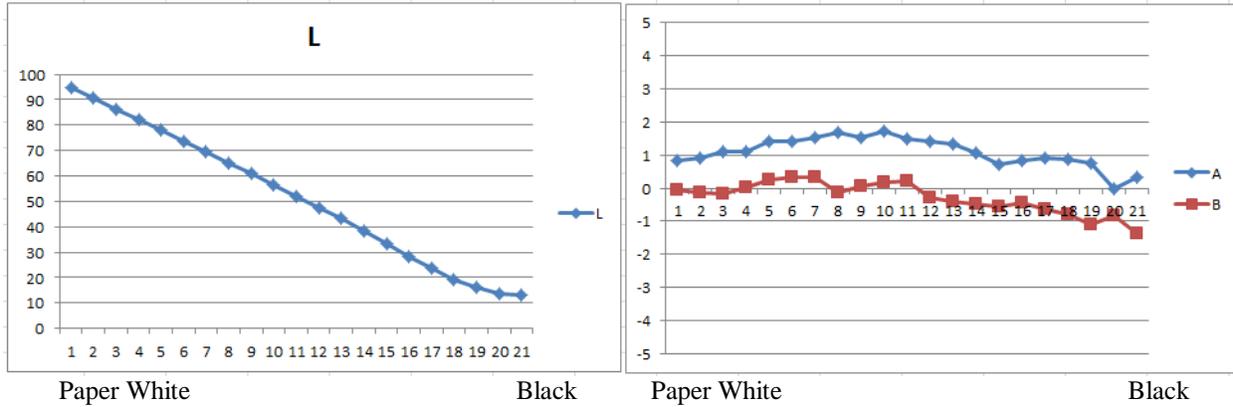


I recommend you save the Epson driver Property settings with a name you'll remember.

If just these settings are used and no ICC or Photoshop curve, the deep shadows are too light.

When the “Gray Ramp” Photoshop *.acv curve is used, where R=G=B, and the curve is drawn to print a relatively standard gray gamma 2.2 Lab L gray ramp, the print tone (color) is a split tone with relatively warm highlights and cool shadows.

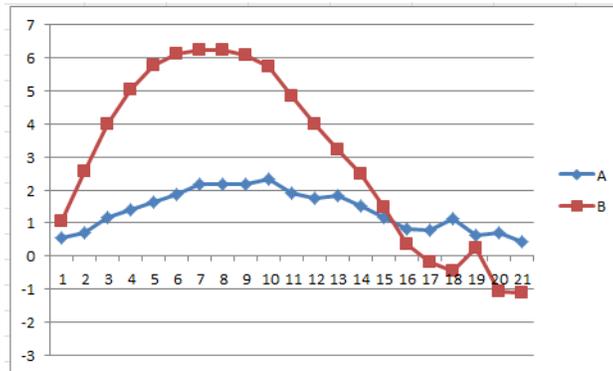
The Neutral ICC for Epson Hot Press Natural prints with the following Lab L, A and B values:



The ICC and the curve that it is based on are in my Profiles Zip file – <http://www.paulroark.com/BW-Info/GlossyCarbon-Profiles.zip>.

The Photoshop image adjustment curves in the Zip file can be used to make ICCs using QTR’s Create ICC-RGB for many papers. The curve for the Red River Polar Matte may give a slightly better Lab B distribution for OBA brightened papers.

The Lab A & B values of the “Warm” curve for Epson Hot Press Natural is shown below:



The graphs above show the range of normal/traditional print tones that are available on one of the popular OBA-free quality fine art papers.¹⁵ For OBA brightened papers the highlights are cooler, and the actual range of Lab B may be slightly higher due to the lower paper white reading.

¹⁵ The light blue toner has enough strength to pull the inkset cooler, but for most uses I would consider these tones outside the normal B&W print range. On glossy papers carbon can reach a light sepia tone, with a Lab-b increase over the paper base of about 13. For Arches the Lab B maximum warmth is about Lab B units over the paper base.

