Successful Color Management in PDF Workflows

By Lou Prestia

The color-management enhancements begun in Acrobat 4 and refined in Acrobat 5 have cemented PDF's role as a digital-master format in many workflows. Proper Distiller setups and judicious use of third-party plug-ins are needed if 'device independent' is to be more than a buzzword.

Adobe's Portable Document Format has for several years been a promising choice for a digital-master format. It solves many of the problems—font fidelity, layout integrity, device and imposition dependencies, single-vendor support issues—that had plagued previous approaches. Here we examine how the color features in PDF 1.3 and 1.4 make PDF an even more compelling choice by enabling device-independent color workflows based on ICC profiles.

Seeking the digital master. For some workflows, the practice is to archive the original application files for purposes of reprints, pickups, and repurposing of content to other publication paths or alternate media channels. While it is always a good idea to have a backup of the work for future revisions of a printed piece, archiving the job as application files makes for tedious repurposing; fonts must be reloaded and the original versions of the creation applications must be archived to ensure consistency. Perhaps the greatest challenge of all in this scenario is repurposing the color, since color files have been typically saved as CMYK with specific target values for the original press and printing conditions.

Many organizations choose to archive the final PostScript files that a project was imaged from. The advantage is that the PostScript file will image exactly as it did originally and, if properly composed, will contain all page components from the various creation applications in addition to the required resources such as fonts and images. This form of digital master may already have addressed certain production issues, such as mapping spot colors to the correct plates and performing trapping. But in most cases, PostScript has the same limitations with regard to color as do native application files: Colors have typically been converted for specific output conditions and are encoded in the PostScript in device-dependent color spaces.

It has been possible to generate device-independent PostScript since the advent of PostScript Level II in 1990. But even in Level II, the interpretation and conversion of the PostScript device-independent color spaces could vary from one PostScript device to another, and the user had no means to control or predict these conversions. This is the reason most users continue to make device-dependent PostScript files for production and archival purposes.

Why PDF is better. PDF has several advantages in the area of encoding device-independent colors. Because PDF may be created from a PostScript file with a standalone application (Acrobat Distiller) with several user-definable parameters for color conversion and encoding, color PDFs may be created with more control than PostScript files written to disk via a print driver. Conversion preferences for the mapping of device-independent colors in the PDF to the color space of the currently selected output device may be specified more conveniently and reliably than when outputting PostScript. Finally, because ICC color profiles may be used directly in the definition of device-independent color spaces in PDF, color consistency with applications that support ICC profiles may be ensured.

In this article, we will explore PDF's features for color publishing. Then we'll discuss PostScript color management, techniques for creating color-PDFs from a variety of applications, and PostScript conversion to PDF via Distiller. Finally, we will examine some third-party tools for inspecting and editing color-PDF files.

Acrobat and PDF features since version 1.0

Versions of the PDF language track to each major release of Acrobat, starting with PDF 1.0 in Acrobat 1.0, followed by PDF 1.1 in Acrobat 2, and so on, up to today's language-version 1.4 in Acrobat 5. With each new PDF version up to 1.3, color spaces that had not been available in earlier versions became available for encoding device-specific and device-independent colors.

Infancy. PDF 1.0 was introduced in 1992. The key features of the corresponding Acrobat 1.0 product were its ability to embed fonts in the PDF for printed output and its ability to support clickable links within a PDF document. But only RGB color was supported.

Acrobat 2.0 debuted in 1994 with a new architecture that allowed third-party plug-ins to extend Acrobat functionality. Acrobat 2.0 added support for external linking, sticky notes and device-independent color encoded as CIELAB values.

At about the same time, Adobe began to offer PDF support in its shrink-wrapped applications, particularly PageMaker and FrameMaker. Good though that was, it created a future obstacle to reliable color-managed workflows, because the encoding of page objects could be handled differently by different PDF-export implementations.

Adolescence. In 1996, Acrobat 3.0 (corresponding to PDF version 1.2) added support for many prepress-specific functions of PostScript, including halftone and overprint specification; support for spot colors, forms, OPI 1.3;, and the encoding of CMYK color spaces. These features made feasible what had previously been only a theoretical possibility: a single-file, digital-master workflow using a format other than PostScript. Plug-ins from companies such as Lantana (www.lantanarips.com) took advantage of the features, and thereby cemented PDF's role as a master format for publishing workflows.

In 1999, Acrobat 4.0 and PDF version 1.3 were released. New features included support for OPI 2.0, double-byte CID fonts, smooth shading technology and a new "DeviceN" color space for better support of spot colors. Perhaps most importantly from a color standpoint, Distiller 4.0 gave users the ability to redefine the device-dependent colors in a PostScript file using the new "ICCBased" color space, assigning the correct ICC profile to these colors so that the resultant PDF could be readily repurposed from one output system to another. Unfortunately, the Acrobat application did not have these features. For a period of time, the ICCBased colors could only be converted accurately via PostScript color management in a PostScript 3 device.

Reaching full vigor. Acrobat 5.0, released in 2000, reads and writes PDF version 1.4. (Acrobat wasn't the first application to do so; because of requirements for transparency features, Illustrator 9 was, by several months.) The key publishing feature in PDF 1.4 is support for transparency. From a color-publishing perspective, the key features are in the Acrobat 5.0 application itself, which allows the specification of an output ICC profile so that ICC-based colors in the PDF file may be converted without requiring PostScript color management. Because Acrobat 5 can use the Adobe Color Engine introduced in Photoshop 6.0 (and now supported in many Adobe applications), the precision of the color transformations in Acrobat matches that of these key publishing applications.

