

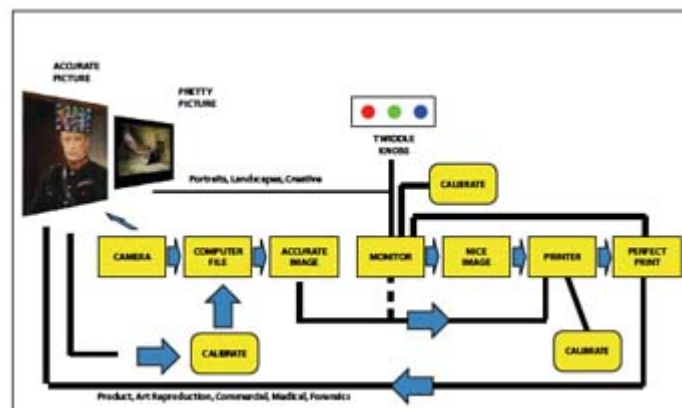


First a few words of clarification. We have come across some areas of confusion out there in the world of seminars and we detect a need to sort out a few misconceptions. The large diagram below shows the locations and uses of calibration profiles. A calibration profile may take the form of an icc or icm standard format, but could also apply to the 'number set' bringing a colour to exactly match a standard reference colour, such as that found in Adobe Camera RAW.

At the left side we have two sorts of pictures. 'Accurate pictures' are those shot of a product, art reproduction, exacting commercial, medical or perhaps forensic scenes. A characteristic of such shots is a desire to obtain an exact colour match of the original scene or object. When made correctly, a print from the image should be an exact colour copy of the original scene (or painting, for example).

'Pretty pictures', conversely, aim to flatter or enhance the subject, possibly sacrificing colour accuracy – a Caucasian bride, for example, may be given an artificial tan by increasing the saturation of the skin tones, a dark-skinned bride may prefer to be imaged slightly paler. Either way, the change from reality is considered to be an enhancement.

Staying with the diagram, and starting with the scanner or camera (a device) to originate a reproduction, we calibrate the colour numbers with a profile. This creates what we shall call an 'accurate image'. The device is calibrated by imaging a set of colours, comparing the result to a known reference file and providing a set of corrections to make the original colours, and those in the image, the same. In practical terms we 'assign' the colour profile to the image file, a process known as 'tagging', so as to build in the corrections and make the image file as accurate as possible.



We are now in possession of an accurate image file and, if we are totally confident of our capture device profiling, we could send the image directly to the printer without even looking at it. You do not need to tweak the image on a monitor because it is already accurate. Now if you print this

file on a calibrated printer, you may expect the print to be an accurate colour match of the original scene or subject.

The pretty picture route is different. Here the image is shot or scanned, hopefully quite close to accurately, but is then viewed and adjusted on the screen. The operator twiddles the knobs (often in Photoshop, but equally likely in Lightroom, Aperture or a camera-maker's software) until the image is to their liking. Providing the monitor is calibrated and the printer is calibrated, a print may be taken and compared to the monitor and will match within the limits of the viewing conditions. There is no requirement for the print to match the original scene.

This is one area where confusion seems to have arisen. Calibrating the monitor only affects the monitor, it has no influence on the colour of the output. The most common mistake is to set the monitor profile as the RGB working space in Photoshop. This is incorrect, the working space should be one of the standard ones such as sRGB or Adobe RGB or (the default for Lightroom) ProPhoto RGB. Each profile controls only the device to which it is applied. Therefore it is only while we have a calibrated monitor and a calibrated printer that we can expect a match between print and monitor.

Sadly, the world of colour is not perfect. Profiles can get colours closer to accurate, but they have to operate within the limits of gamut. The gamut is a description of the size and shape of the colour range that a device can create or show. An Adobe RGB gamut is larger than an sRGB gamut and a device that can capture or display only an sRGB gamut will be able to display a smaller range of colours than an Adobe RGB device. Do not mix up bit-depth and gamut at this point. The gamut will determine how red a red is (usually its saturation maximum) the bit depth will determine how finely you can chop up the scale from red to white (256 increments for 8-bit, 4092 for 12-bit – see Montizambert from last issue.) Similarly, a printer with three cartridges is unlikely to be able to display the same range of colours as a 12-ink cartridge set, because the three-cartridge gamut will be smaller.

