

Colour Management Settings in DPScan

Colour management has the reputation of being a black art, and the exclusive province of professionals. Over the last decade, systems have become available which have attempted to simplify the problem of obtaining consistent colour rendition across a range of devices. These have opened up the process to the amateur field.

The problem of obtaining consistency comes about because no two optical devices 'see' colour, or light and dark, the same way. Colour management is concerned with providing this consistency through the use of colour mapping to standardise the way colours are visualised.

In practice this is achieved by associating a piece of colour mapping code, hereafter called a Profile, to a device. What this profile does is describe the colours in an image from, say, a scanner and allow the colour management system to correctly map them into a device-independent format (hereafter called the Profile Connection Space or PCS) - this is an Input Profile - or, as an Output Profile, it will allow proper translation of colours from the PCS to a device such as a monitor or a printer.

The task of this document is not to go much further into the details of the process, rather to simplify the correct setting up of a colour-managed workflow in general but with specific reference to David Pilling's DPScan for Windows software.

Ideally one should start by having a profile for each device in the colour management chain. If the image has come from elsewhere, it may already have such a profile embedded within it. Often, however, an image will not have been given a profile by its originating device. This is not critical as DPScan can allocate a profile to an image prior to editing (Figure 2). It is most important to have profiles for each of the output devices, particularly the monitor and printer.

In DPScan the configuration of the colour management system is achieved from the Colour Management window (Figure 1) which can be opened from DPScan's *Misc.* menu by choosing **Colour Management**.

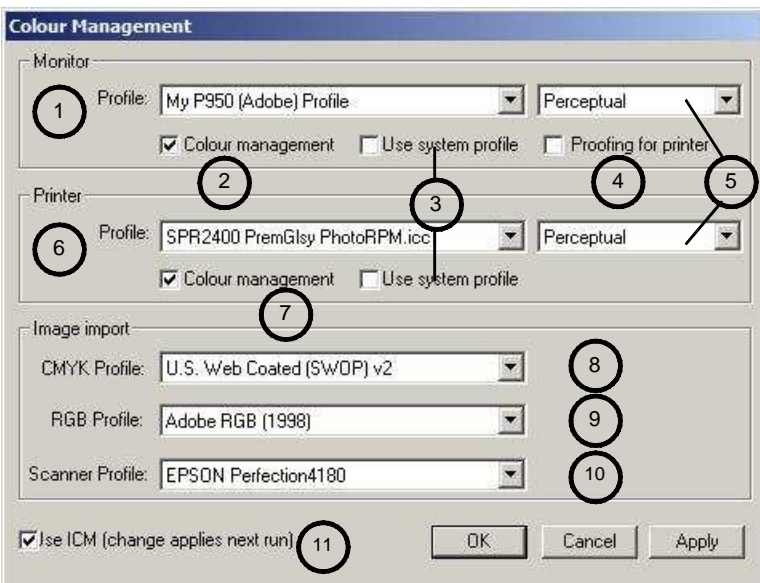


Figure 1: The Colour Management Window

To allow DPScan to successfully colour manage an image many of the default settings above can be left unchanged. To activate the system tick the colour management box (3) and this will manage the image on-screen immediately.

To send a colour-managed image to the printer is a bit more involved and will be discussed a bit later.

Changing between the two available colour management systems available at tickbox (11), should make no difference to the output. Its inclusion is for test and demonstration purposes. Try if you like!

- 1 Monitor Profile: The drop-down arrow will allow you to choose the monitor profile manually from the choice of profiles installed on the system. Either set to sRGB or use (3) to set it automatically.
- 2 Colour Management: When ticked colour management is on.
- 3 Use system profile: Rather than setting the monitor profile manually, tick the monitor system profile box to use the profile set in Windows. See also (1). Leave the Printer system profile unticked - if in any doubt set this manually.
- 4 Proofing for printer: When ticked the image displayed on screen simulates the print colours.
- 5 Rendering Intent: Normally a choice of four settings. As a rule use Relative colorimetric or Perceptual.
- 6 The Printer Profile: If you have a printer driver installed which has an associated Output Profile then this should appear here. In the absence of such, leave this setting as sRGB.
- 7 When ticked, the image is output to the printer with DPScan handling the colour management of the print job.
- 8 CMYK Profile: The profile to be associated with a CMYK image imported lacking an embedded profile.
- 9 RGB Profile: As above but for an RGB image.
- 10 Scanner Profile: The profile to be associated with an un-profiled image when it is imported from a scanner.
- 11 Switches between LittleCMS and Windows ICM colour management systems.