From a color-management perspective, only PDF versions 1.3 and 1.4 are of interest, since only these versions include the ICCBased color definition that allows color PDF files to be easily repurposed after their initial creation. The specific color spaces available in PDF will be discussed later in this article.

PostScript color management

Originally, PDF came from PostScript. The most predictable way to generate PDF is by using the Acrobat Distiller application and a PostScript file representing the publication page or pages. In the past, PostScript was an excellent choice for a digital-master format; the file that rendered the job originally was guaranteed to render it with the same precision in the future when reoutput to the same device. Thus, moving to PDF digital masters is a relatively easy transition; all the master PostScript files may be distilled into master PDF files. But getting the colors right in this transformation requires an understanding of the various ways colors can be represented in PostScript and PDF.

PostScript color spaces fall into two general categories: device dependent and device independent. Device-dependent colors are those that have already been transformed into the color space of the target output device. The best example is the CMYK values in a scan intended for reproduction on a particular press. The scanner operator has converted the original color samples to the CMYK values that will render the best possible results on that press. However, those values will not reproduce properly using other printing systems such as an alternate press or an ink-jet printer. RGB values that look right on one monitor but not on another are a second example of device-dependent colors.

Device-independent color spaces are used to store color information in a repurposable fashion. In fact, these spaces *must* be repurposed. For example, there are no L*a*b* presses, so PostScript colors encoded inthe CIELAB color space (the CIE L*a*b* color model based on the 1931 CIE standard observer) must be transformed prior to output. It is the ability to perform this conversion at (or just before) the time of output that makes a digital master useful for archiving a publication for future reprinting and repurposing.

The device-dependent color spaces in PostScript are DeviceRGB, DeviceCMYK and DeviceGray. Except in special cases, the PostScript interpreter will "pass through" DeviceCMYK values to the CMYK marking engine without modification. If they are the right values for the output device (and it is in proper calibration), acceptable color reproduction will result. If DeviceRGB is encountered in the PostScript stream, most interpreters will convert it to DeviceCMYK using a standard PostScript Level I conversion that is not color-managed.

PostScript's device-independent color spaces include CIEBasedABC, CIEBasedDEF, and CIEBasedDEFG. A PostScript interpreter must convert colors in these spaces before output can occur. For

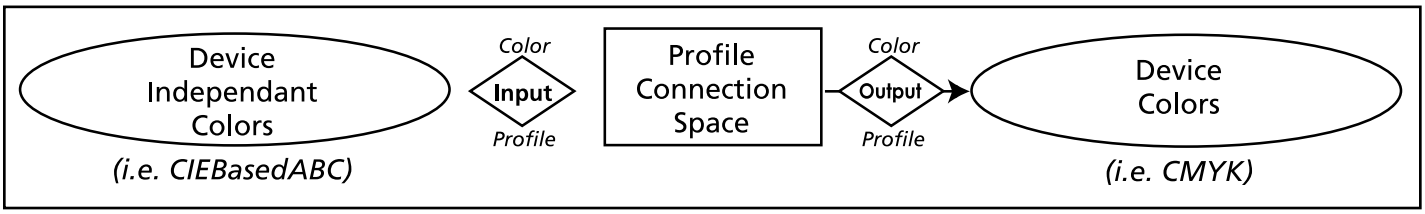

Figure 1. The PostScript color-managed transformation sequence.

instance, if a CIEBasedABC color is encountered while interpreting PostScript for the CMYK output device, the color will need to be transformed from CIEBasedABC to DeviceCMYK.

The manner in which this is transformation is achieved mirrors the conversion functionality of ICC-based color-management systems. The concept of a "profile connection space" was used in the PostScript Level II interpreter of 1990, four years before the ICC was formed. In this approach, colors are transformed twice: once from their source space (such as CIEBasedABC) to an abstract device-independent color space, and then to the output color space, such as DeviceCMYK *(see figure 1)*.

In the case of PostScript color management, the "input profiles" for the conversion of source colors to the profile connection space are known as Color Space Arrays, or CSAs. Device-independent colors in a PostScript job are accompanied by a CSA defining their color gamut. CIEBasedABC CSAs may be used to represent simple three-component ICC profiles such as display profiles. CIEBasedDEF CSAs represent more complex three-component ICC input profiles, such as those for cameras or scanners. CIEBasedDEFG is the only four-component PostScript device-independent color space and is useful for tagging CMYK values with a color dictionary so that they may be transformed for output devices other than the original CMYK device. In general, only applications that allow the definition of colors using ICC profiles can create device-independent PostScript files, since the ICC profile may be used to create the CIEBasedABC, -DEF, or -DEFG CSA.

Output profiles in PostScript are called Color Rendering Dictionaries (CRDs) and must typically be resident on the PostScript interpreter. It is common for a number of CRDs to be available for different rendering styles or choices of ink and media on desktop PostScript devices. This sounds good, but it can be a source of trouble, because application software and print drivers generally have little control over which CRD will be used in the output device.