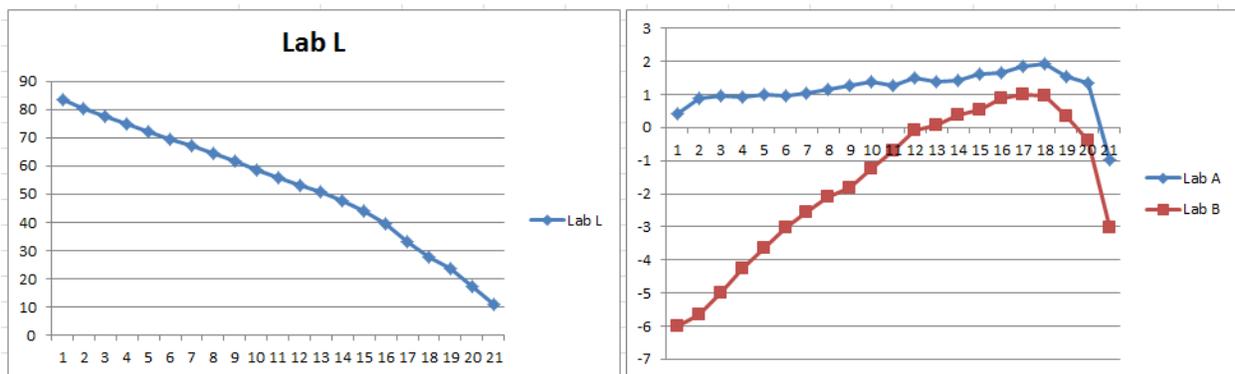
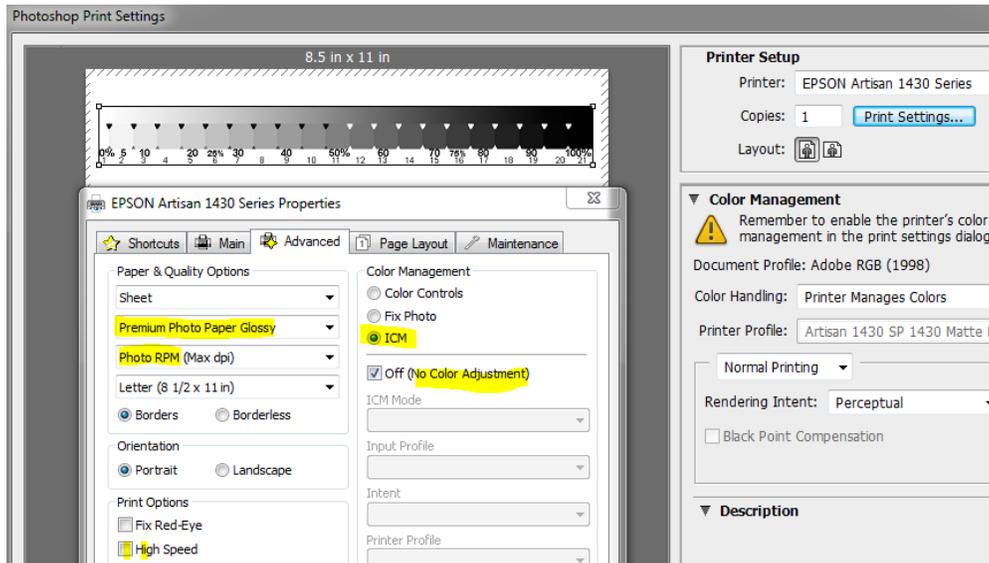
Epson Driver, Glossy Paper – Photo Carbon (PK) in the K position

“Color Controls”

With the driver set to “Color Controls” the print’s gray ramp is light and then reaches its dmax too soon, resulting in posterization in the deep shadows. As such I do not recommend using the “Color Controls” in the Epson driver.

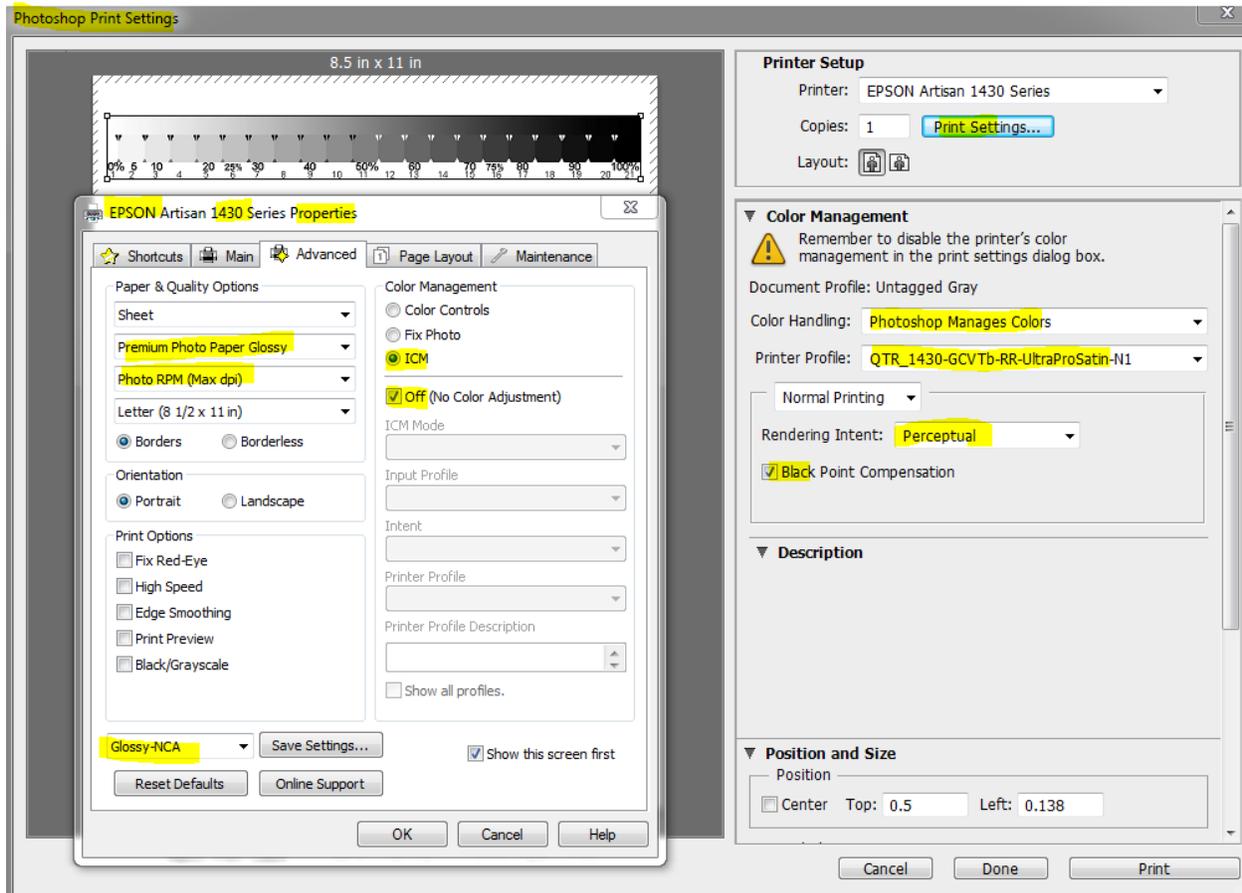
“ICM – Off (No Color Adjustment)”

