Color Management for Artists

Get the best color from your display

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wacom®

How to use this document

Congratulations on your interest and desire in achieving great color! This guide will be a tremendous resource for you.

This document helps you master digital color. Like a cookbook, this guide doesn't have to be read front to back. It's divided into bite-size pieces so you can quickly get the information you seek by using the hyperlinks in the Table of Contents. It reviews how digital color is created, and how its creation may need to differ depending on its final destinations. Next, it gives you professional tips on configuring applications used every day by creative artists. It pays special attention to color in video, an area of rapid change and evolving standards. Finally, it shows you how to use the power of contemporary hardware and software

to preview your work's final appearance on screen, saving time and money while avoiding surprises.

Throughout this document, Wacom's Cintiq displays are used to show digital color concepts such as the importance of keeping display color consistent from day to day and week to week. These concepts are the same for any digital artist and display. Be sure and check Wacom's website for the latest inspiration, updates, tools and techniques. To digital artists everywhere, our best wishes, and our thanks for the work you do. Here's to great color around the world!

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Good color is essential

Excellent color quality is critically important for creative artists and editors in modern workflows.

The fast-paced rate at which modern artists must work requires that color is done right the first time, every time. There's no room in the schedule for re-creating or re-editing.

To ensure best configuration of color tools used in creative workflows, a small amount of knowledge mixed with excellent software and hardware will provide a quick and easy setup for optimal color. The information in this guide shows you and other artists how to configure your workflows for best color in multiple creative workflows, featuring Wacom's new Cintiq 27QHD Pen and Cintiq 27QHD Pen and Touch creative displays. The knowledge in this guide will be useful for all creative digital artists, regardless of the display you use. It will help you optimize your workflow, get the most out of your tools, and spend more time creating, less time correcting.

Introducing new tools for artists

Great color demands great displays. Whether you're a photographer, illustrator, animator, video editor or designer, you (and your eyes) need a top quality display to make you the most productive and help you do your best work. The Wacom Cintiq 27QHD displays are perfect color partners.

Display Quality

Working in color or grayscale, the Wacom Cintiq 27QHD displays are designed to help you judge critical color values on-screen easily and effectively, starting with the finish of the display. Unlike high gloss screens, which cause annoying reflections, the Cintiq's matte finish simulates real world color more closely. The color gamut of this screen exceeds the range of color which can be printed on a standard press or displayed on the Internet, or projected in a digital theater, so you can use this display as a reference monitor to proof your work before you print or post to see how it will appear in its final form.

A great display starts with a great panel. The panel used in the Cintiq 27QHD is one of the highest quality display technologies available, called In-Plane Switching. In-Plane Switching (IPS) delivers an advanced color experience.

This technology was invented to improve the quality of color and contrast, as well as consistency from top to bottom—critical when judging color on-screen. The Cintiq 27QHD displays provide a 178° viewing angle, allowing a group of people to see the same color while gathered around the display, as well as helping to make sure the color viewed is consistent. Trustworthy collaboration is only one of the benefits of this technology—better quality displays are easier on our eyes, delivering more faithful color when color is managed correctly.

Why color is important in workflows

Color enhances our lives, and is used everyday by artists to express themselves, create work for their clients, build brand identity, and move their audiences. Good color is critical.

In our artistic and professional lives, consistent color is essential. Keeping color the same, so that originals match displays and displays match outputs will save money and time, increasing efficiency and productivity. In certain workflows, there are also legal requirements for how color is used and reproduced, which must be managed critically. Corporate identity colors in logos such as the Wacom logo shown on the right are an example of color that must be reproduced consistently each time, every time, to protect the brand and trademark. Artists and designers deserve to know they can match the color of originals all the way from the initial creation of the digital image to the multiple final destinations their work will serve, avoiding the long hours of frustration caused by unmanaged color.

Making this color behave in consistent fashion as it moves through our devices has not always received the attention it deserves from creative artists, who may falsely perceive managing color as too difficult to be bothered with. That's unfortunate. Modern tools and software make color easier to control than ever. The rewards are well worth the small effort needed.
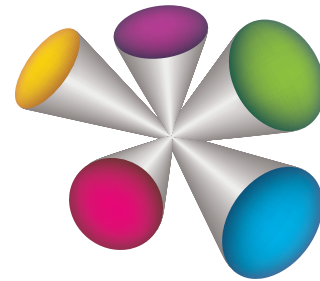
Managing color saves money and improves quality. Some photographers make a dozen prints to get the one they like, regardless of expense, while designers struggle to print their color to match the color they specified in their original designs. Most of those struggles can be eliminated in a color-managed workflow, and should be. Artists should be able to trust that a video, a printed piece, or an image for the web will each match the original, and not be surprised by color different than expected or desired.

To create color consistency, it helps to know concepts about how color works. These are useful for creating and designing in color, as well as managing color. This guide provides those fundamentals so you can build a firm color foundation for your work and art.

The digital workflow

As we work, color follows a start-to-finish process called our workflow. Whether working in graphic design, print, video, photography, animation or any creative digital pursuit, all digital artists share this workflow, each customizing for specific needs. The diagram in Figure 1 shows the four basic steps of color in any digital workflow: input, display, editing, and output.

The basics of color workflows

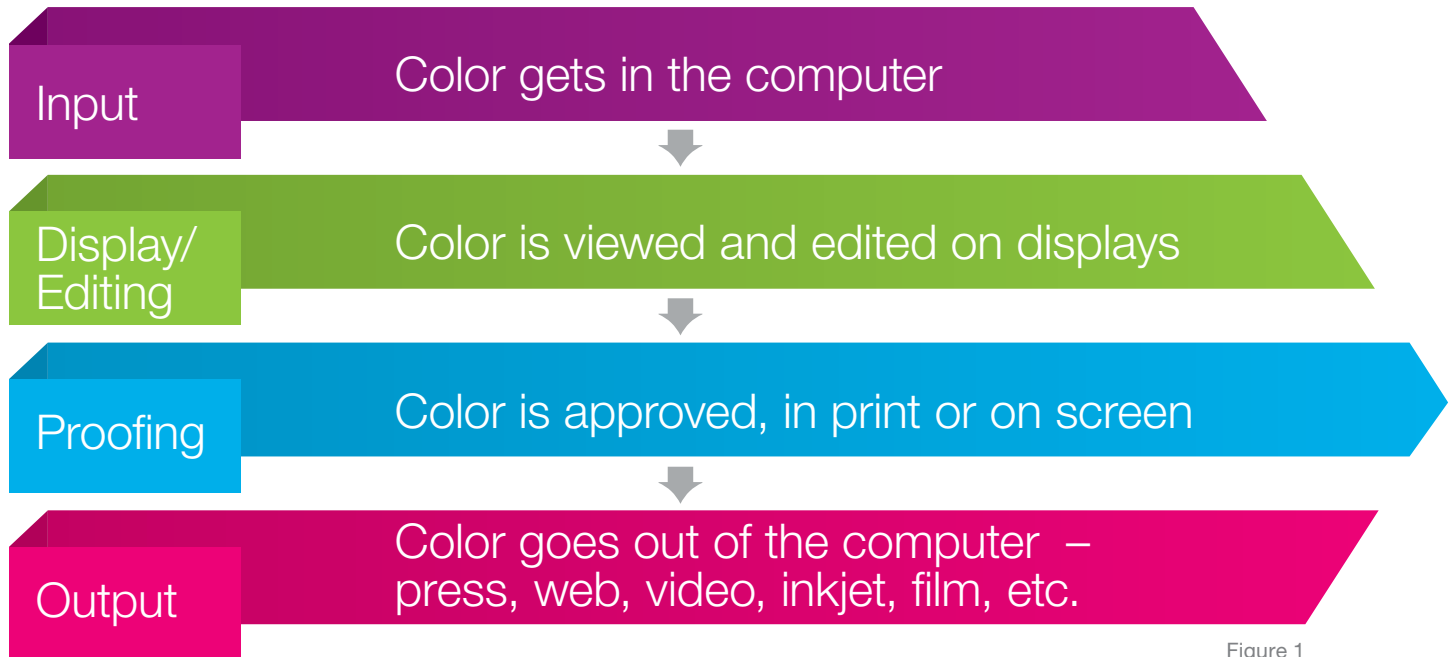| Input | Color gets in the computer |
Display/ Editing	Color is viewed and edited on displays
Proofing	Color is approved, in print or on screen
Output	Color goes out of the computer – press, web, video, inkjet, film, etc.

Figure 1

- **Input** — color gets in the computer. This can be created on the display, imported from a camera, or from a file created using a scanner.

- **Display/Editing** — Digital color is edited on a display.

- **Proofing** — A finished job is previewed on a display to see its final appearance.

- **Output** — Color leaves to go to its final destinations, each requiring different color handling.

Color can be managed to be extremely consistent and as high a quality as possible in each of these steps with just a little effort—and should be.

How color works

Color comes to our eyes in two different ways. We see color in light emitted directly to our eyes, such as light shining out of a computer display or a light bulb. Other color is reflected from objects to our eyes. The main challenge of making color consistent comes from the differences between these two ways our eyes see color.

The color we see coming from a display is called emissive color, because it is emitted directly from the device. The colors that are emitted are made up of red, green and blue light. When those three colors are added together in equal amounts, they combine to make white light, as shown in Figure 2. Other colors are created by mixing various combinations, shown in the overlapping areas. Every color our eyes see is a combination of red, green and blue light, because our eyes have red, green and blue receptors.

RGB color
The additive (emissive) color model

Figure 2
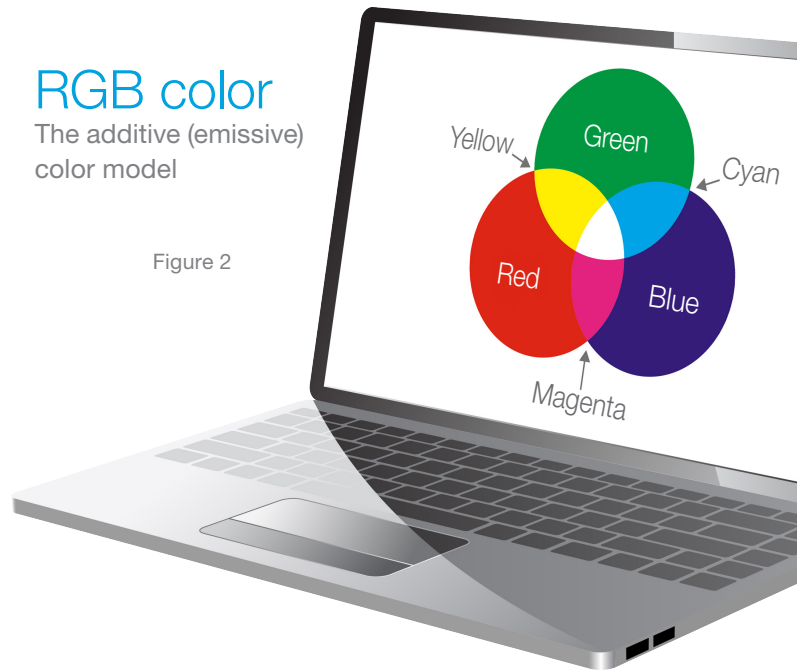
The other set of colors

The second set of colors our eyes see comes from light which is reflected from objects, instead of being emitted by the objects. When white light hits the object, some colors are absorbed, being subtracted from the light hitting the object. Others are not absorbed by the object. These unabsorbed colors reflect from the objects, and come to our eyes. This is reflective color, also referred to as subtractive color. Reflective/subtractive color is built out of cyan, magenta, and yellow pigments (Figure 3). When light strikes pigmented objects, parts of the white light are subtracted as these parts are absorbed; what's left is what we see when it's reflected to our eyes.

Figure 3
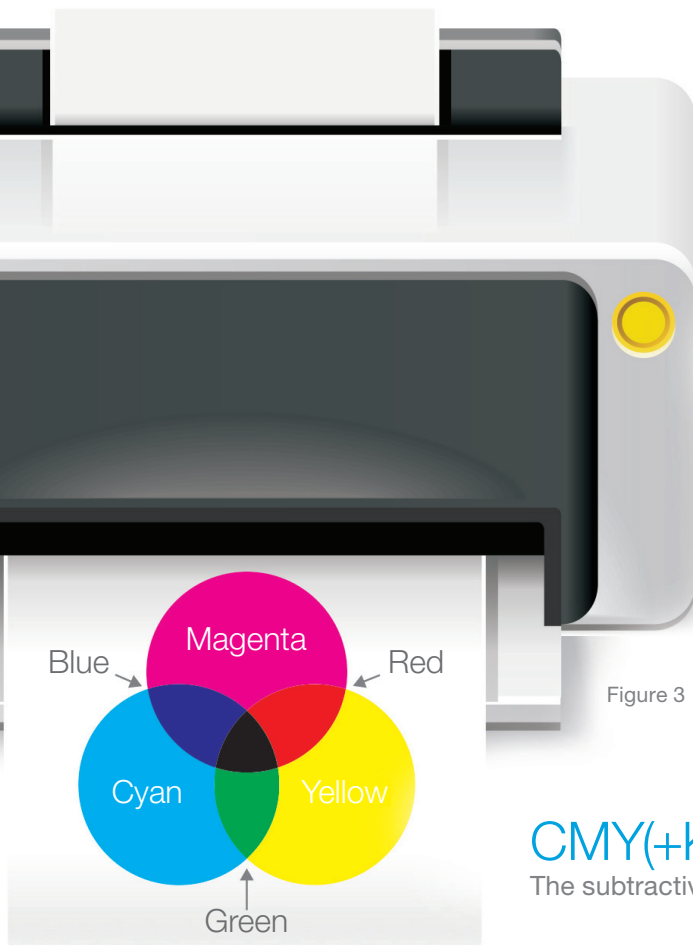
CMY(+K) color
The subtractive (reflective) color model

This subtractive/reflective color is usually referred to as CMYK color, for the standard inks used to print on printing presses and in other printing devices. Black is added as a fourth color, represented by the letter K. This allows for a purer black to be printed than can be created with cyan, magenta and yellow inks, which, when mixed together, make a rather unappealing brown instead of a pure black.

