

What is a color management system?

What is color management? It's the process of maintaining consistent color throughout an entire workflow.

Color management is simple when you have only one output device and not much printing. With a large volume of files coming from many sources under tight deadlines, and the need to output to a proofer, printer and the web, it is imperative to establish good color management practices, within an objective technical system. Translating color accurately between devices and files is the core of color management and this is done with ICC profiles and the CMM (Color Management Module).

Components of a color management workflow.

Color management is not only about color engines and ICC profiles. There are a number of issues that come into play, from the color of your walls, to the quality of your monitor and many more. Here are a few that are within your control, and once properly set up, will greatly improve your output:

- A standardized viewing environment
- Calibrated and profiled devices
- The right desktop printer
- Color-managed files
- Applications that support color management
- Profiles

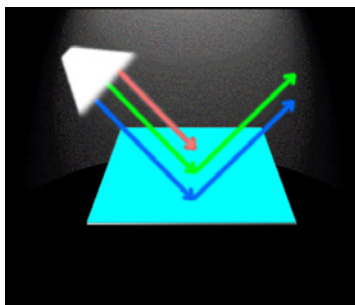
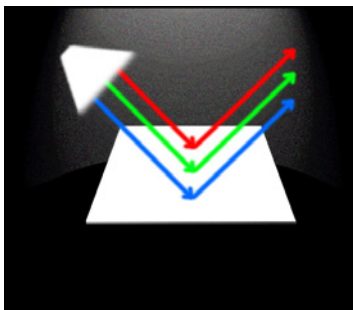


Figure 1

The illustration below (A) depicts a white surface viewed under balanced light. If the same surface was viewed with a light that is lacking in the red part of the spectrum, the paper appears more cyan. (B).

A standardized viewing environment

Your light source is the most critical factor in your viewing environment. Color is created by light projected on a object which reflects or absorbs part or all of its spectrum. If the spectrum of the light source is limited, the light reflected back is limited as well (Fig. 1). When you view a proof under normal fluorescent light, then under incandescent and natural lighting, you will see how different the proofs look. The first standard to establish will be to view your proofs in the same light your printer is viewing them, probably under the US industry standard, 5000 kelvin or (daylight 50) lighting (Fig. 2).

A standard environment for viewing color-critical work includes neutral grey walls and minimum glare. Red walls, for example, reflect red light and will add red light to the image you are viewing. Keep your environment consistent and remember that if it is far off standard, you are not seeing the same colors as your printer.

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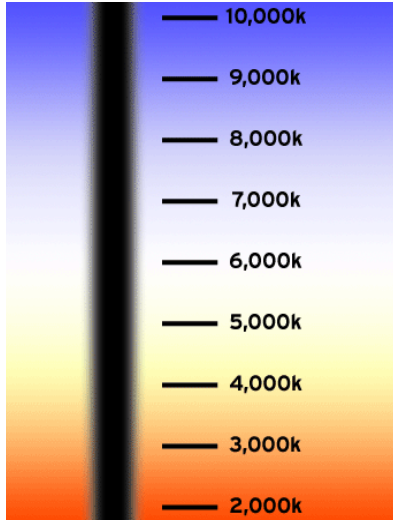


Figure 2: Kelvin

A unit of measure to indicate the color of light. 5000 kelvin is considered the equivalent in color to high noon sunlight. A lower value is warmer in color or more red and a higher value is cooler in color or more blue.



Eizo is well known for its top-of-the-line graphic monitors. Pictured here is the ColorEdge CG211.

Which white point setting should you choose? **6500K**
What is the right Gamma setting? **2.2**

Calibrated and profiled devices

Calibration is the process of bringing a device into a known state or standard using methods that depend on the device. Standards generally include the following:

- Contrast or the maximum white and black values
- White point or the color of white
- Grey balance
- Density of solids colors

Once calibrated, the device is ready to be profiled or fingerprinted. This is done by outputting swatches of known values and reading them using a colorimeter or spectrophotometer. A custom profile is determined by how the device reproduces those values.

Standard viewing environment

- Consistent ambient lighting
- Daylight (D50) bulbs
- No glare on the monitors
- Neutral surrounding colors

Display

When choosing your LCD display, it is important to use a professional model of higher quality because it will provide greater color accuracy than monitors designed for general business. Monitors must be calibrated regularly. Look for one that offers a wide gamut, calibration capabilities, adjustments for brightness and contrast, quality of the panel, viewing angle, uniform display, and contrast ratio.

