



Application Notes

PostScript and PDF Color Management



PostScript and PDF Color Management

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Rev. 1.1

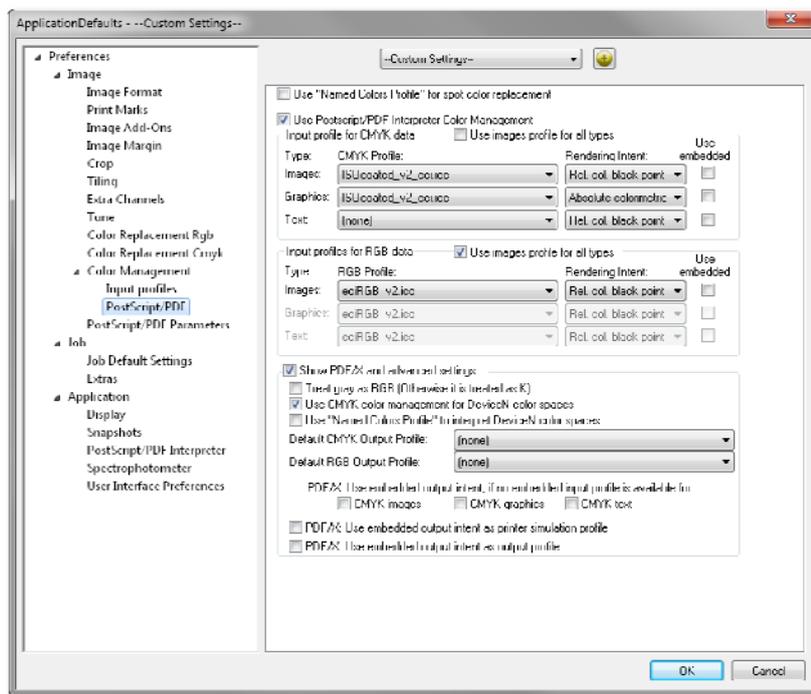
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Introduction

PostScript (EPS, PS) and PDF (PDF, AI) files offer numerous options for color management with a print workflow environment. The **ErgoSoft RIP** comes with several presets for handling color management of PDF documents. It is necessary to carefully prepare both the PDF file as well as the RIP to achieve optimal color results. Since it is difficult to cover all valid PDF print workflows, this document describes some typical workflow possibilities one can use for effective print production. The document also provides some helpful tips to troubleshoot printing and ripping issues related to the PDF file format.

This document primarily focuses on the PostScript/PDF Color Management settings accessed either under *Tools > Options > Preferences > Image > Color Management > PostScript/PDF* or by accessing the Color Management PS/PDF Presets for a specific PostScript or PDF file.



PostScript/PDF settings dialog

PostScript/PDF Color Management in V14 vs. Older Versions

With v.2008, the **ErgoSoft RIP** offers a new color management option for PostScript and PDF files: the **PostScript/PDF interpreter color management**. The color management method of older versions is still available in Version 14.

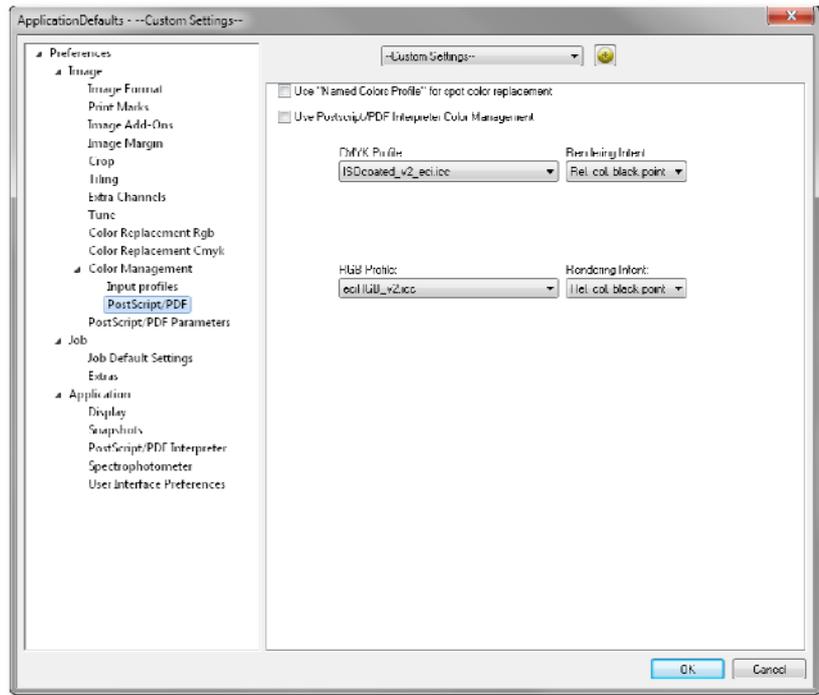
Legacy Color Management for PostScript/PDF Files

The legacy color management for PostScript/PDF Files has one input profile and one rendering intent for the complete file.

