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Making HiFi Separations in Photoshop

A simple, inexpensive way of creating HiFi color 'touch plate' separations in Photoshop. This process uses normal commercial CMYK inks - not Hexachrome™ colors.

Introduction

Although the best known HiFi color system is Hexachrome™, other HiFi systems have existed for years. One of the most effective is to print a second set of C, M and/or Y 'touch plates' with conventional inks to maximize density and color saturation. The extra plates carry detail only where the image needs more than 100% of a particular ink. Printing two plates with the same ink yields a full range of dot values up to 200% and individual ink densities up to 2.2 or more in saturated areas, without increasing dot gain.

The process works best with commercial inks but is fully compatible with SWOP ink and press conditions. It can be proofed on any chemical or digital proofing system that allows two passes of each color in register. Normal screen angles are used because the second plates only print where the first ones are solid. Separations are easily retouched in Photoshop® with an accurate soft-proof of the final HiFi result visible on screen.

The method described here is experimental. Quality depends heavily on the number of patches printed in the profiling target. Ideally 2000 or more should be used, but even 1000 patches may produce useful results.

Benefits

• Increases color gamut in richly saturated colors, especially deep reds and blues.
• Compatible with most analog prepress proofing systems (if normal inks are used)
• Printing the first plates to lower densities will further expand the gamut of bright colors and pastels, but at the cost of compatibility with analog proofing.
• No special screen angles or rulings are required - normal 4-color angles can be used for up to eight plates.
• Produces a conventional CMYK ICC profile.
• Separations can be soft-proofed and retouched in Photoshop similar to any 4-color separation.

Limitations

• Because this process generates a 5-, 6- or 7-color target from a 4-color target provided by the ICC profiling software, the total area coverage (TAC) setting in the software will be inaccurate. Experiment with different software settings until the final HiFi separations produce the required TAC in a maximum black area.
• As with all HiFi systems, pagination can be awkward and you will need to experiment to find the best file formats and pagination methods to suit your particular workflow.
• Some prepress proofing systems do not simulate the effect of touch plates on press well enough to produce an effective HiFi profile by this method. For best results an actual press run may be necessary.
• Profiling software that uses less than about 1200 CMYK patches may not do an acceptable job.

Method

• An original CMYK target from any ICC profiling software is converted into two sets of plates by passing it twice through two pre-set Photoshop curves. The curves can be altered to create extra plates for all four inks, or just some inks (usually cyan and magenta) leaving the others untouched.
• This produces two CMYK files of the original image, one 'normal' and one 'extra', with a total of 5 to 8 plates, depending on how many inks are affected. Each affected ink will now have a pair of plates, one

'normal' and one 'extra', while the unaffected plates will remain unchanged with just a single plate in the normal file and a blank separation in the extra file.

- All plates are printed in register on one proof or press sheet using two passes of the standard CMYK colorants. This means the affected inks (usually cyan and magenta) will be proofed or printed TWICE, once from the 'normal' and once from the 'extra' plate, and the sheet will have TWO layers of the affected inks.[1]
- The printed target is measured as normal and a standard 4-color ColorSync profile is produced.
- This profile is applied to any image to produce an initial 4-color file.
- The initial 4-color file is passed twice through the same Photoshop curves used during profiling and saved as two CMYK files of the original image, one 'normal' and one 'extra'.
- The resulting two CMYK files are printed in register on one proof or press sheet, same as for the target.

