

WHY DOESN'T MY PRINT MATCH MY SCREEN?

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This is the most common question that I get asked and the answer is complex. The guidance below has evolved over several years and has been found to be successful by members of Amersham Photographic Society. Epson printers, Photoshop and Photoshop Elements are used for illustration purposes and because they are the most popular amongst our members.

1. VIEWING CONDITIONS

- prints change colour and density as they dry so allow at least half an hour before assessing them. There is a chemical reaction between ink and paper and using a hairdryer on the print will not speed it up!
- prints should be viewed in daylight. Tungsten bulbs emit extremely yellow light and normal florescent tubes do not emit the full white light spectrum. Blue craft or grow-light bulbs are better than nothing but a specialised bulb or tube rated not less than 5000 deg K is best, ideally as part of a proper daylight viewing booth.
- a screen should be viewed in a room with low ambient light. It should be the brightest source of light in the room.

2. SCREEN SET UP

Traditional cathode ray tubes (CRT) fade with use and need regular re-calibration. A tube which has been used regularly and is a few years old may be unable to produce an acceptably bright image for colour-critical work. Modern LCD or TFT flat screens are very much more stable and perfectly suitable for photographic use provided you avoid the cheapest generic models.

Screens often have user-adjustable settings and the appropriate values for Windows computers are sRGB, 6500K and Gamma 2.2. If your screen is set up correctly, applying *Image/Adjust/Desaturate* to a colour image should produce a neutral greyscale image with no visible colour cast. There is a useful test image of known quality on the APS website <http://www.amershamphotosoc.com/> under the *Digital & Mono* link. This should look neutral, crisp and fresh on your screen, not dulled by an overall colour cast or excessive density.

A utility called Adobe Gamma is supplied with Photoshop for the purpose of screen setup. It is useless. It was never designed for flat panels and never really worked for CRTs. Although flat panels may produce acceptable results out of the box, all types of screens usually need individual profiling (see later in this document).

3. PRINTER DRIVER SETTINGS

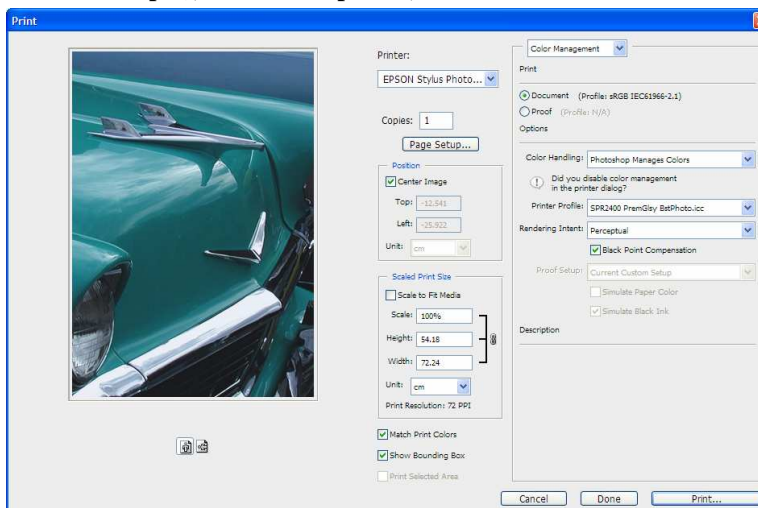
Out of the box, with default settings, colour management rarely works successfully. Colour management can be applied by both Photoshop and the printer driver. The crucial trick is to ensure that only one is active. Which one to choose depends upon the circumstances;

3.1 Let Photoshop Control the Colours - *Recommended*

- suitable for any printer for which you have a generic profile (eg the latest Epson Photo Printers R800, R1400, R1800, R1900, R2100, R2400 using Epson Ink and Paper), or a custom profile;

In this case we have a profile (or preferably, a set of profiles) for the printer. A profile can only be employed when Photoshop handles the colour management. See Para 4 for a description of the various types of Printer Profile.

• **For Photoshop CS3 (illustrated):** Choose *File/Print*. Color Management is selected by default. Select *Document* and for Color Handling *Photoshop Manages Colors* is the appropriate setting. In Printer Profile choose the profile for your printer model and paper type from the list.