The global settings offer a **CMYK Profile**, which is used for printing on all CMYK based printer drivers, and an **RGB Profile**, which is used for printing on all RGB printer drivers that are available for just some printers such as Epson, Canon, and HP.

With the legacy color management, all color spaces within the PostScript or PDF file are converted into either CMYK or RGB depending on the output color space. For this color management workflow, standard conversion tables are used that are part of the PostScript interpreter. This conversion occurs when the PostScript interpreter rasterizes the file. Afterwards, the standard color management works by applying the input profile, rendering intent, density linearization and printer profile to the rasterized data. This method functions similar to the color management workflow for raster data (TIFF, JPG, etc.).

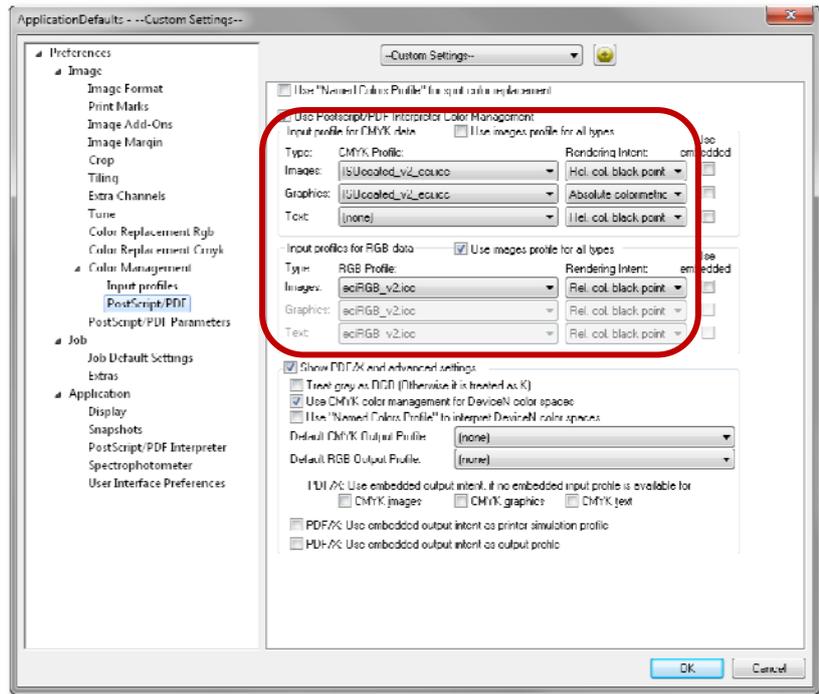
The legacy color management for PostScript files provides the possibility to reproduce older jobs printed with earlier versions of the **ErgoSoft RIP**. For new jobs, we recommend using the PostScript/PDF interpreter color management.



PostScript/PDF Interpreter Color Management

Compared to the legacy color management, the **PostScript/PDF Interpreter Color Management** offers several additional color controls and options. Some basic settings are explained in this chapter. Alternative configurations to the basic settings as well as advanced settings are explained in the next chapters.

Unlike the legacy color management, the **PostScript/PDF Interpreter Color Management** applies input color management during the PostScript or PDF file rasterization process. This means, that all color spaces within the PostScript or PDF file are converted into the output color space using input profiles, rendering intents, and printer profiles. The color managed rasterized data is then adjusted to the printer using only the dithering method, density linearization, and total ink limit settings.



This offers the advantages including the ability to

- Use different input color management methods for RGB and CMYK data
- Utilize different input color management settings for 3 object types:
 - All raster data (object type **Images**)
 - All vector data including text that is converted into outline (object type **Graphics**)
 - All text created with fonts instead of outlines (object type **Text**)
- Enable and disable input color management for monochrome (grayscale) objects (**Treat gray as RGB**)
- Convert DeviceN color spaces into CMYK to ensure color management is applied
- Work with a predefined printer profile if no profile is specified in the print environment
- Control the PDF/X workflow and settings.

