



Please DO adjust your set

Ever looked in the 'expert' settings of your TV and wondered what's going on? We asked ISF-certified calibrator **Mick Peaker from True Colour** to explain the merits of professional calibration, and to give some tips on having a go yourself.

Bought yourself a new TV recently? Managed to negotiate the in-store friendly bright smiles and even friendlier and brighter advertisement banners? Most likely you picked the TV you liked the look of best, that best suited your bank balance and — being a *Sound+Image* reader — which got a good review. Hopefully it looks good now you've got it home. (Most likely anything would after that old box you've been watching.)

Can you make it look even better? Of course you can. But can you make it truly accurate? Probably not. Even if you know your way around the TV's menus and the Brightness, Contrast, Sharpness and Colour settings, even once you settle on your settings and end the whole process expressing complete satisfaction, chances are that your TV's image will remain pretty distant from the ideal. Yet that's where most people stop. "Yeah... that'll do! Let's watch a movie."

THE COLOURFUL TRUTH

So if "it'll do", why get a TV calibrated? Well, here's the thing. The human brain has an amazing ability to tune itself to whatever audio or visual information the senses are receiving, and to accept that as 'normal'.

The concept may be more familiar in audio terms. Say your best mate has just bought a stonking new hi-fi system. You jump in the car to go and have a listen, and on your way you're rocking out to

the car audio system — a bit of AC/DC, Foo Fighters, maybe even some Zeppelin. You're not consciously thinking about it, but it's sounding great.

When you settle down at your mate's place, he may hit you a little hard with the first few minutes of music, but soon you're listening to everything from Simon & Garfunkel to Pink Floyd, Dave Matthews to the latest Muse, immersing yourselves in the ambience of every kick and snare hit, every little detail to be heard.

When it's time to go home, you get back in the car, start the engine and... wait a minute... the in-car system now sounds distinctly below par.

That's because your brain has retuned itself while you were listening to your mate's new system. It now has a new benchmark of what it accepts as good.

But don't worry too much — by the time you get home your brain will probably have tuned itself back again.

It's much the same with a TV picture. It's not until we watch a picture that has been properly calibrated that we realise what we've been missing. For the vast majority of viewers, overly-bright oversaturated images have become accepted as the norm.

In terms of colour, it's worth considering that what you are watching is, effectively, somebody's artwork. When Leonardo da Vinci painted the Mona Lisa, for example, there were certain colours on his palette, and he chose these colours carefully.

This is not unlike what a movie director does when he builds the colours and detail into a movie. The available colour gamut is his paint palette. And although there are a number of different colour gamuts, the standard used for today's HDTV and Blu-ray content is ITU-R Recommendation BT.709, or 'Rec. 709' for short. You can be sure that the movie director's screens were perfectly calibrated to Rec. 709.

Now, if an artist wanted to accurately recreate the Mona Lisa, he would need to use the same colours that were available on da Vinci's palette. Likewise, if your TV is not calibrated to Rec. 709, you're not going to see the same colour and other nuances that the director intended us to see. It is not fidelity, not true to the source. If Leonardo were to see his masterpiece with a fluorescent green background and orange skin tones, chances are he'd get quite grumpy.

Note that some TVs offer a Wide Gamut option — they can display colours outside of the Rec. 709 colour space (see colour space pictures, right). The Wide Gamut can be useful for photographers or graphic designers, who may use a larger colour

space, such as Adobe wide gamut RGB, for their work. But it's not for the movies — it's simply the wrong palette.

OUT OF THE BOX

If calibration is so important, then, why aren't televisions calibrated correctly when you take them out of the box?

There are a number of reasons. One is that the cost of properly calibrating each individual screen at a manufacturing level is just not economically viable. Besides, the lighting conditions of the room affects the final outcome of what we see, and this needs to be taken into consideration when calibrating a TV — so out-of-the-box perfection just isn't possible.