Additive/emissive color is usually referred to as RGB color, for the three primary colors of light (red, green and blue) mixed to make all the colors we see. The gamut of color available using CMYK is significantly smaller than RGB gamuts, as shown in the outlines of Figure 4. This makes conversions from what we see on a screen to what we see in print sometimes very problematic, as shown in the half-and-half graphic in Figure 5, using Photoshop default settings to convert to CMYK. Note that when you view Figure 5 on-screen, the image may show an even bigger difference between RGB and CMYK than it will when printed.
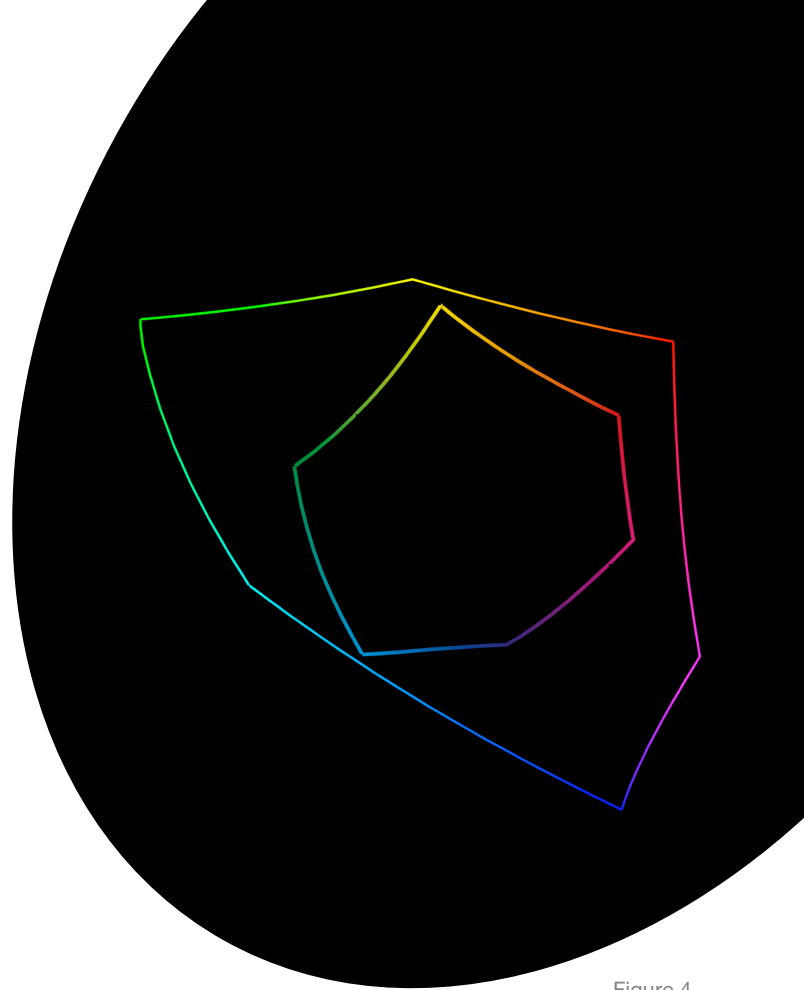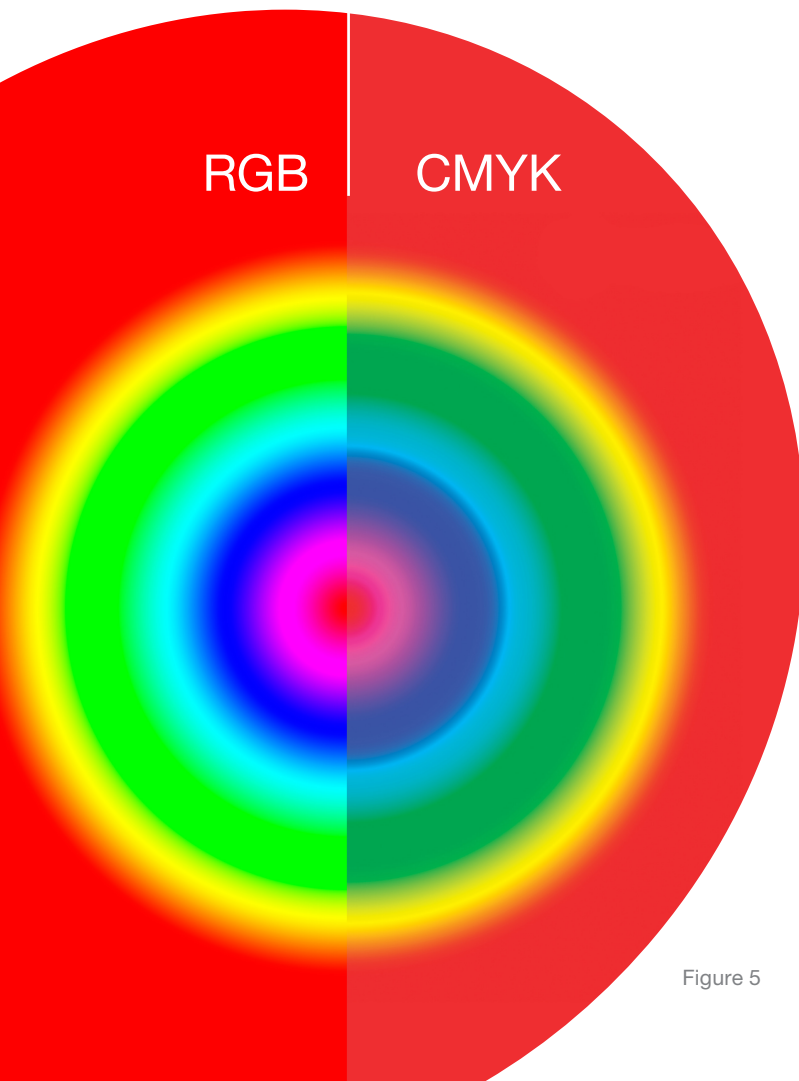

Figure 4

RGB | CMYK

Figure 5

It's the job of good color management to minimize the differences in final outputs, so that this loss of color is kept as small as possible. Well-managed color on displays such as the Cintiq 27QHD series helps the creative professional predict and minimize these color changes when converting color.

How our eyes see color

Brightness vs. Colors

Our eyes have two kinds of receptors, one set to sense brightness, another to sense colors. These receptors, called rods and cones, are found at the back of the eye, as shown in the diagram at right (figure 6). The rods sense brightness and the cones (3 different kinds) sense ranges of light frequencies roughly corresponding to red, green and blue light. Rods can respond to a single photon, whereas cones are only activated when sensing tens to hundreds of photons. This explains why it's difficult to see much color when viewing in low light, such as moonlight. The lower the amount of light, the less the cones are stimulated to see color, while the rods easily see shades of grey, needing much less photon stimulation.

Seeing White

Our eyes are phenomenally flexible when they view color. We can move from the blue-grey light of an overcast day into a house lit with warm yellow bulbs and not notice that white appears very different in those two settings. Figure 7 shows the same image under three very different kinds of lighting so you can see the difference. When only one color of light is present, our eyes automatically balance the color of white light we're using to see our surroundings, and thus the appearance of the surroundings themselves. When multiple colors of white are present in different light sources, we see the strong difference in colors of white. Displays, scanners, cameras and critical proofing attempt to auto-balance white in the same way, but require more management for best results.

Iris
Lens
Cornea
Retina
Macula
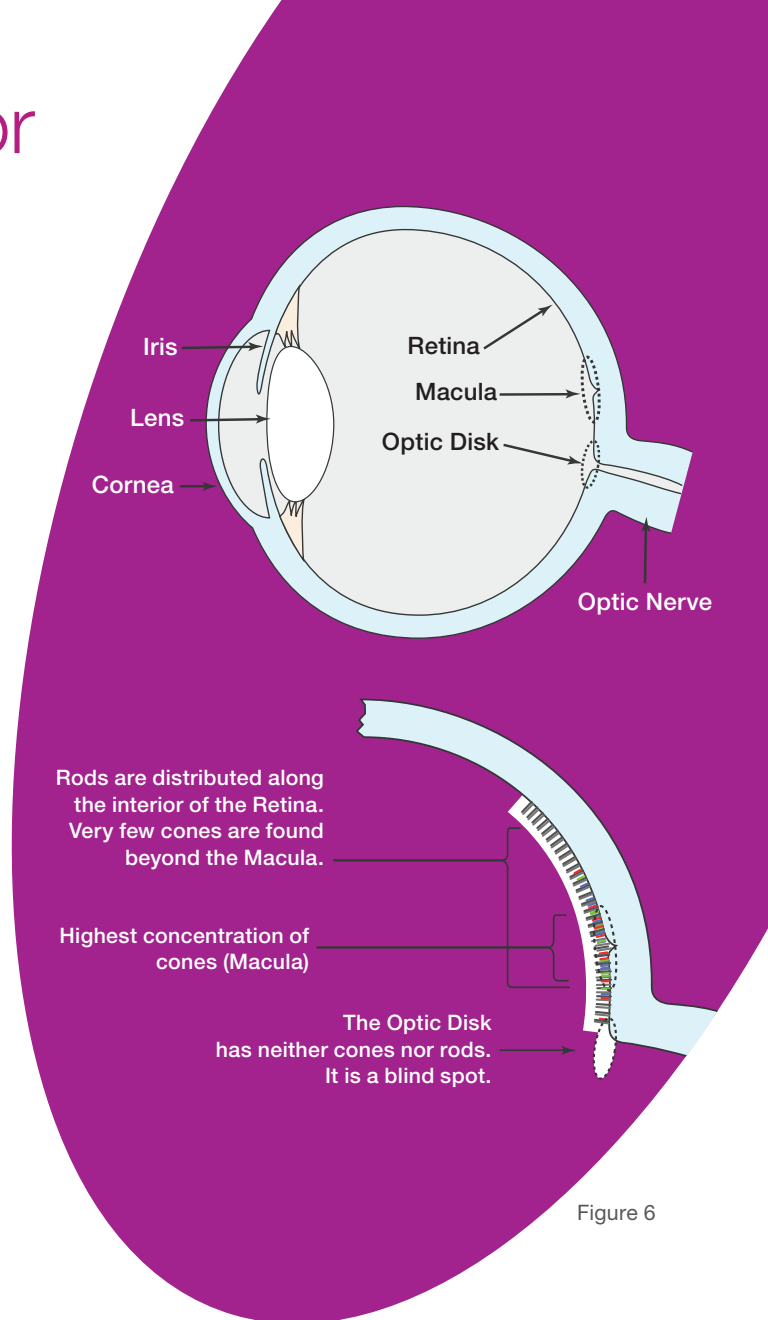Optic Disk
Optic Nerve

Rods are distributed along the interior of the Retina. Very few cones are found beyond the Macula.

Highest concentration of cones (Macula)

The Optic Disk has neither cones nor rods. It is a blind spot.

Figure 6

Figure 7

Courtesy Graphic Technology, Inc.

Figure 8

Every device in a color workflow will image color differently. Some will record similar color; some will be very different. The art and science of color management is all about making each shade match as closely as possible from original to final output, within the limits of each workflow device's ability and the artist's requirements. This sounds intimidating to some people, but once the applications are configured to meet your needs, most of the work is done, and color will be managed automatically without having to think about it. To do this, communication about the color behavior of each device and the applications we use to work in color is essential.

Adobe® applications—Photoshop,® InDesign,® Lightroom,® Illustrator,® Acrobat® Pro DC and After Effects®—have well-implemented support for color management. Corel® supports color management in several applications, including CorelDRAW® Graphics Suite and Painter,® while Autodesk® supports color management in Autodesk® Maya® and other applications.

Support for color management in many applications requires initial setup, because the default settings differ from what many users require. Without these custom settings, users won't enjoy consistent color from Photoshop to Illustrator to InDesign to Acrobat, for example. These settings give the applications essential knowledge about the color devices you're using and what results you want. Later in this document, we offer setup tips for best color practices in a variety of applications favored by Cintiq users and other artists.

Speaking a Common Language

Most software applications used by artists today have some support for color. The best have full support for ICC color profiles. These small files are used to describe the specific color behavior of a particular device, using a standard defined by the International Color Consortium (ICC).
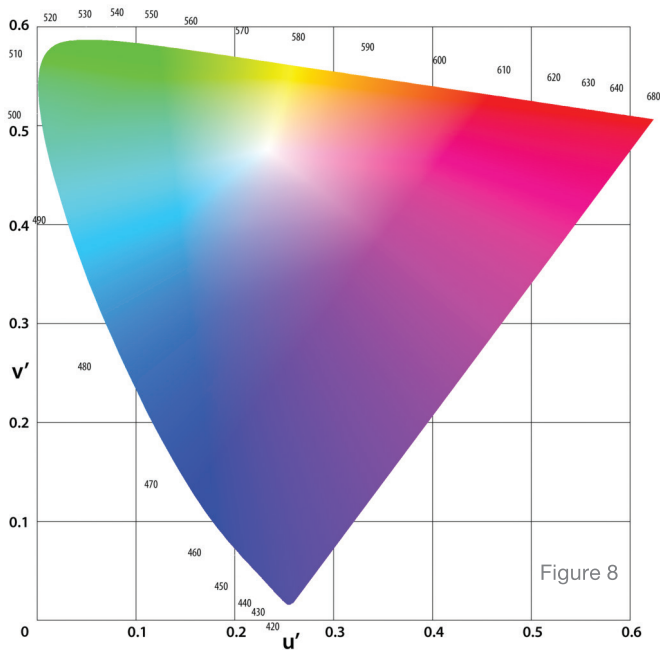
This standard was created by building on the work of the International Commission on Illumination. This group, referred to as the CIE (using its French initials), used measurements of many pairs of eyes to develop a model of what a normal, healthy human eye sees when viewing color. This ensured that any color standards that would be developed were matched to what human eyes could actually see. The three-dimensional model of the measurements results is usually shown in two-dimensional cross section, as in the graphic in Figure 8. Notice that the human eye sees many more shades of some colors than others.

Building on CIE research, the ICC defined a format for transmitting color information, so that any application using ICC color profiles could communicate color consistently to any other application also supporting ICC profiles. These color profiles can be overlaid and mapped against the diagram shown in Figure 8, so that we can compare the range of color each device in our workflow delivers to us against the entire gamut of color our eyes can see.

Theory vs. Practice

Various entities have defined theoretical standard color spaces (ranges of color, or gamuts) that are widely used in creative workflows. When theory and practice meet, it's good to compare the standards against the tools we currently use. One of the most widely used standards is named sRGB, where the lower case 's' stands for 'standard'. It was designed for use in a standard office workflow, using standard displays and standard printers.

The outline of the ICC color profile of the sRGB color space shown in Figure 9 displays a good amount of color.

However, the overlay of the ICC color profile for the Adobe RGB color space in Figure 9 shows an even greater amount of color, often better for capturing, editing and designing color for most destinations, even those that ask for sRGB in a final file. It's always possible to produce less color in a final file; it's not possible to add color back in which wasn't there originally.