Because of this, and because CRDs are difficult to load on the interpreter and a device recalibration sometimes means a new "output profile" in the form of a CRD must be loaded, PostScript color management is not widely used. The ICC approach is easier; the user simply loads a new output profile on the workstation, selects it (either in a publishing application or via an operating-system control panel), and the colors are converted before being sent to the printer.

But things get more complicated when Distiller is involved. Because Distiller will convert PostScript color spaces to PDF color spaces, an understanding of PDF color management is not complete without a basic understanding of PostScript color management and color spaces.

PDF color spaces and conversion from PostScript via Distiller

The key color spaces available in PDF versions 1.3 and 1.4 also fall into device-dependent and device-independent categories. The device-dependent spaces include DeviceRGB, DeviceCMYK and DeviceGray. It's no accident that these are the same names that PostScript uses. Generally, these are the color spaces used to define colors in a PDF file created from PostScript that also had device-dependent color encoding *(see Figure 2)*.

PostScript Color Space	PDF Color Space
DeviceGray	DeviceGray
DeviceRGB	DeviceRGB
DeviceCMYK	DeviceCMYK
CIEBasedABC	CalRGB or LAB
CIEBasedDEF	CalRGB or LAB
CIEBaseDEFG	LAB

Figure 2. Mapping of PostScript to PDF 1.2 color spaces for creating device-dependent PDF files.

Some of the mapping of PostScript to device-dependent PDF color spaces involves making assumptions, such as that any DeviceRGB values encountered are similar to CalRGB or sRGB. CIE spaces are converted precisely using their CSAs to define them in the conversion to LAB. However, only if the emitting application has created the correct CSAs for these colors will their integrity be preserved in the transformation.

Device-independent PDF color spaces include CalRGB, LAB and ICCBased *(see Figure 3)*. The latter is of particular interest because it allows use of stan-

PostScript Color Space	PDF Color Space
DeviceGray	ICCBased
DeviceRGB	ICCBased
DeviceCMYK	ICCBased
CIEBasedABC	ICCBased, CalRGB or LAB
CIEBasedDEF	LAB or CalRGB
CIEBaseDEFG	LAB or ICCBased

Figure 3. Mapping of PostScript to PDF 1.3 color spaces for creating device-independent PDF files.

dard ICC profiles to define colors. ICC-profile assignment in PDF 1.3 and above is achieved via Distiller settings.

For the publisher implementing or transitioning to PDF digital masters, the settings in Distiller for the conversion of color are critical, as they govern the mappings shown in the table. In general, this means creating a PDF 1.3 or 1.4 file and specifying the correct ICC profiles for tagging the device-dependent PostScript colors that will be encountered when distilling. Details on the proper Distiller settings are discussed later in this article.

PDF creation

Creating PDF from desktop applications can result in documents with many variations. Although all may conform to the PDF-language definition, the process of tagging or converting colors can require different steps. In each case, our goal is to create device-independent files suitable for use as digital masters.

Generally, there are two ways to create PDF from an application. The Save As or Export command may write out a PDF file directly. Alternatively, it may be best to print to a PostScript file (representing the printed output the application would normally generate) and then pass that file to Acrobat Distiller.

Adobe Photoshop 6. Photoshop 6 has taken the Photoshop 5 concept of storing colors in a "working space" and expanded it so that every image window within the Photoshop application may contain colors in a different working space. When combining images from different color spaces, the colors are colorimetrically converted using an ICC profile to define each.

PDF is among the format choices in the Photoshop Save As dialog *(see figure 4)*. There are two options related to the definition of color in the PDF. The first, "Embed Profile," will cause a PDF file to be created with the colors defined as ICCBased. The profile associated with this definition will be the profile that defines the working space of the document being saved, which may or may not be the current Working Space. If the Embed Profile option is not set, the colors will be declared device dependent (DeviceCMYK or DeviceRGB) in the PDF file.

The second option, "Use Proof Setup," will convert colors in the file to the currently selected Proof Setup color definition, then encode the PDF colors as ICCBased. They will be tagged with the profile that defines the current Proof Setup. working space.

Adobe Illustrator 10. Illustrator 10 also uses the working-space concept of Photoshop 5 and 6. Unlike earlier Illustrator versions, Illustrator 9 and 10 documents must be entirely in one working space; this means that it is no longer possible to have an Illustrator document with both RGB and CMYK color definitions in it—a relief for many service providers.

Like Photoshop, PDF files are generated from Illustrator using the Save As command. And like Photoshop, Illustrator presents an options dialog where choices including "Embed ICC profile" are available.

If the embed option is set, Illustrator will encode colors as ICCBased, using the profile for the current working space (RGB or CMYK). Placed images will be converted to this working space colorimetrically if they have embedded ICC profiles. Thus a device-independent PDF from Illustrator will typically have only one ICCBased color definition, though it may be associated with multiple page objects.

PDF files saved from Illustrator 10 with the embed option unchecked will have the colors encoded as DeviceCMYK or DeviceRGB, depending upon the document color space.

Adobe InDesign 1.5. InDesign allows each placed object to have a separate ICC profile assigned. An InDesign document will also use a profile to define colors created within the document, one each for RGB and CMYK.

Creating PDF from InDesign is accomplished using the Export command. PDF Export Styles can be defined to control several options at a time *(see Figure 5 for a preview of the dialog in InDesign 2.0)*. When the "Include ICC Profiles" option is set, InDesign will encode each page object created in InDesign as ICCBased, using the InDesign Document Color Management settings to specify what profile to assign.