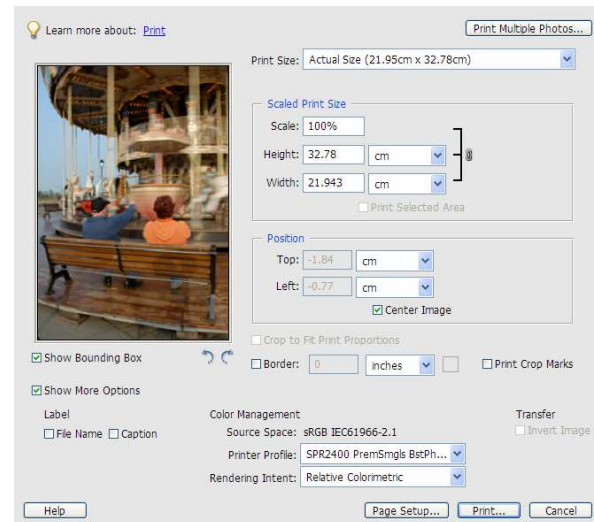
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- **For Photoshop CS2:** Choose *File/Print with Preview*. Color Management is selected by default. Select *Document* and for Color Handling *Let Photoshop Determine Colors* is the appropriate setting. In Printer Profile choose the profile for your printer model and paper type from the list.

- **For Photoshop 7 and CS:** Choose *File/Print with Preview*. Select *Show More Options* and *Color Management*. Choose *Document* for Source Space then in Print Space/Profile choose the printer profile for your printer model and paper type from the list.

- **Photoshop Elements 6:** Choose *File/Print*. For Color Handling select *Photoshop Elements Manages Colors*. In Printer Profile choose the profile for your printer model and paper type from the list.

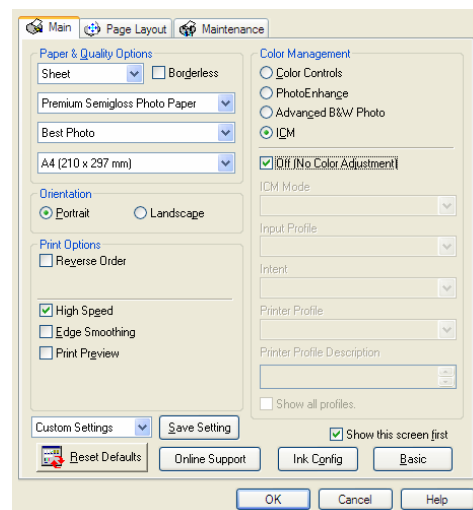
- **Photoshop Elements 3, 4 & 5 (illustrated):** Choose *File/Print* then *Show More Options*. In Printer Profile (Print Space for PE3) choose the profile for your printer model and paper type from the list.



- **All Versions :** Finally set Rendering Intent to *Perceptual* and ensure that Use Black Point Compensation is on. All of these settings ensure that colour management is being applied by Photoshop.

Next click *Print* and *Properties* buttons. On the Properties screen go straight to the *Advanced* button. On the Advanced screen select your paper type, *Best Photo*, paper size and orientation then tick *High Speed* and untick *Edge Smoothing*. Under Color Management select *ICM* and then *Off (No Color Adjustment)*. If you save and name these settings, you will be able to call them up in future with a single click. These settings ensure that the printer receives an appropriate amount of ink for the paper type but that no further colour management is applied by the printer driver. Click *OK* three times and print the image.

In theory an improvement in quality should result in choosing *Photo RPM* instead of *Best Photo* and unticking *High Speed*. Experimentation is necessary here, especially if your particular printer driver has other options, but with my R2400 I cannot see any difference in quality and the printing time is dramatically increased so *Best Photo* and *High Speed* have become my defaults. With some paper types you will not be offered any higher quality settings.



3.2 Let the Printer Control the Colours – Which Can Sometimes Produce Acceptable Results - suitable for printers and printer manufacturer's own inks and papers for which there are no Printer Profiles available;

In this case we do not have any profiles for the printer so we need to let it handle the colours for itself.

- **For Photoshop CS3:** Choose *File/Print*. Color Management is selected by default. Select *Document* and for Color Handling: *Printer Manages Colors* is the appropriate setting.

- **For Photoshop CS2:** Choose *File/Print with Preview*. Color Management is selected by default. Select *Document* and for Color Handling: *Let Printer Determine Colors* is the appropriate setting.

- **For Photoshop 7 and CS (illustrated):** Choose *File/Print with Preview*. Select *Show More Options* and *Color Management*. Select *Document* and *Printer Color Management* for Source Space and Print Space respectively.

