The Spyder and the Eye

Two standards of display profiling and calibration updated

The single most important component to color manage on a digital imaging system is the display.

That's because all the images we preview in an application like Adobe Photoshop are composed of nothing more then a series of numbers, and Photoshop needs a calibrated and profiled display system to properly preview these numbers.

While many users feel comfortable using simple visual (eyeball) calibration products like the old Adobe Gamma to handle this important task, that technique is simply not an accurate or repeatable method for high quality results. Our eyes are great at viewing complex images for conducting color corrections or even color evaluations. However, our eyes are quite poor as tools for setting a device in an absolute and repeatable state, which is necessary when calibrating and profiling a device.

The use of an instrument, usually a device known as a colorimeter, is a far better solution. Colorimeters and the host software products that can drive them have become a far less expensive investment in recent years. It's usually an excellent idea to calibrate and profile a display system once a month.

At the recent Photokina show in Germany, two companies that have been producing affordable color management solutions announced new products for calibrating and profiling display systems. Since I had spent some time beta testing both products, I was asked to provide some impressions.
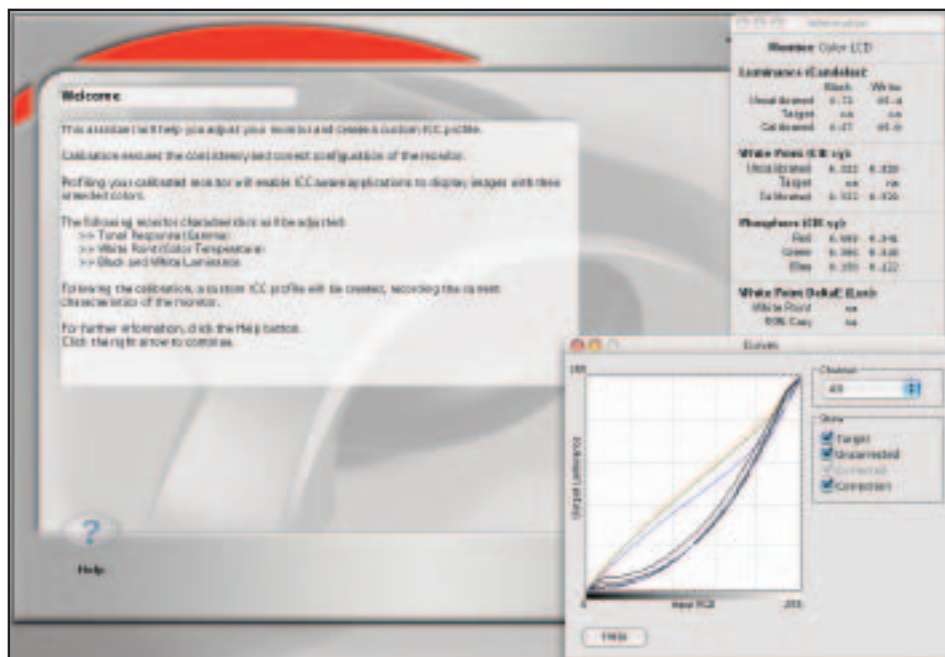

Figure 1: The main user interface for Spyder2PRO software with both the Curves window and the Information palette, which provides before and after calibration aim points.

ColorVision Spyder2PRO

The Spyder2 is a completely new Colorimeter from ColorVision and replaces the original Spyder that has been available for several years. This new hardware is mated with a new wizard-based software host called Spyder2PRO. This package will calibrate and profile both CRT and LCD display systems. In order to calibrate an LCD display, a plastic cover with a filter is placed onto the instrument to protect the delicate surface of an LCD from the suction cups that would adhere to a CRT display. The first issue I found using this new product was the considerable time necessary to calibrate and profile an LCD display. The process took nearly 18 minutes on my LCD Apple 15-inch Powerbook but only about 7 minutes on a 21-inch CRT display, thanks in part to this filter no longer being in front of the instrument sensor.

The new Spyder2 colorimeter is significantly improved over the original Spyder hardware, which is indeed good news. The original high-end software package from ColorVision, used to drive several colorimeters, was called OptiCAL. A separate package called PreCAL adjusted (pre-calibrated) CRT displays that had control over the individual RGB guns. The new Spyder2PRO replaces both products, provides a Wizard-based user interface that is much easier to use, and provides all the features of the original software packages. Online help and

instructions are available at each step of the process.

Calibrating an LCD display is rather simple since there are very few settings available to physically adjust this type of display system. A CRT display provides more adjustments, such as controls over the RGB guns for setting calibration aim points. Important settings like black luminance and white luminance can be specified, or the Spyder2 will measure and attempt to set these values automatically if so desired. The software has an Information palette that provides all the necessary feedback about the aim points specified by the user, such as the gamma and white point and the aim points actually achieved.