PostScript/PDF Color Management V14 vs. v.2008

The PostScript/PDF color management within v.2008 and V14 is essentially identical. In some cases it may be necessary to check **Use CMYK color management for DeviceN color spaces** in V14 to achieve comparable printouts from both RIP versions.

Legacy Color Management vs. PostScript/PDF Interpreter CM

The two color management methods generally produce different color output results. These differences can be quite pronounced especially when printing a RGB generated PDF file on a CMYK based printer, and working with a CMYK generated PDF file using an RGB print environment. In most cases, it is therefore recommended to use the **PostScript/PDF Interpreter color management**.

There is one special set of printing conditions where, in most cases, both color management methods produce identical results. This is when the file only contains **CMYK** data and the **PostScript/PDF interpreter color management** is configured such that the

- **Use images profile for all types** option is checked or the same input profile and rendering intent for all three object types is selected,
- **Use embedded** option is not checked, and
- **Use CMYK color management for DeviceN color spaces** option is checked.

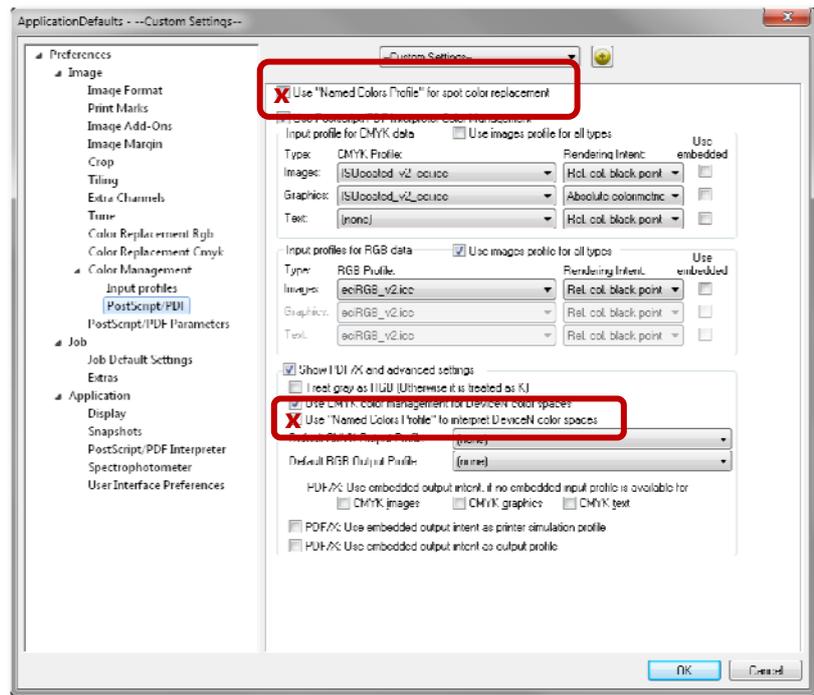
All other combinations of image data and color management settings will generally produce different output colors.

Spot Color Replacement Using “Named Colors Profiles”

The **ErgoSoft RIP** provides an option to automatically replace spot colors (e.g. Pantone colors) with color recipes in the **Named Colors Profile**. For detailed information about this function please see the application note about color replacement.

Replacing Spot Color Gradients

Gradients from either white or black to a spot color or from one spot color to another spot color are often saved as **DeviceN** color spaces. In order to automatically replace these types of gradients with **Named Colors**, the **Use “Named Colors Profile” to interpret DeviceN color spaces option** must be checked.



Spot Color Replacement and Transparencies

When transparencies are flattened, spot color information is often lost in transparent regions of the file and automatic spot color replacement will not work. In general, avoid flattening transparencies when spot color replacement is used.

Option “Use embedded”

When PostScript and PDF applications typically save or export a document, they often embed the application profile as input profile and the application rendering intent. When the **Use embedded** option is checked, the **ErgoSoft RIP** applies the embedded input profile and embedded rendering intent for color conversion.

If the application creating the Postscript/PDF does not explicitly indicate which rendering intent is being selected, it is recommended to keep the **Use embedded** option unchecked and instead work with the desired external input profiles and rendering intents selected from the pulldown menu options for the three object types.