This appears to be the appropriate starting setting for the Epson driver, and it is needed for ICCs.



With no PS curves or ICCs, and the PS Print screen set to “Printer Manages Colors” the resulting prints are not bad and well within what is easy to profile.

Glossy paper, Epson Driver, ICC



Printing with QuadToneRip (QTR)

I most often print with QTR for more control. The Epson driver with an ICC is fast, but an ICC cannot avoid the limitations of the Epson driver, like lower dmax and less flexibility and control.

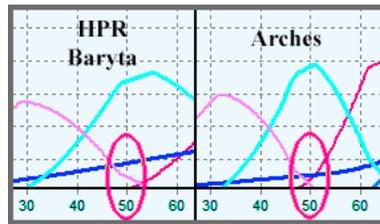
Matte Paper

For work that is going to be displayed when it is framed behind glazing, I prefer matte paper. While the measured dmax of the glossy papers is very high relative to matte paper, in the real world of display in normal homes and offices, where there is a lot of light coming from all directions, even when the glazed work on the wall has spot lights on it, the visual dmax of the matte paper behind glass may be greater than that of the gloss paper behind glass. I measure this with a spot meter at actual viewing position and in actual display settings. It's all about reflections.

My top "signature" medium is carbon pigments on **Arches watercolor paper**. This paper has not coating that on it and should last much longer than any coated inkjet paper. It's not easy to print, but for me the final product and likely longevity makes it worth the effort.

If one likes a medium warm print, Arches can make one with 100% carbon. The difference between the paper base and the warmest part of the print with Arches is about 4 Lab B units. With glossy paper, it is usually about 12 Lab B units. With matte inkjet paper, it's often about 8 Lab B units. The Arches print, when matted with a natural paper mat board, can look quite neutral. The matte inkjet paper will probably look warm, and the glossy 100% carbon print will be more of a sepia tone.

If one wants a neutral print, the Arches is going to use less color toner to achieve that neutrality. For longevity, the less color the better. Screen grabs of the QTR “show curves” graphs in the midtone range for a glossy paper and for Arches, both profiled to be neutral are shown below. The blue line is the toner (color ink). (I changed the original color from Yellow to Blue because the yellow curve was hard to see. The light blue toner is in the Y position, however.) The other curves are dilutions of carbon.



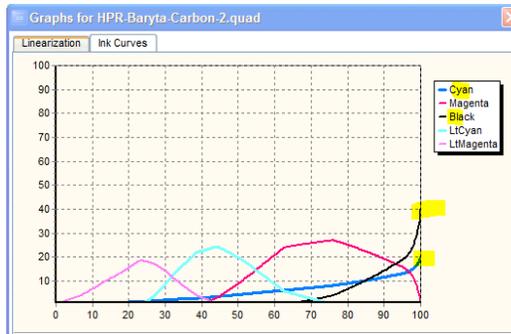
The bottom line is that the Arches neutral print is using much less color to achieve a neutral tone than is the glossy paper. Even if the glossy paper holds up physically, it will be showing the results of color fade and shift much sooner. For very long term display, 100% (or close to it) carbon on Arches, “full sheet” (22 x 30”), matted with a natural 8 ply mat board, and framed behind acrylic (or maybe Museum glass) is my favorite B&W display print. I believe these are better than my silver prints.

