

PPA

version 4

pic4press



PREPARING DIGITAL IMAGES FOR MAGAZINES

Introduction

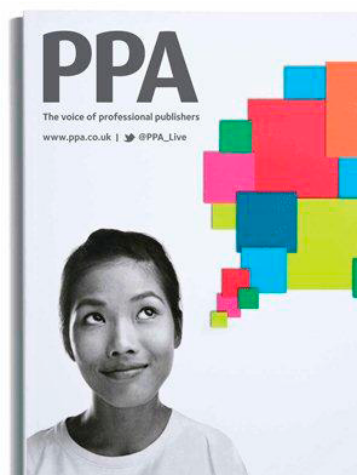
This fourth version of the PPA's pic4press brochure is a minor revision bringing this guide up to date. The aim of pic4press is to provide best practice guidelines to help improve the predictability and consistency of digital images for both the commissioning party and photographers. The guidelines are based on the effective use of ICC profiling and robust colour management policies. As usual, the message is very much based around communication: clear communication between commissioner and photographer will save time and money. Agree specifications up front; use these guidelines to help.

Best Practice guidelines
for the commissioning,
delivery and preparation
of digital images for
magazines

We very much welcome feedback and will be endeavouring to further improve relations with other photography and technical bodies to ensure a consistent message is put out across the industry. The www.pass4press.com website contains more pic4press information along with detailed information on PDF creation.

The pic4press Version 4 guidelines are geared towards magazines produced on Lightweight Coated (LWC) and Mediumweight Coated (MWC) stocks. The first part of this brochure aims to put the commissioning, supply and receipt phases into a logical order, and to suggest best practices for each area of the workflow. Refer to the diagram on pages 6–7 that graphically demonstrates a typical image workflow. The second section, starting on page 14, explains some of the more complex areas to do with managing colour using ICC profiles and how to optimise RGB to CMYK conversions.

Media Technical Group, PPA



CONTENTS

Digital image recommendations	04
Digital images workflow diagram	06
Setting up your computer	08
Metadata and templates	10
Assessing digital images	12
Managing colour using ICC profiles	14
RGB to CMYK conversion	16
Useful links	18
Facts and figures	18
Glossary	19



Digital image recommendations

Use the checklist below as a reference of issues to address when commissioning or preparing digital images.

ISSUE	TYPICAL SETTING	NOTES
Dimensions	According to output size	<i>The file size will depend on the usage intent – see p18. Files must not be artificially enlarged using interpolation</i>
Resolution	300ppi	<i>300ppi is typical for magazines, but requirements may be higher or lower depending on the title – always check with the publisher. See notes on resolutions on page 13</i>
Format	JPEG (maximum quality) or TIFF (8 bits/channel file)	<i>No .RAW variants; .PSD files only with prior agreement. Files should not contain 16-bit information, layers, extra colour channels or annotations unless requested, although clipping paths or alpha channels may be acceptable</i>
Compression	Should only be applied if necessary for certain transmission methods	<i>TIFF files should not be delivered in lossy compressed form (for example TIFF with JPEG compression). JPEGs must use the highest quality setting – see Glossary entries, page 19</i>
Colour space and profile	RGB or CMYK with embedded profile	<i>RGB files should be supplied in an RGB working space with the appropriate profile embedded. CMYK files' profiles should be relevant to the final output device (page 14)</i>
Sharpening	Minimal or none	<i>Sharpening should be applied only at final output size</i>
Colour balance	Files should be colour balanced	<i>Archival files should show the maximum tonal range for the subject – use the Histogram tool in Photoshop</i>
Colour correction	Free of unwanted colour casts	<i>The extent of colour correction needs to be defined. The file should be free of colour casts unless it's a deliberate effect</i>
File extensions	ie, .TIF, .JPG, etc	<i>Always add file extensions – essential for cross-platform transmission</i>
Captioning	IPTC/XMP or text file	<i>Caption and credit info should be included – see page 10</i>
File Naming	According to workflow	<i>Avoid special characters such as accents or symbols</i>

Colour calibration

Digital images should be viewed using profiled and calibrated equipment so that the image can be viewed as intended – refer to **page 9** for information on display calibration. Digital images should never be assessed for colour if being viewed through a web browser. Colour-critical digital images should always be viewed in a controlled environment that is fully colour-managed. This will require the use of regularly calibrated and profiled monitors and output devices, and the full implementation of **ICC profiling** (see **page 14**). This will ensure that the images are viewed as intended and an accurate audit of their quality can be made (see **page 12**). Profiles should always be embedded in images – profiles describe the colour space of the image file as delivered and do not alter the image data.

File preparation

Images should be supplied unsharpened or with minimal sharpening. Excessive amounts can seriously degrade the quality of an image if it is resized and should only be done at the image's final output size. Images should be free from dust and scratches and

cleaned at 100 per cent. Excessive resampling using interpolation is not recommended, and should be applied with discrimination. The results from dedicated image resizing applications should be tested and verified before being used on live images.

Colour space

Images should be submitted with an embedded profile. This profile should describe the actual colour space of the image – we recommend the use of **Adobe RGB (1998)** for RGB files in the absence of a specified working space. Images should only be submitted in CMYK if the client has defined the CMYK colour space. In the absence of information from the commissioning party about the destination space, see **page 14** for guidance. To convert a file to a new colour space accurately you need a destination profile relevant to the final output device.

File formats

Typical formats for images are:

TIFF .tif extension uncompressed file format with options to save with loss-less ZIP or LZW or lossy JPG compression

JPEG .jpg extension lossy compressed file format

See the Glossary entries on **Compression**, **JPEG** and **TIFF**, **page 19**.

File transmission

File names should be no longer than 32 characters including the file extension and they should not contain any non-standard characters, such as `\:/*<>`. A file naming convention must be implemented with the agreement of your pre-press and print suppliers. When images are burnt and sent on CD or DVD, they should be readable on Macintosh and Windows operating systems. Rewritable disks should not be used. Disks should be clearly labelled with the following information:

- Sender contact name and details
- Recipient magazine and name
- File size and names

Best practice is to send files at the requested output dimensions, whilst retaining a copy of the file at its original size. In the absence of file size information, a file should be approximately 25mb uncompressed, printable to A4 at 300dpi.

Copyright

Terms and conditions of supplying images should be agreed with the image supplier up front. When publishing a digital image you must ensure that the supplier has authorised the image to be used for the purposes you intend. Information should be included with every digital image, either as a separate text file or preferably within the file itself in the form of IPTC or XMP metadata (see **page 10**). Using these fields allows clear ownership and descriptive information to be carried with the image itself, which can then be read by XMP-aware software. Most high-end camera processing applications and image storage systems support such data, along with programmes such as **Adobe Photoshop**. The PLUS initiative (www.useplus.com) has developed a schema for entering rights and licensing information into the image file.