Transparencies

In most cases, users intentionally create transparencies to produce a specific printed output result. However, they are typically unaware that the image editing and document design software (e.g. Adobe Illustrator) may also automatically apply transparencies for as part of their document design functionality. Typical examples for automatic transparencies include text or frame objects with shadows or objects placed on top of gradient objects.

When saved, the file format may preserve or automatically flatten transparencies as shown in the table below.

Document Format	Handling of Transparencies
EPS	Flattens
PDF/A	Flattens
PDF 1.3	Flattens
PDF/X – 3	Flattens
PDF 1.4 and higher	Preserves
AI (all CS Versions)	Preserves
PDF/X – 4	Preserves

Known Problems with Transparencies

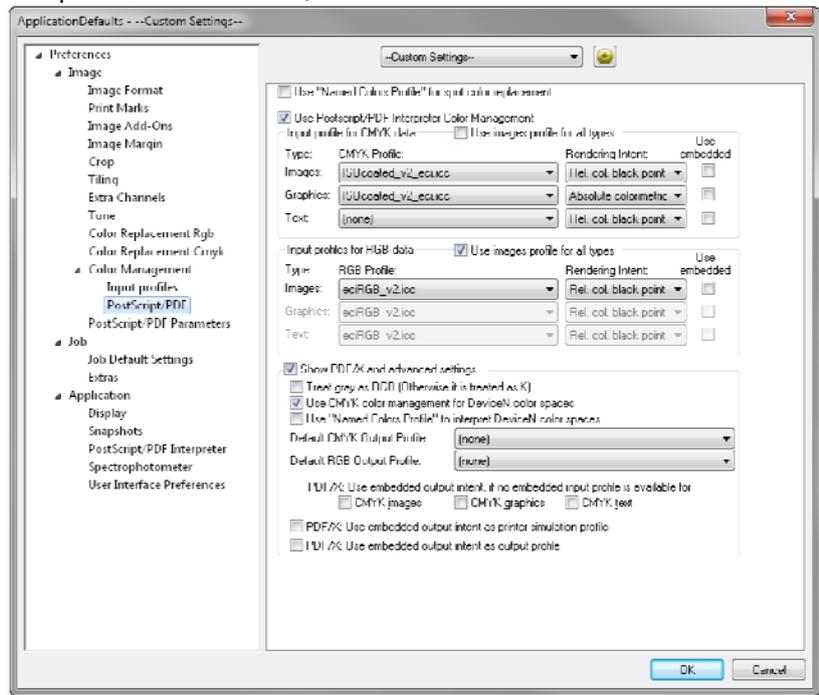
- Some software applications may save PDF files with transparencies in a way that can potentially generate unexpected output results when processed by the PostScript interpreter.
- Reading PDF files with complex transparencies is more memory intensive and can slow down the processing and printing of the file.

Known Problems with Flattened Transparencies

- Flattening transparencies requires transparent regions of a file to be rasterized while other regions remain in vector format. The combination of vector and raster regions in many cases produces objectionable image artifacts and unexpected colors results. This is especially the case when a specific vector object is partially rasterized in the flattening process. The color issues become more acute if different input profiles and rendering intents are applied for **Images** (Raster) and **Graphics** (Vector) objects.
- Spot color information is often removed when flattening transparencies and automatic spot color replacement cannot be used. It is therefore recommended to avoid flattening transparencies when using spot color replacement.

Options for Printing Flattened Transparencies

- Since the legacy color management for PostScript/PDF files only uses a single input profile and rendering intent for all data, working with the legacy color management method is the easiest solution for PostScript/PDF files in CMYK format (or RGB formatted Postscript/PDF files using RGB print environments).
- When the PostScript/PDF file contains a mixture of CMYK and RGB data, the PostScript/PDF interpreter color management should be used to apply the correct color conversion for each color type.
- To overcome color differences between vector and flattened transparent regions, the same input profile and rendering intents need to be applied to all object types. This only works if the raster and vector data are in the same color data format.
- This can be done either by selecting the input profile and rendering intent manually or by checking **Use images profile for all types**. In either case, do not check **Use embedded**.
- In the figure, the settings for **RGB** data avoid the problem with flattened transparencies. The settings for **CMYK** data will still result in issues because the settings differ for each of the object types both in terms of input profile and rendering intent.



