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i This article is one of more than [120 articles](#) written by Jeremy Daalder, director of Image Science. All of this content, in addition to Jeremy's [book on Digital Fine Printing](#), is provided free of charge.

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Colour Control on Monitors

i On this page we present the major options for colour managing your monitor, in order of most accurate to least accurate. The first two options, both hardware based, are very accurate. The other methods are all based around judgements made by eye and are thus not capable of really accurate results.

We strongly recommend a hardware based system if you want to achieve quality results with digital imaging!

If you don't have a clear understanding of what calibration and profiling are (and how they are different), you should start by first reading [Calibration Versus Profiling](#).

Methods for colour management with monitors:

1. [Direct Hardware Calibration](#) - 'Direct to the metal' hardware calibration as offered by the superb [Eizo CG line of monitors](#)
2. [Software Calibration](#) - So-called 'software calibration using a hardware device' - this is the classic way of properly calibrating, using a device known as a Spyder or an Eye One Display (colorimeters)
3. [Purely software calibration](#) (using Adobe Gamma or Colorsync)
4. The bare minimum method, [The worst possible way - matching your monitor to a print your lab supplies](#) ('The Shirley System')

Direct Hardware Calibration




Direct calibration using the high bit depth tables in your monitor

This is the most sophisticated and most accurate method of monitor calibration available. This method requires dedicated hardware inside the monitor and is only offered by premium monitors such as the superb [Eizo ColourEdge](#) line of monitors.

These monitors come with custom software (Eizo Colour Navigator) that allows you to calibrate directly using the higher bit depth processing available in the ASICs/LUTs in the back of the monitor. Because the calibration is being done with higher order mathematics, it means the final result is a smoother calibration across the available gamut - particularly noticeable in gradients and deep shadows. The tables in these monitors are typically 10, 12,

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14 or 16 bit versus the 8 bit table standard in video cards (see the next section). This means instead of just 256 levels being available, there are from 1024 to 65 336 levels available! The result is more accurate tone placement and separation.

If you want the best, most accurate calibration, this is the way to achieve it. You will need an [Eizo ColourEdge monitor](#) and a compatible colorimeter device (Spyder 3 Pro being the best combination of performance and price).

Software Calibration (with a hardware device)

Classic hardware based calibration using the 8 bit tables in your video card

Classic hardware calibration (now confusingly often referred to as 'software calibration with a hardware device') is the most appropriate type of calibration for most users. It is affordable, simple, and accurate.

This method of calibration uses a colorimeter device (often colloquially called a Spyder based on the name of the first really popular brand) to accurately read the colour coming from your monitor. A translation table between the colour you should be getting, and the colour you actually are getting, is created and installed in your video card's colour look up table. Thus, the signal leaving your video card is modified to produce the most accurate possible colour from your monitor.

In the long term if you're serious about getting good results from digital imaging, you will have to buy one of these for yourself, there is just no getting around it. Relative to other costs in photography, colorimeters are very good value for money and extremely useful devices that will, quite simply, pay for themselves in a short time by saving you money day after day on colour misadventures.

[Overview of available monitor calibration devices](#)

Purely Software Calibration

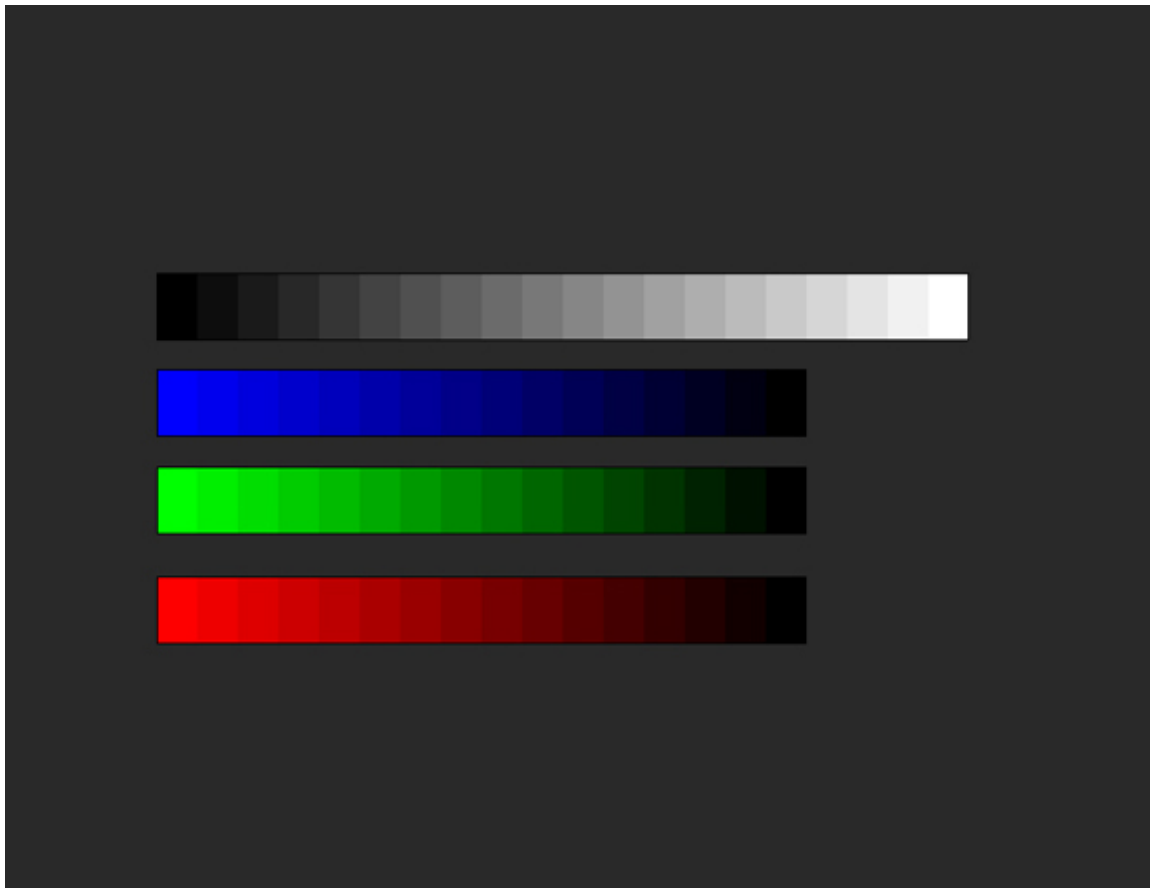
If you're not ready to outlay the money for a calibration device yet, then the next best alternative is Photoshop: it comes with Adobe Gamma, a useful tool for calibration, including a wizard mode to guide you through the process. On the Macintosh platform, the ColorSync utility offers similar functionality. It's OK, better than nothing, but a very long way from the quality of hardware calibration. Just start the software and follow the on screen instructions.