• Copyright and usage permission information should be included with any supplied digital image

Proofs

For critical work, a hard copy output that accurately reproduces the file content should be used. Colour certification bars should be printed on the proof and reference made to the separation profile to allow verification of the result. Check the latest pass4press brochure or visit www.pass4press.com for details.

Digital images workflow diagram

PHOTOGRAPHER

SHOOTING AND SUPPLY

Ensure your computer is properly set up to handle colour (page 8). The native file format of the camera may need converting if it saves as a **RAW** or **JPG**. The resulting image should be proofed on-screen using a calibrated display or as a hard copy, by converting the file using the correct **CMYK** output profile and printing the file on a high quality proofing device (see www.pass4press.com). A file should only be supplied as CMYK if a specific profile has been agreed. The file should be prepared for the client; the size and resolution as per the client's requirements. Metadata should be embedded in the image (page 10). Files should be named relevantly. The file may be compressed for transmission.

ART

RECEIVE AND PREPARE

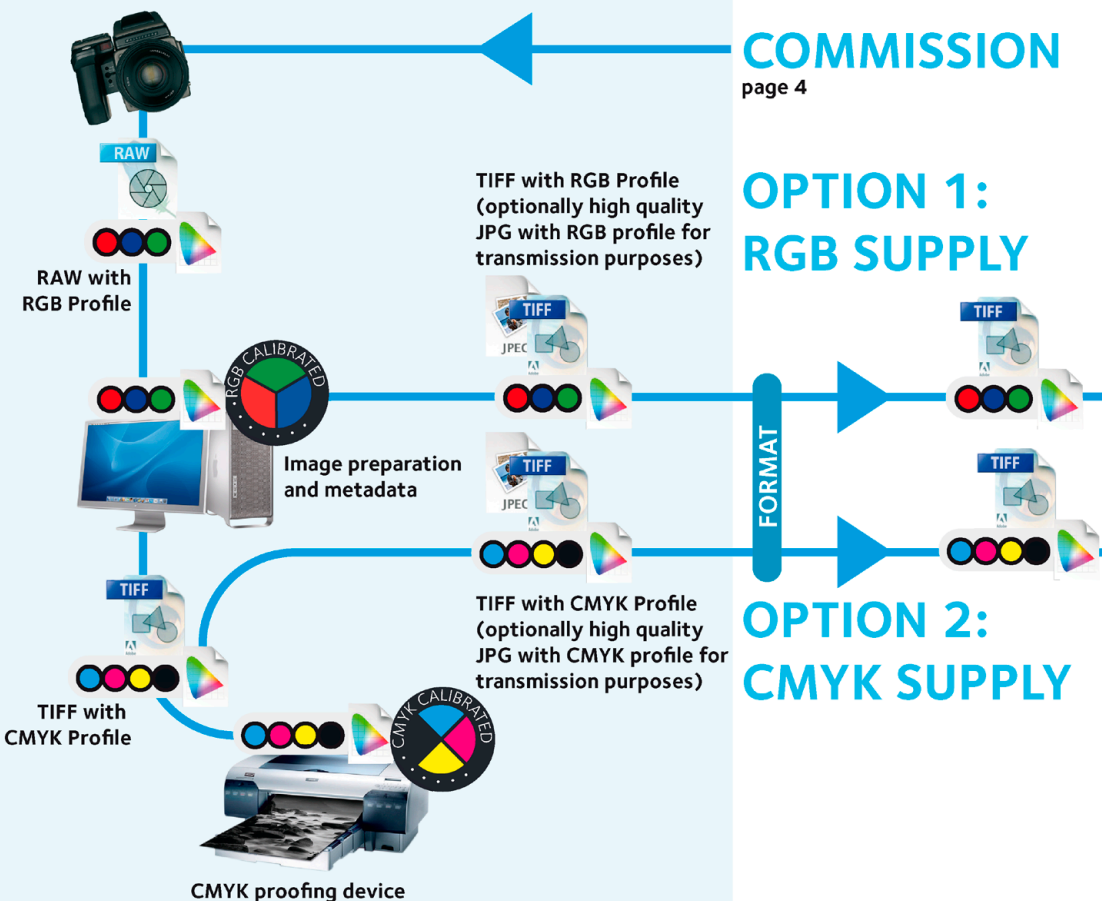
Make sure your computer is properly set up to handle colour (page 8). Supply the photographer with the relevant technical information for the commission (page 4) and a destination profile if possible. On receipt, digital images should be decompressed to a working format if necessary and then verified as per the guidelines on page 12. Images must be assessed on a calibrated and