The consistent approach to colour calibrating.

Monitor Calibration and the Monitor Profile

The first step in colour calibrating a system is to ensure the monitor shows colour in as standard a way as possible.

There are several utilities available to allow monitor calibration. These all involve setting the levels of Red, Blue and Green relative to one another so one can be confident that what should be grey on-screen actually appears as grey to the eye. An incorrectly calibrated screen will not show colours truly so it would be impossible to either check the accuracy of editing or print proofing visually.

A monitor is an RGB device so should have one of the RGB profiles associated with it. By default, Windows contains a profile with the name 'sRGB IEC61996-2.1' and it is that which is set in the window in Figure 1.

Many monitor manufacturers will have taken the trouble to make a profile specifically for a particular monitor. Profile and monitor will normally be associated with each other at the same time the monitor's device drivers are installed. This can be checked in Windows from the **Control Panel ->Display ->Settings ->Advanced->Colour Management** menu. Should there be an entry here then the same profile should be chosen in DPScan's colour management window in the **Monitor Profile** box (1).

If no profile is associated with your monitor in the Windows Control Panel then add the sRGB profile named above in this area as well as in the monitor profile section of the DPScan colour management window. This profile can be found under the filename 'sRGB Colour Space Profile.icm'.

There are those authorities who would advise the use of the sRGB monitor profile in virtually all situations, so leaving the monitor profile set thus is unlikely to cause problems.

Printing with Profiles

Many applications, including DPScan, allow the user to choose where the conversion from image to printer data is done prior to printing. The choice is between

by the application itself or by the printer driver.

This is an area which causes much confusion as it is often not immediately obvious that one must do this in either one area or the other but not both. Thus, if the conversion is done by DPScan, it must not be done by the printer driver and vice-versa. How to achieve this with the settings which must be set is not always obvious either as the terminology changes.

A printer's output profiles are matched not only to the ink but also to the paper being used. In the strictest sense one needs a separate output profile for every combination of ink, paper and printer. This is not always the situation at the cheaper end of the market (see the caveat, below) and this may have a bearing on the choice of where the print management is done.

How does one choose where to manage the printing?...

...in the Printer Driver

The simplest way is to manage in the printer driver. The way this is achieved in DPScan is to set **Colour Management** (2) to 'on' and **Printer Colour Management** (7) to 'off'. By doing this one ensures that DPScan sends an unconverted image to the printer driver but also sends the necessary profile information to the printer driver with the image when it is sent.

To make this work fully it is then necessary to turn colour management in the printer driver to 'on'. Quite how to do this varies with make and type of printer and is beyond the scope of this document. Read the printer documentation to find out how.

...in DPScan

The alternative option is to let DPScan do the pre-printing colour management and to send a managed stream of data to the printer. To set DPScan's configuration to do this one must enter the appropriate printer profile for the ink/paper combination into box (6) and set the tick box (7) to 'on'.

It is imperative that management is turned off in the printer driver to avoid this already managed data being 'managed' again. Once again, read the printer manual to find out how to do this.

Caveat

There is a potential problem when managing the printing this second way. This involves how certain printer manufacturers arrange their printing profiles. Many of the Epson printer profiles, for instance, are held in a single file with a prefix something like 'E_'. This file is not quite like a standard printer profile inasmuch as it contains the mapping information for all the manufacturer's papers in the one place with the setting within the printer driver dictating which paper profile is used. Consequently it is unlikely that using such a profile in DPScan is going to produce output matched to the paper being used. In this case one may be obliged to print using management in the printer driver although a trial-and-error approach may prove otherwise.