Comparing color gamuts

Comparing those two color spaces against the capabilities of a display is very instructive. Properly configured, the Cintiq 27QHD displays can show more than 97% of Adobe RGB, enough to edit video for the Rec. 709 specification, edit images for photo labs in either sRGB or Adobe RGB, create and export color for web browsers (currently best exported in sRGB), or proof color on-screen (soft proofing) for standard CMYK presses, all without making color compromises.
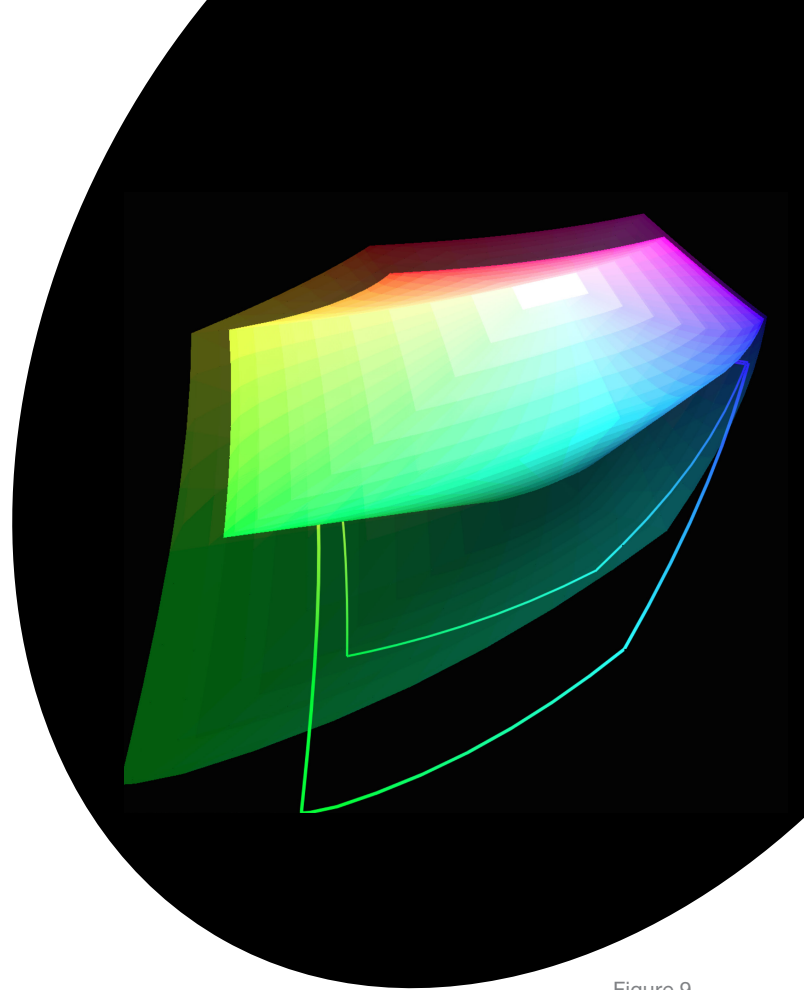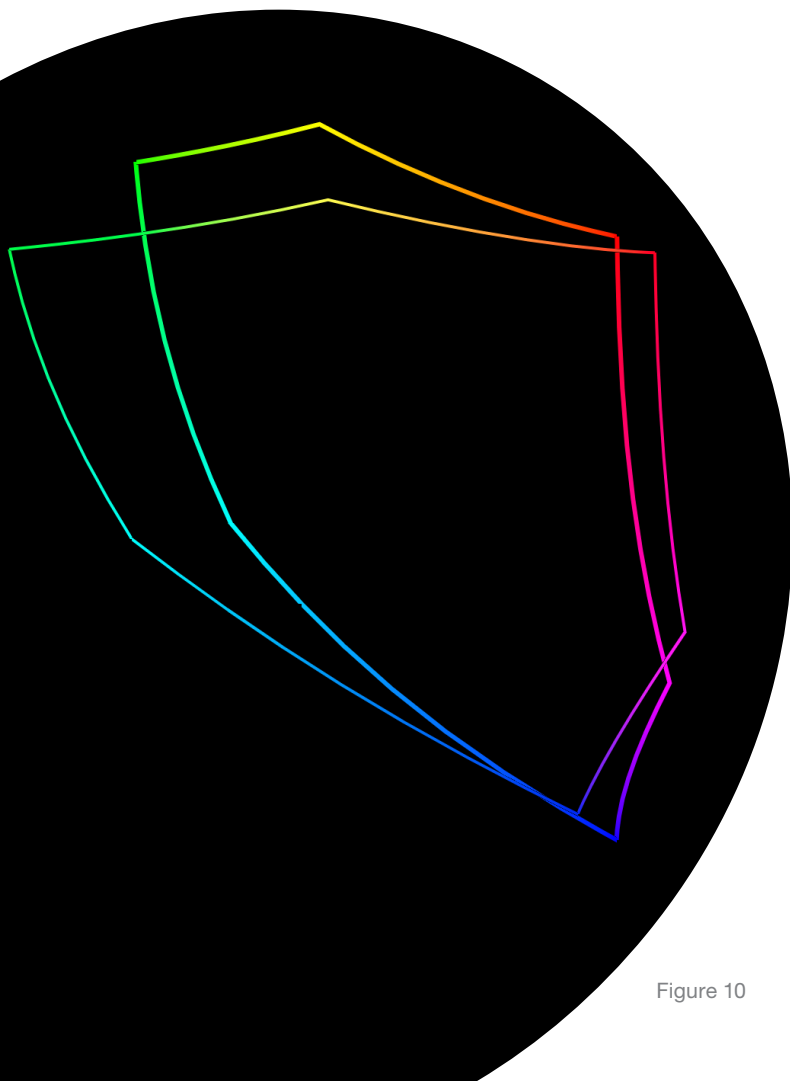

Figure 9

Figure 10

These comparisons are very useful when making purchasing decisions. One display will often display a significantly smaller range of colors than another, such as this comparison shown in Figure 10. Artists and editors wanting to see all the color possible can use comparisons such as these to be certain they're getting the best color possible in their workflows, or to be aware of potential problems if their current tools deliver less than best-of-class color.

In Figure 10, the sRGB gamut is shown with a laptop display gamut inside it. Users needing to see all the color in sRGB, the wider gamut shape in the screen capture, might want to plug a Cintiq 27QHD display into their Apple® MacBook Pro to enjoy both portability and a larger color gamut while editing critical work. The Cintiq 27QHD displays provide almost 100% of Adobe RGB in addition to 100% of sRGB.

The value of 10-bit color

The number of shades of color available in a program or on a display is measured in bit depth. Standard displays show us 8-bit color. By default, programs such as Photoshop® work in the same 8-bit RGB color, though they support a higher bit depth when available. In 8-bit color, for each channel (red, green or blue), there are 256 shades possible from pure black to pure white.

$$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 256 \ (2^8)$$
$$256 \times 256 \times 256 = 16{,}777{,}216 \ (256^3)$$

When the three channels are multiplied together (256^3), it's possible to have 16,777,216 shades of display color. While more than sixteen million shades sounds like a very large number, an even higher bit depth is desirable in creative workflows, giving a greater sense of depth in some work, and smoother transitions in blends in other work.

The Cintiq 27QHD displays make 10-bit color available to users who connect their displays to their computers using their video card's DisplayPort connector. These computers must support DisplayPort technology, their video cards must support the resolution the Cintiq 27QHD displays require, and the applications used must support 10-bit color.

This color bit depth provides 210 bits per channel; 210 = 1024 shades for each channel, delivering 1.07 billion shades of color!

$$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 1024 \ (2^{10})$$
$$1024 \times 1024 \times 1024 = 1{,}073{,}741{,}824 \ (1024^3)$$

The 16.7 million shades of color from an 8-Bit display are a little bit more than one and a half percent (0.015625) of the color available on a 10-bit display. Color at this level provides state of the art shading and depth. The quality of this display makes it suitable to use a a reference display for final output, a key indicator of display quality. A Cintiq 27QHD is a smart investment for the future as this level of color depth expands into the workplace. Users purchasing a Cintiq today can use it in high-end color workflows well into the future.

Preparing your Cintiq for great color

Use your display in the best environment for consistent color

You've already started well, by choosing a display that delivers quality color. Now put it where it can do its best work. The optimal environment for great color on your Cintiq is one where no light strikes your display directly, and light in the room does not overpower the light coming from the display. Stray light bouncing around degrades the quality of images on any display, and can cause you to make faulty decisions about color, brightness and contrast in your work. This requires expensive correction(s) later.

For best color, set your display in an area without strong lighting or lots of windows. Cover or turn off large light sources, such as windows or strong overhead lights. Aim to have the least amount of light in the room to navigate safely. If this is not possible, consider surrounding your display with shields that block light from striking the display, such as a deep-set box created of black foam board or other sturdy, non-reflecting material. Controlling light is a critical part of getting great color on your display.

Change any lights in the room to daylight color temperature bulbs whenever possible. These bulbs are available at hardware stores and specialty color and lighting retailers, and are worth the investment.

Use the supplied DisplayPort connection (as opposed to a standard DVI or HDMI connector) to yield 10-bit color for the the widest color gamut. Consult the Cintiq User Guide for instructions on using the DisplayPort. The Cintiq User Guide is found as a help tool in the Wacom Desktop Center, installed when you installed the Cintiq driver.

Make color consistent day to day by calibrating your display regularly

We calibrate displays to make sure they work the same way consistently, similar to tuning cars or musical instruments. We need consistent color—the same this week as it was last week, and each week going forward. Calibrating makes that happen. Many programs such as Photoshop® and After Effects® assume you have calibrated and profiled your display and act accordingly, whether you truly have done this or not. If you haven't calibrated and profiled your display, each application will use defaults which might be OK for consumers, but certainly not precise enough for creative professionals. For professional work, we calibrate regularly using an instrument and software to ensure precise results. How often? Some users calibrate weekly, many bi-weekly or monthly. A few super-critical workflows require daily calibration. Usually, every two weeks in color-critical workflows is sufficient on most contemporary displays, assuming environmental conditions or workflow requirements haven't changed.

The process is quick and easy—and delivers superior results. Once finished, profiling software automatically installs the new color profile in the operating system to use your new color information without you having to think about it again.

Courtesy Graphic Technology, Inc.

Wacom Color Manager

For absolute best color results on the Cintiq 27QHD, Wacom recommends a package of software and display calibration hardware named Wacom Color Manager, developed in collaboration with noted color management company X-Rite® (Figure 12). This package will also work with other displays in your workflow. It even includes a tool which can help you ensure that every display in your workflow matches the others as closely as possible.

You may already own a color measuring device, but an older device may not be capable of correctly measuring modern display hardware. For best results, use Wacom Color Manager for calibrating and profiling your display.

The software and hardware will do most of the work for you. Presets support a variety of workflows, so you can choose the one most closely matching your needs. You can also create and save new workflow presets for an exact match to your color requirements. Tips for optimizing color on your Cintiq display using Wacom Color Manager follow on the next page.
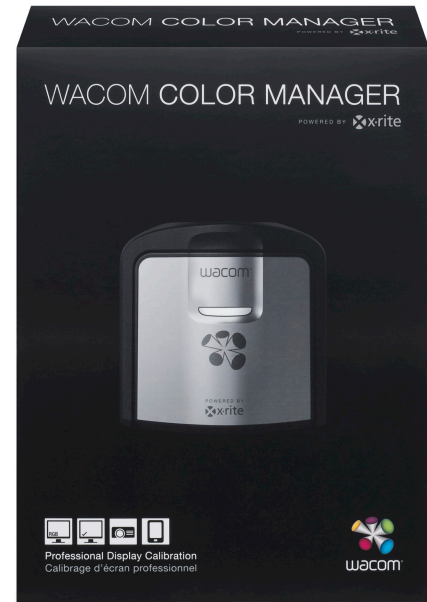

Figure 12

Configuring Wacom Color Manager

Step 1 – Install Color Management software

Install the Wacom Color Manager software and plug the measuring device (Figure 13) into a free USB port on your monitor.
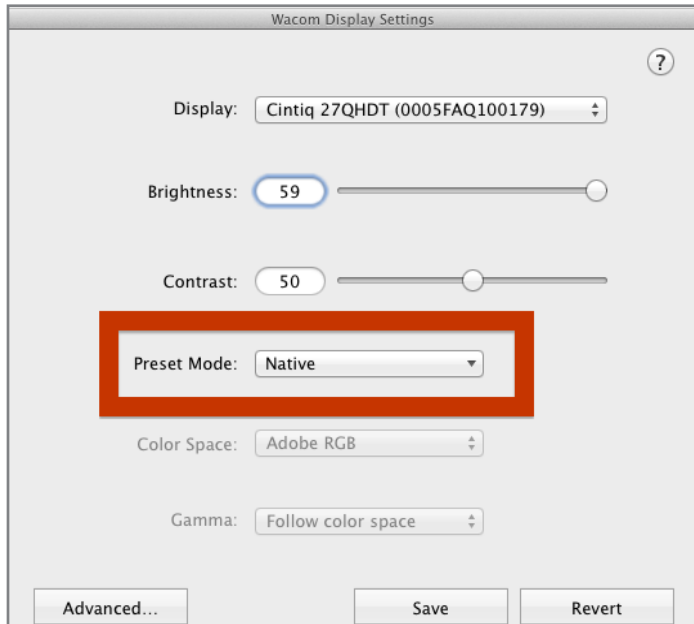

Figure 13

Figure 14

Step 2 – Configure the display's native color

Before calibrating, open the Wacom Display Settings (Figure 14), installed when you installed the Cintiq driver. By default, this tool is set to open on startup, so check to see if it's already running in your Windows Taskbar or Mac Dock; if you don't see it there, it's installed in your Applications folder. Use the display's built-in controls to configure the display to use the full color available. Select the Preset Mode pulldown menu and set the display to Native as outlined in red, to take advantage of all the display's available color.
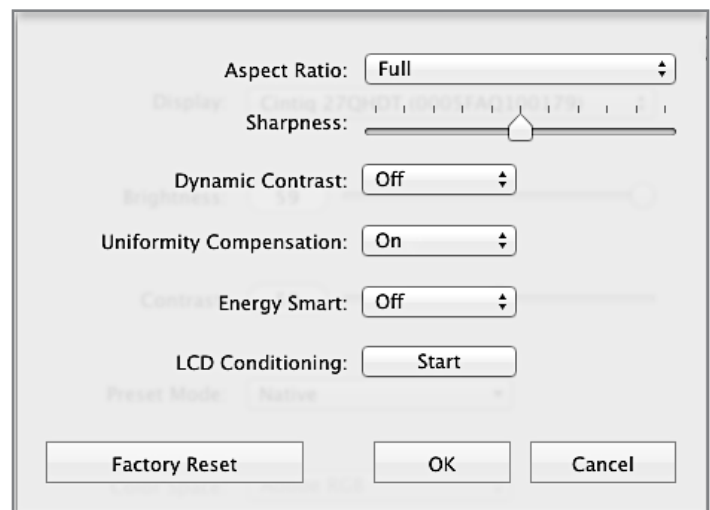
Step 3 – Configure advanced settings

Click on the Advanced button, and in the window that opens (Figure 15) click on Uniformity Compensation, selecting On. If your Cintiq has not been in use for at least 30 minutes so that it's fully warmed up before calibrating, click on LCD Conditioning. This will cause the display to rotate through a range of colors, fully preparing it for the best calibration and profiling. It has another benefit of making sure that no pixels are stuck in an on or off position. Once fully warmed up, close the window, and launch Wacom Color Manager. Tip: While it's tempting to turn the Energy Smart setting to On, this will compromise your color quality. You will need to save energy elsewhere, so keep it off. Dynamic Contrast should also be left Off.

Figure 15

Step 4 – Using Wacom Color Manager

When you launch the Wacom Color Manager, it displays a series of choices for profiling. Click on Display Profiling. When you do this, the software defaults to the Basic setting. To access presets for various types of workflows, you'll need to click on the Advanced button, shown outlined in Red in Figure 16.

Please Note: The total brightness of a display is measured in units called candelas per meter squared, usually written cdm^2. In most environments you should set your displays to a much lower brightness than the maximum output possible. For example, the Cintiq 27QHD has a maximum brightness of 330 cdm2, but is rarely used at more than 140 cdm2 brightness. Various workflows require different levels of brightness. In all of them the goal is to make sure the display on which you work is not brighter than the final environment in which the output is viewed, so that the match between original and output is as close as possible.

International standards specify different levels of brightness for different workflows. For example, in some print workflows, you should have no more than 120 cdm2 brightness, to match the standard; for other standards, it's only 100 cdm2. Using the Wacom Color Manager, many of the presets in the software have standard brightness levels predefined, so you simply choose the workflow you want and the correct brightness levels will be set automatically. If you are not using Wacom Color Manager, consult your color management provider for information on appropriate brightness (luminance) levels for your particular workflows.

Figure 16

Step 5 – Select the preset for your workflow

Selecting the Advanced button displays a Workflow Selector in the left of the Color Manager window. Immediately click on the Display icon disclosure triangle to reveal choices.