COMMISSION

page 4

OPTION 1: RGB SUPPLY

OPTION 2: CMYK SUPPLY

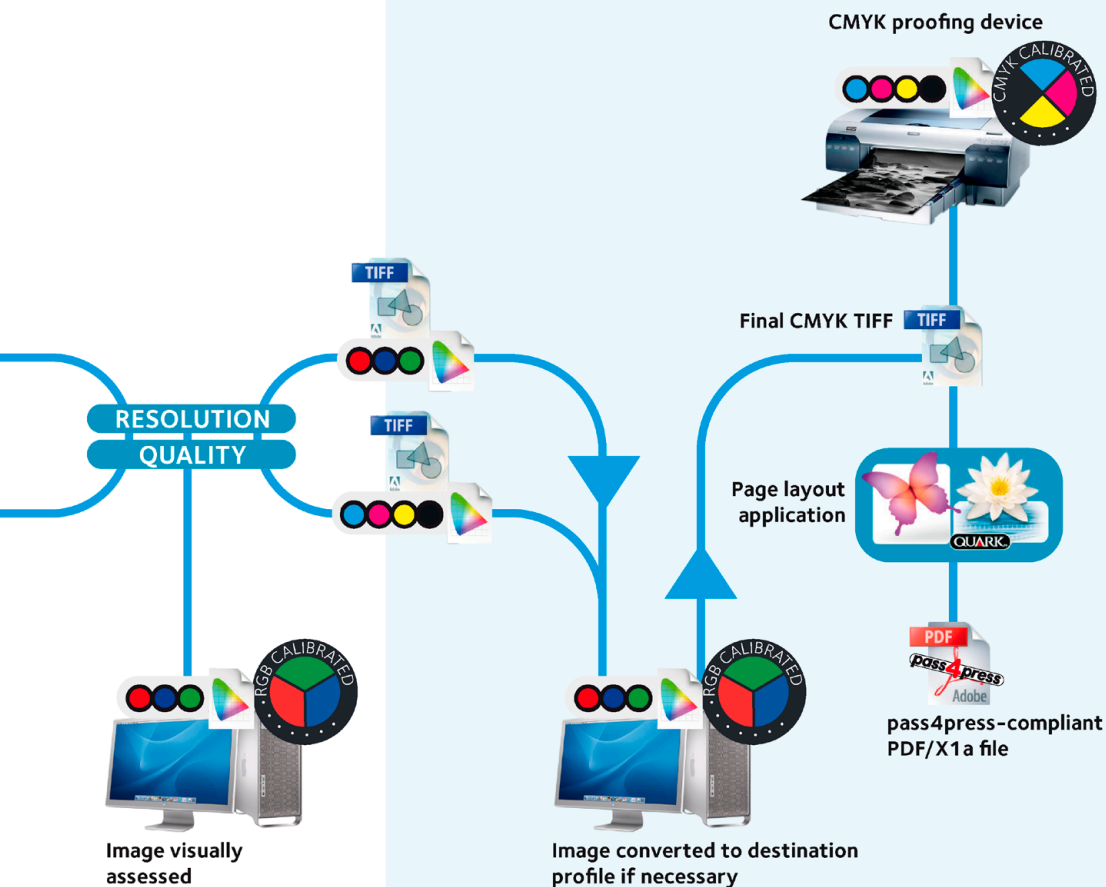


profiled monitor (**page 9**) using the embedded profiles (**page 14**). On top of the visual image quality, format, resolution and colour balance need to be checked. If the files are **RGB**, they should be previewed in the relevant **CMYK** colour space (**page 14**) using the **Proof Colours** option (**page 13**), to check for any obvious colour shifts.

REPRO

COLOUR CONVERSION

A digital image will need to be converted from **RGB** to **CMYK** before it is printed (**page 16**). This can potentially happen at the supplier's end if they are in possession of the relevant CMYK profile. It is imperative to use the correct profiles during a conversion and to be aware of issues such as **TAC** and **GCR** (**page 17**). When the image is converted to CMYK it is ready to be placed on a page document, which must reflect the target printing colour space. **Pass4press-compliant PDFs** must not contain files with embedded profiles, so before the PDF is created profiles must be stripped out.



Setting up your computer

Correctly configuring your computer's colour settings and calibrating your display is essential when dealing with digital images

Colour management set-up

Before handling any digital images on your computer, you must make sure that your system and applications are correctly configured to handle colour profiles. There are four phases of working with digital files that your computer needs to be configured to cover:

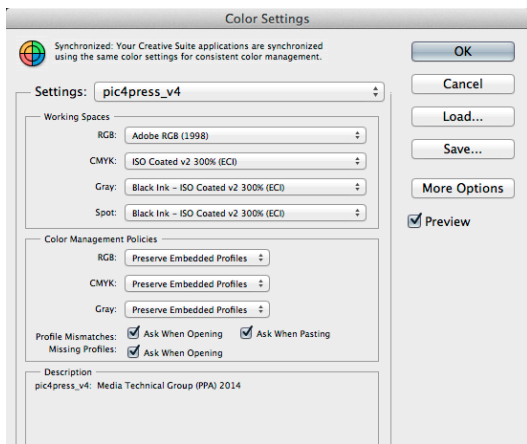
- Source** • describing where the image has come from
- Working** • a linear device-independent space such as Adobe RGB
- Monitor** • how your display sees the image
- Destination** • the device the image is going to

See **Managing colour using ICC profiles** on **page 14** for more details.

Start by setting up your display profile (**System Preferences>Displays>Colour**). This should be the result of a calibration routine – see below for more information on monitor calibration. Next use the settings shown in the screen grab to ensure that the **Adobe CC** or **CS** applications are optimised to properly handle ICC colour profiles. For example, in **Photoshop CS6** open **Edit>Colour Settings**. The RGB working space should be the recommended industry standard **Adobe RGB (1998)**; the CMYK profile should be the profile relevant to your output device – check with your pre-press supplier or printers for details. In the absence of any information, use one of the **European Colour Initiative's** ISO-derived profiles (see **page 14** for more information and also PPA's latest pass4press brochure). The **Colour Management Policies** are set to retain any profiles embedded in files – this is vital, as these profiles describe how the originating device interprets colour and allow your computer to represent the file's colour accurately. Files without profiles will have the default working profiles assigned – these may not be correct. These settings will warn you of any mismatches.

Use **View>Proof Setup** in Adobe applications to set the on-screen soft proofing configuration. This can then be dynamically turned on and off using **View>Proof Colours**. Once colour settings have been configured in a CS application, you can then use **Adobe Bridge** to keep all your applications' colour settings synchronised. Open Bridge and select **Edit>Creative Cloud/Suite Colour Settings** – choose your colour settings file and click Apply. Any subsequent changes you make in one application will then be pushed out to other CC/CS packages.

• Adobe Colour Settings: use Bridge to implement consistent colour across your applications



Display calibration

Although there are fundamental differences in the way that images are viewed on-screen or on a hard copy proof, a high quality calibrated monitor is increasingly accepted as a viable means of checking colour critical work. There are dedicated reference displays available on the market for several thousand pounds, but even a relatively humble display can give surprisingly good results if properly calibrated.

Types of display

LCD panels have become the de facto standard for colour reference screens. In the past it was not recommended to use LCD flat panel displays for colour reference, and certainly the older models or even the current bargain displays are completely unsuited to the task. But the market is now awash with reasonably priced high quality displays which are more than capable of good results when properly calibrated: Apple, Dell, NEC, Samsung and Eizo all produce excellent equipment. An advantage with LCD panels is that, theoretically, they require less frequent calibration as there is greater consistency with the way that pixels display on-screen. However, there can be a large difference in the way that pixels display across a wide panel [and also issues with the angle that you can view a screen at where the colour noticeably changes](#). Some high end modern LCDs on the market are able to represent the full Adobe RGB (1998) gamut. Uniformity across the screen is a necessity. Some poor-quality monitors are brighter in one area than another; typically brighter in the middle of the monitor and darker as you look toward the corners.

Calibration

Calibration covers four main areas: gamma, white point, black point and colour accuracy. Although a holistic solution will still usually require the services of a colour expert, basic monitor calibration is relatively cheap and easy. There are several devices that can be used to calibrate your displays or measure proofs, the most popular manufacturers being X-Rite, and Datacolor. Calibration systems consist of a measuring device coupled with calibration software that is loaded onto the target computer. Normally the device is positioned over a colour target displayed in the centre of the screen, and the software is used to analyse the difference between what is measured on the screen and a reference target.

