# Ultimate Monitors for Photographers

By Stan Sholik

## WYSIWYS

What you see is what you saw. Unfortunately for photographers, when we view the capture on our monitor we are often disappointed that we don't see the full range of color that we saw while we were taking the photo. With the top digital backs capturing in native 16-bit color and professional digital SLRs capturing in 12- or 14-bit color in the Adobe RGB color space, we expect to see a very accurate representation of the original scene on our monitors. But this is often not the case.

Even assuming we nailed the exposure and properly white balanced before we began, magentas, oranges and yellows can look muted in the highlights, and many cyan and green hues, especially in the shadows, may be totally absent on the monitor. And the sky, instead of being smoothly graduated, might look like bands of color. There can be a number of reasons for this, but one of them is the inability of your monitor to reproduce the full spectrum that your digital capture device is producing.

If so, technology has an answer. You need a wide gamut monitor capable of accurately reproducing the full Adobe RGB color space. But, as you will see, it's not nearly as simple as all that.

One measure of a monitor's ability to reproduce color is given by the percentage of the Adobe RGB (1998) color space that it can reproduce. Unfortunately, this information hasn't been available for monitors until recently. Color response of older monitors and many new ones is characterized by the percentage of the NTSC (National Television System Committee) color space that they can reproduce. The NTSC color space is similar to Adobe RGB, but far from identical. For the tech minded, there is an excellent 3D graphical comparison of many color spaces on the Web at http://www.brucelindbloom.com/index.html?WorkingSpaceInfo.html.

The best CRT monitors were only able to display about 75% of the NTSC color space. That is adequate to display the sRGB color space, and the availability of CRT monitors at the time was one of the reasons that sRGB became the standard color space for the Web.

Until recently, LCD monitors didn't do much better. The reason for this has a lot to do with the type of backlight behind the LCDs. The most common type, CCFL (cold cathode fluorescent tube), doesn't produce a full enough spectrum. The best modern CCFL LCD (liquid crystal diode) monitors can display 102% of the NTSC color space, but most CCFL LCD monitors still only display about 82% of the NTSC color space. This has changed with the introduction of RGB LED (light-emitting diode) backlighting. The three top choices for ultimate performance feature LED backlighting and are capable of displaying at least all of the entire Adobe RGB (1998) color space.

*The EIZO ColorEdge CG221*

## Eizo ColorEdge

Eizo's top-of-the-line monitor is the 22-inch diagonal ColorEdge CG221. It is capable of reproducing 98% of the Adobe RGB color space. The type of backlight is not specified, though I suspect that it is CCFL. The CG221 incorporates 16-bit per channel internal processing and 12-bit per channel LUTs (look-up tables), with data reduced to display 16.7 billion colors from a palette of 68 billion. The 12-bit look-up table of the ColorEdge CG221 can be calibrated using the bundled ColorNavigator software and a GretagMacbeth Eye-One, X-Rite MonacoOPTIX, or ColorVision Spyder2 calibration devices (sold separately). The monitor is based on an IPS (in-plane switching) LCD panel, considered the best for graphics applications and the type that gives the widest angle of view without color distortions of the three types of LCD panels. Street price is around $5000, making it the most expensive of the wide-gamut monitors.

## NEC MultiSync LCD

The NEC MultiSync LCD2690W2-BK-SV is part of the NEC SpectraView II graphics monitor line. The 26-inch diagonal monitor is capable of reproducing 97% of the Adobe RGB color space utilizing a CCFL backlight and an IPS LCD panel. The monitor features the SpectraView II

*NEC MultiSync LCD2690W2-BK-SV*

Color Calibration Solution, which combines a customized wide color gamut measurement sensor and associated color calibration and profiling software. It supports internal programmable 12-bit look-up tables (LUTs) for calibration and displays information at 8-bits per channel for a total of 16.8 billion displayable colors. Display Data Channel Command Interface (DDC/CI), a two-way communications link between the video graphics adapter and display monitor, allows all adjustments to the monitor settings to be made automatically. MSRP is $1449.

*LaCie 724*

### LaCie 724

The LaCie 724 is reputed to be a rebranded Samsung XL24, but with advanced electronics and packaging. It can deliver 123% of the Adobe RGB and 125% of the NTSC color spaces. Rather than the higher quality IPS or S-IPS LCD panel, it uses an S-PVA (Vertical Alignment) panel. Most PVA panels are subject to "color shifting," where critical viewers will notice slight color shifts from the center of the screen to the edges and when viewing the screen from different angles. They do deliver better blacks because VA panels offer higher contrast, but this may actually be a disadvantage for really critical work. IPS panels are more expensive, but have wider viewing angles.