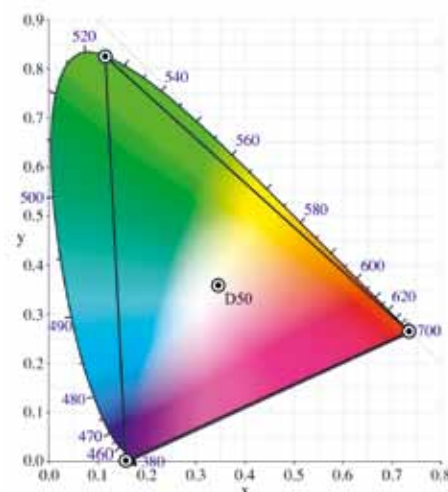
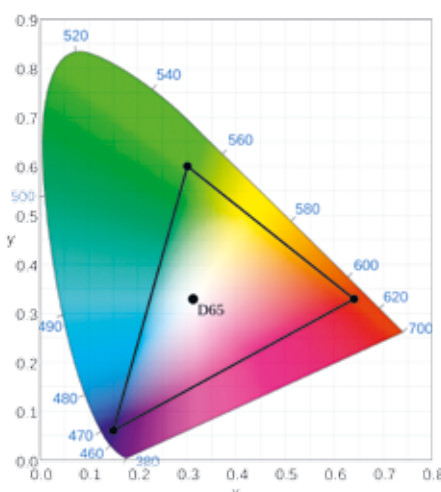
Equally relevant is the extremely competitive TV market. Manufacturers want to catch your attention in that brightly-lit shop showroom. The infamous 'store mode' — unnaturally-bright and colourful — used to be the out-of-the-box default for many TVs,

and is the biggest reason that TVs look different in the store... they're all wrong! The introduction of energy ratings has helped to end this — measurements are taken in the out-of-the-box state, so now there's usually a clear selection between home or store mode when you first turn a TV on.

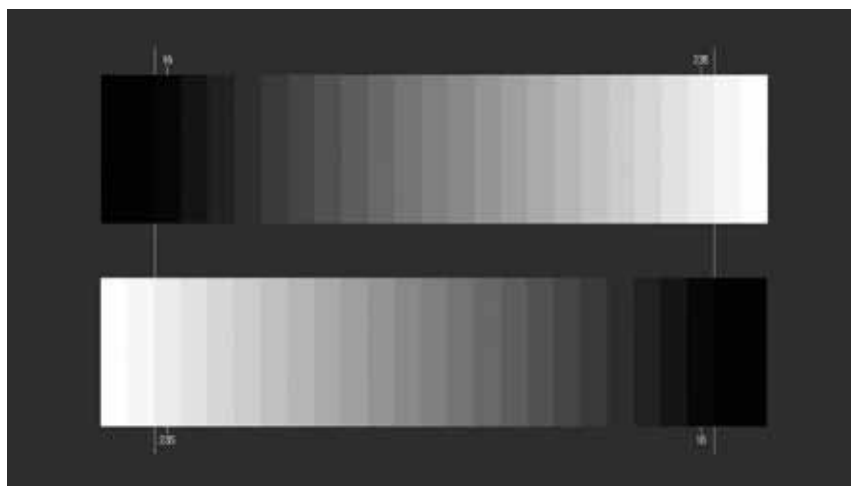
WHAT CAN YOU DO?

Well, as a certified and experienced video calibrator, my first suggestion would be to hire a certified video calibrator! The adjustment process can be complex for a first-timer, and may require a check of source equipment and iterative tweaks.

Of course, *Sound+Image* readers will be keen to have a go for themselves — and there are a number of DVD/Blu-ray discs you can use to set up your TV. See overleaf under 'DIY'. But first let's look at the proper calibration process, so you can understand what is being adjusted, and whether your gear deserves the professional treatment.



ABOVE LEFT: Rec. 709 colour space, as used for Blu-ray and DVD releases
ABOVE RIGHT: Wide-gamut RGB colour space



ABOVE: Example of a ramped greyscale pattern used to set dynamic range

The calibration process does depend partly on your TV. Check its 'Advanced or 'Expert' settings and look for something about White Balance/Greyscale and Colour Management. If your TV has these, there's a good chance it can be very closely if not precisely calibrated to Rec. 709. Some TVs only offer White Balance/Greyscale controls. Even those alone can get us 90% of the way home. If your TV has 'ISF mode', then it will be also able to store specifically calibrated settings for Day and Night viewing.

CALIBRATION: DYNAMIC RANGE

There are a number of variables to consider while calibrating, but the big three are dynamic range, greyscale and CMS.

Dynamic range measures how black the blacks are, and how white the whites. The potential dynamic range will vary depending on the quality of the screen, but essentially we're looking to get the picture as black as possible without losing detail in the dark areas of the picture (using the Brightness control), and as white as possible without losing detail in the bright areas of the picture (using the Contrast control).