- Basic monitor calibration is relatively cheap and easy

Setting the gamma value on a monitor sets how the display shows the intensity of colours – a setting of 2.2 with a white point of 6500K is now generally accepted as being a good working baseline. This provides good luminance, dynamic range and the smoothest display gradient, therefore providing the best image editing environment. However, some parts of the industry still prefer to work with a gamma of 1.8 and a white point of 5000K, in order to match their monitor to D5000 viewing booths. It is of course possible to calibrate and profile your monitor to enable either standard to be used as and when desired, although this is somewhat easier to achieve when using an LCD display. Most calibration software packages take you through these issues step-by-step.

Environment

Even when the screen is calibrated, there are other issues that must be addressed. It is best to use a neutral solid grey background on your computer display, as human eyes are very sensitive to colour differences and a colourful background on a monitor can severely impair your ability to judge colour. Your computer's surroundings can also effect your ability to judge colour accurately. Even though it may be impossible – and in general is not particularly enjoyable – to work in a colour-controlled grey bunker, there are many things you can do to reduce outside factors impacting on your monitor. Always look at the monitor face on. Keep the display away from direct sunlight or lamps – using a hooded display can help. Bulbs can be sourced for most regular lighting fixtures that provide a less yellow, more natural colour – this will again help stop unwanted colour casts appearing.

- Don't forget that all monitors need frequent recalibrating, and that any dramatic changes in the environment will negate current calibration settings.

Metadata and templates

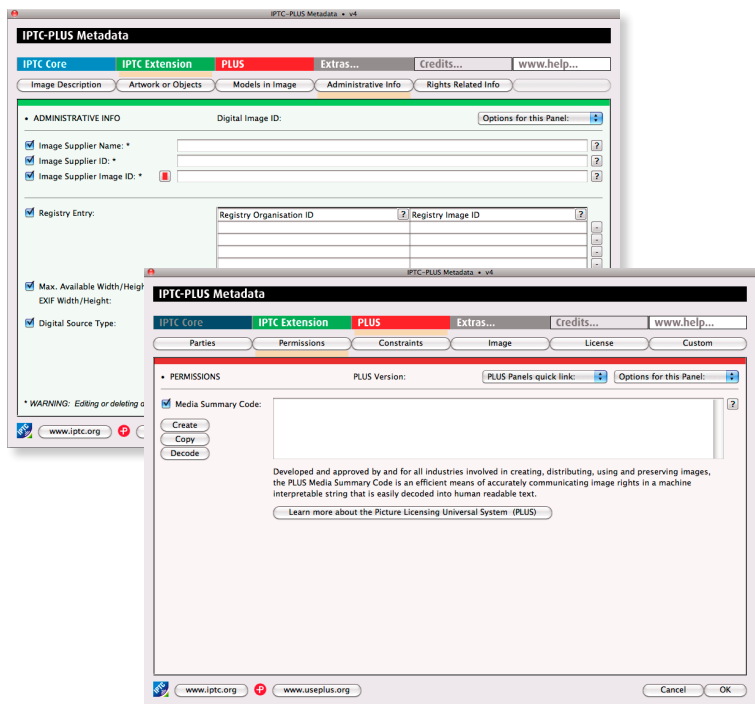
Since pic4press version 3 was published the International Press Telecommunications Council (**IPTC**) has collated opinion from across the professional photography industry and used this to develop specifications for the IPTC Extension Schema and update the IPTC Core specifications.

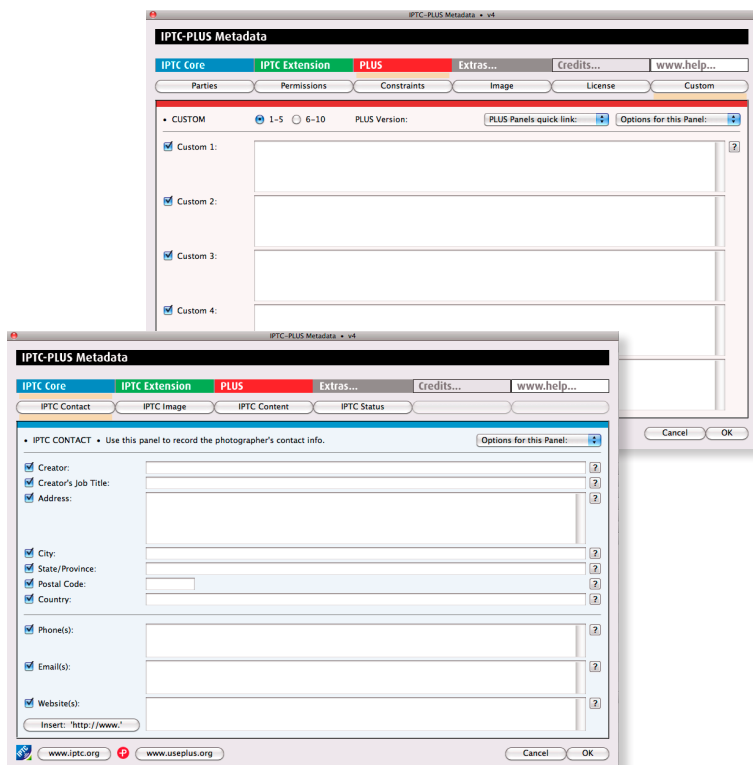
Metadata are information embedded in or linked to a digital image file that can be read by Photoshop and other **XMP-compliant software**. Image metadata can also be utilised by some workflow applications to move and sort files, automatically apply credits, provide captions and aid searches in database systems. Older images (or images edited with older software) may have metadata stored in the IPTC-IIM format, but this cannot be read by XMP-only software.

Since the last edition of pic4press was published there have been a number of substantial changes to the IPTC specifications that formed the basis of the joint PPA-British Association of Picture Libraries and Agencies (BAPLA) metadata panel for Photoshop CS. Therefore this panel is no longer suited to its task and has been withdrawn.

Instead, the PPA's Media Technical Group recommend using the **IPTC-PLUS panel** for **Adobe CS Bridge** for Photoshop CS3 through to CS5.5. This has 16 separate sub-panels, some of which are shown below. These include: fields identifying the creator of the image; who to credit; and if applicable, a licensor. Information about the subject and any restrictions in the use of the image should also be shown under the appropriate categories. Please note: the IPTC_PLUS panel does not work in Adobe CS6 and CC. Instead, users of these latest versions should use Adobe's built-in panels which cover both the IPTC Core and IPTC Extension schema.