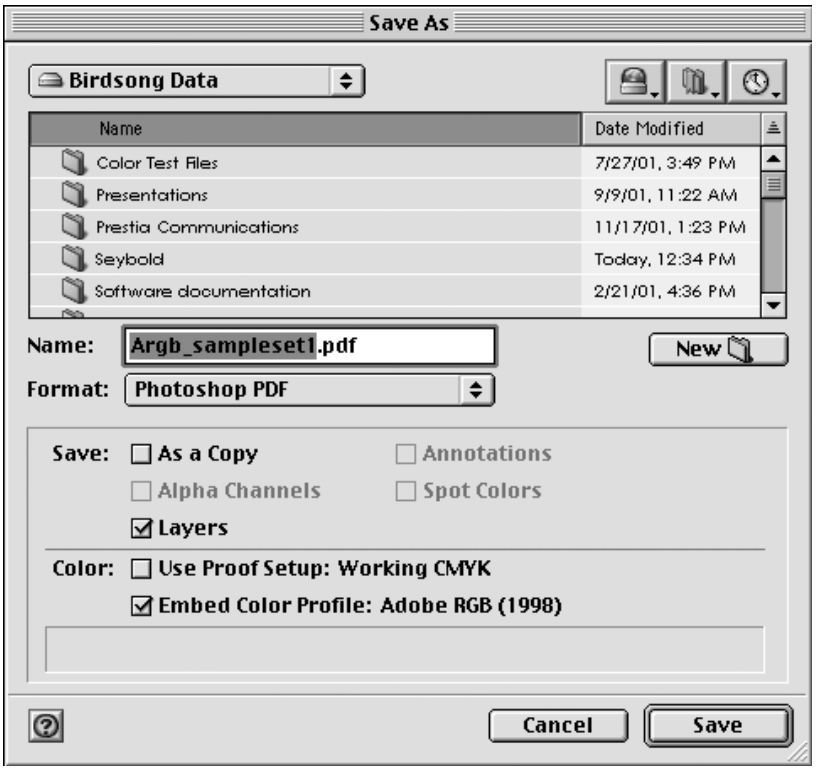

Figure 4. Save As PDF dialog from Photoshop.

The treatment of imported (placed) objects depends on whether they have an embedded ICC profile. If they do, they will be defined as ICCBased and their profile will appear in the output. (This includes placed PDF files.) If not, they may be assigned one via the Image Color Settings command in InDesign, and this profile will be the basis of their ICCBased definiton in the PDF. (Image Color Settings is not available for placed PDF, however.) Otherwise, they will be encoded as DeviceRGB or DeviceCMYK.

Quark XPress. XPress 4.1 does not have native functionality for PDF generation. Instead, Quark provides a PDF Filter (currently at version 1.6) for download from its Web site. This filter adds an Export PDF command to the application's Utility menu. PDF Filter requires that Distiller be installed on the user's machine and that a Distiller PPD be selected in Quark's Export PDF Options dialog. The filter prints a PostScript file to disk and launches Distiller, then deletes the file after Distiller finishes.

The characteristics of the resultant PDF depend on Distiller's current Job Options. If Distiller is configured to create PDF version 1.3 or 1.4, and if the proper color settings are configured, you will get a device-independent PDF file with colors encoded using the ICCBased color spaces. The file will have all RGB colors converted to CMYK using the profile that was selected in XPress's Color Management Preferences before the PostScript was generated. However, because XPress 4 does not support placement of PDF files, vector objects will not be color-managed.

You may encounter a pitfall if some imported objects have embedded ICC profiles and others do not. Objects that do not have embedded profiles will be assumed to be in the same color space as the currently selected CMYK profile in XPress, so they will not be converted. They will still be tagged as ICCBased in Distiller, however. Objects with profiles will be converted to the current CMYK space and then tagged as ICCBased by Distiller. This will succeed only if Distiller is using the same profile for ICCBased colors that was used for the composite printer profile in XPress—that is, the profile to which all colors in the document will be converted before PostScript is generated.

Ideally, you would set up a homogeneous workflow with respect to color definitions, XPress settings and Distiller settings. (A homogeneous workflow is one where all objects come in either tagged or untagged, rather than a mix of both.) If you must accept a mix of page objects with and without embedded profiles, a defensive practice might be to convert all objects to the same color space using Photoshop before placing them.

Macromedia FreeHand. FreeHand 10 offers an Export PDF command similar to that found in other applications. However, this Export function generates a PDF 1.1 (Acrobat 2.0) file, so this is not a path to repurposable PDF; the ICCBased color space requires PDF 1.3 (Acrobat 4.0) or higher.