A pattern similar to the bottom picture on the previous page is used for setting the dynamic range — this is called a 'pluge' pattern (Picture Line-Up Generation Equipment). The number 16 marks the reference point for 'black' and 235 marks the reference point for 'white'.

With this pattern, we want to adjust the Brightness up or down until we can just see the bar below 16. If we adjust the Brightness too low, the blacks will be 'crushed' and we will lose essential detail in the dark areas of our picture.

Then we want to adjust the Contrast up or down until we can just distinguish the bar above 235. If we adjust the Contrast too high, the whites will be 'clipped' and we will lose essential detail in the bright areas of our picture.

It's all too common for picture presets to have crushed blacks and clipped whites. The TV appears to have a larger dynamic range, but all it really achieves is a loss of overall detail in the picture.

CALIBRATION: GREYSCALE

Greyscale is how the TV produces the colour grey, from black through to white. This is what gives us light and shade: the black and white detail of the picture. An even gradient from black to white is produced when the primary colours Red, Green and Blue are evenly balanced.

This is where the White Balance controls come into play. Many quality modern TVs will have a two-point High/Low control for each primary colour — 'High' for the lighter half of the greyscale, and 'Low' for the darker half. Some TVs have a 10-point control in which red, green and blue can be adjusted at 10 individual points, from black

to white, along the greyscale. Obviously the 10-point system allows for greater accuracy in adjusting the RGB balance. The first two images shown below left represent pre- and post-greyscale calibration of a Samsung 8000 LED TV (my calibration using a SpectraCal CalMAN 5).

CALIBRATION: CMS

CMS (Colour Management System) is where we adjust the red, green and blue primary colours and the cyan, magenta and yellow secondary colours. The approach that each manufacturer takes with their CMS controls will vary, but essentially they all adjust x and y co-ordinates and the luminance for each colour to match the Rec. 709 colour space. The bottom two images below left show pre- and post-CMS calibration of a Samsung 8000 LED TV.

ALL TOGETHER NOW

Dynamic range, Greyscale and CMS all relate to each other. If one is altered, they can all be affected. So during the calibration process it's essential to revisit each step in the process and make adjustments until they are all balanced.

And further, each component in a home cinema system — receiver, video sources — has the potential to alter the video signal. So once the display is properly calibrated, we need to check the signal at each component in the signal path, back to the source, making adjustments along the way if necessary.

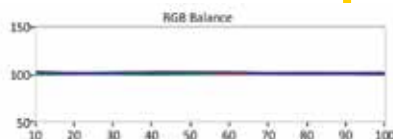
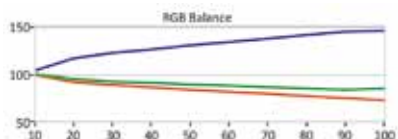
The benefits of correct professional adjustment all through the chain can be significant (see panel opposite). But there's no reason not to take the first steps yourself. After all, if you can see the difference with your own tweaks, it may even convince you there are further benefits to be had from a professional visit! So how best to start?

DIY CALIBRATION

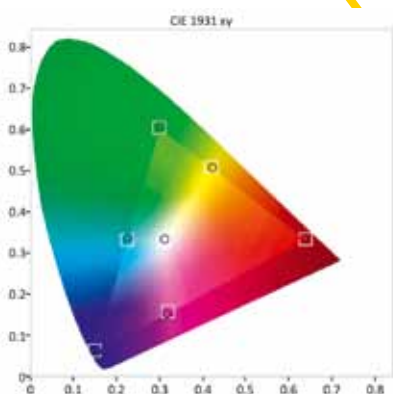
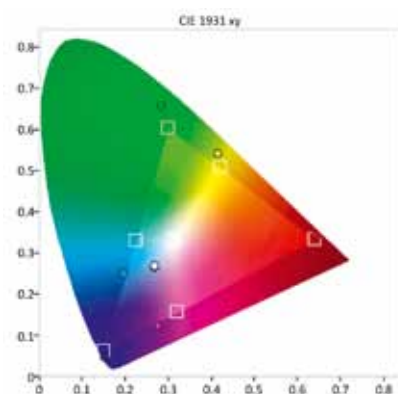
There are a number of home calibration discs on the market, and perhaps the most user-friendly is the 'ISF HDTV Calibration Wizard'. It's great for a quick step-by-step guide that can make a huge improvement using just the basic picture settings.

If you want to get a bit more technical and play with test patterns and filters, other recommended discs include 'Disney WOW World of Wonder', 'Digital Video Essentials', and the 'Spears & Munsil' benchmark disc.