• Metadata is information embedded in a digital file which can be read by Photoshop and other XMP-compliant software





For further help with IPTC-related metadata please see the IPTC's Adobe CS Toolkit at <http://www.iptc.org/goto?iptcplustoolkitadobe> or their online help at <http://www.iptc.org/std/photometadata/documentation/GenericGuidelines/>.

Digital cameras embed metadata when an image is taken, including camera settings, ICC profiles and position coordinates. The Exif standard governing this type of metadata is handled by the camera manufacturers and their industry associations. Therefore the IPTC Photo Metadata specification does not cover technical metadata.

All metadata embedded in a file or residing in a sidecar file should be retained throughout the publishing process, and it is essential that any software processing such a file does not strip this information out. In particular, with the advent of 'orphan works' legislation in Europe and the free exchange of images across the web and mobile devices, copyright protection via embedded data must not be lost. Indeed, the removal of rights-related metadata is prohibited by copyright laws in many countries, including those within the European Union.

As well as storing metadata in the IPTC fields of the image file, for bulk management of data it can be simpler to store the metadata separately, but still using fields defined by the IPTC schema. When supplying images in this way, a spreadsheet with the fields separated out will allow a third-party to import the data in the order that best suits their particular system.

With thanks to Michael Steidl, IPTC and Sarah Saunders, Electric Lane

• With the advent of 'orphan works' legislation in Europe and the free exchange of images across the web and mobile devices, copyright protection via embedded data must not be lost.

Assessing digital images

It is imperative to check incoming images for quality and to make sure they match the specification you have given your suppliers

Rectifying a substandard image becomes more expensive the closer you get to printing it, so it makes sense to monitor images as they arrive. Before any images are handled, your system and applications need to be properly configured and your screen calibrated (see **page 8**). Here is a checklist of the main issues. All these factors must be taken into account when assessing digital images to get an accurate idea of the picture's viability and quality.

File size and resolution Check that the image is supplied at the dimensions and resolution requested.

Sharpening If you see halos around the edges or granulation in vignettes, the image may be over-sharpened.

Compression Over-compression will result in artefacts, blotchy-looking skies, banding within vignettes or steps appearing on curved lines and edges.

Saturation Check that RGB colours are not over-saturated, which can result in a lack of detail in areas of bright colour if the image is generically converted to CMYK – preview the image in the correct CMYK space.

Highlights Check for sufficient detail in highlights and shadows.

Cleaning Check the image for dust and scratch marks.

Colour cast Check where relevant that the whites and greys are neutral.

Colour space Check that the image is supplied as requested and that it has a colour profile embedded.

Gamut check Use **Photoshop's Gamut Warning** to check which RGB colours could shift in CMYK.

Resolution and file size

In general, the resolution of an image supplied for printing in the glossy magazine sector is **300ppi** (pixels per inch) but publications can differ. Always check with the publisher. Using lower resolutions can result in pixellation of the image and lower quality results. Approximate file sizes required for printing at certain dimensions are illustrated in the table on **page 18**. Confusion can arise from the fact that resolution and dimensions are not fixed for any graphics file format: a file can be supplied at any resolution and any size. Also, a digital image has no inherent PPI/DPI value – resolution only matters for an output device, such as a monitor or printer. For example, a 1000×1000-pixel image could be printed at 4×4 inches and 250 pixels per inch, or at 10×10 inches and 100 pixels per inch – see the examples printed on the right: a single image with a fixed number of pixels printed at different resolutions.

The way to interpret an image is to divide the pixel dimensions by the resolution (**ppi**) of the output device to give the optimal print size at that resolution. Therefore the resolution should always be changed to 300ppi (or the relevant print resolution) when images are submitted, as this allows a designer to see immediately its maximum optimal print size. Resize the image proportionally to 300ppi in **Adobe Photoshop** (using **Image>Image Size**, with **resampling** turned off), then save it down in a loss-less format such as **TIFF**. Turning resampling off means changing the image size and resolution without changing the number of pixels in the image. Therefore as the resolution increases the print size will proportionally decrease – but in a completely non-destructive way. Blowing up an image once it is imported into **InDesign** or **Quark XPress** will entail a proportional decrease in an image's resolution, therefore a potential quality drop. Conversely, reducing an image's size on page will increase the pixel density, increasing its resolution though not necessarily its quality.



- An image has fixed pixel dimensions. The resolution is dependent on the output device

Visual quality

Even if an image's resolution is correct, digital images are just as prone to visual quality issues as transparencies: blurriness, colour shifts or image artefacts like dust and scratches. It is imperative to check digital images at 100 per cent of their pixel size – ie, using **View>Actual Pixels** in Adobe Photoshop – and not zoomed in or out. This will often mean having to scroll around, but it is only in this view that you can accurately assess the pixels in the image. Small amounts of blur or over-sharpness can normally be compensated for, but excessive amounts of either will dramatically affect the results. Set Photoshop's **Preferences>Units & Rulers** to display mm, cm or inches as the units so you have a clear idea of how big the image is at its print size; change the pop-up in the bottom-left of a Photoshop window to show **Document Dimensions**, which will display the image's physical size.

Colour space

Because CMYK is used for the final image output, RGB images must be previewed using the correct destination profile, using **View>Proof Colours** in Photoshop or InDesign. As long as your computer's colour settings are correctly configured and your screen is calibrated this will show you exactly how an image will look when converted to CMYK using the default profile (**page 5**). The CMYK preview can be used in conjunction with the **View>Gamut Warning** option in Photoshop: this displays a non-destructive overlay on the image which highlights colours that will not translate accurately from RGB to CMYK. Because far fewer colours exist in the CMYK range compared to RGB, some colours simply cannot be reproduced: particularly bright blues, greens and reds. Gamut problems are often highlighted on vibrant colours: a typical example would be a deep blue sky or a bright red subject, where the blue flattens out and the red turns to flat magenta. In clothing, detail is often completely lost in the folds of fabric. Small areas or individual pixels that are flagged up can often be accepted, but large areas of out-of-gamut colour can destroy an image. In this case, it is best to isolate the problem colour and have the image manually retouched to eradicate it. The warning colour is customisable in Photoshop's preferences; it is grey by default, so is worth changing to a more obvious colour such as a bright green or pink. Effective use of ICC profiling will reduce these kinds of problems to a minimum.