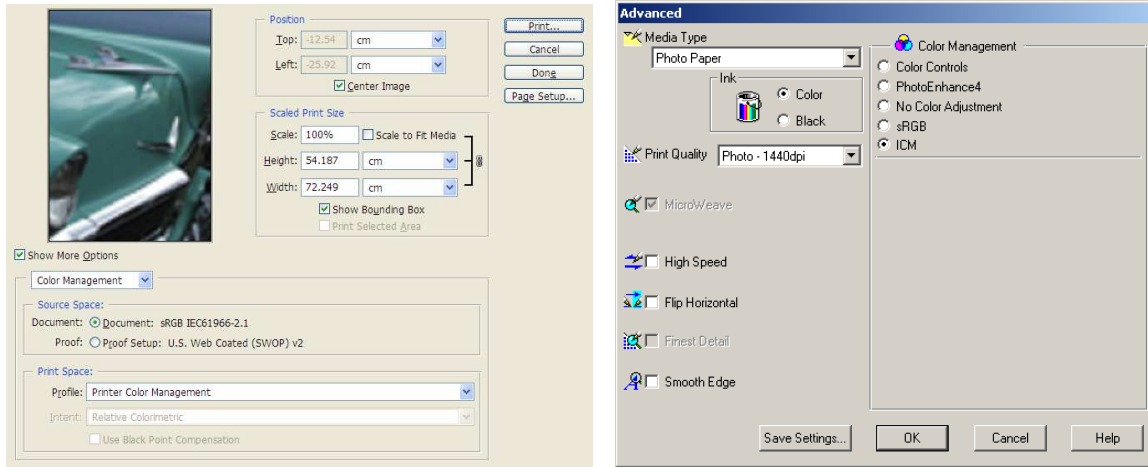
- **For Photoshop Elements 6:** Choose *File/Print* and then *Printer Manages Colors* for Color Handling.

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• **For Photoshop Elements 3, 4 & 5:** Choose *File/Print*. Select *Show More Options* and then *Printer Color Management* for Printer Profile (or Print Space).

These settings will ensure that no printer colour management is applied by Photoshop.

Next click *Print* and *Properties* buttons. On the Properties screen select *Custom* and click on the *Advanced* button. On the Advanced screen select your paper type, color, 1440 dpi (or higher), and untick High Speed. Under Color



Management select *ICM*. If you save and name these settings, you will be able to call them up in future with a single click. These settings ensure that the printer driver colour management is active. Click *OK* three times and print the image.

4 COLOUR PROFILES

Colour Profiles (or ICC Profiles) are tables of figures which adjust colour values. They may be associated with any photographic element such as cameras, printers, screens, scanners and images themselves. Usually they are employed to adjust colours to match a particular colour standard of which there are many. They are necessary because different devices are capable of reproducing a different range of colours (or 'Gamut') and to compensate for individual manufacturing tolerances.

4.1 Generic Printer Profiles

A Printer Profile is designed to adjust the colours for a single printer/paper/ink combination. If you have printer profiles you will use the procedure in 3.1 above. If not, then you will use the procedure in 3.2 above.

During printer driver installation, a set of generic printer profiles may be installed on your computer. If so, these will appear in the list of printer profiles available for selection in 3.1 above and each profile may consist of the printer model and one paper type eg *SPR2400 PremiumGlossy*. (NB If you see a profile for the printer with no paper type then this will be of little value and should be ignored).

It is strongly recommended to check periodically on the manufacturers websites for updated ICC profiles as these are likely to give superior results over the ones in the box with the printer. For example updated profiles for a wide range of Epson papers in Best Photo and Photo RPM modes are available here for the following printers;

[Epson Photo R800 Profiles](#)

[Epson Photo R1800 Profiles](#)

[Epson Photo 2100 Profiles](#) (called 2200 in the USA)

[Epson Photo R2400 Profiles](#)

Because of the complex chemistry involved between paper and ink, they must be compatible. Materials from the printer manufacturer always give good results but beware of the vast array of 'compatible' inksets. They are very cheap but unfortunately totally unsuitable for colour-critical work such as photography. Nevertheless there are one or two specialist manufacturers such as Lyson who make inks and papers specifically for photographic use and several excellent paper manufacturers. Any non-standard ink/paper combination will need a printer profile and reputable manufacturers will make these available to download.

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For example, free generic profiles for their range of papers with Epson inks are available from [Permajet](#) and [Ilford](#)

Having downloaded a profile to a known location such as the Desktop, right-click it and select *Install Profile*. This simply moves it to a special folder eg for Windows XP; C:\WINDOWS\system 32\spool\drivers\color. To use the profile, select it by the procedure in 3.1 above.