The Spyder2PRO software has a reminder feature, which will alert the user after a desired period that recalibration is necessary. At the end of the calibration and profile process, the Spyder2PRO software has a button that will toggle the final calibration on and off, showing the effect of this calibration on a supplied reference image. A "Validate Calibration" option allows users to check the accuracy of their previous calibration and profile session, which can indicate if another recalibration process is even necessary.

GretagMacbeth Eye-One Display 2

Although it's outside appearance looks like the original Eye-One Display product that has been on the market for several years, the Eye-One Display 2 is a new colorimeter. Under the hood, this new colorimeter has a new sensor that is both faster and more accurate according to GretagMacbeth. The Eye-One Display 2 can be used on both LCD and CRT display systems.

A major feature that makes this instrument different from the original is the ability to read ambient light after a user snaps a white plastic cover onto the unit. Ambient light measurements are useful to provide feedback to the user in setting up optimal lighting in and around a display system based on ISO specifications. Simply snap the cover onto the unit, hold it away from the display, and the software will provide a bar graph indicating the environmental conditions with feedback about the color temperature and lighting levels. This white plastic ambient light cover for the Eye-One Display 2 is used to calibrate the device and is a good protector for the sensor when not in use.

Eye-one Match version 3.0 software

Figure 2: The main interface for Eye-One Match 3.0, where a user can measure the ambient light in the environment by the display system. The color temperature and luminance in LUX++ is reported here.

accompanies the Eye-One Display 2, and its capabilities have been updated and improved from the previous version. Users of GretagMacbeth's older Eye-One Display can upgrade to this free version, although older colorimeters are unable to use the ambient light options. There are many new capabilities in version 3.0, such as the ability to specify a luminance level, a serious omission in the older software. A user can now select a specific or suggested luminance, as an example, 95cm/d2** for a CRT. This aids in allowing multiple display systems to match each other in the same environment. Eye-One Match 3.0 also adds an option that a user can set so that after an allotted time, the software will display a dialog reminding the user it's time to recalibrate and profile the display. The software is Wizard-based with two modes (Easy and Advanced) and provides onscreen help and suggestions for each step in the process.

At the finish of the calibration and profiling process, Eye-One Match provides a feedback screen showing the calibration aim points specified and the actual aim points produced. If mated with the more expensive Eye-One Pro Spectrophotometer, this package can create ICC profiles for scanners and printers.

How they compare

Both products were tested on a Powerbook 15-inch G4 Laptop and on a 21-inch LaCie CRT display hooked up to a single processor G5, both running OSX 10.3.5. Both products produced previews of images in Photoshop that were more accurate than what I saw prior to calibration and profiling, as one would hope. Testing the accuracy of a display and ICC profile after calibration can be subjective. There are several tests that can provide useful analysis, both conducted in Adobe Photoshop. (See tutorial, page XX)

Testing the accuracy of the black calibration display can be accomplished by creating a document in Photoshop set to black (R0/B0/G0). Then assign the display profile to this document and make a rectangle marquee in the center of this document in full screen mode. Using the Curves command, the trick is to see at what level the inner selection separates from the outer (black) surround. In a perfect world, one should be able to visually see the difference between R1/G1/B1 from the pure black around it.

With both products, I was able to see the differences on the 21-inch CRT between value 0 and value 2, which indicates excellent black calibration from both products. I found better gray balance from the Eye-One Display 2 profile, especially in highlights. The Spyder2 produced a slight magenta bias in highlights, but not enough to cause great concern. On the Powerbook, gray balance was much cleaner from the Eye-One Display 2.

Another test that can be useful is to load the display profile to be tested, assign that profile to a document in Photoshop that has a black to white gradient viewed at 100 percent. Since a gradient is completely smooth, any banding seen is the result of the profile and calibration.

In this case, the Eye-One Display 2 profile produced a bit less banding then the same gradient using the Spyder2-generated profile. In a prefect world, the gradient would be completely smooth as any banding seen is the result of the 8-bit video subsystem affected by the display profile look-up table. Some users may find the long 8-foot USB cable on the Spyder2 Colorimeter a thoughtful addition, especially if they have to connect to an actual CPU rather then a keyboard or hub. The Spyder2 should reach the display with cable to spare. The length of the USB cable on the Eye-One Display 2 is just over 5 feet, so it's possible some users may need a USB extender. ❏

Both the SpyderPRO2 and Eye-One Display 2 can be used on Macintosh and Windows platforms. System requirements are Windows 2000 and XP and Mac OS X 10.2 or higher. Both software products support ICC 2.0 and 4.0 profiles and both products can be used to calibrate profile a dual display systems. For more information, see www.colorvision.com and www.i1color.com.

** The candela per meter squared (cd/m2) is the standard unit of luminance. It represents a luminous intensity of one candela radiating from a surface whose area is one square meter.

++ LUX. Lumens per Square Meter, a unit of illumination. To provide an idea of the values discussed above, full daylight ranges approximately from 3,200 to 10,000 LUX, while a typical office is approximately 200 to 400 LUX. Twilight is approximately 10 LUX.