Failing the use of hardware calibration or Adobe gamma, or something similar, your video card may have come with calibration software. This won't help you much, but will still be better than nothing.

Calibration By Eye

If none of the above options are available to you, then follow the instructions below to do basic monitor calibration - this will make no permanent changes to your system but will be a good start for tuning your monitors controls (you may need to use the physical monitor controls on the monitor itself, and/or the software tools that came with your video card - found under the system/display settings on your computer). If you adjust your monitor to the settings suggested here, you will find images all over the web display more accurately.

With this test image:



Step One: Brightness and contrast (the top row)

You should be able to see all this:

- 20 sections of equal width and different tone
- the darkest section must be pure black
- the lightest section must be pure white
- there must be no hint of colour anywhere along the grey spectrum
- If you don't see 20 different tones, you may need to lower your monitor's contrast.
- If black is not pure black you need to darken your monitor until the point you see pure black
- If white is not pure white you need to lighten your monitor until you see pure white
- If both black and white are not pure, try boosting the overall contrast.
- If there is a colour cast (ie the greys are not pure grey), try and adjust the colour balance.

Step two - colour (bottom 3 rows)

Once you have adjusted everything as precisely as you can, look at these test images (Red, Green, Blue):

- There are 16 clearly defined sections in each strip.
- If you cannot distinguish between them towards the dark end in any of the strips, you may need to lighten that respective colour, or darken the other two colours.
- If you cannot distinguish patches towards the light end in any of the strips, you may need to darken that respective colour, or lighten the other two colours.
- You can also try to work with saturation controls for the individual colours, if they are available in your monitor controls/software.

Matching your monitor to a lab print - why this is wrong, wrong, wrong!!

The classic approach that many labs take to 'solving' the colour management problem is the 'Shirley' system.

This system, no more accurate really than pot luck, involves taking a print out of an unappealing 1970s photograph from the lab's printer (of a woman apparently named Shirley) and twiddling your monitors controls until your screen looks roughly like the print out.

This is fundamentally wrong and fortunately most labs are beginning to realise this – however you may yet come across a lab still stuck in the dark ages and I suggest if anyone tries to convince you to use a Shirley that you run, as fast as you can, to another lab.

Why is the Shirley system wrong? Well, if nothing else, it permanently ties you to printing at one lab to get best results. Of course they love the idea that you will, forever more, do all your printing with them, because printing is a very high margin process, and so many labs are reluctant to give up this system. It's also wrong because - and this is important - it just doesn't work! Your eye just isn't up to the job. It's far too adaptable, and far too influenced by surrounding factors like light, the colour of your shirt, what else is in your field of vision etc. etc.

Getting good colour/tonality is all about science – not art. Art is what you actually do with the colour, but viewing, reproducing and printing colour accurately is all about science.

Furthermore, your monitor simply does not offer controls that replicate the sort of adjustments that a proper calibrator can make, so there is simply no way you can achieve a calibration that is anywhere near the quality you can get using methods one and two above.

So your eye simply can't make the measurements required for accurate colour, and you can't make the required adjustments using only your monitor's controls, so quite simply the Shirley system fundamentally can not work with anything like the accuracy of hardware based calibration.

Here's the key point. Colour is not whatever happens to come back from some lab on a particular day. What we need is some sort of objective standard for colour, and then to calibrate all our devices to that standard, so they all produce the same colour. To achieve that with any level of accuracy, which is essential to getting good results from digital images, you really need to use a hardware based calibration approach (type one or two above!).

File Attachments

No file attachments were found.

These Articles May Be Related...

- [Introduction to Prat Folios](#)
- [Introduction to Eizo Premium Imaging Monitors](#)
- [How to Calibrate an Eizo Flexscan Monitor \(with an Eye One Display 2\)](#)
- [Image Science are Eizo Monitor Experts](#)
- [How to Calibrate an Eizo ColorEdge Monitor using ColorNavigator](#)