Double-click on Profile Settings, directly below the Display icon. A series of settings under the heading Assets will display at the top left of this window (Figure 17). Rotate the disclosure triangles at the right of both the Display Settings and the Saved Workflows headings, in the list of Assets. Various workflow options will be revealed. Choose the preset matching the workflow you want to use, or create and save custom workflows for specific needs.
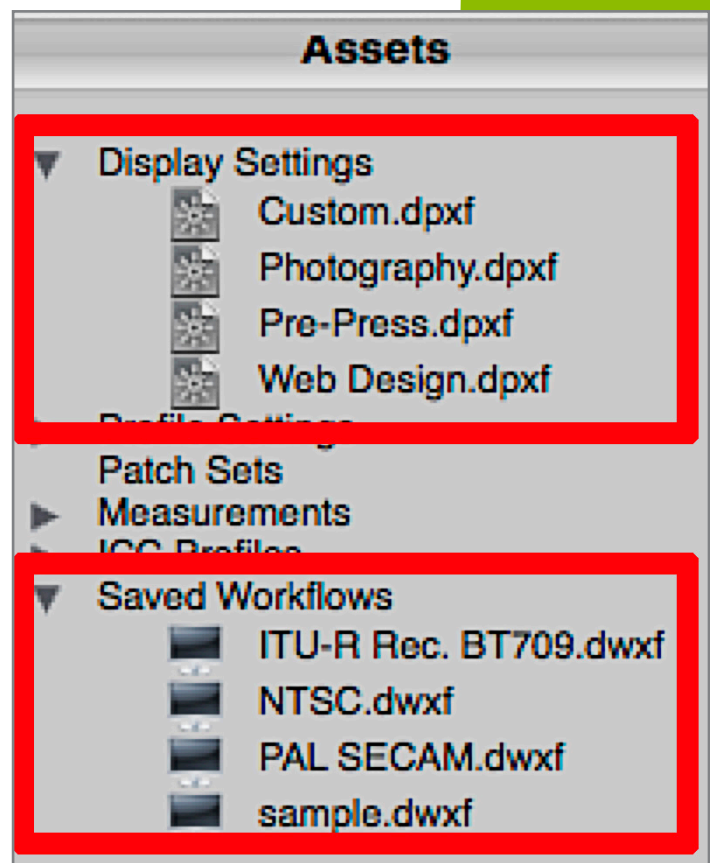

Figure 17

Step 6–Confirm the Settings

The next screen, shown in Figure 18, confirms the settings for the preset you selected. In this window, using the Rec. 709 setting for video editing, best results come from simply using this default setting without changes. The defaults have been designed to optimize color for various workflows, so use the presets unless you have a very compelling reason to change one or more of the settings. Now, click the Next button.
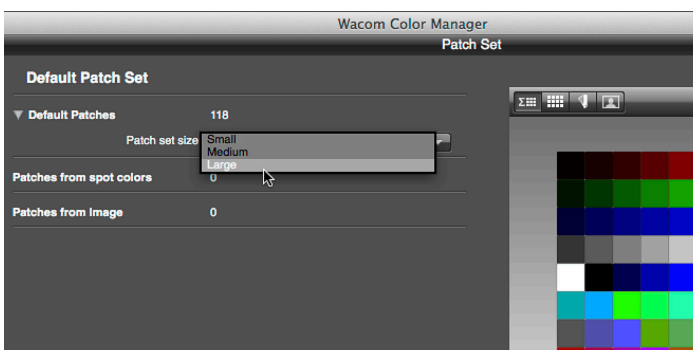

Figure 18

Figure 19

Figure 20

Step 7–Select the Large Patch Set

Select the size (S,M,L) of the patch set you'll use for creating your profile (Figure 19).

The large patch set takes a couple minutes more to use but delivers best accuracy.

Click the Next button, and then on the Start Measurement button underneath the set of patches (Figure 20). Follow the on-screen instructions to position the hardware, and continue. The software will use ADC (Automatic Display Control) to correctly configure the display settings for you. When the measurements are finished, click on Create and Save Profile. It's a good idea to name your profile with the workflow (Rec. 709, in this case) and the date. Wacom Color Manager will then set this new profile as your system's default, automatically selecting it each time your system starts up.
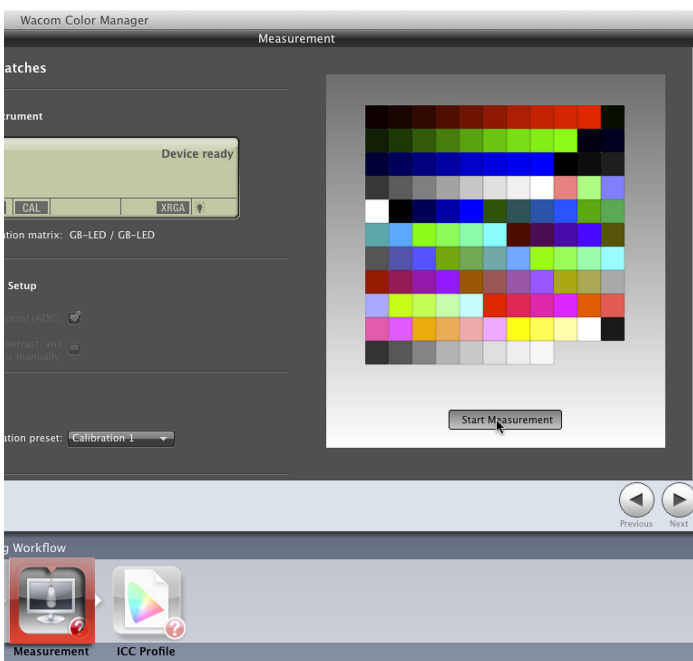
Evaluating your color

A tool built into the Wacom Color Manager is very useful for evaluating your color to get the very best from your Cintiq 27QHD display. In Figure 21, the Before and After button, (outlined in red at the top right of the window), shows the difference between color currently displayed using your just-created calibration and profile, and what your Cintiq was displaying before profiling. The default test image can quickly be changed by selecting the pull-down menu shown and choosing a different image to evaluate hues in specific parts of the color spectrum.

A series of images are available, each themed with a different color, such as the three shown here. The default image is a good start. If you'd like, select one or more of these other color-themed images to check color handling of particular colors of interest following a calibration and profiling session, to see more deeply what will happen on your display and in your art. Swatches of various shades of each color are shown on the sides of the images to assist in evaluating a specific color range.
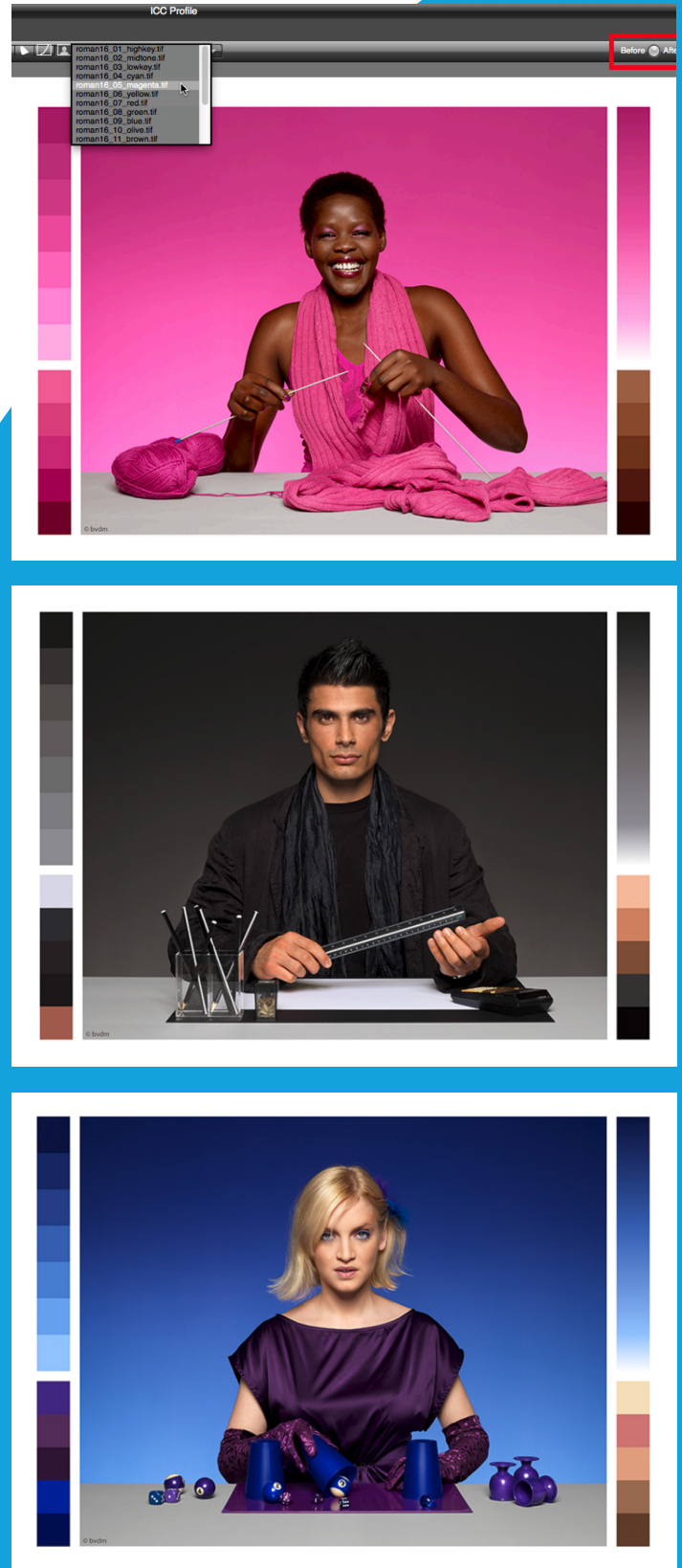

Figure 21

Configure your applications for great color

Different devices deliver different versions of the same color, rarely matching. Without help, an image displayed on-screen rarely matches an original object, and a print rarely matches the display. Modern applications and operating systems solve this problem by using color management, built into contemporary software—but it has to be turned on and set correctly to give great color results.

Contemporary applications and operating systems use ICC (the International Color Consortium) color management, a modern system for assuring color consistency. This system uses a snapshot of each device's color ability called a color profile to synchronize color between devices. Modern devices come with factory profiles, but for best results, custom profiles are the best choice.

For each device's color to work correctly, two things are needed—you have to turn the system ON in each application, and you have to give it current color information specific to your workflow's needs. Both are easy to set up with a little care. (Note: If you work in a corporate environment, you should check to be sure these recommended changes are consistent with your corporate workflow standards.)

Correctly setting your software for good color produces three great results:

1. It preserves more original color.

2. You can preview how color will change as it moves through your workflow(s).

3. You will match color as closely as possible between each step of the workflow, given the limits of each device's color.

Start at the front of the workflow

It's important to get color right at the beginning, while editing original images. Once color has been damaged, it's almost impossible to repair it later. Though it's tempting to jump in and just start editing, configuring your applications for great color will save time and grief later.

Color Settings for Photoshop®

Photoshop has color management turned ON by default, unlike the rest of the Adobe® Creative Cloud® color-managed applications, but needs to be properly configured for best results. Configuring is easily done, and once done, it will be even easier to make color match between Photoshop and other Adobe applications.
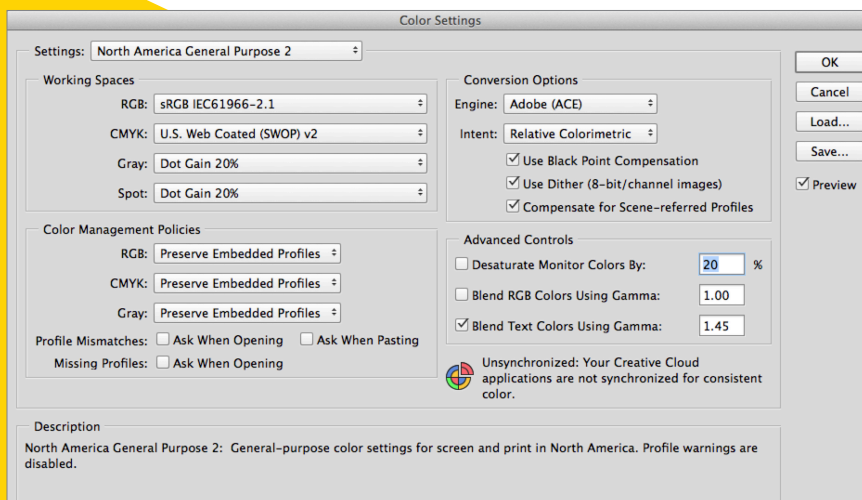

Figure 22

To configure color correctly in Photoshop, select Color Settings under the Edit Menu. A Color Settings window will appear (Figure 22). The default setting (in this figure, North America General Purpose 2) will differ, depending on the region of the world in which Photoshop is installed. In all regions of the world, your color will be better with customized settings matching your particular needs.

To customize your Photoshop color settings:

1. Change the RGB working space to Adobe RGB, which allows you to preserve more original color for use later in your workflow. This is a better default for almost everyone, even if your final destinations are mostly sRGB.

2. Change the default CMYK working space to Coated FOGRA39 (ISO12647-2:2004). As shown in Figure 23, the range of CMYK color provided by Coated FOGRA39 is bigger than the default setting (U.S. Web-Coated SWOPv2), and preserves more color. The amount of extra color preserved in the larger outline shown in the image at right is not immensely larger, but some of those colors are essential, especially in the yellows, greens and reds. Coated FOGRA39 provides one of the biggest CMYK color spaces of all the CMYK profiles installed with Photoshop and is an excellent default. If you have specific CMYK profiles you use in your workflow, you may wish to use one of those as a default instead.

3. Select all three check boxes for Profile Mismatches and Missing Profiles. Once checked, Photoshop will communicate with you so you make informed color choices. For color as in medicine, our first goal is always to do no harm, so this communication helps you make the best possible color decisions. When you've finished, click the Save button and give your new settings a recognizable name. You will use this named setting to coordinate color between multiple Adobe applications.

4. Master the use of Rendering Intents, so that you can choose different defaults for different workflows, as needed. Selecting the correct intent is essential to converting color correctly. The default rendering intent for the Creative Cloud applications is Relative Colorimetric, a good starting point. To understand the

Figure 23

differences between rendering intents and choose the best intent for your workflow, see the section in this document titled Soft Proofing in Photoshop.

Make Adobe Applications' Color Match

Adobe has provided a quick and easy way to synchronize color (Figure 24). It takes just four mouse clicks, and color will match between Photoshop, Illustrator,® InDesign® and Acrobat® DC Pro. The steps are:

a. Open Adobe Bridge.®

b. Go to the Edit Menu, to the last item (Color Settings).

c. In the window that opens, (Figure 24) find the same setting you chose or created in Photoshop, whether a standard or custom setting.

d. Click on this setting, select Apply, and voila! Illustrator, InDesign, Photoshop and Acrobat Pro DC will now display color the same way.
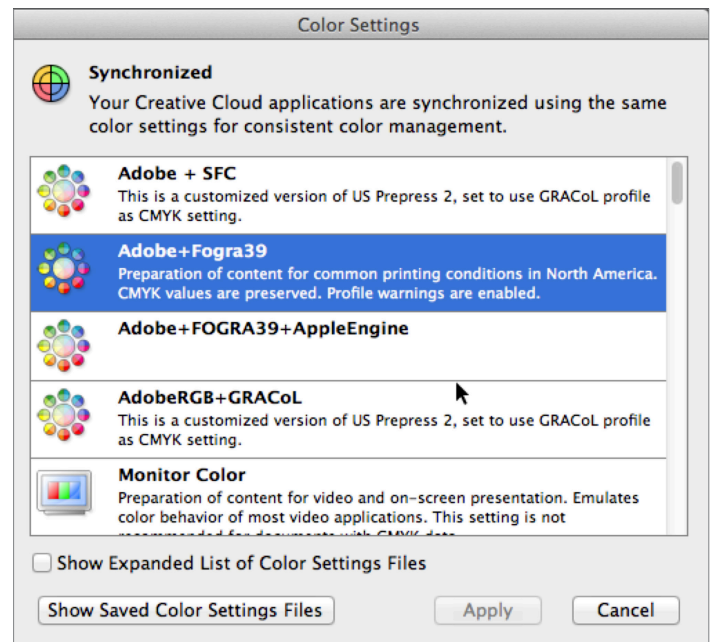
Figure 24

Figure 25

Adobe Lightroom®

Unlike the Adobe applications already discussed, Lightroom offers no option to select color settings for the first part of the color workflow. Files in the Develop module are always processed in ProPhoto RGB color space, significantly larger than Adobe RGB or sRGB, the two color spaces we've already discussed. Figure 25 shows the three color spaces' outlines; the smallest is sRGB, Adobe RGB is the second, and ProPhoto is the outer shape. Big, isn't it?