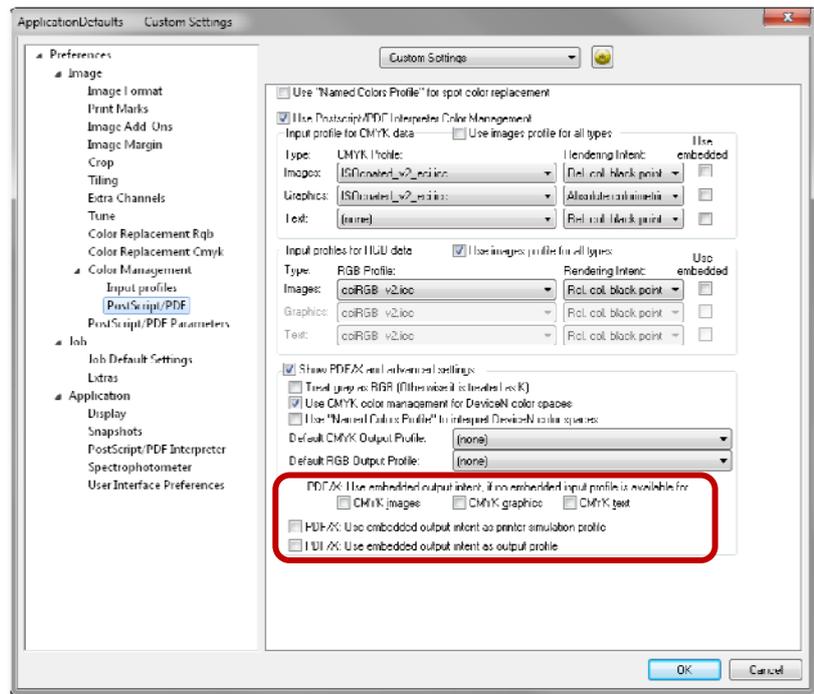
PDF/X

PDF/X is a standard for creating color managed PDF files for the graphic arts and conventional printing industry. The PDF/X file contains embedded profiles, rendering intents, and the description of the output color space (output intent).

The output intent within a PDF/X file is less suited for digital printing workflows.

The PDF/X settings are meant for experienced users that want to have more control over their documents. In most cases it is inadvisable to check the **PDF/X settings**.

One specific exception would be when the PDF/X file contains colors that are already converted to the output intent and do not contain an embedded input profile. In this instance, the embedded output intent can be used as an input profile in order to revert back to device-independent colors.



CorelDRAW X5 – Using Spot Colors

When spot colors (e.g. Pantone colors) are used in PostScript/PDF files for automatic color replacement with *Named Colors Profiles*, do **not** check **Convert spot colors to** on the **Colors** tab of the **PDF settings** dialog.

With this setting for PDF export, colors that are selected from a color palette or library (e.g. Pantone Color Library) are saved together with the color name so that automatic spot color replacement can be applied to the file.

DeviceN Color Spaces

DeviceN color spaces are defined as multi-channel color spaces that do not match CMYK, RGB, Lab, and Grayscale. Examples of DeviceN colors include

- Gradients from RGB or CMYK to a spot color,
- Gradients from one spot color to another spot color, and
- Mixtures of spot colors

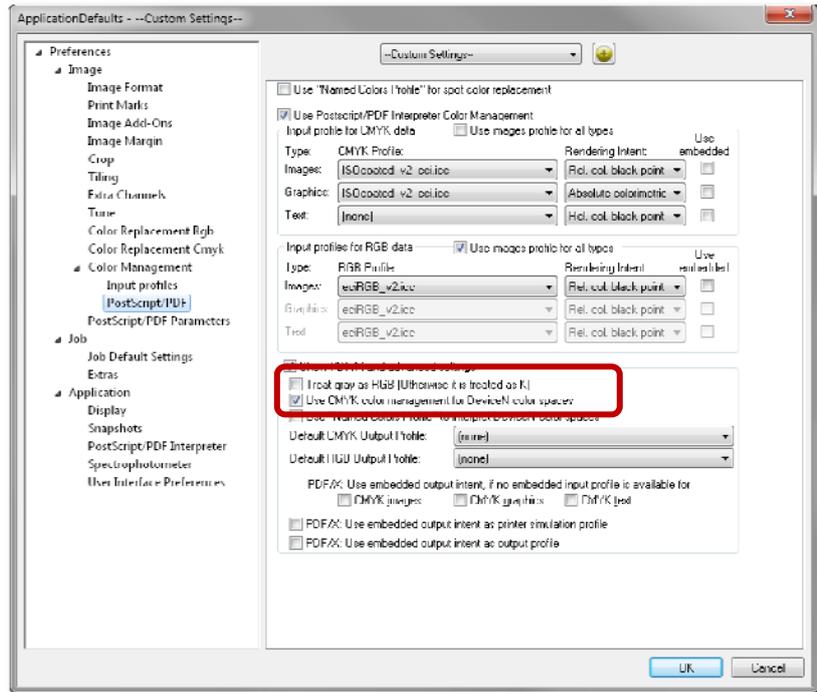
The **PostScript/PDF interpreter color management** allows the user to