Printer Proofing

The '**Proofing for Printer**' tick box (4) attempts to show on-screen how the final image will appear in print. This is of greatest use with CMYK images but its use with RGB should go some way towards showing how an image will print. Ideally, with RGB, print proofing will show little or no difference between proofed and un-proofed views. If much change is seen, it is an indication that colour management is not working as it should.

Scanning and Profiles

Many newer desktop scanners are supplied with matching input profiles. Normally profiles are registered with the scanning software on installation but it is common that colour management in the scanner's software will be turned off by default.

Older scanners may not support colour management. This is not a great problem but an unmanaged image should have a profile assigned to it on loading.

Look at your scanner's documentation to find out more about this.

Digital Cameras and Profiles

The majority of modern consumer digital cameras output images in the sRGB colour space by default and often this is the only option.

Rarely, though, does an image from a digital camera actually contain a proper profile as the information about the image's colour space is contained within the its EXIF data. It is advisable to check the image's status in the *Colour Profile* dialogue, assigning the appropriate profile if necessary (Figure 2).

At the higher end of the consumer digital camera market exist cameras, often SLRs, which give the user the option to output images in the AdobeRGB colour space. The current situation is that an image output in the AdobeRGB space is recognised by the addition of a leading underscore character in the filename - thus, where an image named 'Image 001.jpg' would be in the sRGB space, a similar image named '_Image2.jpg' would be in the AdobeRGB space. For any software to be able to detect this it is important that the filename remain unaltered prior to first loading into an editing package and that the correct profile be subsequently both assigned and embedded.

Choosing which Profiles to use - Colour Models and Spaces

RGB

Normal desktop printing using an inkjet printer is done using the RGB colour model. Although all inkjets are essentially modified CMYK devices the drivers and profiles will always handle this conversion which thus remains transparent to the user. Monitors and desktop scanners are also RGB devices. For normal use desktop use, it is therefore right to have images in RGB rather than CMYK.

There are several colour spaces within the RGB colour model, the most common being sRGB and



Figure 2:
The colour profile dialogue.
In this instance the image has the AdobeRGB profile.

To convert it to sRGB one selects the sRGB profile in the 'New Profile' icon and clicks '**Convert to new profile**'.

This will not only assign the new profile to the image but also convert the colours to fit inside the new colour space. Conversely, the '**Assign new profile to image**' button will assign the new profile to the image

but not carry out the conversion.

The '**Embed current profile**' button will place the chosen profile in the image which will be saved with the profile.

The advantage of this is that the image will contain the information required for correct rendering whatever the settings of the image application. This allows consistent colour rendition across systems and platforms.

It is good practice to embed a profile in an image.

AdobeRGB. The difference between these two is not very great but, in simple terms, the saturation of the colours in the sRGB space is greater than that of AdobeRGB. In contrast, the range of colours available to AdobeRGB is greater than that in the sRGB space.

Changing the Working Colour Space

To alter the settings to use the AdobeRGB colour space requires the AdobeRGB profile name be put in the DPScan colour management window as the input colour profile (8). To complete the transition to AdobeRGB requires that any images have that profile assigned to them using the Colour Profile dialogue. All these adjustments are explained above.

CMYK

Conversions within DPScan to and from CMYK are carried out using the Colour Profiles dialogue box. If a CMYK profile such as Euroscale Coated (available from Adobe in a free download) is selected then the '**Convert image to new profile and CMYK**' button becomes available. Clicking on this will not only convert the image to CMYK but will associate the named profile to it. To convert from CMYK to RGB is done by selecting an RGB profile and clicking the '**Convert image to new profile and RGB**' button.

Note

Editing of an image in CMYK format is not possible in DPScan. Consequently conversion from RGB should be done as a final stage in the preparation of the image.

Convert to Profile vs. Assign Profile to Image

The '**Convert to Profile**' button changes the data representing colours in an image to fit them into the range of colours defined by the new profile. '**Assign Profile to Image**' associates the image with the new colour space without changing the data representing colours.

It is possible for an image converted from one profile to another have some colours which fall outside the range of colours available in the destination colour space.

An image whose profile has been changed without an alteration of the colour data may appear on screen with distorted colours as, although the data has not changed, the way of displaying it has.