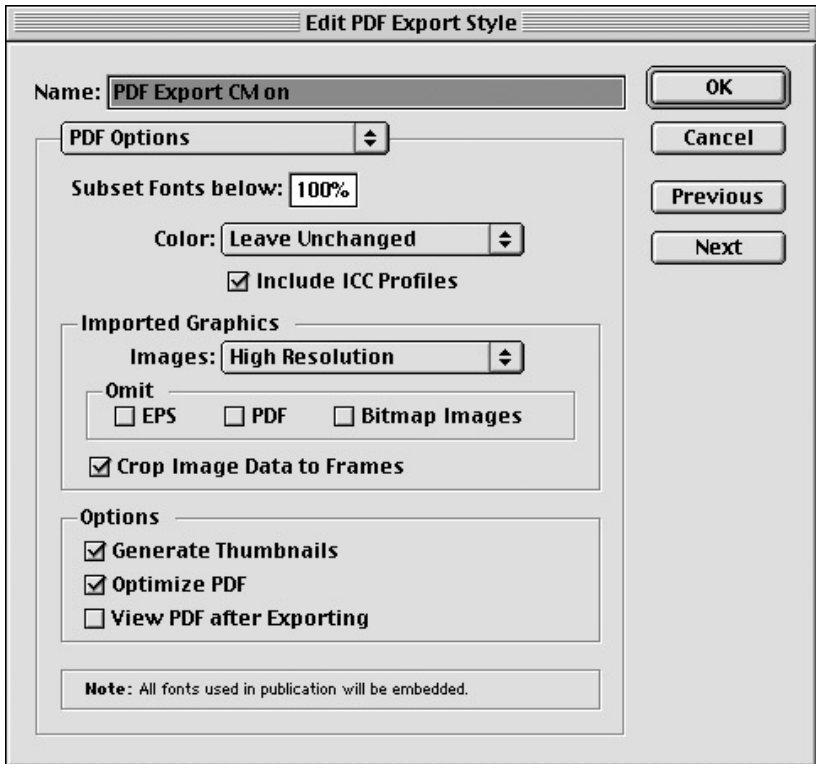

Figure 5. PDF Export Style settings in a pre-release version of InDesign 2 (slated for release this winter).

PDF files can be placed into FreeHand documents, and color management via ColorSync may be enabled. But determining if various placed formats are properly converted to the composite printer profile when PDF is exported is beyond the scope of this article. Frankly, the best general approach is to save as EPS or print PostScript to disk after placing or creating colors that share the same device-dependent definition. The .eps or .ps file can than be Distilled with the proper profile used to tag these color objects. *(See the Distiller section below.)*

Microsoft Office applications. Excel, PowerPoint and Word do not offer direct export of PDF. Colors may be defined in these applications using a variety of color pickers, including direct entry of CMYK percentages or RGB percentages. (This approach is shared with XPress, but it is different from entering 8-bit values as is common in image-editing applications.)

Creating PDFs from Office documents entails creating a PostScript file using the system print driver, then processing this file through Distiller. PostScript generated from Office applications encodes all colors as DeviceRGB, so it is advisable to define colors as RGB in the Office documents; that way, you can assign the appropriate profile in Distiller. Creating tints as CMYK values in Office applications results in a conversion to RGB values for which the correct profile is not known.

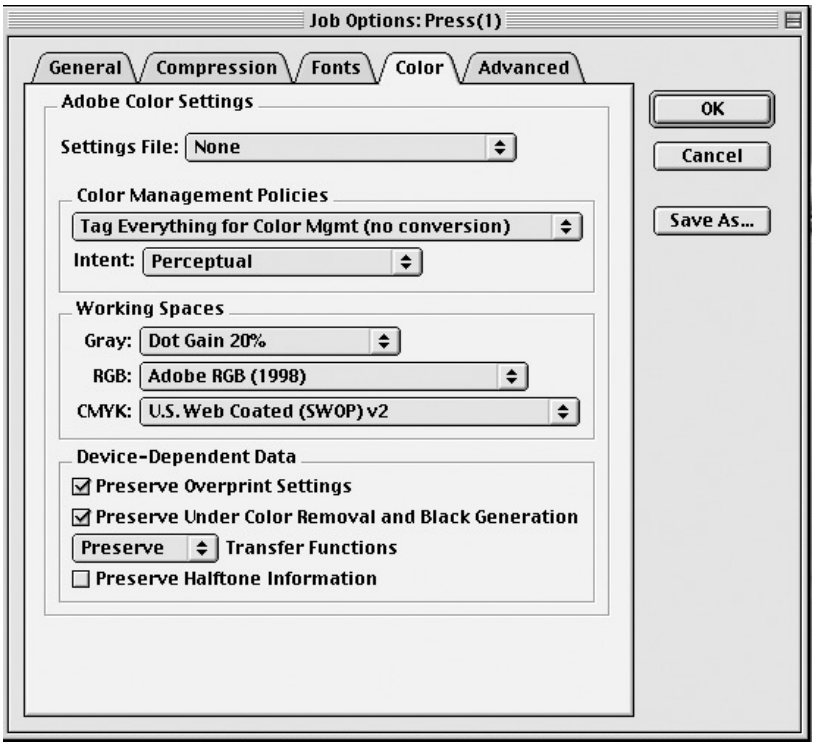

Figure 6. Color tab of Distiller Job Options dialog.

Creating PDF with Distiller

Distiller provides the most reliable way of generating PDF from a variety of sources. In some cases, such as Quark XPress 4.1, Distiller is a required component in the PDF-generation process.

Distiller's Job Options control such variables as font embedding, image resampling and the preservation of job characteristics such as overprint. The Color section of the Job Options dialog provides access to the creation of device-dependent or device-independent color PDFs from PostScript files *(see figure 6)*.

There are four main options here:

- ***Leave Color Unchanged.*** In a prepress environment, colors are written into the PostScript file as device-specific values—that is, they have already been optimized for a target device. This option instructs Distiller to create its PDF output using the device-dependent color spaces: DeviceCMYK, DeviceRGB and DeviceGray.