Using ProPhoto RGB in the Develop module ensures you have access to all the color possible from your original image; what you do with all that color depends on your choices for setup and destinations for your images. See the next section of this guide to learn how to preview your color output in Adobe Lightroom.
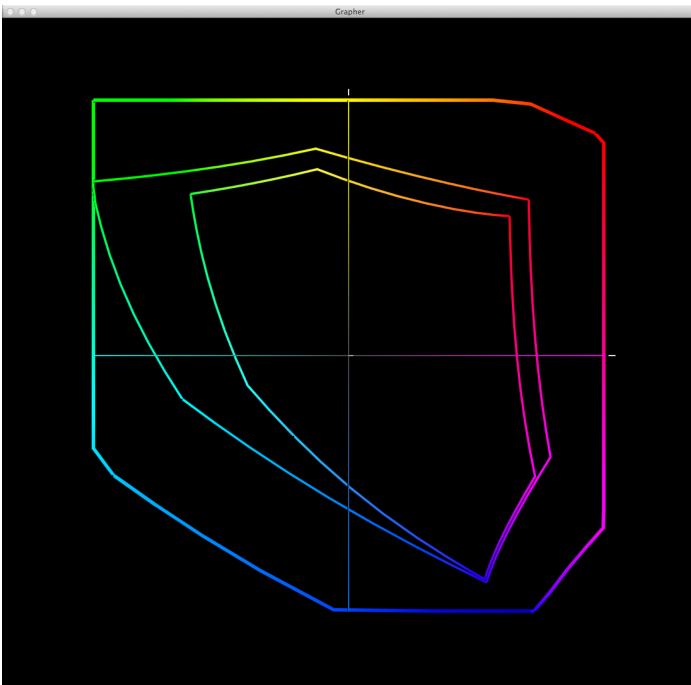
Configuring the Best Color in Corel® Painter®

Every document created in Corel Painter is made using color management settings. The factory default RGB color profile in Corel Painter is sRGB, which we've discussed earlier in this guide. While sRGB is the default color profile for many monitors, digital cameras, and even some printers, it's usually better to create in Painter using a larger gamut profile, such as Adobe RGB(1998), or even ProPhoto RGB. Larger profiles allow artists to create with a wider range of colors that can be printed later, and it's easy to clip color into the smaller-sized sRGB gamut as needed.

The Corel Painter color management dialog offers controls similar to Adobe Photoshop, as shown in Figure 26. To configure Corel Painter for best color, select Color Management Settings under the Canvas Menu.
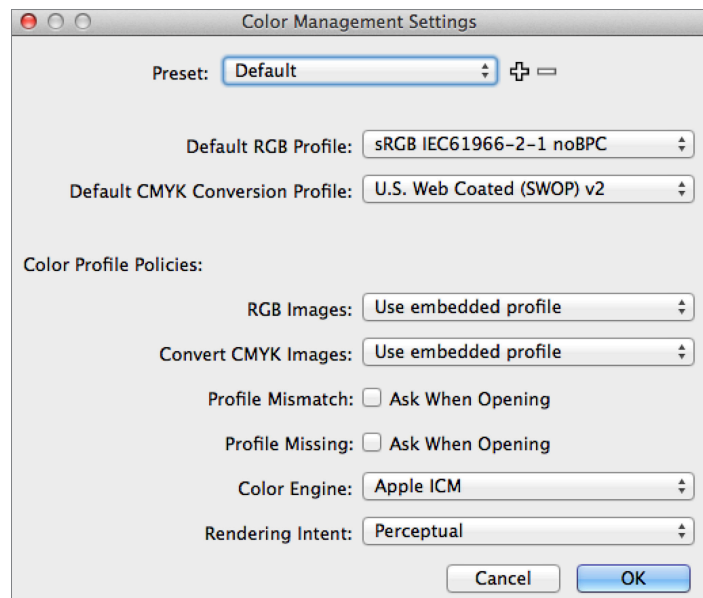
Figure 26

You can also access the Color Management Settings dialog box from the Navigator panel by clicking the Open Navigator Settings button, clicking Color Management, and choosing Color Management Settings. To select a wider RGB gamut, change the default RGB profile to Adobe RGB (1998) or ProPhoto RGB. Change the Default CMYK Conversion Profile to a gamut bigger than the default. Figure 28 shows a comparison between U.S. Web Coated (SWOP) v2, which is Corel Painter's default CMYK profile (also installed as a default in Photoshop), and a bigger CMYK profile now installed with Photoshop, Coated FOGRA39 (ISO 12647-2:2004). Although the difference in the size of the outlines of the two CMYK gamuts may seem modest, using the bigger of the two CMYK destinations will preserve critical color values in your document. Bigger than both of them is AdobeRGB, and the largest is ProPhoto RGB, all shown in Figure 28.

Why should you choose a wider gamut of color in which to create your work? Several reasons apply. Most important, shades of some colors that can be printed on many presses and inkjet printers or displayed on-screen are clipped out when creating in sRGB. Art created in a larger RGB color gamut can be displayed on higher-quality displays with all its original color intact.
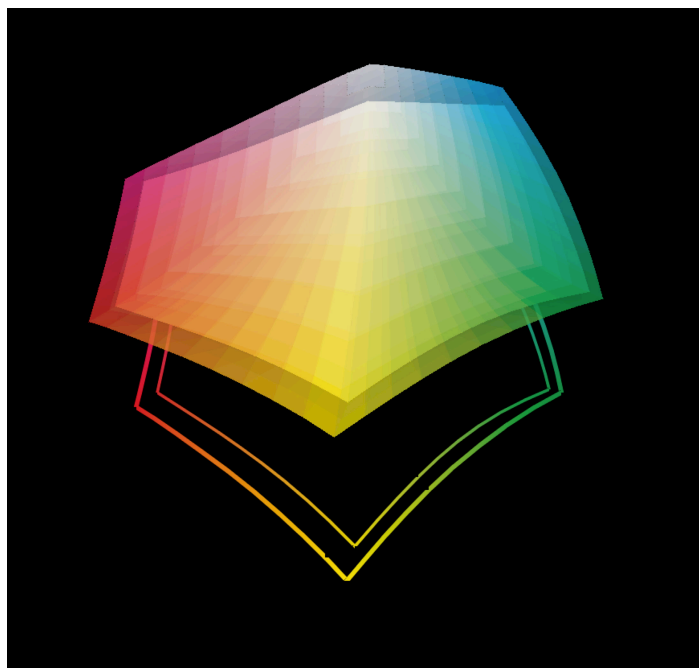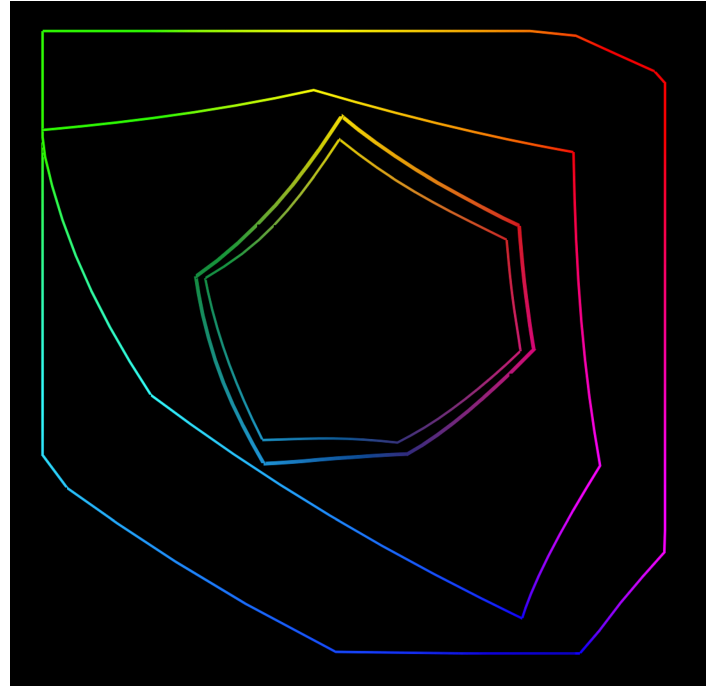

Figure 28

Most artists will want to use all the colors they can get to create their art, and this means working in a bigger color space. The Cintiq 27QHD displays allow artists to work in almost 100% of Adobe RGB, providing them more freedom to create great color in their art.

Working in a bigger color space than currently needed is also wise planning for the future. As various technologies expand the range of colors that can be displayed, projected and printed, art that you create now in gamuts larger than are currently available, will be better able to take advantage of future advances in color.

Figure 27

OS Color Engines

Although it's possible (and recommended) to match your color settings between Adobe's applications and Corel Painter as closely as possible when using both companies' applications for a project, one item cannot be matched. The Color Engine shown in Figure 29 is Apple® ICM. Color engines handle the calculations to convert and manage color from color sources to their destinations, and unless a particular software provides its own engine, as Adobe does with Adobe applications, the software developers will use the color engine built into the operating system. These engines calculate color in similar ways, but may reach different results for various shades of various colors. If an absolute match is required, you can configure Adobe applications to use the operating system's color engine to match what Corel Painter and other color-managed Corel applications use, as shown in Figure 29, outlined in red. Be sure to save this new configuration with a name that will let you use it to synchronize color across Adobe applications as previously discussed.

Another consideration when changing engines that's important to note that the Apple ICM is not available for Windows.® The Adobe engine (ACE) is not available to non-Adobe applications. So, while you may want to use a common color engine for absolute consistency between Corel Painter and Adobe applications, this can only be achieved if all your work is done on one platform, or you obtain a third-party color engine that works cross-platform. Fortunately, improvements in how each engine calculates color have diminished glaring differences between them. That being said, changing engines should not be done the night before a major deadline, as the one color that is calculated differently by two engines may be the most critical shade in your deadline project. Test and verify before critical work is due.
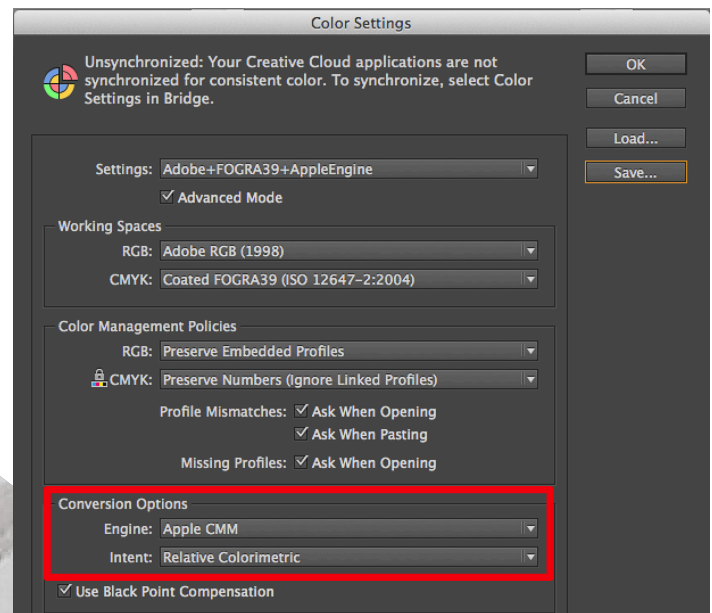

Figure 29

Color Management for Video, Animation and Game Design

You can manage color between users in multiple locations, synchronizing art created in multiple seats and places for precise color. Profiled high-quality displays are the foundation for this synchronization, along with matching color settings at each seat. High quality displays properly managed for color give you a fighting chance of editing color that will look the same on other displays when your work is viewed. Recent changes in professional standards and specifications for on-screen creation and editing bring state-of-the-art color to artists working in these fields, and lay the groundwork for anticipated future color developments. Savvy artists will master current color workflows with an eye toward the future. Color management for video must address creation, mastering, presentation, archiving and future re-mastering. Emerging standards for video color address these needs.

Choose the Best Color Space First

To avoid unwanted changes midway through projects, choose your RGB working space before you start work, to guarantee best results on multiple device types with differing color gamuts and color handling. Once chosen, calibrate and profile your display to match that color space.

To help you choose, here is information on different options, with gamut outlines (Figure 30).

a. For standard broadcast television and DVD only, use SDTV, NTSC or SDTV PAL. This is the smallest gamut.

b. For high-definition television, use HDTV (Rec. 709). This colorspace is similar to sRGB.

c. For digital cinema, ProPhoto RGB (with a linear tone response curve, e.g. gamma of 1.0) is an excellent choice, or use DCI-P3, which matches digital projectors currently in use. This space (P3) is still considered to be a relatively small space, as shown in Figure 30.

d. Use sRGB IEC61966-2.1 for video only intended for the web.

e. For multiple destination projects, use the biggest color space you'll need, and plan to convert your master file to each destination's color gamut.

f. To guarantee best displaying of your work in the future, create in the biggest space possible, such as ProPhoto RGB or Rec. 2020, on the horizon for UHDTV.
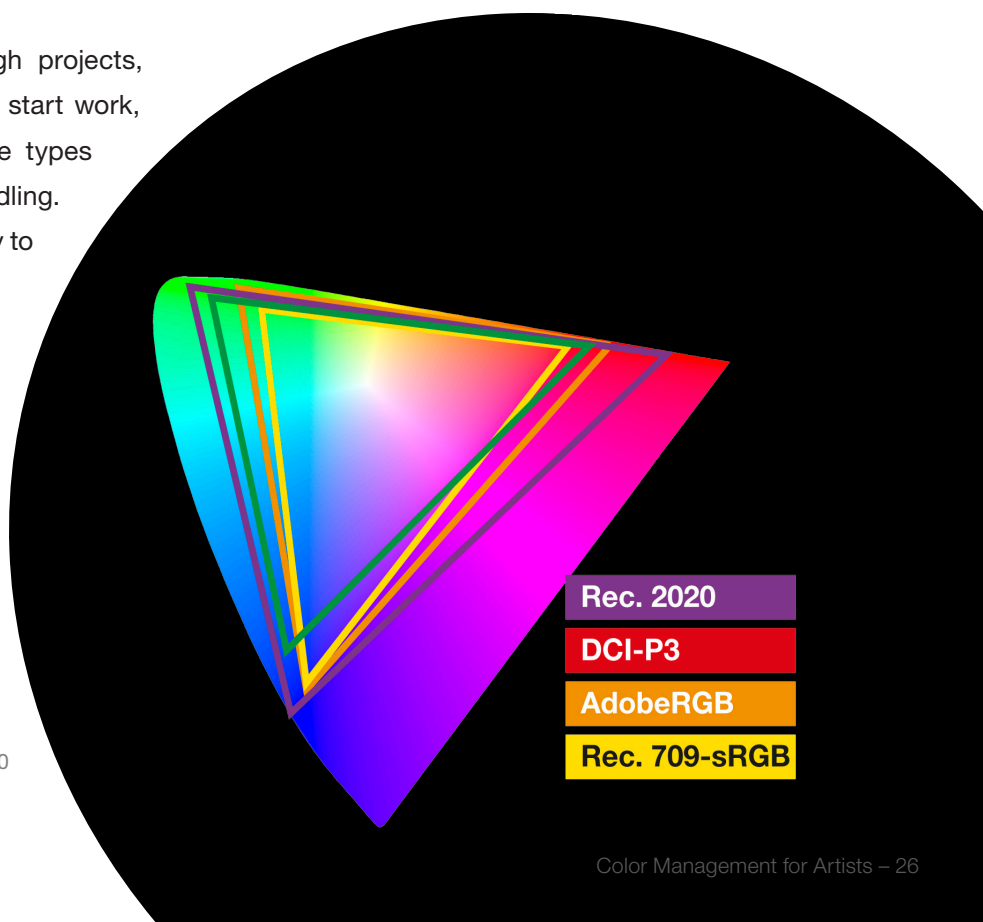

Figure 30

Rec. 2020
DCI-P3
AdobeRGB
Rec. 709-sRGB

Color Management in Adobe® After Effects®

After Effects has full support for color management, including the new ACES (Academy Color Encoding System) standard from the Academy of Motion Pictures Arts and Sciences.