- Automatically convert DeviceN color spaces into CMYK using the alternative colors that are saved together with the spot color in the PDF, and
- Use automatic color replacement with *Named Colors Profiles* for complete control over the ink mixings for DeviceN colors

PDF Files Created with Adobe CS5

Adobe CS5 often automatically converts black-only CMYK gradients into the monochrome color space (grayscale color space). By default, the monochrome color space is printed in the **ErgoSoft RIP** without color management.

To activate color management for colors saved in the monochrome color space, check **Treat gray as RGB (Otherwise it is treated as K)** to automatically convert all gray values into the RGB color space with equal values for all 3 components.



It is important to note that Illustrator may choose to save CMYK gradients in a DeviceN color space (with Cyan, Magenta, Yellow, Black as DeviceN color channels) as opposed to CMYK process colors. Because of this, it is highly recommended to ensure that the **Use CMYK color management for DeviceN color spaces** option is checked.

Recommendations for Saving PDF Files

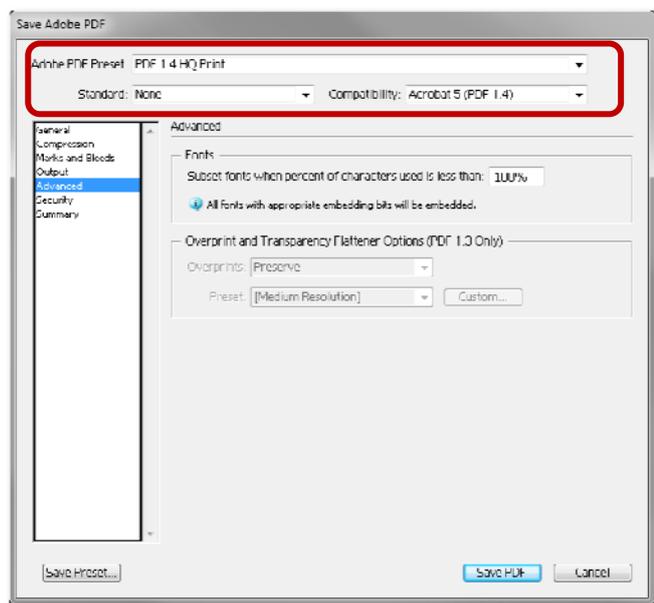
PDF export/saving dialogs normally offer numerous options. Some of these options are important for optimal printing. The following information illustrates these options with the help of the PDF export dialog of Adobe Illustrator CS3. Other PDF export dialogs may look different, but the mentioned options are typically available.

Most of the recommendations below do not depend on the selected PDF version unless specifically noted for PDF compatibility and compliance.

Selecting the PDF Version

The selection of the PDF version (**Compatibility**) depends on some other options, you want to use.

- Automatic flattening of transparencies requires that you save in Compatibility "Adobe 4 (PDF 1.3)".
- Keeping transparencies require that you save in any higher Compatibility than PDF 1.3, e.g. "Adobe 5 (PDF 1.4)" which we recommend.
- The PDF/X versions (**Standard**) may be linked to specific compatibility requirements (PDF/X3 or higher recommended). Please read the chapter "PDF/X" for hints on its usage.



Saving Raster Data

Raster data that are included in PDF files can be compressed as well as converted into lower resolutions.