Managing colour using ICC profiles

The use of ICC profiling is established practice in the print and digital photography industry – it is a proven system used to maintain colour accuracy across devices

Profile recommendations

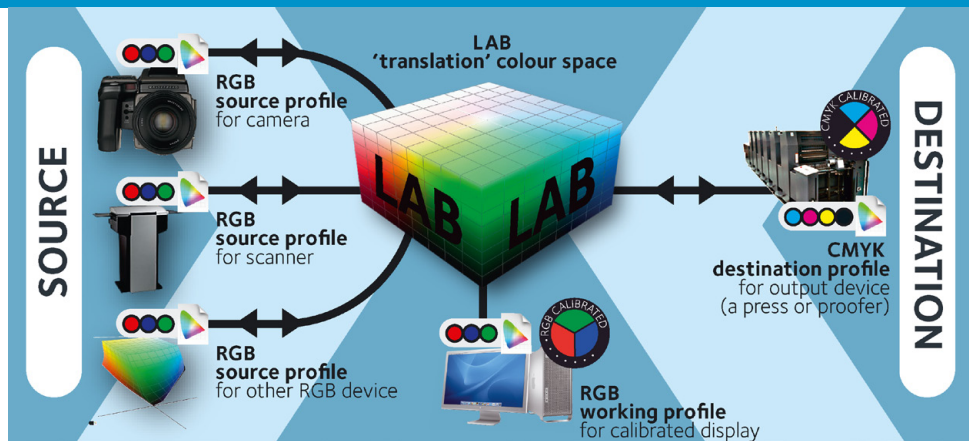
Which ICC profiles you use for a colour conversion depends on the job, but the destination output device must always be taken into consideration. A digital commission should ideally indicate the colour space in which the job is to be delivered. If RGB files are requested and no specific ICC profile is supplied, then it is recommended to use Adobe RGB (1998). If CMYK files are requested and no profile supplied then choose from the following options: if you are experienced at creating profiles, our recommendation is that you build your own using the relevant **FOGRA** characterisation data. For other stocks you can use the data for the international printing standard **ISO 12647-2** (you should focus on the characterisation data called **FOGRA39** which is available at www.color.org/FOGRA.html). Alternatives are to use the **European Colour Consortium's (ECI) ISOcoated_v2_300_eci.icc** or **PSO_LWC_Improved_eci.icc** profiles (available from www.eci.org as a compressed archive called **ECI Offset 2009**) for glossy and yellowish-stock titles respectively. Please remember that these profiles are used as the mechanism for moving from RGB to CMYK and, as such, make a decision as to how colours should be separated. They may not necessarily be optimum for each individual image you are looking to convert (see **page 16**). For colour critical work, in order to gain an accurate understanding of how the image will appear you should print a hard copy proof to the correct profile and tolerances.

Version 2 of **pic4press** mooted a profile being worked on by PPA for the glossy end of the magazine market, based on the now-suspended proof4press colour space and directed to address perceived gaps in **FOGRA27L**-based profiles. However, shortly after Version 2's publication the **FOGRA39** data set was announced, and it was decided to not release the PPA profile and instead work with the **European Colour Consortium (ECI)** to produce a profile more suited to the UK's glossy titles. The result is the **ISOcoated_v2_300_eci.icc** profile, which has a lower TAC value (300) more suitable to those titles.

How profiles work

ICC profiles are supported by both Windows and Macintosh operating systems and all the popular software packages, such as **Adobe InDesign**, **Adobe Photoshop** and **Quark XPress**. Every device capturing, displaying or outputting images describes colour in its own particular way – this is known as **device-dependent colour**. Imagine that each device has its own language to describe colour; some languages have a large vocabulary, some small and some contain words that are just not available in other dialects. What you need therefore is some way to translate between these languages. ICC profiling does this by using a universal language with a wide vocabulary as a reference for translation between other languages. This reference 'language' is a device-independent colour space called **LAB** (**Glossary, page 19**) which contains all of the colours visible to the human eye. Each of these colours is assigned a numerical value that relates to the coordinates of that colour within the LAB colour space (see diagram opposite).

Profiles are made using different methods depending on the device being profiled, but the underlying principle is the same. For instance, in the case of scanners you scan a set of colour patches, with a camera you photograph a target made of colour patches and with printers you output a file that consists of colour patches. In each case,



the RGB or CMYK colours captured or output are referenced to LAB colour using a suitable measuring device or dedicated colour management software and the resulting calculations produce an ICC profile that describes that device's colour space. If you calibrate and profile every device in the digital workflow you can capture, view and output images accurately and predictably within the colour spaces that you choose, by enabling the best translation from one colour space to another. A profile does not make magically-optimised conversions from RGB to CMYK, but it will allow you to view your image in the destination CMYK colour space, giving you the opportunity to optimise the image before conversion. By embedding a profile within a file you let recipients know its provenance, enabling them to view and process it correctly. You are in fact sending the description of the colour space of the file along with the file itself.

• Colour conversions use a central LAB colour space to translate from one space to another

When you convert a file from one colour space to another you are changing the colour space of that profile by remapping the colours. The usual use of conversion in publishing is to convert from RGB to CMYK – this will usually mean moving from a larger colour space to a smaller colour space, which inevitably means losing some colour information by clipping the gamut. Any conversion will, as a general rule, result in some degradation, however slight, of colour accuracy, so the number of conversions should always be kept to a minimum. If you strip the profile from a file you do not change its content, but you lose the immediate ability to view or output it accurately because you have lost the definition of its origin. If you assign a different profile to the file than the one embedded in it you change its meaning – for instance, you are saying that Russian is now Chinese. As you can probably imagine, this way lies chaos! The assigning of profiles has a powerful use: if you receive a file without an embedded profile, you can view it on a calibrated system in a number of different colour spaces. This is akin to looking at a letter whose content you are unsure of, in a number of different languages until it makes most sense. When this happens you can assign that language (or profile) to it and attach or embed that profile when you pass it on. From the moment it is assigned, you are defining the colour space and thus the meaning of the file for any further purpose.

The **ColorSync Utility** application (**Macintosh HD>Applications>Utilities**) is actually a very powerful system-level application, and can be used to assign, view and repair ICC profiles. Under **Devices**, profiles can be assigned to specific equipment: cameras, scanners, your display or proofers for instance. In the **Profiles** tab you can view 3D representations of colour spaces and also compare two profiles – click **Hold For Comparison** in the **Lab Plot** window. This is a useful way to graphically demonstrate the differences between RGB and CMYK spaces.