Despite the frequent call to profile all your devices, we can find you any number of practitioners who are doing very well without being fully profiled. However, they are, at best, making corrections guided by experience to bring some order to their colour. Profiling makes the job more simple. The classic case is a photographer (let's call him Clicky Bill) who always sends his prints to the same laboratory. If we ask the lab we may find them saying, 'oh we always warm Clicky Bill's shots, that's the way he likes them.' This cements and ties the relationship of the lab and Clicky Bill – if he sends his files to another lab, all hell is likely to break loose because they have no idea of his desires. Conversely if Clicky Bill is calibrated, changes his files to warm them himself, and then passes them over for printing, they will be to his taste if the lab prints without any further changes (and the lab is calibrated).

In summary then, you always have to have a calibrated printer and depending upon the route to the printer, you need either a calibrated scanner, camera or monitor to enable you to confidently match the final print to either the monitor or scene.

We now move on to look at camera calibration and monitor calibration. We will not be addressing printer calibration other than to say that it is accomplished by making a set of test colour patches, measuring them with an instrument and then using software to build an icc profile to control the printing. For the better printers a profile will be available

which does a reasonable job on most of the individual units and this may be downloaded from the company website, or comes on the driver CD, with the printer. The Epson 3800 and 4880 (as examples) print at acceptable commercial quality right from the box, using the profiles that come on the CD. If you require proofing level of precision you will need bespoke profiling which is specific to your printer.

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Photo Quote: Both the grand and the intimate aspects of nature can be revealed in the expressive photograph. Both can stir enduring affirmations and discoveries, and can surely help the spectator in his search for identification with the vast world of natural beauty and the wonder surrounding him. - Ansel Adams

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Rags to Riches. Precision calibration for free.

An essential feature of calibration is a 'standard reference'. At it simplest this can be an 18% grey card, moving onward through the various Macbeth Charts to some very specialised targets. All of these provide an accurate 'levelling' patch for both colour and exposure. For work of any real precision the Macbeth Color Checker is the entry level, a 24-swatch target. In the general pecking order, the various calibration targets can do the following:

White Card – colour balance.

18% Grey Card – colour balance and mid-tone exposure level. Macbeth white grey black card – colour balance, mid-tone exposure level, contrast range.

Macbeth Color Checker – colour balance, mid-tone exposure level, contrast range, calibration of primary and secondary colours. Macbeth Color Checker SG – as above, but with more swatches for higher precision and a wider range of colours, including a wider gamut.

The calibration method we concentrate on here is a development started by Thomas Fors and now modified by Rags Gardner. This is based upon the Macbeth Color Checkers and provides input values to Adobe Camera RAW rather than an icc profile. The software is in the form of a Javascript and is free to download. Once it is downloaded the javascript file is dragged into the folder found at: C:\Program Files\Adobe\Adobe Photoshop CS2\Presets\Scripts It then appears under File>Scripts. Javascript files are cross-platform compatible and may be used on either Mac or PC.

In use, the following procedure should be followed:

1. Set up the Macbeth Chart in even illumination of the type you wish to employ. Directional lighting is not suitable although it may be used with some modifications to the Adobe Camera RAW settings later.
2. Expose an image in which the Macbeth Chart is frame-filling and square. The exposure level should be adjusted for a top-quality result and great care should be taken. The correct exposure is the one that just fails to show clipping of the highlights and may be found by increasing the exposure until the highlight flashes lights and then backing off by a third or half stop.
3. Correct the file in camera RAW to white balance it.
4. Run ACR script (which typically takes about 10–30 minutes but could take as much as an hour on a slow machine).

5. Transfer the 'Adjust' and 'Calibrate' setting (it may be done automatically by the script, depending upon the version).