Effective color management in After Effects allows requires a methodical approach to each element used to create a project, shown in the workflow map in Figure 31. Here's an overview of the needed steps.

1. Choose the color space in which you're going to edit your project, as discussed previously. For multiple destinations, choose a big color space which covers all final destinations.

2. Calibrate and profile your display for the color space needed. If you are using Wacom Color Manager, see the instructions for using presets to match color most precisely to your project's chosen color working space.

3. Prepare each footage item for good color. Each item needs to be in the same color space as your project color space. Three separate possibilities exist:

   a. Some footage items have the same profile as your working color space already embedded.

   b. Some footage items have a different color profile, and must be converted to the same profile as your working color space.

   c. Some footage items have no profile, so you will have to guess which profile is most likely, assign it, and test to be sure you assigned correctly. If not, you will need to try other profiles so that you can assign the correct source profile in order to convert these footage items into the correct color working space for your project.

Once color is matched to your working space for each item, import them into After Effects, build your project, and view it on-screen.

4. If you have chosen to build your project in a larger color space, and plan to convert the project to different color spaces for different destinations' requirements, preview each color space conversion on-screen. Previewing is discussed later in this document. Note that the default "Animation codec" is only 8-bit, so when working in 10-bit color, it's important to choose a different codec.

5. Convert a copy of your project to each color space needed for distribution of your project.

6. Save your master copy for future use.

Adobe After Effects color workflow

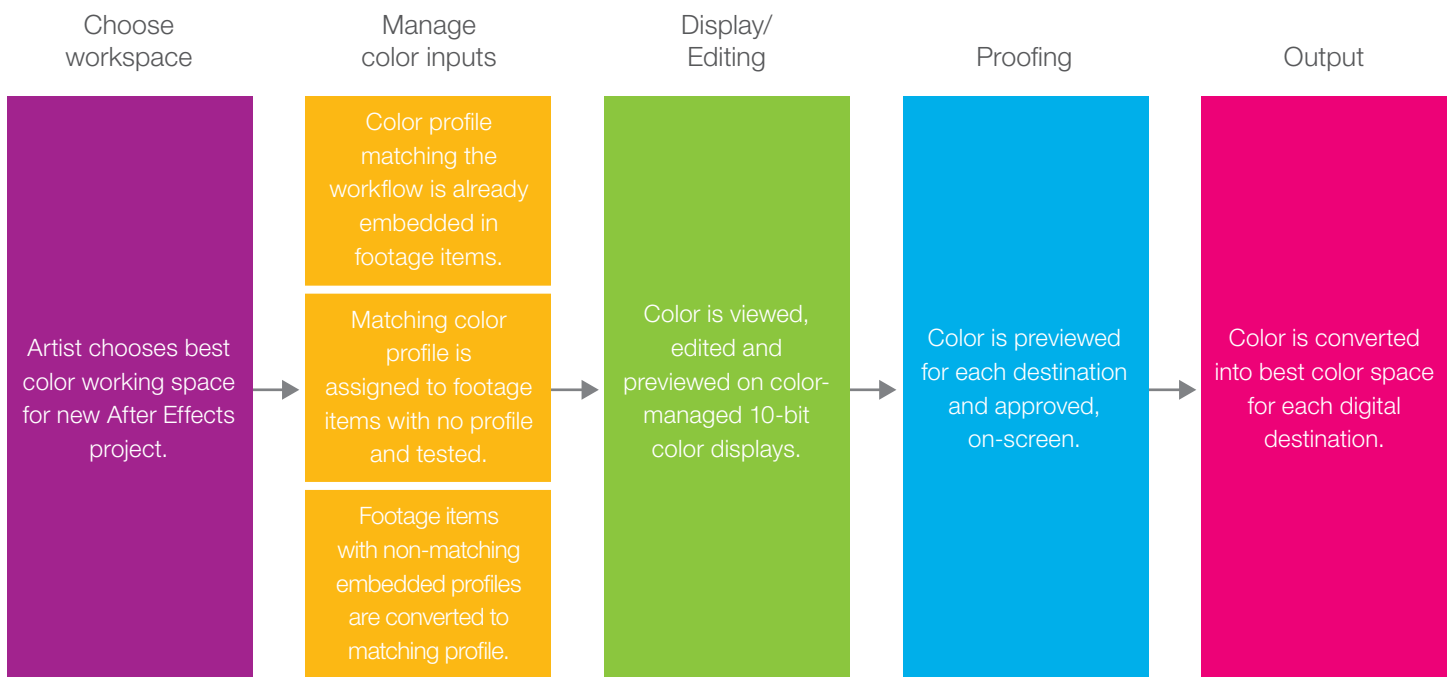| Choose workspace	Manage color inputs	Display/ Editing	Proofing	Output
Artist chooses best color working space for new After Effects project.	Color profile matching the workflow is already embedded in footage items.	Color is viewed, edited and previewed on color-managed 10-bit color displays.	Color is previewed for each destination and approved, on-screen.	Color is converted into best color space for each digital destination.
	Matching color profile is assigned to footage items with no profile and tested.			
	Footage items with non-matching embedded profiles are converted to matching profile.			

Figure 31

Color Management in Autodesk® Maya®

Autodesk Maya now offers robust color management implementation. Artists can easily build great color into projects and synchronize their creations' color with work created in other locations, softwares and workflows. A standard ICC color management workflow is enabled by default (Figure 32), and Maya also supports color management using ACES and OpenColorIO (OCIO). Whether animating for video, creating special effects, or designing games, Maya users can achieve consistent color on a high quality display. Once a few settings are configured and mastered, color management can speed up artists' productivity while enhancing final quality.

Figure 32

The Challenge of Color in Maya

Maya works in a linear mode to calculate color. Certain elements imported to a Maya project, such as those including texture bitmaps, use non-linear correction. Color corrections applied to the whole scene distort the appearance of these non-linear elements. Maya users can attempt to correct these elements individually to compensate, but usually this will distort the appearance of other elements that are already correct. It's much easier to use the built-in color management tools to save time and raise quality. Analyze your particular workflow's or project's needs and customize Maya defaults to match your requirements, as outlined next.
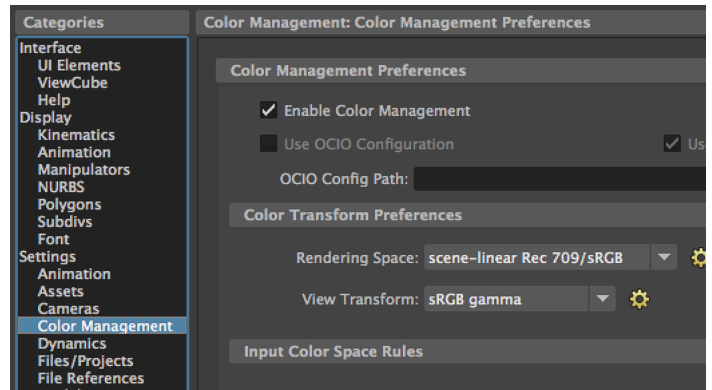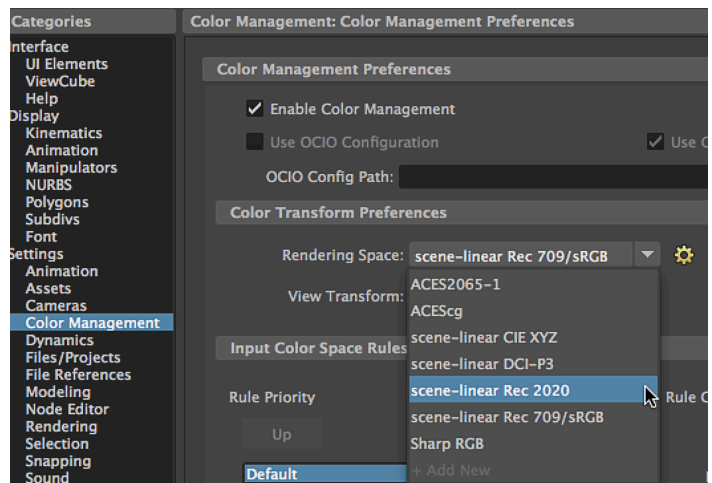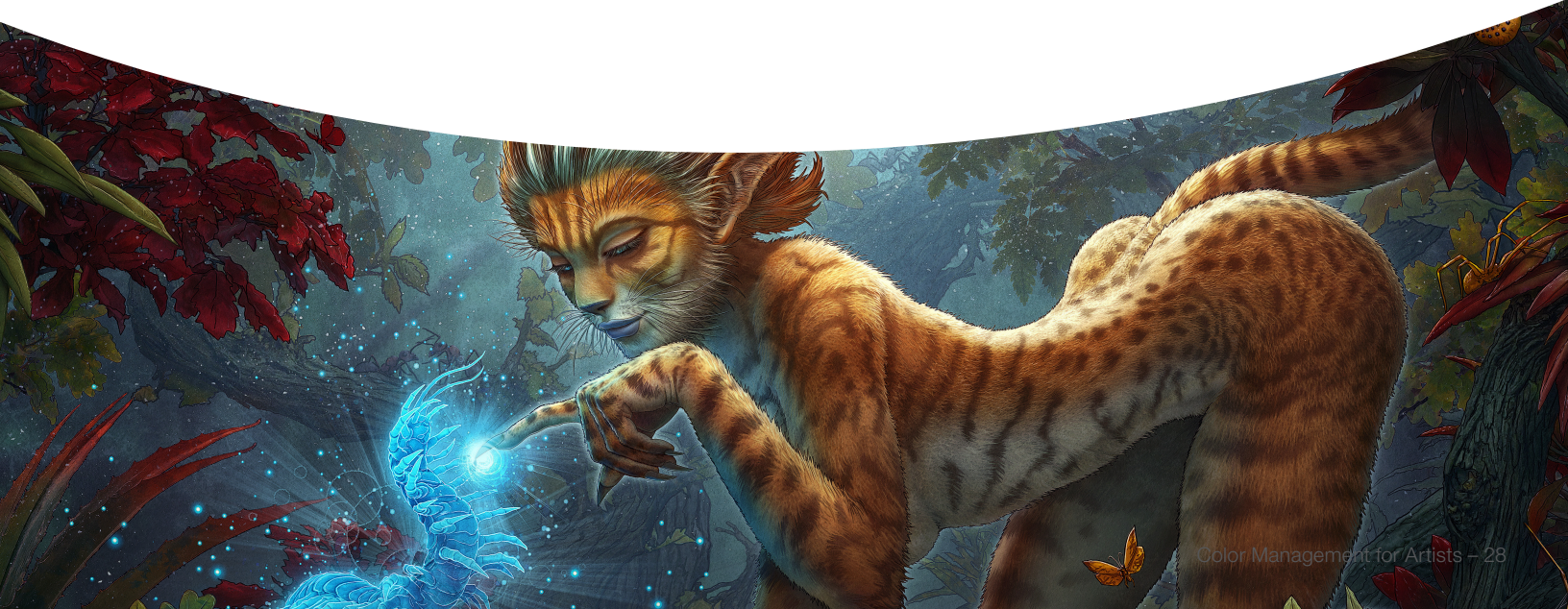

Figure 33

Steps to Great Color in Maya

1. Decide on a rendering space before you create new scenes, choosing the color space to best accommodate your desired color destinations (Figure 33 on previous page). The defaults
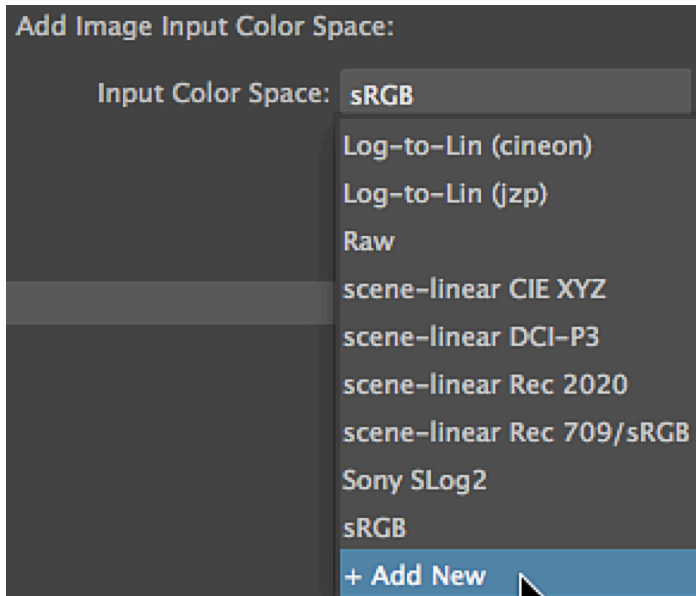

Figure 34

have been chosen to match a wide variety of use cases, so they're often a good fit for many needs. You may wish to choose a rendering space with a larger color gamut than your final destination, to use in later conversions.

Be sure color management is correctly enabled in every single scene. It's important to verify settings to ensure consistency between old and new scenes, because color options and settings are enabled for each scene separately, and legacy settings may have been used with color management turned off.

Waiting to enable color management until midway through scenes causes serious changes in colors such as those selected for swatches and ramps.

2. The default workflow assumes that you are using sRGB texture images; if not, you'll need to customize this setting. Customization can be a modified default, used when all your imports are in another color space such as Adobe RGB (Figure 34). Then, if you have an occasional file you've imported that is in another color space, you can customize its color handling by activating Ignore Color Space Input Rules in the item's settings.

If you find that you're having to change profile assignments often, consider using additional rules for certain types of images (Figure 36). A rule lets you automatically assign an input color space based on the

file extension, the file naming conventions that you use for different types of images, or both. You could create a naming convention that all of a set of textures include a code or a word in each of their file names. Then, you could create a rule with that code or word that matches to another default import color setting.

3. Set the default for the Output Transform to match your most-used destination (Figure 35). You can change this destination as needed.
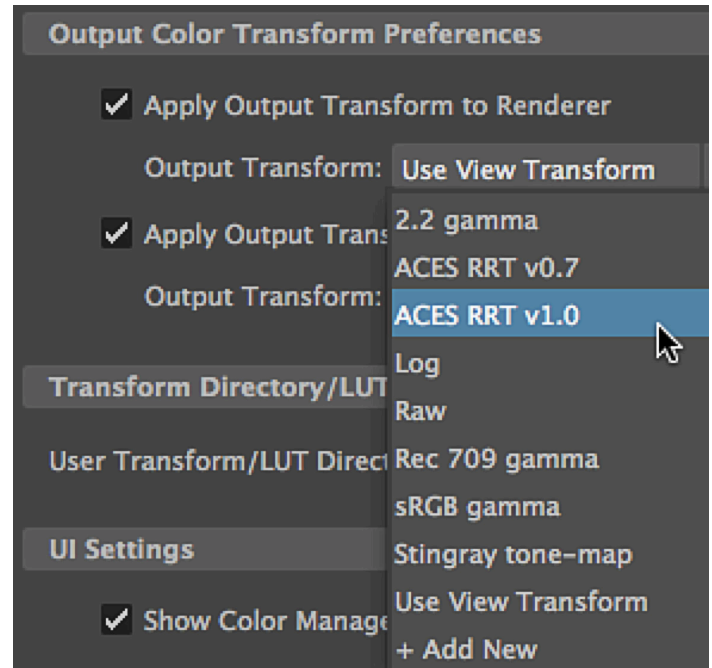

Figure 35

The view transform converts colors from the rendering working space in order to display a preview. The setting underneath it should also be on, as Apply Output Transform to Playblast allows the result to be played with devices or viewing software that do not apply the appropriate view transform to scene-linear images.