RGB to CMYK conversion

RGB images must be converted to CMYK at some stage before they are printed. It is recommended to use ICC profiles to make the conversion from RGB to CMYK

Even using industry-standard RGB and CMYK settings, generic colour conversions can lead to substantial shifts in hue and loss of detail in gradients, particularly in areas of vibrant colour. Sometimes this is unavoidable, because of the simple fact that a large number of colours do not exist in printable CMYK colour space. It is important to highlight potential issues early on: this not only encourages a more realistic approach to colour, but also allows more time to compensate for such problems, using the expertise of colour retouchers. The only way to obtain predictable results from digital images is to implement a holistic policy to cope with colour. Although fully locked-down, colour-controlled offices with colour-calibrated monitors are often impractical, basic steps can be taken to at least raise the quality bar – see [page 8](#) for more information.

Colour spaces

It is important to remember not just the obvious difference between RGB and CMYK, but also their different variants. RGB – the way the human eye sees colour and the way computer monitors emulate colour – is an additive colour space: adding the full strength of each red, green and blue element (measured on a scale from 0 to 255) displays white. The most common RGB colour spaces are **sRGB** and **Adobe RGB (1998)**. CMYK was developed for the printing press: four colours are laid one at a time using a system of dots. CMYK is a subtractive colour space; each element is measured from 0 to 100 per cent strength. One of the differences between CMYK and RGB is that white doesn't exist in CMYK: using zero per cent of each element actually means no colour will be printed, leaving the pure colour of whatever paper the file is printed on.

Device profiles

There are three stages to be addressed when dealing with colour workflows for digital images: where they have come from, the computer they are loaded onto and the device that will print them. These stages are controlled using profiles. Each profile is in effect a table of numbers that describes how that individual device deals with colour in respect to a device-independent RGB or CMYK colour space. By applying a device profile to an image, the colour will be correctly interpreted as it is passed through the chain, maintaining colour consistency. See [page 14](#) for more detail.

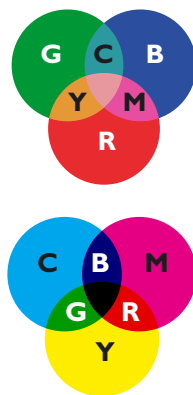
Rendering intents

Intents determine how colours are remapped when moving image data from one colour space to another, and have a massive effect on how colours that fall outside the destination profile's gamut are treated. There are four rendering intents specified by the ICC.

Perceptual tries to preserve the overall appearance by changing all the colours in the source so that they fit inside the destination space while preserving the colour relationships, because our eyes are more sensitive to the relationships between colours than they are to absolute colour values. This is a good choice for images containing significant out-of-gamut colours, but it usually retains the relationship between colours at the expense of their ultimate accuracy and saturation.

Saturation aims to maintain vivid colour, but it can sacrifice colour accuracy to do so. This is normally used for flat colour graphics.

Relative Colorimetric rendering takes account of the fact that our eyes always adapt to



• Rendering intents determine how colours are remapped when moving image data from one colour space to another

the white of the medium we are viewing. The white on output is the white of the paper rather than the white of the source space. It then reproduces all the in-gamut colours exactly and clips out-of-gamut colours to the closest reproducible hue. It can often be a better choice for images than Perceptual since it preserves more of the original colours, but this can sometimes be at the loss of fine detail.

• There will never be a profile that is appropriate for all subject matter, even if it describes the target colour space accurately

Absolute Colorimetric differs from Relative Colorimetric in that it maps the white point of the source space to that of the destination space. It is mainly used for proofing where the aim is to simulate the output of one device by using another. A classic example of this is the use of paper simulation on a proofing device to achieve the coloured stock of a printing destination, such as the *Financial Times* newspaper. The 'white' point becomes the pink of this newspaper's substrate.

TAC and GCR

Whenever you convert an image file from RGB to CMYK you will be deciding on a number of criteria which determine how it will print. Two of the critical criteria are often referred to as **TAC** and **GCR**. TAC stands for **Total Area Coverage** and defines the maximum amount of ink that can be used to create any printed dot before that amount of ink becomes a problem to the printer. There is a definition and further explanation of TAC in the **Glossary** on **page 19**.

GCR stands for **Grey Component Replacement** and in essence relates to the amount of black used within any colour to recreate that colour on the press. Colours in an image are made up of cyan, magenta, yellow and black. The image could be a metallic silver car, a vignettted background to a cosmetics advert, or any number of other possible subjects. The subject could actually be reproduced with little or no black, regardless of its colour. If GCR is applied, then the combination of cyan, magenta and yellow within a particular colour (whose cumulative effect would be grey) will be replaced with black.

A profile for every occasion

Professional colour experts (in pre-press houses and printers, for instance) will use a range of different profiles, all based on the same target colour space, and will pick which one they use to transform an RGB into the right CMYK colour space dependent on the nature and content of the image. For example, for images that have a high amount of four-colour neutral content (predominantly grey colours but made up of CMYK, not just black – frequently used within cosmetic, fragrance and car advertising) the tendency is to separate them using a profile that attempts to match any specific shade of colour using as much black as possible and as little cyan, magenta and yellow (described as using a high level of GCR). Doing this helps to minimise any swings in colour on the press caused by minute variations in the amount of cyan, magenta and yellow ink being laid down during the printing process. Conversely, images that have a high amount of sensitive colour, such as skin tones, would most likely be separated in the opposite way – with little or no GCR applied – and so on.

Any profile describing a CMYK colour space will have only the black generation parameters (GCR and UCR) which were defined when it was created. Certain types of content are better handled with little or no GCR, while others do not react well to GCR at all. This means that there will never be a profile that is appropriate for all subject matter, even if it describes the target colour space accurately. To obtain the optimum result, different images often need to be separated differently.

Useful links

Where to find more info on topics covered in pic4press version 4

www.pass4press.com

PPA's PDF and imaging site

www.bsigroup.co.uk

Search for ISO 12647

www.eci.org

The European Color Initiative

www.fogra.org/

Click on English>Products or Services

www.gwg.org

The Ghent Workgroup

www.color.org/

The ICC site

<http://www.color.org/>

Glossary of colour terminology that relates to print (see ICC White Papers – WP5: Glossary)

www.thecqi.org

The CQI (formerly IQA). UK's best practice guidelines

<http://www.ugra.ch/>

Swiss Center of Competence for Media and Printing Technology

www.updig.org

Universal Photographic Digital Imaging Guidelines: supported by many international photographers' associations

Facts and figures

Tables of useful information related to digital image specifications

File Size Guide

Approximate sizes for uncompressed TIFFs

TIFF at 300ppi effective resolution	RGB	CMYK
Double page (A3) 420mm x 297mm	50mb	66mb
Full page (A4) 297mm x 210mm	25mb	33mb
Half page (A5) 210mm x 148mm	12mb	17mb
Quarter page 148mm x 105mm	6mb	8mb
Eighth page 105mm x 74mm	3mb	4mb

Image bit depth

Bit depth describes the number of tonal values or shades of a colour each channel in a pixel is capable of displaying. Increasing the bit depth of colour channels in an image's pixels exponentially increases the number of colours each pixel can express. The initial bit depth of an image is controlled by your camera. Many cameras offer several file settings; for example, DSLR cameras usually have two settings, allowing the photographer to shoot an 8-bit JPEG file (with 8 bits per colour channel) or a 16-bit RAW image file (with 12 to 14 bits per colour channel). Image file types use static bit depths. JPEG, RAW, and TIFF all have different bit depths. The file type used to shoot images dramatically impacts the tones visible in your images.

