

Digital Workflow

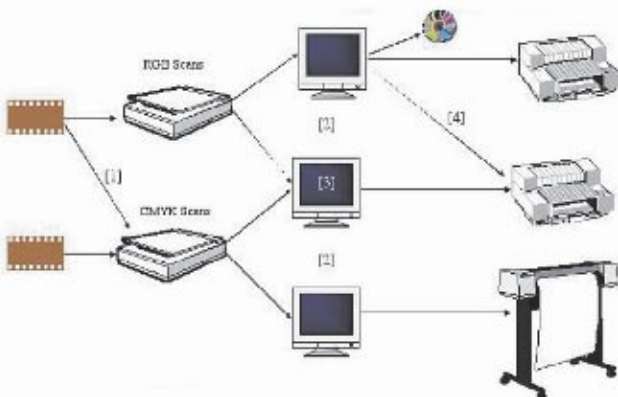
Background

Digital printing has been going on for a long time. Publishing and advertising have long converted images to digital form intended for some kind of reproduction. Typically this work has been performed in what is called a “closed loop” system in which all the equipment used was located in one place.

In the days prior to ICC based color management (see the Color Folio whitepaper on Color Management), consistent color was achieved by forcing each device to match the other. There are many problems with this workflow which we will describe before revealing what we consider a far superior digital printing workflow.

Old Style Digital Workflows

Below is a diagram of a common “old style” digital lab workflow:



Each device has a specific purpose. One scanner may do RGB scans, the other being setup for CMYK scans. Different monitors are adjusted to match the input from each scanner and these monitors are also adjusted to match the output of specific printers.

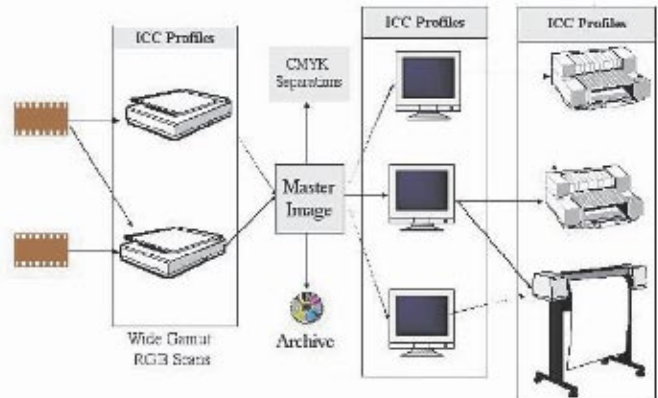
Problems with this workflow include:

- Scanning of film multiple times
- Same scan looks different on different monitors
- Different scans of same image looks different on same monitor
- Monitors matched to printer so same color corrections don't print the same on different printers

This inflexible model makes any changes to the environment difficult and it becomes almost impossible to successfully integrate with the workflow of anyone else.

Modern Digital Workflows

Here we show a more modern workflow that offers much greater flexibility. This is the workflow used in the Color Folio studio:



In the modern workflow, all devices have ICC profiles which allows much greater freedom in mixing and matching monitors to printers and scanners. It also means that files can be opened and successfully worked on by others in different environments, as long as they, too, are using a standard ICC workflow.

All scans are done in a wide gamut RGB color space such as Ektaspace 5. Scans are done at the maximum optical resolution for the film (up to 5000dpi) rather than at the size of the print currently contemplated. This approach usually means that the film only has to be scanned once, regardless of future uses - you've created the best digital archive possible to begin with. This approach is commonly referred to as “scan once, output many”. It also means that changes to the file need to be made only once rather than to each scan of the image.

Scans can be worked on using different monitors, with identical results. Typically Adobe Photoshop™ is used as it combines powerful editing tools with excellent ICC support.

Digital Workflow

The objective in Photoshop is to create a “master image”. This is a file that contains all changes to the image but is independent of any particular print. The master image is the version that is archived, usually to a CD, for long term storage and future use. It has not been sized or sharpened, nor has any particular ICC printer profile been applied to it. When a print needs to be made, a copy of the master image is made and the following steps are typically followed:

- Flatten all layers (more on layers in a moment)
- Size file to dimensions and resolution required for print
- Sharpen the image
- Create any borders required for image placement on sheet
- Apply printer profile, including CMYK separations (if necessary - some printers do this on the fly)

In this manner, the master image is “targeted” for output with each use. There are situations, particularly when outputting to smaller gamut CMYK devices, that changes specific to the printer must be added to the master image. In this case, we suggest that these changes be added as layers in the master image file, color coded and placed in layer sets (available beginning with Photoshop 6) so they can be easily identified and applied as necessary when targeting.

Photoshop Workflow

Within Photoshop itself we also recommend a workflow. As with all issues as complex as digital imaging, this workflow is a generalization - exceptions are sometimes necessary but we believe these recommendations are useful in most cases.

To begin with, all changes to the file in the process of creating the master image should be made on layers distinct from the raw scan, or background layer. Not only does this allow you to endlessly revisit changes and adjust them, but it will not degrade image quality and it allows you to always keep a copy of the raw scan in the master image file. We have not found any task we want to perform to a file that we cannot do on a separate adjustment or content layer.

Changes should be made globally to your file first, followed by selective changes. Often a global change will correct several seemingly unrelated distinct problems in a file and is a more economical approach.

We often follow this approach to corrections:

- Clone any dust and scratches from image
- Adjust white and black points to correct overall tonal range
- Adjust midrange density
- Adjust contrast

- Adjust color balance and saturation
- Make selective corrections such as dodging/burning or color/contrast/density adjustments to specific areas of the image
- Check for out of gamut colors and make necessary adjustments
- Archive as master image

It is often necessary to iterate over some of these steps, particularly the changes to density/contrast and color balance/saturation. In the RGB color space, changes to one often changes the other so iteration back and forth is sometimes needed.

Printing and Proofing

Even with color management workflows, knowing exactly how an image will print requires a hard proof. We recommend using Photoshop’s soft proofing mechanisms first, particularly with smaller gamut CMYK printers, but ultimately before a final print is made we make a smaller print to see how the image will really look.

It is a common practice to use one printer to proof for a final print on another printer. While this can provide good results when done properly, we don’t generally advocate this workflow for critical fine art work. There are always differences caused by differences in inks, paper, etc. At Color Folio, we always create a proof on the final output device using the selected paper. Because our printers are so consistent in their output, this allows you to see exactly how the final print will look, rather than wondering if small differences can be anticipated because the proofing device is different.

Sometimes this practice may not be convenient or economical, in which case proofing using a different printer can be done. Make sure you have good ICC profiles for both devices, use a media as similar as possible in the proof and the final print, understand how to apply the profiles properly for proofing and understand and anticipate the natural differences you will find.

Summary

The modern digital workflow, based on ICC profiles and a pragmatic and economical approach to image management, can allow you to achieve consistent and predictable results that achieve your artistic goals. It also allows you to integrate successfully with digital studios when high end equipment is required. This is the workflow we have employed from day one in the Color Folio studio and it has allowed us to offer our clients a wide array of options and the ability to collaborate with us in innovative and cost effective ways.