4. Make sure the UI Settings check box is selected (Show Color Managed Pots, Figure 36). This enables consistent color for color controls, including solid colors and ramps. Set the Floating Point Render Target to use 32 bit rendering, if available, as this will render target options with gamma correction to reduce banding artifacts. This setting is video card-dependent, so not all possible options may be offered; for example, if you see a 16_ at the end of an option, as opposed to 32_FLOAT as shown, this indicates a 16 bit option, not 32 bit.

5. The Export or Load Color Management Preferences button can be used (with caution) to synchronize color management preferences and behaviors between multiple workstations. Imposing these preferences on multiple stations must be done carefully to ensure that correct settings in preexisting scenes are not overridden and overwritten.

6. When your color settings are all configured, be sure to click the Save button at the bottom of the Preferences window to lock your choices in place.

7. Work on a high quality, 10-bit display like the Cintiq 27QHD, that is regularly calibrated and profiled, to avoid being surprised by color in your work.
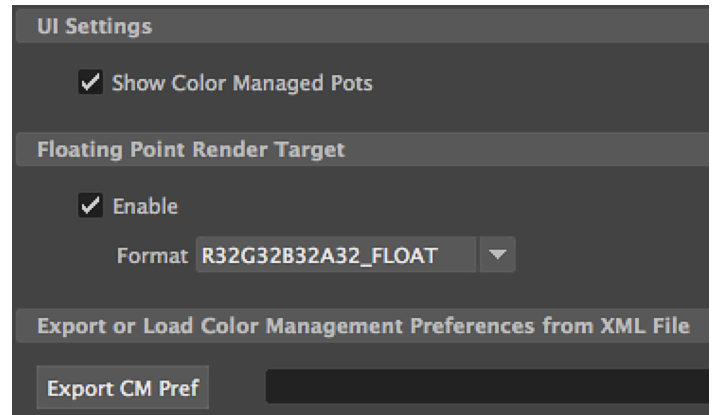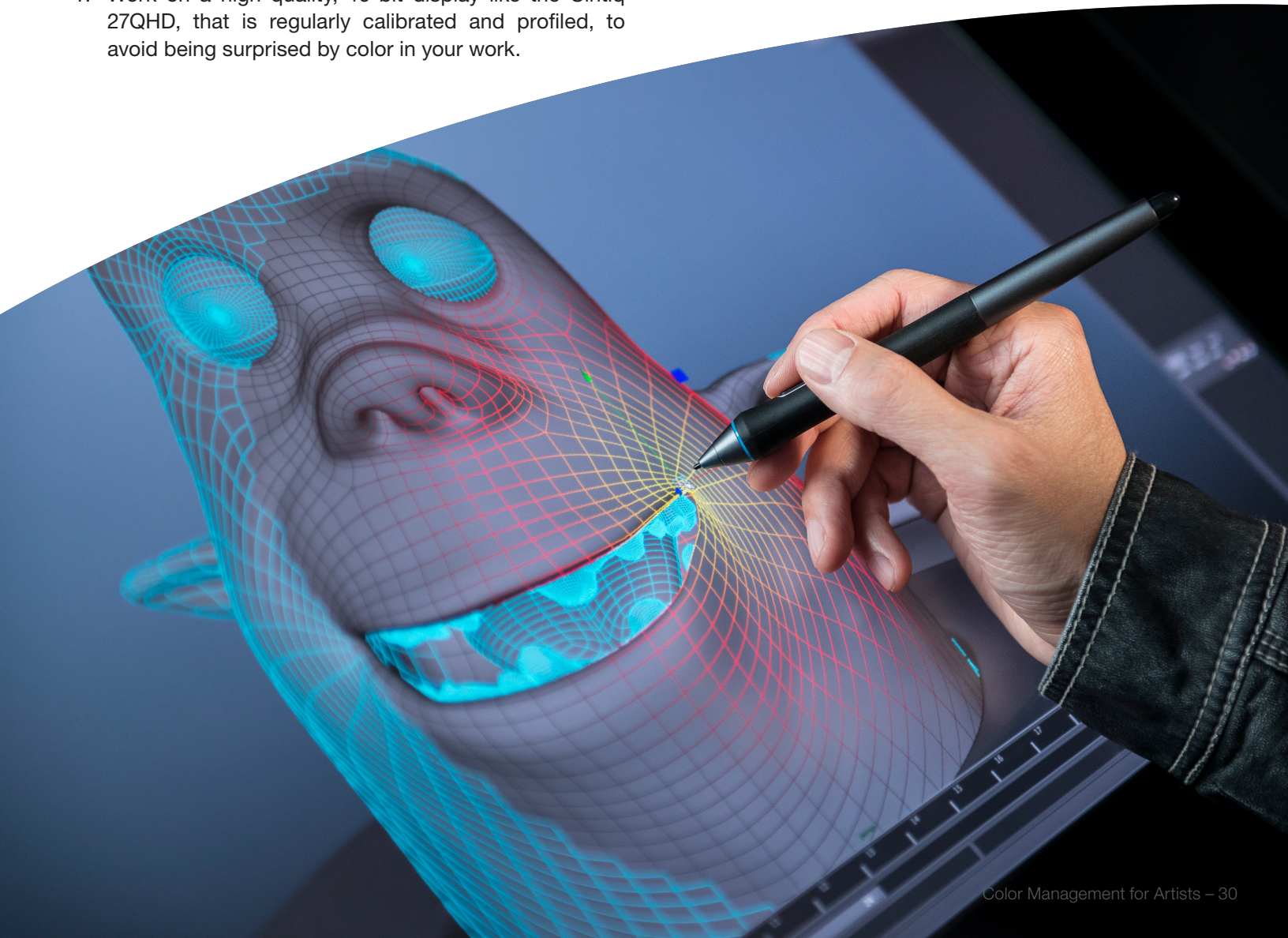

Figure 36

Proofing with Light Boxes

Once you've completed the steps above, one last step remains. Different light sources (sunlight, shade, fluorescent, LED, etc.) change the color of an object being viewed. The kind, quality and amount of light on the object being viewed changes its appearance, so the original may or may not match the display unless viewed under correct lighting.

Whether you are viewing a print, or comparing an original object to its on-screen rendition, you can use a viewing device such as the one shown (Figure 37) for proper lighting. View your work in an industry standard light box as shown; they're available in very small to room-sized models to meet every workflow's needs. The amount of light in the light box needs to be balanced against the light coming from the display, so that one doesn't overpower the other, preventing an accurate preview. Fortunately, some of these light boxes come with tools for automatically balancing light intensities between the viewing box and the display.

Figure 37

Courtesy Graphic Technology, Inc.

Use the Built-In Software Preview Tools

With color correctly configured in software, you can now preview on-screen the color of an image as it will appear when converted for various destinations, such as print or the web. You will need to tell Photoshop or other applications that you are previewing an image on-screen. This is called soft proofing. Here's how to soft proof in various applications.

Soft Proofing in Photoshop®

For Photoshop, use these instructions:

a. Under the View Menu, select the first item (Proof Setup).

b. If your default (working) CMYK setting matches the destination you want to preview, select Working CMYK; alternately, if you've already created a named preset, scroll down to this named preset and watch the color change on-screen. Sometimes the change is very dramatic; other times, it will be very subtle. You can toggle the preview on and off easily by typing Cmd/Ctrl-Y.

c. If you need to use another destination, select Custom and then select the device you wish to simulate for your on-screen preview. You will need to install the ICC color profile for the desired paper and printer combination if not already present.

d. Try a different Rendering Intent. Directly below the Device to Simulate menu, you'll notice the pull-down menu for Rendering Intent (Figure 39). This is a very powerful (and little known) setting you use to control the math used by Photoshop to change the original color to its destination. By changing the Rendering Intent, you change how Photoshop prioritizes one type of color over another. The default setting is Relative Colorimetric, chosen by Adobe® because this setting most closely matches each shade of color in the original to the nearest possible color in the destination. The Perceptual intent is used to preserve color relationships between different shades of color, which will maintain perceptually pleasing color, but is not always an exact match. Using Perceptual intent enhances certain images' color conversion, and should be tested if Relative Colorimetric is not satisfactory.
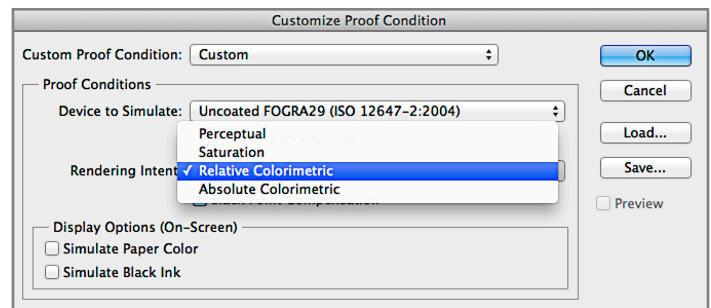

Figure 38

e. Create a convenient named preset for each of the rendering intent and profile combinations you use on a regular basis. To do this, click on the Save button at bottom right of Figure 38, on previous page, and give the preset an easy to understand name, including device, substrate and rendering intent. For example, 7900-PuraVelvet-RelCol will preview how an image prints on an Epson 7900, using Breathing Color Pura Velvet with Relative Colorimetric rendering intent (Figure 39).

Best practices for rendering intents include making presets for Perceptual and Relative Colorimetric rendering intents with the same profile, to compare how each intent converts color from original to destination. You'll usually find that you prefer one intent for some images, another intent for others. Testing on a color-managed 10-bit display is the best way to be sure before printing, or converting a copy to send elsewhere for output.

Whatever rendering intent you choose to preview, be sure you use the same rendering intent when you convert the color after previewing, whether to print or convert your file for other destinations, such as the web, a different paper in the same printer, a newspaper (Figure 40a+b) or other press.

Figure 40a

Figure 40b

Softproofing in Adobe Lightroom®

To take full advantage of Lightroom's soft proofing capabilities, go to the Develop module. Under the View Menu, select Soft Proofing —> Show Proof (Figure 41). When you select Show Proof, the name of the profile embedded in your image will appear at top right of your Lightroom window if you don't have any of the disclosure triangles rolled down (Figure 42). Click on the disclosure triangle next to the profile name to show the Soft Proof window. If you already had the Histogram window showing at top right, it will automatically change to Soft Proofing (Figure 43).

Figure 41

Figure 42

Just as Photoshop assumes you have calibrated and profiled your display, and are managing the amount of light in the room which will affect the display, so does Lightroom. Editing your images on an uncalibrated, unprofiled or light-drenched display can cause serious problems when editing images or sending them elsewhere to be viewed by others on calibrated, profiled displays in controlled lighting.

In the Soft Proof window, choose the profile you wish to use for previewing how your image will appear when converted to another profile, using the pull-down menu below the Create Proof Copy button. You can toggle between Perceptual and Relative intents in this window. For output profiles, this window also offers an option to simulate paper and ink settings, which can help you judge more faithfully how a final print will appear.

This proofing function can be used to see how an image will look when converted to sRGB for the web, to Adobe RGB when clients request your files be submitted in this color space, or converted to profiles used for inkjet and other printers.

Please Note: Earlier versions of Lightroom did not support soft proofing using CMYK profiles, used for presses, RIP-driven inkjet printers or other destinations. Lightroom CC supports CMYK soft proofing.
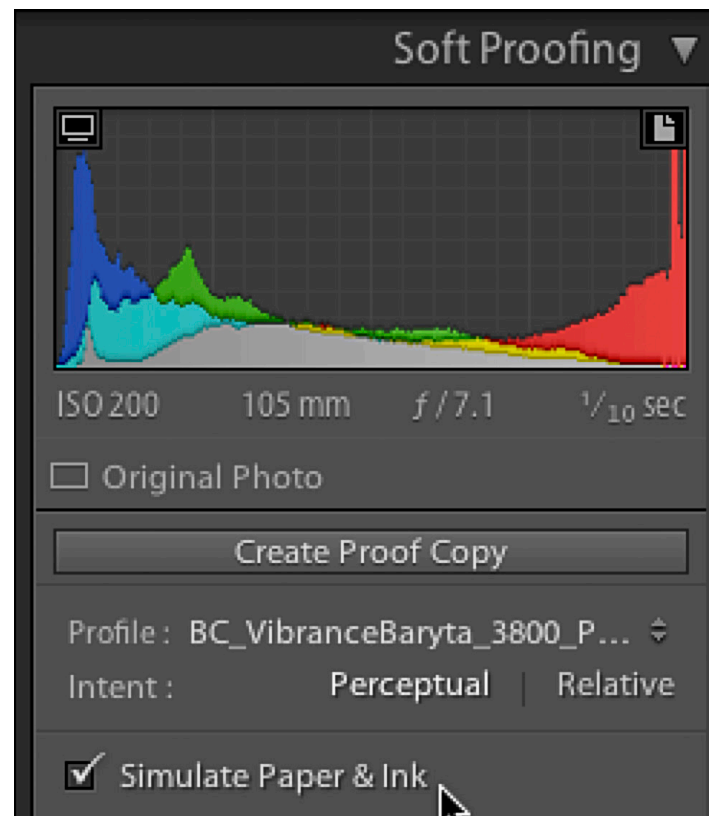

Figure 43

Soft Proofing in Adobe InDesign®

1. Launch Adobe InDesign, and open the file you wish to soft proof.

2. Under the View menu, select Display Performance, to ensure the setting is High Quality Display (Figure 44). This setting delivers the best possible viewing quality from InDesign.
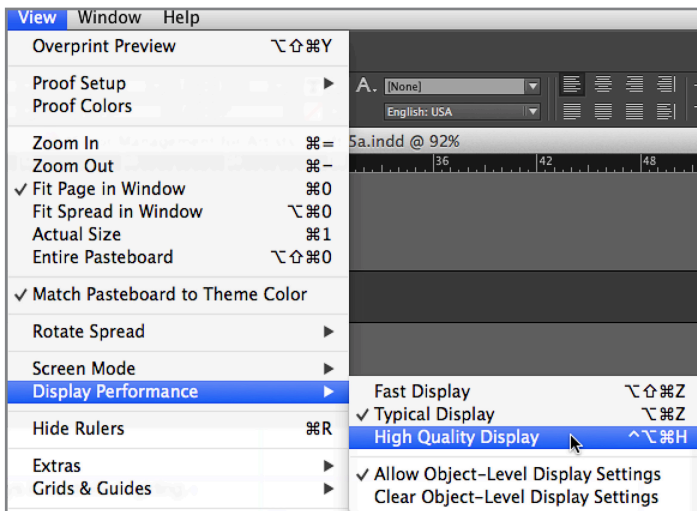
3. Next (also under the View menu), select Proof Setup, and hold down your mouse to display the screen shown in Figure 45. The document's color space (RGB or CMYK) can be set at the time you create the document. If you don't set it, InDesign will use the default color spaces set in the Color Settings dialog under the View Menu or synchronized using Bridge.
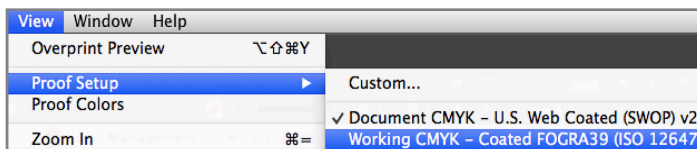
Figure 45

4. If your CMYK document is going to be printed in one of the two color spaces shown (Document or Working CMYK), select one of those profiles. If you have a profile for a specific destination, such as a specific print house, paper and ink combination, be sure the profile is installed, and then select **Custom** instead of the Document or Working CMYK. The Customize Proof Condition window (Figure 46) appears. It allows you to select any installed profile to simulate how your document will print on a device and paper combination. You can also choose to simulate the color of the paper, checking the box in the dialog box, which usually results in a darker preview on-screen, showing the effect of the particular chosen paper on your color.