(Courtesy Apple Computer Inc)

Bit depth per colour channel	Tonal values per colour channel	Equivalent file type
2	4	
4	16	
8	256	JPG, some TIFF
12	4096	Most RAW
14	16,384	Some RAW
16	65,536	Some TIFF

Glossary

Explanation of common terms used in pic4press Version 4

CIE LAB The most complete colour model used conventionally to describe all the colours visible to the human eye. The three parameters in the model represent the luminance of the colour (L), its position between red and green (a) and its position between yellow and blue (b). The **LAB** colour model serves as a device independent model used as a reference in colour conversions.

CMYK Subtractive colour spaces for the four-colour print process: **cyan** (C), **magenta** (M), **yellow** (Y) and **black** (K). Adding all three colours together creates black; where they overlap, red, green and blue are created – the reverse of RGB. CMYK spaces are affected by ink-and-paper combinations, dot-gain settings and ink limits.

Colour space A three-dimensional model representing colours that can be generated by a specific colour model – use Mac OS X's **ColorSync Utility** to graphically view and compare spaces.

Colour management The various methods of maintaining consistent colour across devices, using systems such as ICC profiles, **ColorSync** and calibrated displays.

Compression The reduction in size of a digital file. Compression is split between lossy and loss-less formats. Lossy formats like **JPEG** throw pixel information away to reduce file sizes and rely on algorithms to rebuild the discarded data when decompressing (ie, opening) the file. Excessive use of lossy compression can seriously decrease image quality. Loss-less formats such as **Stufit** or **ZIP** archives look for repeating code in a file, remove it and then tag that area so it can replace that part when the file is decompressed. The file therefore contains all the information from the original and is decompressed in its original format.

Destination profile The profile that defines how to convert colours from the profile connection space to the target colour space.

DPI/PPI Dots per inch/pixels per inch. Measurements determining the resolution of printing images and text.

Embedded profile A profile saved in a digital image file, which should describe the colour space in which it is delivered. This enables the recipient to view the file in the same colour space as the sender.

Gamut The range of colours and densities reproducible by a device: can be viewed as a three-dimensional model using the ColorSync Utility application.

JPEG Joint Photographic Experts Group. The body that has defined compression standards. A JPEG trades image quality for file size. Compression can be set in Photoshop from 1 (lowest quality) to 12 (highest quality). Ideally the maximum setting should be used for print-quality images. Every time a JPEG is saved there is a potential quality drop, normally visible in the form of pixel 'blocks' appearing on the image. JPEGs are typically supplied at 72dpi in RGB. It is advisable to convert JPEGs to a loss-less format (ie, a TIFF) if any work such as retouching is to be carried out.

Metamerism Phenomenon by which colour samples with different spectra appear to match under a particular type of illuminant, although under other illuminants they show a colour mismatch. (definition courtesy <http://www.heidelberg.com/wwwbinaries/bin/files/dotcom/en/glossary.pdf>)

Profile A file that contains information to enable a colour management system to convert an image into or out of a specific colour space accurately and consistently. This can describe a device-dependent colour for a particular device or a device independent colour space such as Adobe RGB (1998).

RAW A file format containing unmodified data captured directly from a digital camera.

Rendering intent The method by which out-of-gamut colours are mapped to another device's reproducible gamut.

Resample Refers to changing the pixel dimensions of an image. When you downsample (decrease the number of pixels), information is deleted from the image. When you resample up (increase the number of pixels), new pixels are added. You specify an interpolation method to determine how pixels are added or deleted. When resizing an image you would normally turn resampling off.

RGB Additive working spaces used for the visual representation of colour, consisting of red, green and blue primaries. Cyan, magenta and yellow are produced by the overlap between two RGB colours; white is

produced where all three colours overlap. Displays, cameras and scanners all have their colour spaces described using RGB.

Source profile The profile that defines how to convert colours from the first device or working colour space to the profile connection space.

TAC Total Area Coverage. The maximum amount of ink of all the colours being printed in one area, expressed in the cumulative sum of dot percentages. For example, CMYK has a theoretical maximum of 400 per cent – 100 per cent of each colour. In Offset printing 400 per cent of ink in one area can cause problems ranging from inconsistent results to ink drying problems. Pass4press recommends 300 per cent maximum for the printing of magazines on Heatset Web Offset printing on good quality coated paper. In all cases one should verify with the printer or publisher for the recommended TAC.

Tagged Refers to an image that has been saved with a colour space profile.

TIFF Tagged Image File Format. The standard rasterised bitmap file format for high-quality image files, which can theoretically be any resolution or colour space. TIFFs are typically used in print at 300ppi at 100 per cent of their placed size. TIFFs will lose quality if enlarged.

TVI Tonal Value Increase (also commonly known as dot gain) expresses the percentage increase in the apparent darkness of an image in the mid-tone range during the production run. For example, with a 15 percent dot gain, a 55 percent halftone will increase to 70 percent. This increase is compensated for in reproduction by making the image lighter in the color separations. (<http://www.heidelberg.com/wwwbinaries/bin/files/dotcom/en/glossary.pdf>)

Working space The colour space in which you edit a file, which can be different from its original space. This can be taken either from a device profile or a colour space such as Adobe RGB (1998).

UCR and GCR Under-Colour Removal and Grey Component Replacement. UCR replaces the grey component of neutral colours with black ink, whereas GCR replaces the grey component of cyan, magenta and yellow with black ink, to minimise the amount of ink used during printing – see **page 17**.



Copyright PPA 2014

Initially produced by **Jonathan Moore**

Updated by **Robert Banbury**
The Economist

PPA
2nd Floor, 35-38 New Bridge Street
London EC4V 6BW

T 020 7404 4166
www.ppa.co.uk
[@PPA_Live](https://twitter.com/PPA_Live)

Company no. 00132310