Most operating systems come with software calibration options that rely on subjective criteria which often give inaccurate and inconsistent results. The best results are obtained using a calibration package consisting of a colorimeter and software. These are generally inexpensive, usually configured to allow multiple users, and are easy to use. The software takes the user through the calibration process and then creates a profile which is automatically activated. Eizo makes a proprietary software. X-Rite offers three choices, and the more discerning user should consider ColorEyes from ICC (Integrated Color Corporation)

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Printers

Before they can be profiled, printers must be calibrated (brought to a known state). Many printers and scanners have built-in basic calibration programs that will calibrate to factory standards. Other more sophisticated options are packaged with some RIPs (Raster Image Processor) and with profiling software. Advanced features include tools that control ink usage and linearization procedures which are particularly important because they improve the light to dark transitions. Once calibrated, the device is ready to profile. A profile is made by printing a target, reading the print with a spectrophotometer, and feeding the data to the profiling software. Most often, profiles will require some editing. This is a costly and technical process which often requires the services of a color technician.

The most recent inkjet printers, Epson, HP, and Canon, come with optional or built-in spectrophotometers. If these are somewhat expensive, their usefulness is undeniable because, once correctly configured, your printer will linearize itself automatically.

Color managed files

A color-managed file is a file with a profile. If an image does not have a profile, the monitor and the printer have no way to interpret its values.

Applications that support color management

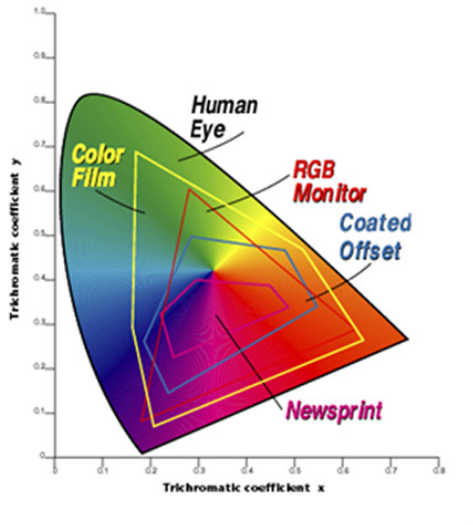
Most applications used in publishing support ICC profiles. How you use color management tools and features determines how accurately the files will print. Today, Adobe applications have set **color management** as the default, forcing the user to use the tools or to actively turn it off. What color settings to select depend upon the many variations in your workflow. You will find a detailed explanation of how to choose the right settings and how to print from your applications, in a separate white paper titled [Printing from Color-Managed Applications](#).

Profiles

ICC profiles are the key that makes color management possible. ICC stands for International Color Consortium, whose founding members wrote a standard data file format for exchanging color information called ICC profile. When all the devices in a workflow are profiled, including the scanner, digital camera, monitor, desktop or large format printer, and press, it becomes possible to predict on screen how the file will print in house and on press. This is particularly useful to publishers who use low grade papers like newsprint.

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Figure 4



This figure illustrates how different color gamuts are. The human eye sees colors that can not be reproduced at all. Newsprint, in green, has the smallest gamut. Being able to predict which colors made it into this gamut is very useful and having your monitor show only what newsprint can print will enable you to compensate for lost data.

For instance, because a designer is able to see how on screen that a page printed on newsprint will look much duller and the shadow areas will be plugged up, he or she will use retouching techniques to “draw out” color and optimize the file as much as possible.

Figure 4 is an example of the gamut of a monitor compared to the gamut of newsprint. This illustrates well how much is lost and how necessary it is to predict specifically what data is lost.

Summary

Color management is the process of maintaining consistent color throughout your workflow. Fully implemented the colors you see on your monitor can be consistent with the final output.

Color management is **not** color correction, a poor quality image will be faithfully translated in the final output. But since your monitor will more closely represent the output, the color correction process is much easier and predictable.

The first step to creating a color managed workflow is calibration. This is the process of bringing your output devices into a known repeatable state or standard. Once calibrated, the device can be profiled or fingerprinted. For the profile to remain accurate, the calibration must be maintained.