4.2 Custom Screen and Printer Profiles

Even when you have followed the above advice to the letter it is quite likely that your screen and print will still differ significantly in colour or density. So far we have covered generic solutions. You must now consider custom solutions for your individual equipment and materials. Most people will need a custom screen profile. Conversely, many people will not need a custom printer profile unless they have an older printer or non-standard materials.

New flat screens are usually set to an excessive level of brightness in the factory. This is just one common source of mismatches between screen and print. Colorimeters such as the Spyder or Eye-One can create a custom screen profile but the results are mixed and I believe that an element of experience is required to get the best from them, especially since the results depend upon a bug-free video driver - something of a black art.

I highly recommend using a colour management professional. Our local such expert is Derek Wells at [SD Services](#). Screen profiling is of major benefit to almost everyone. In the case of non-standard materials or older printers, printer profiling usually gives immediate and dramatic improvements. In addition, your system and procedures will be reviewed in the course of the consultation. The cost is reasonable and should be more than offset by the savings from no longer having to make test prints.

If you wish to profile your own screen with a device such as the Eye One, Derek can supply this at a competitive price and provide support for it too.

Professional screen profiles always require a home visit but printer profiles can be done by post and are available from many sources at a reasonable price. If you use Permajet papers, they offer a free custom profiling service.

5. MONOCHROME PRINTS AND THE EPSON R2400

The R2400 has the benefit of two additional ink cartridges containing greyscale inks (curiously called Light Black and Light Light Black). These enable this printer to produce exceptional monochrome prints in both neutral tones and colour tints when coupled with suitable papers.

To achieve best results, this printer requires a slightly different approach to colour management. It is necessary to let the printer control the colours by turning off Photoshop colour management (Para 3.2 above). However in the printer driver, select the *Advanced* screen and then *Advanced B&W Photo* (Note that this setting is only available for certain paper and quality settings). Under the *Settings* button, preferences for tint and density can be adjusted but beware that the default Tone setting is *Darker* which should be re-set to *Normal* for most situations.

A shortcoming of this printer is that gloss paper requires Photo Black ink but matte paper requires Matte Black ink. Unfortunately these inks cannot co-exist in the printer simultaneously and indeed it won't even allow you to select what it considers an inappropriate paper for the installed ink cartridge. Although changing between the two blacks is very easy, it does initiate a wasteful ink purging process which further increases the already high cost of inks in this printer, estimates for which are up to £3 per A3 print.

6. CONCLUSION

Screens emit light and paper reflects light. These very different processes can never produce identical results but the objective is to eliminate test prints and wasted material. By working systematically through the above recommendations many APS members have now achieved this.

The next step is to maintain this colour consistency between your system and others, including the club projector for competition purposes. To achieve this, read the separate handout *Achieving Consistent Colour – sRGB vs. Adobe RGB*.

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APPENDIX

COLOUR MANAGEMENT CHECKLIST

If your print and screen don't match, check the following;

- The printer manufacturer's recommended ink and paper are being used (otherwise you're into uncertain territory)
- You have made the appropriate settings in the Photoshop Print dialogue box (see above)
- You have made the appropriate settings in the Printer Driver (see above)
- Double Check: colour management is only set in Photoshop or the Printer Driver, NOT both

If you use a generic printer profile;

- You are using the exact paper quoted in the profile (terms can be misleading eg Epson Archival Matte and Enhanced Matte are the same paper but Epson Matte Heavyweight is a different paper)
- You are using the quality setting in the printer driver for which the profile was designed
- You are using the latest available printer profiles
- All the ink cartridges and ink nozzles are working (print a nozzle check pattern)
- The print is at least 30 minutes old and you are viewing it in daylight
- The paper is in the printer with the front side forwards (!)
- View/Proof Colours is switched off (Photoshop only)

If you already have a screen profile;

- It is the active Windows default profile (Start/Control Panel/Display/Settings/Advanced/Colour Management)
- You have not updated your graphics card or driver since having the screen profiled
- The On Screen Display (OSD) settings for your screen have not been changed since the profile was created
- Any colour management software installed with the screen or graphics card is switched off or uninstalled including Adobe Gamma (check Start/All Programs/Startup for anything relevant)
- Any colour management hardware associated with the screen (eg a light-level sensor) is switched off
- Your screen is not more than five years old
- Get your screen individually profiled
- Get your printer/paper/ink combination individually profiled
- Your screen matches your prints
- Relax.