Photoshop curves

Two sets of curves must be saved prior to beginning. These will vary depending on how many extra plates are to be used and the preferred cross-over point. Here are some typical curves and their coordinates.
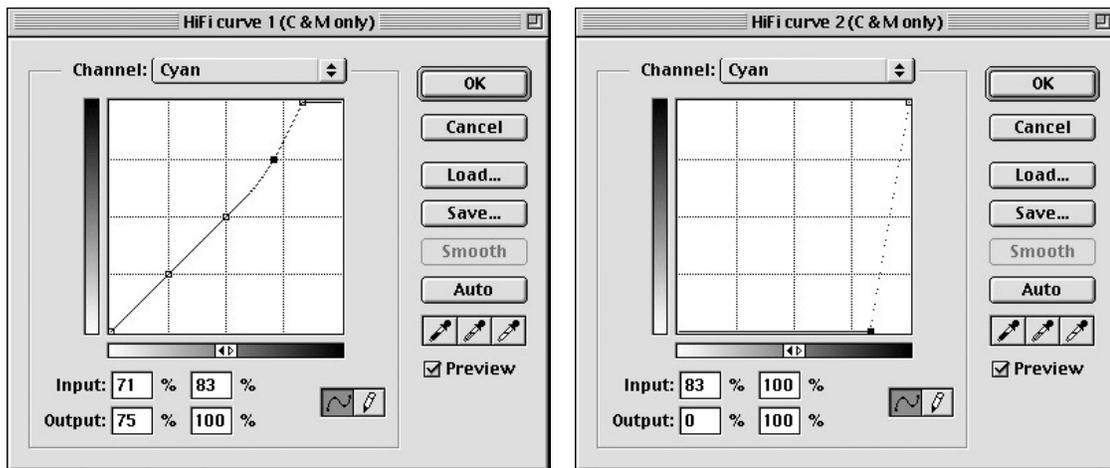
- Typically only the Cyan and Magenta channels are affected in the pre-set curves. Unaffected inks in curve 1 have a normal 45° line, while unaffected inks in curve 2 have a flat line all the way across at zero %.
- The cross-over point is the percentage dot value at which the first set of plates goes solid and the second begins printing. This should coincide with one of the original patch values in the 4-color target, typically between 75 and 85% - in this case 83% is one of the values in the GretagMacbeth 'TC6.02' target.
- Feel free to modify these curves but remember the cross-over point must be the same on both curves
- In this example the affected inks are adjusted only in values above 50% (see locked 25 and 50% points in curve 1) so that gray balance is not affected in lighter tones. This is a precaution to minimize possible side effects of 'cheating' on the profiling software. With some software it may be safe to make curve 1 a straight line from zero % to the cross-over point.

Printing the target

- Open any 4-color profiling target with as many patches as possible[2] in Photoshop.
- Apply the curve 'HiFi curve_1' and save the resulting image as '(target name).norm'.
- Click **File … Revert**, or use the History palette to go back to the original version.

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[1] The proofing system must be able to accept more than four laminations. Most chemical proofs such as DuPont WaterProof™, Imation MatchPrint™, Agfa PressMatch™ or Fuji ColorArt™ qualify, but Imation Rainbow™ and Kodak Approval™ do not.

[2] The more patches the better – ideally there should be two or three thousand in the original target.

- Apply the curve 'HiFi curve_2' and save the resulting image as '(target name).xtra'.
- Print or proof the first file ((target name).norm) using normal CMYK colorants but NO FINISH COAT.
- Once the first four colors are down, print any extra separations from the second file ((target name).xtra) IN REGISTER OVER THE NORMAL IMAGE, using the same CMYK inks or colorants[3].

Ink sequence

It is recommended that the standard sequence already in use on a particular device be followed, both for the first (normal) and second (extra) files. If a color is absent from the extra file, skip to the next color in the normal sequence. Naturally, the same sequence should be used for profiling and production printing.

Creating the profile

- Measure the resulting press sheet or proof as you normally would in the profiling software.
- Note that the profiling software has no idea that you split the original target into two sets of separations. Just tell it which CMYK target was used (most software gives you a choice.)
- Build a profile as normal, but note that you may need to reduce the total ink amount ('Total Area Coverage') to get the desired total dot in maximum black areas, because of the effect of the Photoshop curves.

Producing an 'initial' 4-color image file

- Apply the profile as you normally would to an original RGB image. This produces an 'initial' 4-color file that WILL NOT PRINT PROPERLY, but which can be edited and dust busted as normal.