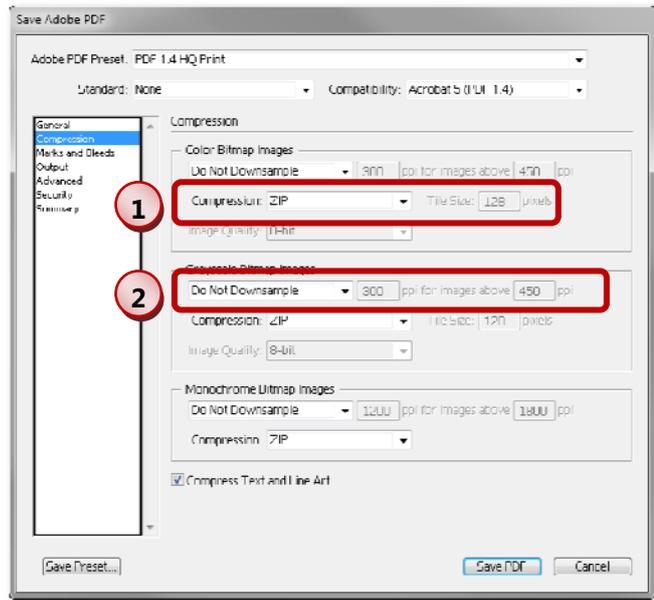
Most of the available presets may hold quality problems so that you should check the settings for **Compression**.

1 To reduce the file size, raster data often is compressed. This **Compression** method (automatic, JPEG, JPEG2000, ZIP, etc.) may not only reduce the file size but also the quality of the saved raster data.

All **JPEG** compression methods will reduce the file size by reducing the quality of the data; the **ZIP** compression methods just reduce the file size but not the quality. ZIP compressions always results in larger file sizes than JPEG compressions, but the quality of the raster data is (much) higher. Thus, we strongly recommend favoring the **ZIP** compression methods over the other options.

2 Automatically downsampling images reduces the PDF file size as well as the resolution. For optimal image quality it is generally recommended to select **Do not Downsample**. When you run into the limits of the PostScript interpreter for embedded raster data, which is 2 GB for all raster data (uncompressed) in the PDF file, it is necessary to save them in lower resolution. When the limit of PostScript interpreter is reached (PostScript error -25), you may either

- Split multi-page PDFs into several one-page PDFs or
- Downsample high-resolution bitmap images to a lower resolution. For information on the downsampling methods, please refer to the documentation of your image editing or document design software.



Color Spaces

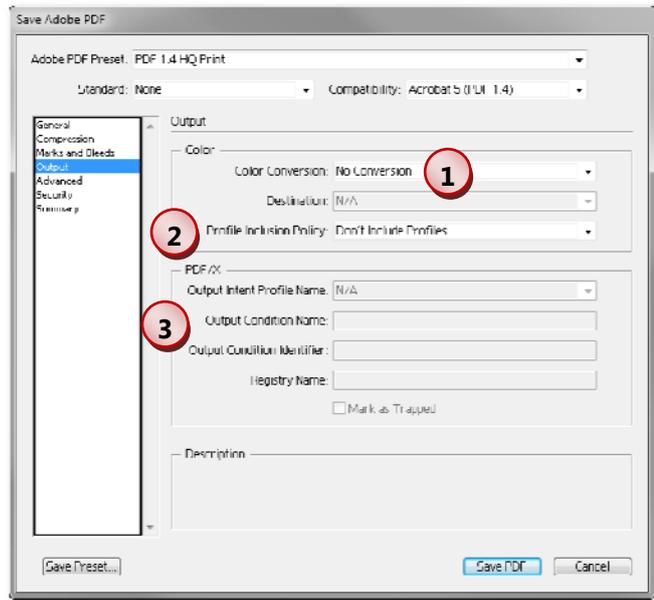
When saving the PDF file, all colors may be converted into one single output space (e.g. converting RGB colors into a CMYK color space).

1 To keep the original colors and benefit from the possibilities of the PostScript/PDF interpreter color management, we recommend to select **No Conversion** for **Color Conversion** options.

2 The input profile and possibly the rendering intent that are selected in the color management setting of your image editing software may be embedded in the PDF. Please refer to the chapter "Option "Use embedded" for more information.

For future reference about the color setup of the PDF file, it may be useful to embed profiles without using them for the PostScript/PDF interpreter color management (but when later re-opening the PDF in the image editing software).

