

# Working With Color

Color is an integral part of the desktop publishing process. It can be added to any element on the screen and edited using layout, drawing, or image editing software. This section examines how color is used in an electronic layout as well as the challenges to working with color on the desktop.

## Questions This Section Will Answer

- How does basic color theory apply to electronic prepress?
- What is the difference between the color scanned and viewed on the monitor and the color that is printed?
- How can different computer devices be made to perceive color the same way?
- How can color be corrected on the desktop?

## Terms This Section Will Define

- additive color
- subtractive color
- calibration
- color management
- under color removal (UCR)
- gray component replacement (GCR)
- trapping (overprinting, knocking out)

the color printed. Prepress specialists need to make sure that the scanned color, the viewed color on the monitor, and the printed color are consistent. The process for enabling this to happen is called calibration.

Calibration involves several factors. First, each single piece of equipment needs to be calibrated to produce consistent color over time. Then, each device's color characteristics need to match the other devices so that they all display color with identical characteristics. Lastly, your company needs to match and reproduce the colors that the customer has planned for a job. It helps if your customers also understand why different computer devices don't interpret color the same way.

Before these devices can be calibrated, a standard color environment needs to be created because external lighting conditions affect the way people see color. First, images should be scanned and viewed in a work area that has consistent lighting. The area to be used shouldn't be subject to glare. If it has windows, blinds or shades should be used to dim the light. If not, a consistently dim light source should be used. The color of the walls in the work area should be neutral and subdued, and the background color of the monitor should be set to a neutral gray, because bright colors around the images on the monitor can distort how the image colors are perceived.

**Calibrating the monitor.** A monitor that is not calibrated may not represent the true colors of the images. For best results, the monitor should be calibrated only after it has been on for about 30 minutes to give the colors time to stabilize after the computer has been activated.

Most image editing packages come with calibration utilities for the monitor. Some offer basic options like adjusting the representation of grays and colors, and some are more advanced and can adjust elements such as the brightest and darkest shades the monitor can display (the white point and the black point), even distribution of tones between white and black points (gamma curve), and color balance. Some of these advanced tools can also save and load multiple calibration settings for variable lighting conditions and matching a particular monitor's display characteristics to paper stocks for different projects.

Also, many CMSs provide a way to profile monitor display characteristics. Two monitors made by different manufacturers probably won't display color exactly the same way. A CMS profile can record a particular brand-name product's color characteristics.



## Reading Assignment

The Agfa prepress books contain lots of valuable specifics about calibrating a desktop system. Pages 12-13 of *An Introduction to Digital Color Prepress* as well as pages 10-11 of *A Guide to Color Separation* provide a basic introduction. Afterward, pages 34-35 of *An Introduction to Digital Scanning* discuss calibration in further detail.

flatbed and scans it, and then the software measures how much the scanner either matches or deviates from the target image. The software then records any deviations as a custom profile that can be applied to images after they have been scanned to correct color deviations.

Calibrating a printer that will be used for proofing can also be done using a CMS package. As previously stated, these packages have the ability to describe and record color characteristics of a variety of prepress devices and translate the characteristics to the other electronic devices.

Even after all the different hardware devices are calibrated, the colors of the monitor, scanner, and printer all need to be represented the same way. A system can be calibrated manually, but this tends to be time-consuming because it involves using a

## BASIC COLOR THEORY AND THE DESKTOP

If you'll remember from the color theory chapter of the *Home Study Course*, the printing field is concerned with two basic categories of color: additive and subtractive. With regards to electronic prepress, additive color is the color a monitor and scanner use. This means that red, green, and blue (RGB) are the primary colors of these two devices. When color appears on a monitor, red, green, and blue light beams are projected to the screen where they combine and form other colors. Even though both the monitor and scanner read additive color, a scanner still won't see red, green, and blue exactly the same way as a monitor. Thus, the scanned color and the displayed color will look different.

Printed process color is subtractive color, which is referred to as cyan, magenta, yellow, and black (CMYK). The subtractive system is used for mixing inks and printing color on paper. Because the printer is not using the RGB system, the color from a printer will look different than scanner and monitor color.

Essentially, all this seemingly complicated color theory is what makes working with color on the desktop quite challenging. The fact is, the color seen on the computer screen always looks *entirely different* from

After a standard color environment has been established, the devices can be calibrated. Many software utilities are available to accomplish this. What your customers need to remember is that calibration software isn't perfect, and just because a desktop system has been calibrated does not mean the monitor will display printed color. Ultimately, customers still need to rely on your shop's equipment for the most accurate color. A calibrated system will produce consistent color, not necessarily right color.

Some devices and image editing programs ship with calibration software. Also, color management system software (CMS) can be used. This is a software package designed to achieve consistent color by recording color characteristics of a particular device and then translating these characteristics to the other computer components in a "device-independent" way—a way that the monitor, scanner, and printer, can all understand even though they are based on different color models.

The CIE color model, developed by the Commission Internationale de l'Eclairage (International Commission on Illumination) has become the foundation for color management systems software because it focuses on human perception of color. The earliest form of this system was based on virtual primary colors that don't physically exist. They are theoretical, making them independent of any device or color model.

Hardware calibration devices are also available for calibrating monitors. These devices match the viewing conditions on a monitor to the lighting conditions under which the final output will be seen. They are most frequently used by those who process a high volume of scanned images, such as advertising agencies and service bureaus. To calibrate the monitor, they adjust the monitor's white point to the desired Kelvin temperature for viewing printed color—5,000. This automatically adjusts the other colors the monitor can display. These devices also let the user adjust the gamma curve and color balance and can actually work in conjunction with software calibration tools because they can save digital profiles of a monitor's color characteristics to a disk.

## Calibrating a scanner and printer.

Many high-end and flatbed scanners calibrate themselves when they are activated. Midrange flatbed desktop scanners use calibration software shipped with the scanner. This software comes equipped with what is known as an industry-standard grayscale or color reference target on film or a reflective medium, which is composed of various color "swatches" or samples that are industry standard colors. To calibrate a scanner, the user places the target on the

color reference target, such as the one that ships with desktop scanners, passing that target through the entire system, and making color adjustments to the equipment as necessary. This is strictly a trial and error process. Making all the devices speak the same color language is a task at which CMSs excel. After a CMS records the different color characteristics for each device, it navigates between the RGB and the CMYK color languages by using the CIE color gamut, which contains both RGB and CMYK colors. Most CMSs, such as Apple ColorSync, are Macintosh based, but Agfa Fototune and Kodak P ICC are two products that can be used with Windows software.

## Customer Service Tip



If color in your customer's job is critical, you may want to suggest to the prepress staff members that they work closely with the customer, because the colors the customer sees on his or her monitor and printer will not be the same as those produced on your shop's equipment. Your prepress staff can then show the customer what colors look like from their equipment, so the customer can get a more accurate representation of what the colors in the document will look like when printed.