Glossy Paper – QTR

As usual, QTR allows one to optimize a paper-ink combination better than the Epson driver. One of the interesting patterns in profiling glossy papers appears to be that with a number of “RC” types of papers, the 100% PK by itself will have a lower dmax than if a significant percentage of PK is also used. People have observed for some time that an LK, if printed to a very high ink load, might have a deeper black than the PK. The PK will clog the microporous coating well before the lighter inks. On the other hand, using a very high load of lighter ink might also result in such a wet surface that the paper will exhibit “pizza wheel” marks. So, there is a compromise that one might have to make in profiling. It will probably vary with printer, paper, and image.

As a practical matter, I’ve found that printing the 100% black with a 1:1 mix of PK and 50% PK (or 2 PK to 1 50% PK for baryta papers) gives a very high dmax, with pizza wheel marks seldom a problem. The Profiles Zip file contains a profile called “K-C-0-40” that usually allows one to find the best black point. My RC paper profiles will often have the 50% PK as a “toner” that has a density of 100% so that it is treated something like a PK “Black only” ink, but it is unlikely people will see any dots. Setting the K boost and this 50% PK ink limit to what the K-C-0-40 shows as the best black usually seems to work.

Below I show the overall curves (QTR’s “Show Curves” feature) for a profile that uses 2/3 PK and 1/3 50% PK (C position) to form the black. With some papers a 1:1 ratio works better. The C ink here also helps to hide microbanding, as well as to minimize the obvious color and reflective differences between the 95% and 100% values of the deep shadows. Again, what works best is dependent on a number of variables.



Using the 50% PK ink as a component of the 100% black point profile also tends to minimize the color difference between the 100% K point and the deep shadows. The black point is often cooler than the rest of the print. This can be an advantage if the 100% K areas are small, like spectral highlights. However, if they are large plain areas the color difference may be more than wanted.

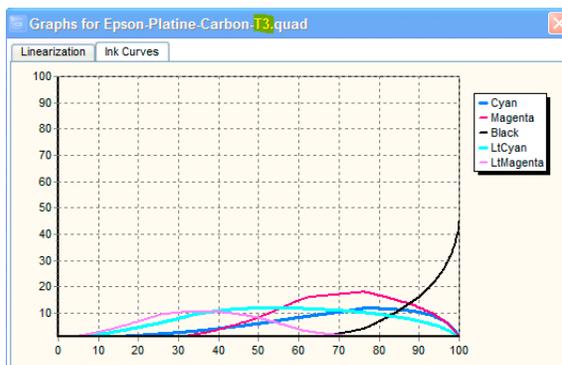
When the 50% PK, C-position ink is used this way the Toner tab for it may have non-default settings, with the Highlights at 1 and gamma at 2.2. See, for example, the Red River Metallic profile setup.

Additional QTR Profiling Notes

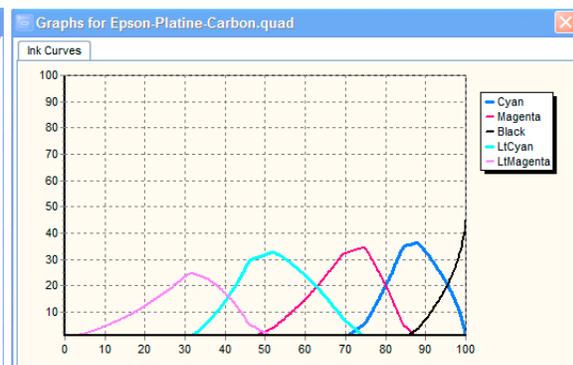
(These are notes I make as I think of them; there is no particular order at the moment.)

The 1430 is subject to microbanding in top and bottom 1.06". This appears to be a paper transport issue/weakness that may afflict a number of Epson printers. The Epson driver has attributes, including more inks firing and, apparently, a different dithering approach, to help lessen the visibility of the problem.

With QTR, I have found that the more inks that are firing at the same time, the less likely the problem will show. To do this, I often assign some of the carbon inks to be "toners." The "gray" and "toner" channels can be individually partitioned or graphed. These profiles will often have "T" (for "toner") in the name. They may hide microbanding better than if all the carbon inks were put into a single "gray" partition.



Carbon inks in "gray" and "toner" channels



Standard "serial" (my term) partitioning of QTR

Which profile approach works best depends on the circumstances. To some extent there is a trade-off of microbanding to “noise” (graininess). It is very printer, paper, inkset, personal taste, etc. dependent.

(That’s it for now.)