3 Please read the chapter "PDF/X" for hints on the usage of PDF/X.



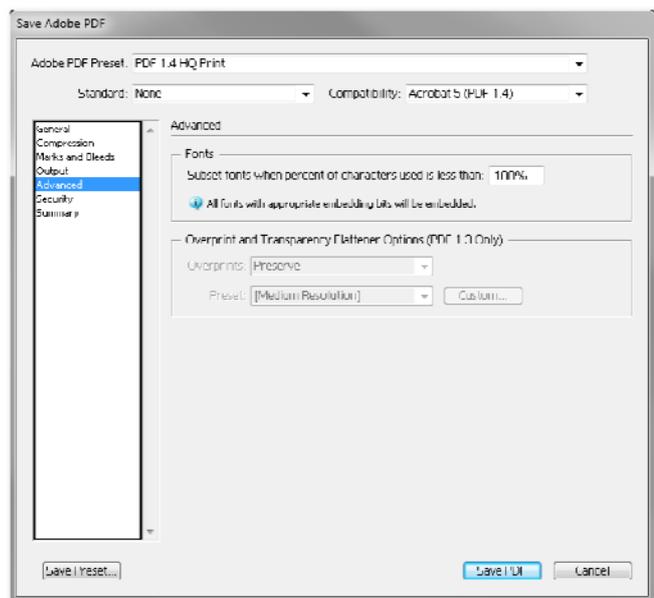
Fonts

For compatibility reasons with other operating systems we recommend to either

- embed the fonts in the PDF file,
- convert all text into outlines or
- convert some text into outlines and embed the remaining fonts.

Text generated with embedded fonts will be recognized as a **Text** object type while text converted with outlines become **Graphics** object types.

It is important to note that text in a file without an associated embedded font may be rendered incorrectly.

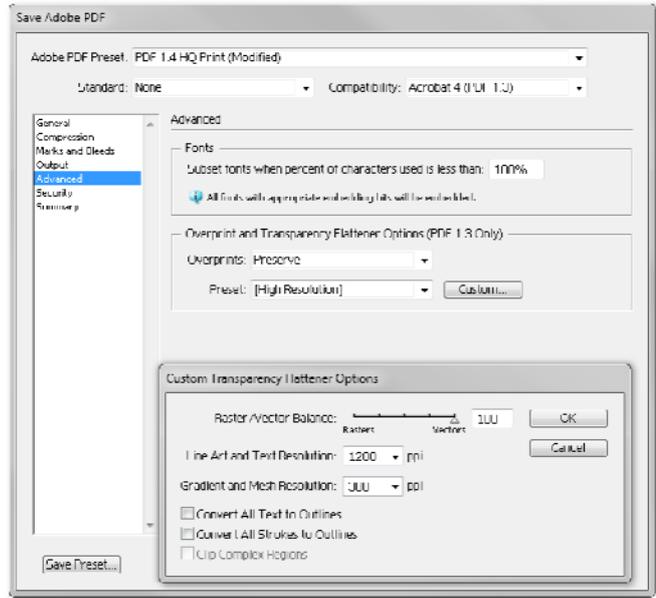


Transparency Flattening

Automatic transparency flattening is only available for PDF 1.3 format. For higher PDF formats, transparencies must be flattened manually when needed. Please note that we do not recommend manual flattening of transparencies when you want to benefit from the PostScript/PDF interpreter color management.

For high-quality printing, we strongly recommend to select **High Resolution** options for transparency flattening.

But keep in mind that you might run into some limits of the PostScript interpreter related to raster data (see chapter “Saving Raster Data” for more information).



PDF File Preparation and RIP Settings Overview

Below is a summary of general recommendations for creating, saving and ripping PDF files for optimal color results.

PDF File Creation Guidelines

- Embed all fonts used in the file or convert text to outlines
- Avoid using color conversion when saving file
- Use ZIP compression for images within the file
- Downsample images only if absolutely necessary
- Embed input profiles in file and record rendering intent for optimal color conversion
- To preserve transparencies, save file either as PDF/X-4 or PDF 1.4 (or greater). It is advisable to preserve transparencies when using spot color replacement.
- To flatten transparencies, save file either as PDF/X-3 or PDF 1.3. It is recommended to use the same profile and rendering intent for all object types (**Images, Graphics and Text**).

RIP Setting Guidelines

- Check **Use PostScript/PDF interpreter color management**
- Check **Use Embedded** if the input profile and rendering intent are known for the file. Otherwise uncheck this option and manually assign the profile and rendering intent for each object type.
- Check **Use CMYK color management for DeviceN color spaces** to ensure all colors are correctly color managed.
- For monochrome files, check **Treat gray as RGB (Otherwise it is treated as K)** in order to apply color management.
- Check **Use "Named Colors Profile" for spot color replacement** when replacing spot colors in a file with Named Color recipes.