- ***Tag Everything for Color Management.*** This option is the path to creating device-independent PDF files from application-generated PostScript. The ICC profiles selected by the "Assumed Profiles" pop-up menus will be used to tag the PostScript Device colors. The only limitation is that all colors of a particular type (such as CMYK) will be tagged with the same profile. If images from several CMYK sources (and thus, perhaps, optimized for different press conditions) have been combined on the page, it may be that some of them need to have different profiles associated. In this case, a specialized tool such as Enfocus PitStop Inspector will be required to post-process the PDF. We will discuss such third-party tools later in this story.

- ***Tag Only Images for Color Management.*** This option applies the chosen profiles only to image-sample data, but otherwise has all the benefits and limitations of the Tag Everything option. The reason for the differentiation between images and other objects is to allow for (or avoid) special handling of fonts and vector illustrations in the PDF file.

- ***Convert All Colors to sRGB.*** The fourth option is designed to create PDF files for online use, though it may be a viable choice for some print applications as well. As above, the device-dependent color values in the PostScript file are tagged with an assumed profile; but then the profile is used in a color-managed transformation to the sRGB color space. The output file contains color values in PDF's ICCBased color space that are tagged with the sRGB profile. These colors are device independent (if somewhat gamut-constrained) and thus may be used as masters for both online and printed output.

Here are a few sample scenarios of how Distiller creates PDF from popular desktop packages.

Quark XPress. Consider a scenario in which users are converting scans to CMYK, perhaps using the color computer of their scanner, but more likely using Photoshop and a profile (called, in our example, "Press1.icc") that has been created for their press. When creating PostScript using the PDF filter, they are creating a device-dependent PostScript file that will render colors optimally only on their own press. When distilling PDF from such a PostScript file, they will specify tagging for color management and "Press1.icc" as the Default CMYK Profile.

What happens? Distiller takes the DeviceCMYK values and changes them to the ICCBased color space. Distiller then assigns the "Press1.icc" profile to define them. The PDF is now device independent. When printing the PDF using Acrobat 5, a user who has a different press may specify the output profile that matches that device. This is accessed by clicking on the "Advanced" button in the Acrobat 5.0 pop-up within the AdobePS print dialog *(see figure 7)*.

What happens next depends on which profile is chosen. There are three possibilities:

- If a profile is selected for an output device, such as a local ink-jet printer, Acrobat will color-manage all the ICCBased color in the PDF, transforming it to the color space of the selected profile. This is enormously useful in proofing workflows.

- If the "Printer/PostScript color management" profile is chosen, the ICCBased colors will be sent to the printer as PostScript device-independent colors with CSAs created from the profiles used to define the ICCBased spaces in the PDF. This is useful in certain PostScript color-managed workflows.

- If the "Same as source" setting is chosen, the ICCBased values will be sent to the printer as device-specific colors. Note that if the PDF were to be sent back to the original press, the original tint values would be reproduced exactly without color management.

There is an alternative to a workflow where preconverted page objects are placed: Use the color-management functionality in XPress to convert images from a variety of RGB and CMYK spaces to the press profile when printing. Again, all DeviceCMYK in the resulting PostScript file will have been transformed to the color space defined by the current composite printer profile and can then be tagged in the PDF as ICCBased to create a device-independent PDF master.

FreeHand. As with XPress, images already converted to press-optimized CMYK may be placed in FreeHand and then tagged using the appropriate profile when distilling device-independent PDF. Alternately, FreeHand's color management may be used to convert objects to a single CMYK color space when saving the PostScript file. In this case, the choice of profile for tagging in Distiller is quite clearly the profile used when printing from FreeHand.

Office applications. Colors created in Excel, PowerPoint and Word all share certain characteristics. First, regardless of the color space used in the color picker, these colors are written as DeviceRGB into the PostScript stream. For this reason alone, it is clearly best to define colors using RGB percentages in these applications. Second, all three applications seem to use a common encoding of colors; a series of tints created in each of the applications results in the same color appearance in a PDF, assuming all are tagged with the right profile.

What is the right profile to assign to RGB values from Office applications? The right profile and rendering intent settings for Distiller may require some experimentation. Tests show that tagging these colors as sRGB results in color shifts; it seems they are not defined as sRGB within the applications. The configuration that seems to result in the least color shift is tagging with the AdobeRGB(1998) profile.

Distiller as a reference. Any discussion of Distiller is incomplete without adding that Distiller is quite useful as a reference implementation of a PostScript interpreter. A PostScript file that is not printing with the expected color appearance may be diagnosed reliably by distilling it with the setting "Leave Colors Unchanged." What device colors are written to the PDF file? If it is these color spaces or values that are resulting in errors or poor appearance, what combination of profile choices for tagging these colors results in a better appearance? What if different page objects require different profile assignments for optimal results?

