

CRT v LCD

The lowdown on monitor technology

The Cathode Ray Tube—or CRT—has been the leading technology for computer monitors and television screens for many years. However, the emergence of the Liquid Crystal Display—or LCD—technology has seen a gradual shift in the landscape, with the slim line and stylish flat screens becoming the new monitor of choice for many. But are LCDs really up to the task of serious image editing and soft proofing for professional output? David Harradine compares the choices.



2005 is certainly shaping up to be the year the LCD monitor truly arrived. One by one, all the factors that kept CRTs clearly ahead of their competition have been caught up—and in many cases overtaken—by the current crop of high-end LCDs.

Just like vinyl records, photographic film, drum scanners and zip drives, the aim of the CRT's competition was not necessarily to be better, but to be at least as good in a more convenient form. And just like CDs, digital cameras, CCD scanners and USB keys, that's exactly what the LCD monitors have achieved. Comparable quality to the CRT, but without the cumbersome size and weight, the heavy power consumption and the flickering refresh rate causing eye fatigue when watched for long hours.

So what are the key arguments that have kept the LCD as a second-class citizen in the professional imaging world? And how have they changed in recent times to raise the LCD's profile as a professional imaging device?

Colour gamut

'LCDs can't reproduce as many colours as CRTs'. This was a common catch cry not so long ago. But anyone making such a claim these days can be very quickly set straight. The common default RGB colour space—known as sRGB—came about as a



good way to describe the average monitor. Although few CRTs were capable of the entire sRGB gamut, most half decent ones would come pretty close—so the standard was born. Larger colour spaces like Adobe RGB 1998 could be utilised as working spaces, however, no CRT could come close to actually displaying it.

The current generation of professional LCDs have well surpassed sRGB and have Adobe RGB 1998 firmly in their sights—with the Eizo CG220, for example, not just matching it, but in fact surpassing it slightly in the yellows, reds and magentas.

Brightness

Again in the brightness stakes LCDs easily win out. In fact, brightness has always been one of the LCD's strengths, much like a standard light globe trying to compete with a fluorescent tube. The greatest advantage of a brighter monitor is the ability to work with brighter room light, as we all know that for optimal viewing conditions, no light in the room should be brighter than your monitor—and this includes windows. It should however be noted that LCDs have a fixed contrast ratio, so turning up the brightness is making your blacks lighter by the same amount you make your whites and greys lighter. (More on this shortly when we talk about calibrating for optimal response.)

Viewing angle

Another big problem with early LCDs was their ability to display a consistent image as you moved from side to side, or had multiple people sitting around the screen at once. I remember the first time I saw a 23-inch cinema display. I was drawn to it in awe, but that awe soon turned to shock when I moved my head from side to side to see a strange bronzing effect take hold of the image. This was four years ago—back in 2001—and four years is a long time in the development of computer technology. Needless to say, this viewing angle issue has been significantly improved in most current LCDs, and all but eliminated in the professional models.

Calibrate-ability

When we calibrate a CRT monitor we adjust the black point (brightness), adjust the white point (contrast), adjust the mid tones (gamma) and adjust the colour temperature. The combination of these four adjustments gets our display as close to a recognised standard as possible. Once calibrated, we then profile our display. The profile takes care of any remaining inconsistencies by tweaking the look up table (LUT) in the video card. The LUT is basically a conversion table that informs input values how best to be output to for a given device.



I would have no hesitation in purchasing an LCD—provided, of course, that it had a 10-bit LUT.

Therefore, much like converting one unit of measurement to another, the LUT provides the scale reference.

However, this LUT adjustment is basically carried out in an 8-bit environment, so excessive adjustment can lead to banding or abrupt, rather than smooth, tonal transitions on screen. This is why we always calibrate first—to reduce the amount of work the profile has to do at the LUT. Provided our monitor is not beyond its useful life span, this combination of calibration and profiling will bring it back to known standard—much like tuning a musical instrument.

So how do LCDs shape up in the calibratability stakes? (Okay, so I made up the word, but I think it's useful.)

Well firstly we can adjust the brightness on our LCDs, after all it does have a big fluorescent light source behind it. But sadly, that's about it—no contrast, no gamma and no colour temperature. Because after all, it's just a big fluorescent light source, not a series of individual red, green and blue ray guns like the CRTs.

Even if your LCD monitor claims you can adjust more than the brightness—as many do—you can't adjust the light source. The adjustments must take place at the LUT. So, you guessed it, banding central when we have to make our entire monitor calibration



and profiling adjustments at the look-up table.

Enter the 10-bit LUT

So, with necessity being the mother of invention, current generation LCDs have upped the bit depth of the LUTs to 10-bit rather than 8. And just as higher bit depth files in Photoshop give us files more resilient to tonal adjustment, higher bit depth LUTs give us look up tables more resilient to tonal adjustment. So calibration and profiling can now be carried out successfully on LCDs for even the most discerning user—provided your LCD is equipped with a 10-bit LUT. So ask for it by name.

Stability

So how often should you calibrate and profile an LCD? The old rule of thumb with CRTs was at least once a month, and then possibly more regularly as the monitor aged, due to the fact that it would become increasingly less stable and more prone to variation. Having said that, many recommend doing it more often to be absolutely safe, and ideally before you begin any major project regardless of when it was last done.

Well LCDs are clearly more stable than even the best CRTs ever were. Consequently, their tonality and colour will drift much less

over a given period. However, experts still recommend calibration and profiling once a month to be safe. But at least you'll know at the end of each month—just before you re-calibrate—your monitor is a lot closer to a standard than a CRT ever would have been.

Expect to pay...

So now that you want one, how much would you expect to pay? Well, the leading professional LCDs to which I've referred, hover around A\$3,000 for a 19-inch—and beyond that for larger screens. This is pretty reasonable compared to what far lesser quality past models used to cost, and compared to what you'd pay for a top of the line CRT back in their day. Two leading models that have been embraced in professional publishing circles, and deemed suitable for soft proofing, are the Eizo Colour Edge series and the Quato Intelli Proof series.

VGA vs DVI

As CRT monitors were basically analogue devices, an analogue connection from your video card to the device was all that was required—namely the VGA or Video Graphics Array. Now that the digital LCDs are in the house, a more sophisticated digital connection—DVI or Digital Video Interface—is required for optimal performance. LCDs will still run via a VGA connection, but they will be sharper and cleaner with a DVI connection.

The future

What we can expect around the corner is anyone's guess. There is talk of technologies that will marry CRT technology with LCD—using separate red green and blue LED lights—and many of the old CRT purists claim they are staying put until that arrives. There are also new developments in the area of High Dynamic Range display, which is currently more applicable to television sets than computers monitors, but will inevitably trickle down should the technology be adopted.

Have a look at www.sunnybrooktech.com for a glimpse into the future.

I'm sure that just like DVD players and digital cameras, we are going to see further increases in performance, coupled with decreases in prices, as LCD monitor sales go up. Luckily, I still have a year or so left in my current CRT monitor, but I have no doubt my next monitor will be an LCD. However, if I was faced with having to buy a new monitor for colour evaluation today, I would have no hesitation in purchasing an LCD—provided, of course, that it had a 10-bit LUT.

David Harradine is a Photographer Trainer and Adobe certified Photoshop expert. David regularly presents seminars around Australia and New Zealand on Digital Photography, Colour Management and Photoshop. To see a listing of his current events go to www.whack.com.au.