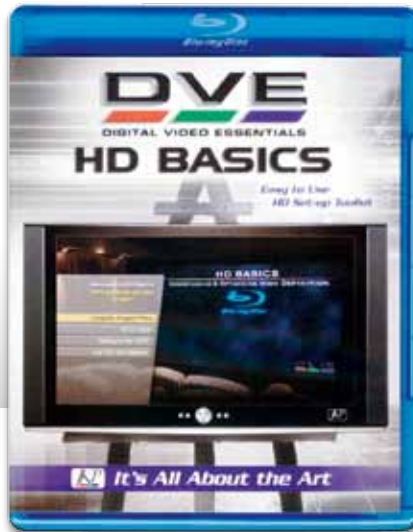
The ultimate accuracy of all of these will, of course, be dependent on your source player outputting a correct video signal — which you won't know unless you have a standard to compare it to. (A professional



Pre- and post-greyscale calibration of a Samsung 8000 LED (calibration performed by True Colour using SpectraCal CalMAN 5)



Pre- and post-CMS calibration of a Samsung 8000 LED (calibration performed by True Colour using SpectraCal CalMAN 5)



Test discs allow a certain level of home calibration

test pattern generator from a certified video calibrator, for example.)

Even without one of these test discs, you can improve your picture by setting the basic Brightness, Contrast and Colour using movie content you already own.

First, pick a viewing mode from your TV options. A mode like 'Warm' or 'Warm 1' is often the best; 'Standard' or 'Normal' is OK too. But don't pick 'Dynamic' or 'Vivid' — they are just wrong on so many levels (unless you want all your content to look as though it's been animated by Pixar).

Brightness. Remember that you want the brightness setting to be as dark as possible without sacrificing detail. Pick a movie with dark scenes (e.g. 'The Dark Knight', 'Blade Runner', 'The Matrix'). Find a dark scene that contains a decent amount of detail and hit pause. Turn up the brightness control. Can you see more detail being revealed? Good. Keep going until no new detail appears, then stop. Then slowly turn the brightness control down until the detail in the darkest area of the picture just starts to fade. Stop there.

Contrast. We want the contrast setting to be as bright as possible, but without sacrificing detail. So pick a movie with a lot of bright scenes — maybe something with a lot of snow (e.g. 'Fargo', 'The Empire Strikes Back', 'The Art of Flight'). Turn the contrast control down and look for the shadow detail in the snow. When you don't see any extra shadow detail appearing, stop. Then turn the contrast up until the detail in the brightest area of the picture just starts to fade — and stop there.

Colour. Look at skin tones and other colours that you're familiar with — the colour of grass on a football field, say. Do the skin tones look right? Does the grass look real or does it look fluorescent? Turn the colour up or down (usually down!) until they look natural.

Tint. Don't mess with the Tint control! For the most part, manufacturers are hitting this nail on the head.

Sharpness. Rule of thumb for the Sharpness control is to turn it down low — to less than a quarter of its full range. In some cases it's best to just turn it off, or to zero. If sharpness is too high it will add 'noise' to the picture. (Note that there are a few brands of TV that put the sharpness 'zero' point in the middle of a range, with the lower numbers actually softening the source. You'll catch on to this pretty quickly.)

So, is this DIY adjustment going to make your picture perfect? No! But any step we take to improve our picture is a good step. Although the DIY process is not accurate, it will most likely improve things — and may persuade you of the merits of taking the next step of professional calibration. +

Mick Peaker of True Colour is an ISF-certified calibrator. For more information visit www.truecolour.net



WHY PROFESSIONAL CALIBRATION?

Professional calibration ensures you will see a director's content as it was intended to be seen. It can potentially deliver the following benefits and more:

- a sharper, clearer picture;
- detail revealed that was previously missing from the picture;
- realistic colours and flesh tones;
- increase the life of your display;
- decrease the likelihood of 'phosphor burn';
- decrease the power consumption of your display.

The ISF (Imaging Science Foundation) has been dedicated to improving the quality of electronic imaging since 1994. From a consumer standpoint, its key role is to certify calibrators, ensuring they have a proper understanding of the parameters of calibration, digital imaging and display standards, and of the use of professional test equipment.

But the ISF also plays an important role in consulting with manufacturers and others (such as Dolby) regarding product development, and endorses products that contribute to systems with 'High Fidelity Video' through formal licensing programs.

More info: www.imagingscience.com