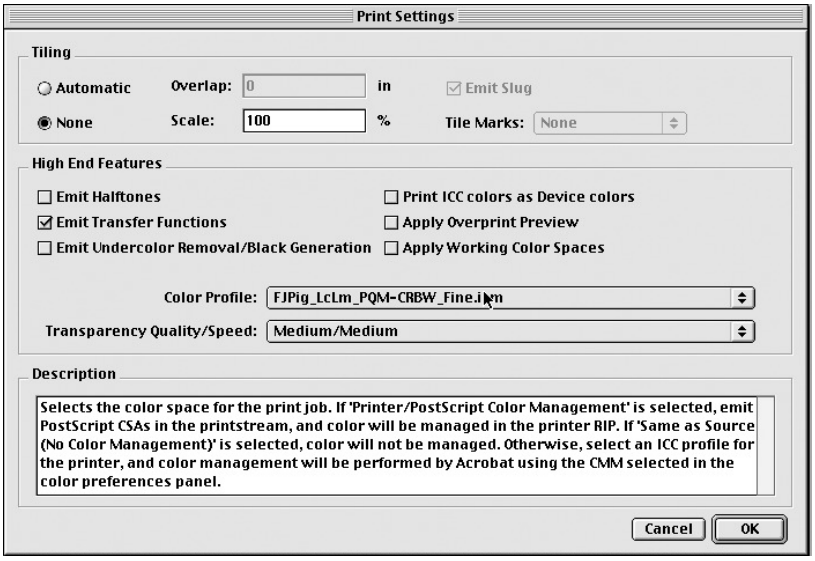

Figure 7. Acrobat 5.0 Advanced Print Settings dialog.

Examining Distiller results for troubleshooting purposes, fixing the file after a problem has been diagnosed and addressing special PDF printing needs such as separations are all beyond the purview of Acrobat or Distiller. They require something more—a third-party solution.

Specialized PDF tools

Advanced tools for managing, examining and altering PDF files are available from many vendors. For our purposes, the products from Adobe, Enfocus and Lantana are representative of what can be done.

Adobe InProduction. Adobe began offering InProduction with Acrobat 4.0. It provides a number of preflighting functions for PDF files, as well as tools for modifying them for production requirements. Although version 1.0 is still available at this writing, there has been no further development on the product and rumors of its demise are rampant. InProduction is limited to working with Acrobat 4.05 and is fully compatible only with PDF 1.3 and below, though it can scan and report on PDF 1.4 files as well. Nevertheless, InProduction is inexpensive and is a good tool to keep installed with a copy of Acrobat 4.05.

The primary advantage of InProduction is that it is best able to identify the ICCBased color spaces that are commonly used in device-independent PDF files. As we shall see, some third-party solutions exhibit com-

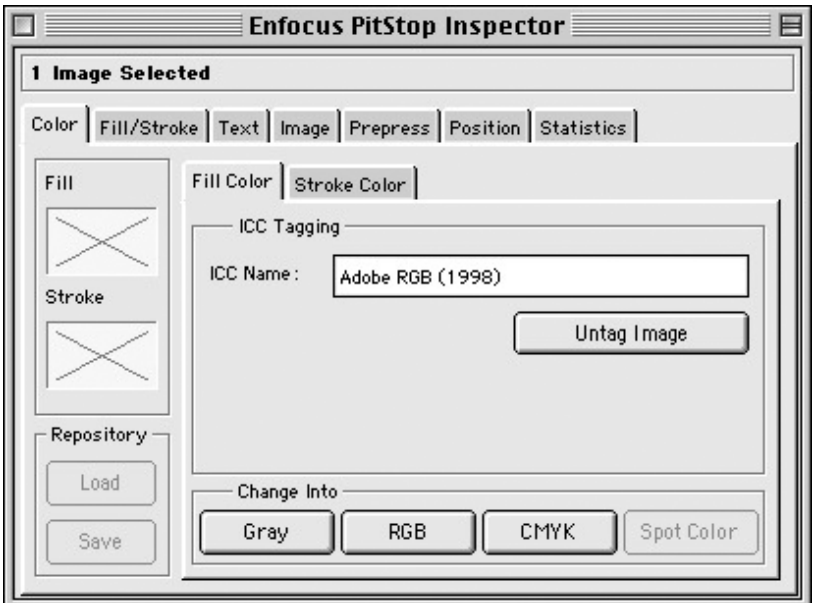

Figure 8. PitStop Inspector identifies (and optionally modifies) tagged color objects in PDF files.

patibility problems when used to examine PDF exported directly from applications.

Enfocus PitStop. PitStop Professional 4.6, priced at about $400, is a tool for examining and modifying PDF documents. It offers most of the functionality of Adobe InProduction and a significantly richer toolset for examining, error-checking and altering PDFs. In particular, it can add new page objects to existing PDF files. It also supports the "sampling" of other page objects to pick up such characteristics as color or font, which can then be applied to newly created objects. There are, of course, some limitations, such as if a font has been subsetted.

PitStop's Inspector can report the object type and attributes for any object on the page *(see figure 8)*. It also lets the user change the attributes, such as reassigning profiles to ICCBased page objects. This is essential for correcting PDF files that have images from various sources all tagged with the same profile by Distiller. PitStop also offers a "global change" functionality that can apply a change to all objects throughout an entire PDF document. For purposes of color, the Image Color Matching palette may be used to modify image objects within a PDF for optimum output consistency.

PitStop Professional (and its Server version, priced at $1,200) are quite useful for preflighting PDF files and can automatically correct many errors upon detection. Corrective actions may also be done through Action Lists, which automate tasks with multiple steps, such as profile reassignment. Preflighting is accomplished through the use of "PDF Profiles" that define in great detail the characteristics that a PDF must have to be accepted into a particular workflow.