Image editing

There are two ways of editing these separations in Photoshop; working on the 'initial' 4-color file, or working on the two separate 'normal' and 'extra' files.
- Working on the 'initial' 4-color file has the advantage of a good simulation (soft proof) of the final print on screen. Edits made to the file will immediately display correctly on screen (within the limits of the monitor profile, HiFi profile and local lighting conditions.
- Before working on the file, make sure to select the HiFi profile in Photoshop 5's CMYK setup dialog.
- The second method gives discrete control over each plate, but saturated colors will not look display the combined effect of all plates on screen.

Producing HiFi separations

When all editing is finished, convert the initial 4-color file into HiFi separations as follows;
- Apply the curve 'HiFi curve_1' and save the resulting image as '(image name).norm'.
- Click **File … Revert**, or use the History palette to go back to the original version.
- Apply the curve 'HiFi curve_2' and save the resulting image as '(image name).xtra'.

Sharpening

- USM (unsharp masking) can be applied at any stage in the process, but registration will be easier if the extra plates are NOT sharpened. This implies sharpening the normal plates only after passing the initial 4-color file through the HiFi curves.

Screening

- No special screen angles are required because the extra plates only print where the normal ones are solid.
- The normal and extra files should be output with identical screening characteristics.
- Stochastic or fine-line screening is sometimes preferred for HiFi work, but not essential.

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[3] Only print plates in the second file that have some visible image areas above zero % – don't print any plates that are all white.

Printing live work

Note that live images must be printed exactly the same way as the target was.
- Print or proof the 'norm' file using normal CMYK inks or colorants but NO FINISH COAT.
- Print any separations from the 'xtra' file in register over the normal image, using the same CMYK colorants.

Press control
- An extra color bar should be included for the second set of plates.
- Both sets should be run to normal dot gain and density unless the profile was made with dual densities.
- If a 4-color press is used, run the normal plates first then re-plate with the extra plates and run a second pass. No clean-up is necessary between passes.

Digital proofing

Depending on the software used, the profile should do a reasonable job of simulating the final print appearance on any digital proofer that has equal or greater gamut than the profiled process. Note that only the 'initial' file, not the two separated files, can be proofed using ICC color management.
- Open the **Initial** CMYK file in Photoshop.
- Select **Image … Mode … Profile** to Profile.
- Select the HiFi profile as '**From:**', and the proofer's profile as '**To:**'
- Use **Absolute** or **Relative Colorimetric** intent.
- Convert to a proofing file, print the proofing file to the proofer, then delete the proofing file.

HiFi page assembly

Because most pagination software and RIPs are designed for 4-color work, the easiest way to print occasional or experimental HiFi work is as follows. Higher-productivity workflows depend on user ingenuity.
- Create a basic page in the layout program (QuarkXpress, InDesign, etc.)
- Place the 'norm' file of each image in position and process the page for output.
- In the folder containing the separated images, remove or alter the name of the 'norm' versions and re-name the 'xtra' version of each image to the old 'norm' name. This is easiest by simply altering the name extensions from "___.norm" to "___.xtra" and vice-versa.
- Delete or make white any other page elements, except register marks.
- Note that solid-color linework and other page elements can also make use of the extra plates, but this requires careful planning and execution and intelligent spreading and choking (trapping) to ensure appropriate values appear in the norm and xtra page versions.
- Output the page again. The resulting two sets of plates or films will be obvious by appearance. Remember to only print (or proof) the 'xtra' plates that contain an image.

About the author

Don Hutcheson don@hutchcolor.com has designed several HiFi color systems including Royal Zenith's '5th color' control (1984) and DuPont's HyperColor system (1993). As an independent consultant he develops and installs ICC-based color management systems and specializes in custom solutions for exotic or demanding applications. Clients include commercial and fine art printers, separators, publishers, photolabs, photo and movie studios, art galleries, image banks, billboard printers, magazines, newspapers, and manufacturers of color scanners, printers and related software.