The LaCie 724 is sold with a hood to shield the image from ambient light and full-featured blue eye pro Proof Edition calibration software. An optional LaCie blue eye colorimeter is available. The La Cie 724 series also embeds ColorKeeper, an advanced backlight stabilizer technology that constantly analyzes brightness and chromaticity of the backlight, and then adjusts it in real time. Included 14-bit per channel gamma correction look-up tables handle the data, but data is delivered to the monitor in 8-bits per channel. Street price is about $1750.

*HP DreamColor LP2480zx*

### HP DreamColor

Top of the list and considered to be the ultimate monitor for photographers is the 24-inch HP DreamColor LP2480zx. It was developed by HP in conjunction with Dreamworks Animation Studios to replace the CRT monitors that Dreamworks had always used. It is capable of reproducing 133% of the NTSC color space and comes pre-programmed to fully reproduce the sRGB, Adobe RGB and several other color spaces. To do this it incorporates internal 30-bit (10 bits per color channel) processing and a 30-bit LCD panel capable of producing 1.07 billion colors, smashing any 24-bit based monitor whose maximum is a mere 16.7 million colors. The monitor is based on an S-IPS (in-plane switching) LCD panel, the latest development of the IPS panel. MSRP has recently dropped from $2900 to $2000. No calibration device is included with the LP2480zx.

### It's What's Inside That Counts

Monitor calibration is essential with a wide-gamut monitor. So is a high-end video card. Do you remember I said that accurately reproducing the entire Adobe RGB color space wasn't as simple as just buying a wide-gamut monitor? Here's why.

*ATI FirePro V8750 graphics accelerator*

A gamut of a monitor specifies the boundaries of the color values that the monitor can display. The wider the gamut, the more space there is to display the colors fed to it, and the more of the visible spectrum you will see. But if you pass the same information to a wide-gamut monitor that you do to a monitor with a smaller gamut, the wider-gamut monitor will map the colors to the wider space, actually producing less accurate color because the same colors are spread further to fill the color space. That is why the monitors above have 12-, 14- or 30-bit look-up tables. They use the tables along with some method of color emulation to map the color correctly.

So, monitor calibration is essential in order to generate the LUTs. Without calibration, corrections you make on a wide-gamut monitor will look far different on a lower-gamut monitor. And an uncalibrated wide-gamut monitor will reproduce sRGB images with over-saturated magentas, yellows and oranges with cyans and blues in the shadows. Hardware calibration is essential for wide-gamut monitors, which is why several models come equipped with them.

The other essential hardware piece necessary to fully take advantage of a wide

*NVIDIA FX4800 graphics accelerator*

gamut monitor is a high-end video card. While ultimate wide gamut monitors will map 8 bits of color per RGB channel

to higher bit depths, ideally you want to send higher bit information to the monitor to begin with. Video cards that do this are now available on the market, from both ATI and NVIDIA. I will ignore those from Matrox since they have no Mac cards in this class and Mac support is more limited overall than Windows support.

Part of the reason for minimal Mac support is the Mac video interface. The DVI interface found on Macs until recently only supports 8 bits of color information per channel. Rather than adopting, as Windows has done, the industry standard DisplayPort interface that is capable of supporting 6 to 16 bits per channel, Mac has introduced the Mini DisplayPort interface. Mini DisplayPort supports the same higher bit depths as the full DisplayPort interface, but is smaller in size. Both ATI and NVIDIA provides Apple with video cards with the Mini DisplayPort interface to install in Macs, but there are no aftermarket cards available for Mac as of yet.

**Accurately reproducing the entire Adobe RGB color space isn't as simple as just buying a wide-gamut monitor.**

The situation for Windows computers is far different. Both ATI and NVIDIA produce a wide range of video cards with DisplayPort interface that are suitable for wide gamut monitors. ATI's top of the line FirePro V8750 includes 2MB of GDDR5 video RAM and two DisplayPort interface adapters. Street price of the V8750 is about $1500. The FX 4800 from NVIDIA with 1.5MB of video RAM also features two DisplayPort adapters. It is available for $1799. These and other cards in the same families from these manufacturers would be ideal for driving the HP DreamColor LP2480zx in full 30-bit mode.

A final note to Mac users wondering why the new LED Apple Cinema Display with mini-Display Port input connector isn't included. Sorry, but it just doesn't qualify as a wide gamut monitor. In fact, it isn't even all that suitable to photo manipulation at all. Even with calibration, the LED Cinema Display is too bright and too contrasty for accurate photo editing. Aptly named, the Cinema Display is ideal for video editing, watching DVDs and even looking at still images. But the monitors in this article are far better suited for image editing and adjustment.

In this economy, all this might seem beyond practical reach. But if you really want to see on your monitor what you saw when viewing the scene, a color-managed, wide gamut RGB LED monitor driven by a suitable high-end video card is essential. AC

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