Enfocus EyeDropper. EyeDropper ($30) is a tool for measuring color values of objects within PDF files. It can display percentages or 8-bit values. It is a useful tool to have for color quality assurance, even if there is no need for the more sophisticated functionality of PitStop. Note, however, that it does not have the ability to alter the PDF file.

Testing Enfocus. The effectiveness of PitStop and Eyedropper varies with the source of the PDF. For test purposes, we created several device-independent PDFs using the techniques described earlier in this article. We then processed them with the current releases of the Enfocus tools: PitStop Professional 4.6 and Eyedropper 4.0. Some anomalies were noted.

PitStop failed to identify ICCBased color definitions for placed images and native objects in PDFs saved or exported from Illustrator, Photoshop and InDesign. It reported that they were device-specific colors. Eyedropper also failed to properly identify these object color spaces. Examining the same files with Acrobat InProduction, we verified that the objects were properly tagged.

In the InDesign case, the problem was caused by OPI links to the images. When we removed the OPI links in the PDF file, PitStop reported the correct ICC profile.

We should note that, in all cases, Distiller-generated PDFs of the same documents showed the proper color characteristics when measured with PitStop or Eyedropper. This is because PitStop must struggle to keep pace with the manner in which various applications export PDF. It is clear that you will have fewer problems if you create PDF files using Distiller.

Lantana Crackerjack 4.0. This popular plug-in enables printing of color separations from composite-color PDF documents. Without this functionality, digital-master PDF files would be constrained in what they could handle; while they might be useful for monitor or ink-jet printer proofing purposes, they would not be able to drive production output devices in many workflows.

Priced under $500 (or bundled with Enfocus' PitStop Professional for less than $800), Crackerjack is useful for production printing even where separations are not required. It supports composite-color, separated-color and in-RIP separation of files. Settings for various Crackerjack windows may be saved, and the Crackerjack Pilot may be configured to automatically process PDF files from a hot folder using a combination of these settings. The product offers a very sophisticated set of controls for production output requirements, particularly for such options as halftone screen-ruling and angle specification.

Color transformations are relatively limited in Crackerjack. (As with PitStop Professional, this is a sign of the struggle to keep up with new versions of PDF and the accessibility of available functions within the Acrobat application.) There is some support for

ICC profiles—RGB-to-CMYK conversions may be specified using an ICC profile—but it is essential that ICCBased colors in a device-independent PDF be pre-converted to the target CMYK space (using a tool such as PitStop Professional) prior to outputting separations using Crackerjack.

Lantana PDF Imageworks. This $300 package is the Lantana solution for examining, adjusting and replacing images in PDF files (including the ability to edit OPI links). Because it is image-centric, this tool will not work for examining or changing color-space definitions for vectors or text. It can identify ICCBased encoding for images from some sources, including Distiller, but the current version of the product does not provide the ability to perform ICC-based color conversions nor to re-tag or de-tag ICCBased images.

Conclusion

PDF workflow has been gaining tremendous momentum in the print and publishing arenas since the introduction of PDF 1.2 (Acrobat 3) in 1996. With the addition of the ICCBased color space in PDF 1.3 (Acrobat 4), using a single digital master for both archiving and production of professional publications entered the realm of possibility.

Distiller's central role. The key is using the right configuration of Distiller so as to properly tag colors using ICC profiles. Distiller, we believe, is the most reliable way to create device-independent PDF masters that will render optimal color both on the originally targeted output system and on a variety of other output systems such as desktop printers and calibrated monitors.

Although many applications offer the ability to save or export PDF files directly, the ICCBased encoding of colors from these various PDF sources is not consistent. For reliable PDF generation from most applications , it is still advisable to first generate device-dependent PostScript then process this with Distiller. In workflows with PostScript masters already in place for archival and reprinting purposes, the conversion of these legacy masters to device-independent PDF masters via Distiller is an elegant one.

Plug-ins are needed. The primary limitation of Acrobat for high-end print production has been its inability to make separation output from a PDF. This functionality may be added to version 4.05 of Acrobat using InProduction or to version 5 using Crackerjack. While we see InProduction as a better choice for identifying color-space definitions for PDF page objects, its limitation to Acrobat 4.05 (combined with Adobe's stated intention to end development of the product) means that it has only limited future compatibility.

Crackerjack provides a rich set of controls over output, including details of output device configuration, PPDs and media options. It lets you add printers marks and, in version 4, preview separations. But essential though they are for professional print production, Crackerjack and Imageworks fall short of providing the sophisticated tools needed to examine and convert colors in both device-dependent and device-independent PDF files.

PitStop, in contrast, is quite good at examining and fixing colors within PDF files—especially within files created by Distiller. Of course, the ultimate goal is a workflow in which the proper tags are applied to all color objects early in the creative process. Until that happy day, there will be an ongoing need for error-checking and correction tools. **TSR**

About the Author

Lou Prestia runs a consulting and training company, Prestia Color Consulting (www.prestia.com). During the late 1990s, he worked at Adobe Systems, first as technical marketing manager for Adobe's prepress products and later as Adobe's color technology evangelist. In the latter role, he developed color technology training programs that included topics in PDF and PostScript color management. Before that, he worked for Barneyscan (later PixelCraft), supporting users of desktop scanning systems, maintaining a production graphic arts lab and developing training programs for scanning system users. He holds a Bachelor of Science degree in Printing Management and Science from Rochester Institute of Technology.

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