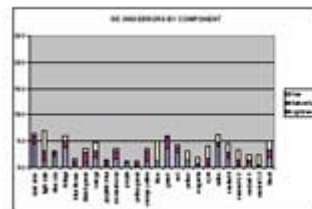
6. Open the file.

The technically correct sequence of calibration should always include an audit of your corrections. This is done with another Rags Gardner script called 'measure patches'. This compares the colour of the patches in the files with the reference values. Ultimately this may produce a set of statistics and/or a new layer that places the reference colours on their own layer above the camera image, to provide a visual assessment of the calibration.

At this stage you should have an accurate image but not necessarily a pretty image (who sells portraits of Macbeth Charts after all?). You may also find the resultant image a little flat, the contrast range in a Macbeth chart is not high. However, it represents an accurate record of the scene and an excellent starting point for monitor-based tweaking to create a neutral, 'pretty' image. Therefore, if you fancy a darker image, darken it. If you wish to lighten or darken the image, do so using the sliders on the Adjustment panel – this will leave your hue and saturation accurate, changing only the lightness values. The values set in the Calibration panel are both camera- and lighting-specific and may be left unchanged to give a starting point from which to shift colours, should you choose to do so. A good analogy for the Macbeth Chart is that of giving directions to a visitor to a town. You might tell the visitor to follow the road-signs for the town centre and the 'Cross' and then take the road out to the north for 200 yards, to find the destination point. The finding of the town cross is akin to setting up the Macbeth Chart – it fixes your position before you move out to your final point.

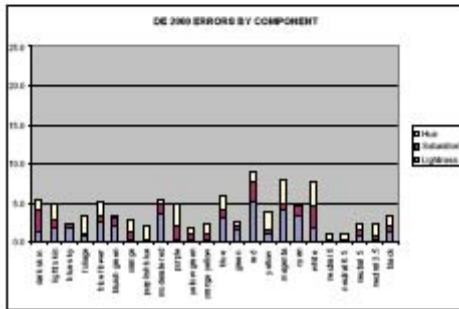
How good is the method?

In tests carried out using the original ACR Calibrator we achieved results that compared very favourably with those obtained using high-end software. The fact that it is free in no way lowers the quality of this method, it really is top-rate and Messrs. Fors and Gardner have done us a great service. Even if you can't be doing with all the statistics, the overlay gives you a good visual reference of how you are performing for your 'accurate' pictures.



LEFT: We asked SWPP member, Paul Atkins to try the Rags Gardner method independently. Paul used a Nikon D2x to obtain a final error of 2.54, very much in line with our own findings

BELOW: The progression of the correction sequence on the errors in the Macbeth Chart can be seen. At the top, only the white balance and exposure level have been corrected. Second down has been corrected for White Balance, Exposure, Shadow level and Contrast – that is the 'Adjust' dialogue box values. In the lower image all the above have been corrected along with all the settings in the ACR 'Calibrate' tab (red, green and blue hues and saturations). The bars of the graphs on the left are gradually becoming smaller as the errors are brought under control. The average ΔE_{2000} error falls from 4.64 to 3.06 to 2.61.





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Photo Quote: More varied than any landscape was the landscape in the sky, with islands of gold and silver, peninsulas of apricot and rose against a background of many shades of turquoise and azure. - Cecil Beaton

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Monitor Calibration

Over the past few years, the prices of monitor calibrators have fallen considerably resulting in their adoption by more and more photographers. The type of monitor you have and the way it can be adjusted has more influence over the resulting calibration than the profiling device that you choose. Many computers cannot be calibrated because the monitors are incapable of being driven at the low luminance levels required or because the computer graphics card is either inferior or may not even have a Look Up Table (LUT). This is particularly true of laptop computers. You should check carefully, preferably by borrowing a calibrator, before committing your cash.

In this issue we concentrate on a new software package – ColorEyes Display Pro. This is a software which supports most of the better calibration ‘pucks’ but in order to make the additional investment worthwhile you have to consider what it offers over and above the software that is provided with the pucks themselves. The main claim for the software is that it makes use of multiple luminance measurements to refine the setting of the white balance (ie the neutrality of the greys). The software also provides more feedback for those who may be interested in the figures, along with tracking of the audits, over time, so that monitor drift may be checked.