Assign's most common use is to tag an unmanaged file which is imported from scanner or other non-colour managing source. It can also be used to

change a profile because the current profile is wrong as evidenced by it displaying incorrectly on-screen. **Convert** is used to actually change an image and the range of colours available to it when this is desirable. An example of where conversion would be used is when an image produced in the AdobeRGB colour space is wanted for use on the web, which uses the sRGB space. Conversion will change the colour space whilst maintaining the image's correct appearance as far as is possible.

Embedding Profiles

A colour-managed image file may be saved either with a profile or without. The advantage of saving an image with a profile is portability both between systems and individual programmes. Unless storage space is limited, it is advisable to embed a profile before saving the image. This can be achieved using the '**Embed current Profile**' button in the Colour Profile menu (figure 2).

File Formats and Colour Management

Only certain types of image file format are capable of containing information about colour rendition. The following formats are able to do this.

TIFF:

Within DPScan this a format which will be either compressed losslessly or uncompressed and can be RGB or CMYK. Tiff files have the capability to contain a wealth of metadata. It is not the most economical format available when size is important.

JPEG:

Like Tiff, Jpegs can be RGB or CMYK. Jpegs use a lossy compression method which will degrade an image to some degree. The level of compression is much greater than achievable in a Tiff so, when space is limited, Jpeg is a reasonable storage format.

PSD: (unavailable in DPScan)

The native Photoshop format, PSD is similar to Tiff. A versatile format but its use is not universal. Its presence here is for completeness.

BMP:

The vast majority of BMP files will not be capable of carrying colour space data. The version 5 BMP is capable of doing this and DPScan can handle BMPs of this type. Very little else can so its usefulness is not great.

PNG:

This format is capable of carrying colour space data. Although it is not in popular use in a colour managed environment it would confer certain advantages over the previously mentioned formats inasmuch as its levels of compression are greater than Tiff yet still lossless. It does not support CMYK, however, having been initially developed for Internet use.

In Conclusion

Some Rules of Thumb:

Setting Up

Read the manuals for scanner and printer to see how they deal with colour management before setting DPScan's colour management up. Then set all the elements up together to maintain consistency throughout.

Setting up the monitor correctly is crucial. Utilities to help with this process are often provided by the graphics card vendor, check *Display Properties->Settings->Advanced->Colours...* within Windows, or from 3rd party suppliers. Search the Internet for 'Monitor calibration' for much more information.

Match profiles where their appearance is duplicated eg. make all references to the monitor profile read the same. Do the same for scanners where possible.

Use sRGB for the **Import RGB Profile** and see how you go before changing to a different colour space. Use the same for the **Scanner Profile** and **Monitor Profile** unless you have dedicated profiles for those devices.

If in real doubt then you can expect to get reasonable results setting everything to sRGB with the one exception of the **Printer profile** box. Even this setting is not crucial if you use the printer driver to colour manage the print process and have print management in DPScan turned off.

Loading and saving

Always '**embed**' the profile into the image prior to saving it.

Hesitate before changing an already tagged image's profile. If in doubt, leave it alone.

Printing

Don't duplicate colour management when printing, do it in the application or in the printer driver - not both.

Start by using the printer driver's colour management system to print, not DPScan's.

On-screen proofing was originally conceived to be used with CMYK images rather than RGB but it can be used as a rough guide in RGB and can save wasting ink and paper. Bear in mind that the printed image will often look better than the proofing might lead one to believe.

If print proofing in RGB shows much variation between proofed and unproofed versions of an image, check all the settings especially those involved with printing.

If all the settings prove to be right and subsequent prints prove satisfactory then all is well. However, if the settings are correct and the prints are still unsatisfactory, this is an indication that some component in the printing chain (printer profile, printer driver and printer itself) may not be as good as it could be.

Do use the newest available version of the printer driver for your printer. If print quality is subsequently still not as good as wished for, then it may be necessary to consider replacing the printer with one of the newer models.

Devices

Monitors and desktop scanners are RGB devices and should be associated with RGB spaces.

Although inkjet printers use modified CMYK inksets they are treated as RGB devices and will be unlikely to produce good results if you send CMYK images to them.