It is quite difficult to make an assessment of monitor accuracy as, outside of an optics laboratory, you cannot find a decent reference standard to work with – it’s not like having a printed Macbeth Chart. Holding a Macbeth Chart up against the side of a monitor is not a very sound way of making a comparison even when the chart is sitting in a corrected colour booth, such as we use at Professional Imagemaker. Comparing one monitor alongside another will almost certainly reveal differences, but you will be unable to quantify things.

During our testing of the software, one thing that was happening was that the Monaco profile was kicking in first, to be replaced, a couple of seconds later, by the ColorEyes’ one. The ColorEyes’ profile did seem to be more neutral in the greys. The statistics also indicated that the ColorEyes software was performing slightly better than Monaco Profiler, using both the Monaco Optix XR and the X-Rite Eye One Professional.

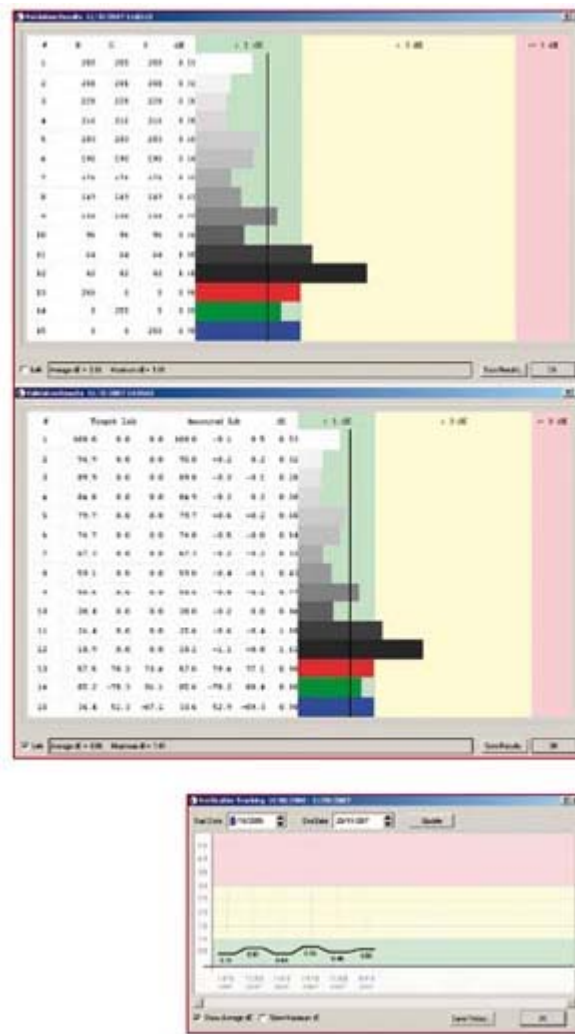
In practice the ColorEyes takes quite a bit longer to complete a profile build because it does a much more thorough measurement check and even checks itself, mid-profiling. Multiple measurements seem to be taken at all stages – you get the impression that things are being carried out very diligently. For the record, the values obtained were:

Puck Used	Average Error	Max Error
Eye One Pro	0.71	1.12
X-Rite XR	0.72	1.05

We had a number of issues with the software. Photoshop was unaware of ColorEyes and even though we were pretty certain that the ColorEyes profile was in use, Photoshop thought it was still using an old profile from X-Rite profiler. Similarly, the Windows colour management module was under the impression that the older profile was in operation. We understand that these issues are being worked upon for the next release. It is one of the mysteries of the calibration interfaces that you are never really sure what is actually going on. We have in the past resorted to building really out-of-balance profiles just to check that the profiles were in operation (ie when the screen kicked in bright green we knew the computer had latched onto the profile!).

At \$175, the investment is not particularly trivial, but at least you can download a trial version and check out if you feel the improvement is worthwhile.





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Photo Quote: You've got to push yourself harder. You've got to start looking for pictures nobody else could take. You've got to take the tools you have and probe deeper. - William Albert Allard

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