When you click on your desired proofing profile and release, Proof Colors (the next line in the View Menu below Proof Setup, also shown in Figure 45) will have a check mark in front of the line, indicating that proofing is On and displaying an on-screen preview of how the document will print. Toggle the preview on and off to see how your file's color will change.
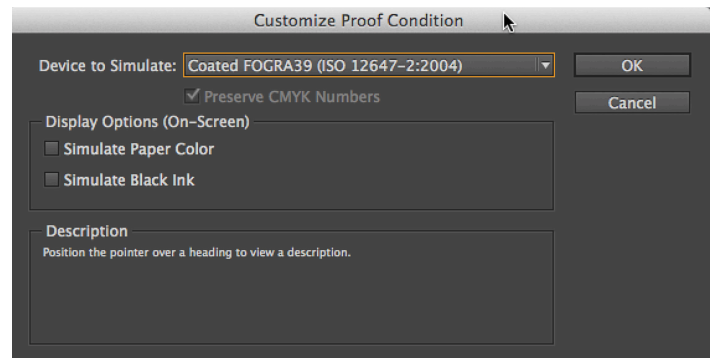

Figure 46

Tip:

When a new document is created in InDesign, the document's default profile is set by the type of document you choose. In the New Document dialog (Figure 47), an often-overlooked default setting, the Intent determines which default color profile is the document profile. The Print and Digital Publishing settings default to CMYK, the Web setting defaults to RGB. When creating content that will go to both CMYK and RGB destinations, you can also use the Web setting to create documents for RGB and CMYK.

Soft Proofing in Adobe Illustrator®

Open Illustrator, and view the file you wish to soft proof. When you initially created the file, Illustrator offered a choice of file type, either RGB or CMYK, but you may use any profile installed in your operating system to preview a destination for your document.

1. Once the document is open, go to the View Menu, and select Proof Setup.

2. In Proof Setup (Figure 48), select the Device to Simulate you wish to preview, or load another profile if the desired proof condition doesn't show in your menu. A nice feature in this window is the ability to preview without closing the window, so you can quickly test your design with different paper/profiles profiles, toggling the Preview check box on and off to see the effect.

3. When you release this menu, the item below Proof Setup, named Proof Colors, will be checked. You can also toggle Proof Colors on and off here to see before and after effects of converting the color.
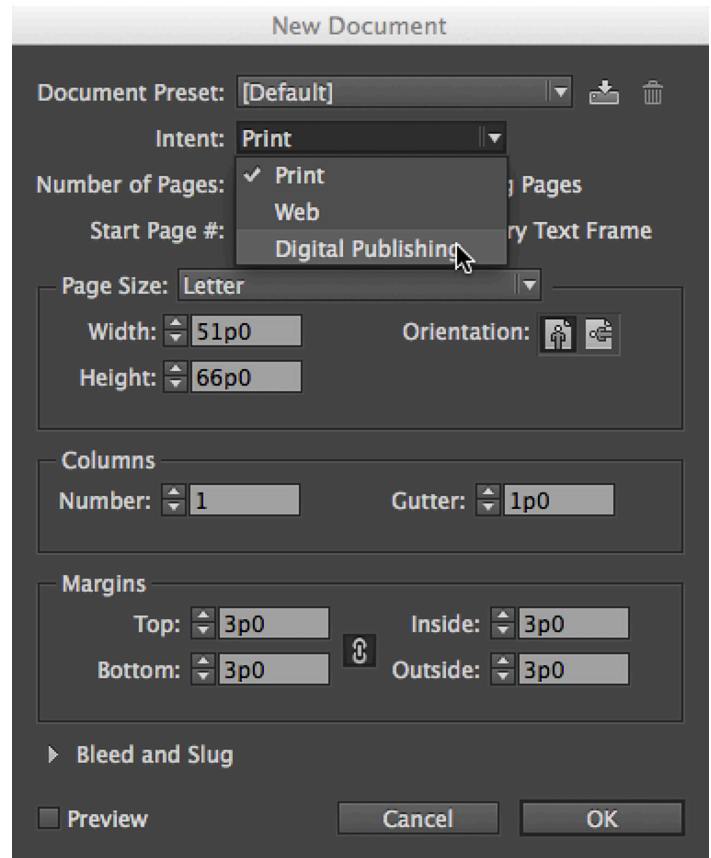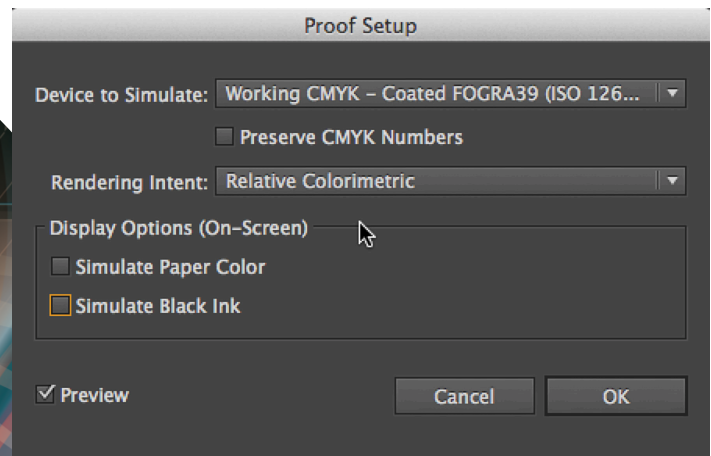

Figure 47

Figure 48

Soft Proofing in Adobe Acrobat® DC

Adobe Acrobat Pro DC (formerly Acrobat Professional) offers very good color management support. To soft proof, open Acrobat Pro DC, then open the Preferences, under the Acrobat menu (Figure 49).

1. In Preferences, select Color Management as shown. If the window at the top displays an Unsynchronized icon, go to Bridge as previously shown, and synchronize your color for most consistent results.
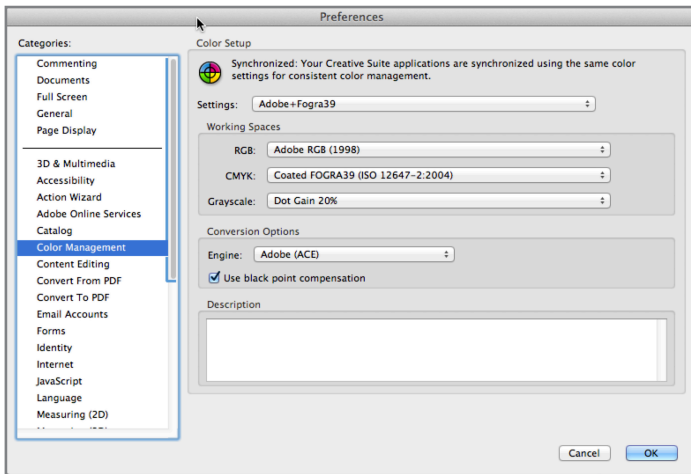

Figure 49

2. Close the Preferences, and open the document you wish to preview. Select Tools as shown in Figure 50.
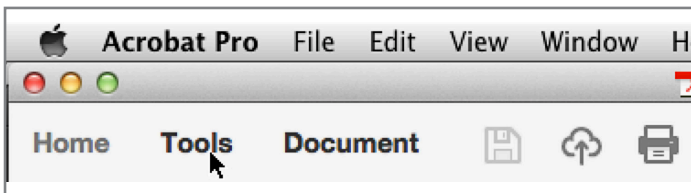
Figure 50

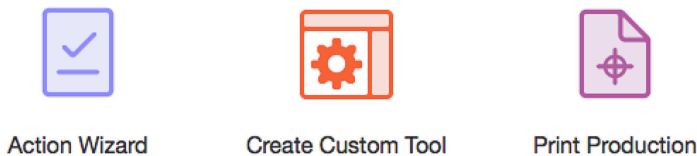3. In the Tools window (Figure 51) select Print Production.

Figure 51

4. In the next window that Appears (Print Production), Select Output Preview at the top right (Figure 52). A dialog box will appear. (Figure 53).
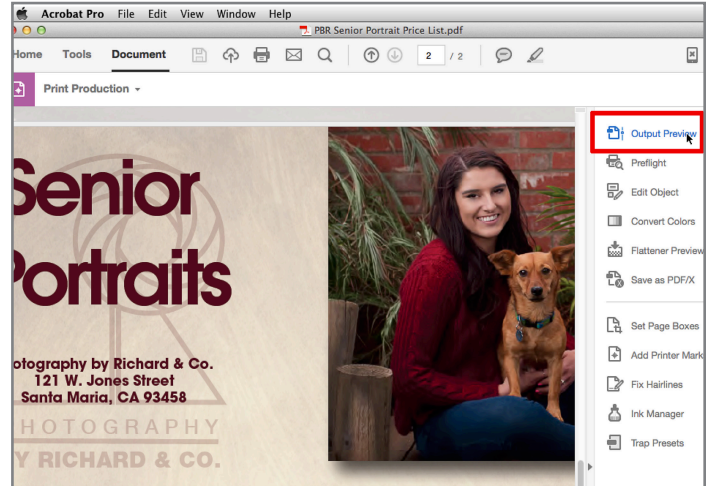

Figure 52

5. Select the profile you wish to use to soft proof in the Simulation Profile menu pulldown (Figure 53). If you want to see how the color of the paper will change the color on the page(s), click the Simulate Paper Color check box.

6. The profile will be applied while this dialog is open, so you can see how the color will change upon output, and try a different profile for comparison. You can select any profile installed in your system, or install a profile from a print provider you plan to use. Note that some print providers don't provide profiles to their customers, and some only provide a few, not necessarily an exact match to the paper you'll use for your printing.
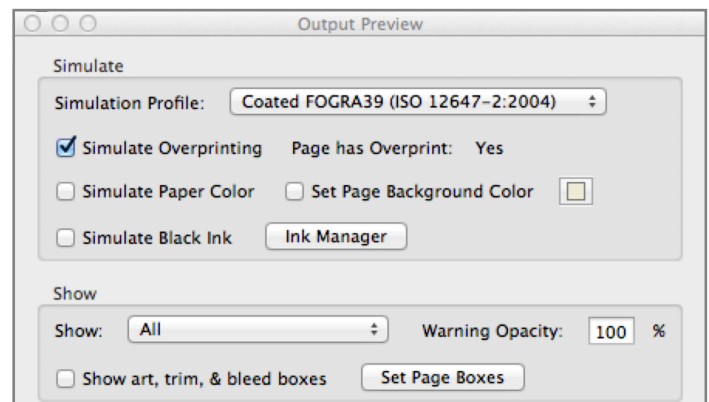

Figure 53

Soft Proofing in Adobe After Effects®

Once a project is built in After Effects, it's possible to convert it to multiple destinations, each with its own color requirements. To soft proof your project before actually converting it in order to make sure the color will be what you want it to be for each destination, start with a current calibration and profile for your display.

1. Go to Preferences —> Previews and set Color Management Quality to More Accurate, as shown in Figure 54.
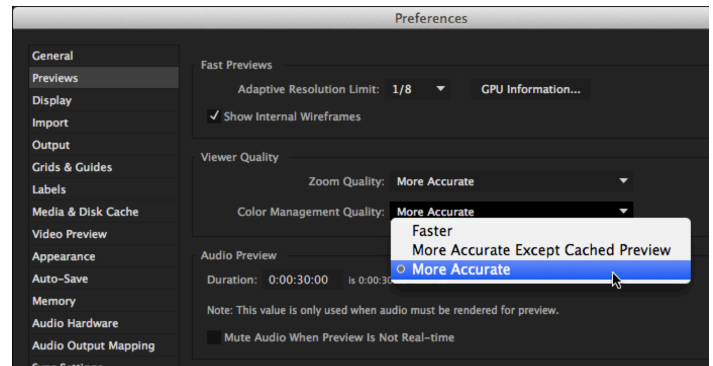

Figure 54

2. With the project open in After Effects, go to the View Menu and choose Simulate Output (Figure 55). Select the target color profile to preview on-screen exactly how your project will appear in the color space for each desired destination. The best color will be provided using a DisplayPort connector, in order to take advantage of all the billion+ shades of 10-bit color Cintiq 27QHD displays can provide.
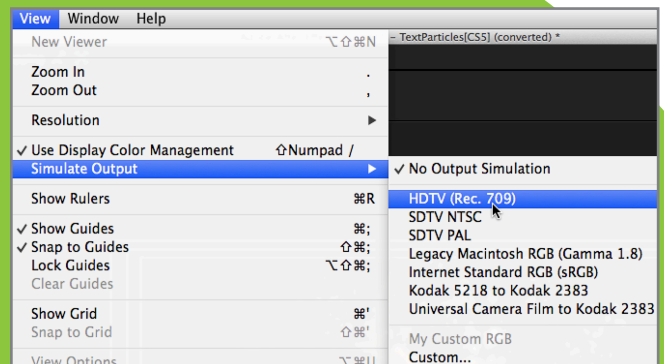

Figure 55

Soft Proofing in Autodesk® Maya®

Soft proofing in Maya is a powerful tool, letting you preview your work for multiple destinations, including some not yet shipping. Soft proofing allows you to work in a large color space and preview how your scenes will appear when exported to final destination color spaces. Here are the steps for best practices for soft proofing.

1. Know which final destinations you'll need to use to export your work. If your working space is the same color space into which your final work will be exported, unless you apply a transform to prepare your work for different colorspace requirements. For example, you may have created the entire project in ProPhotoRGB with a linear gamma (1.0) for displaying on Ultra High Definition TV (UHDTV), but you also need to send this content to the web, for which sRGB is the best destination. Before applying a transform to your project, soft proof it.

2. You can enable a soft proof in the Render View and Viewport 2.0 toolbars (Figure 56). The View transform is On by default when color management is enabled. Note: View transforms do not change your files' color each time you preview; rather, they create a temporary view that disappears when you close the preview.
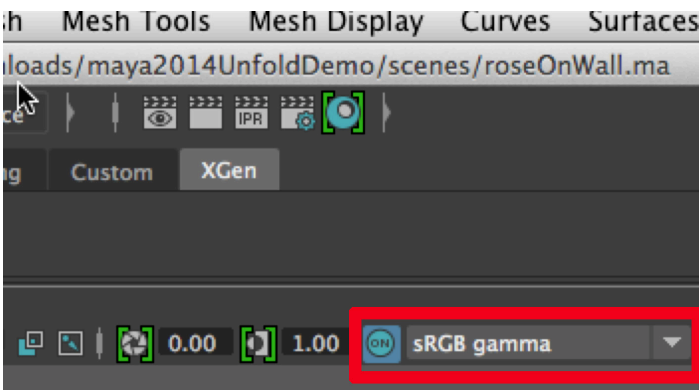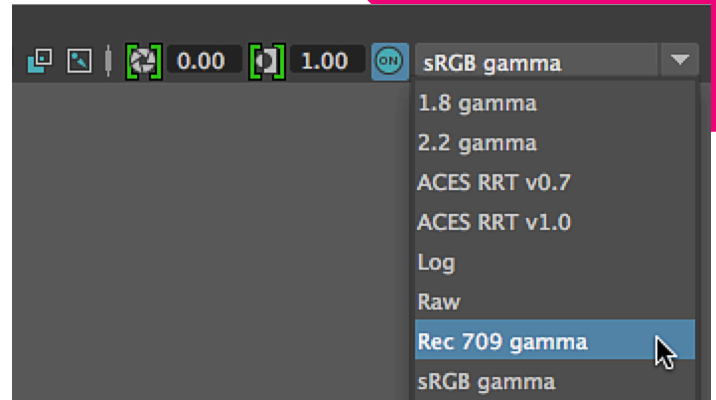

Figure 56

Figure 57

3. The default is sRGB gamma. This is the same view transform default used in many compositing and finishing applications. Because it doesn't include a tone map, values above 1.0 will be clipped by the display. A wide number of alternatives can be used to apply different gamma values for various destinations.

4. To preview a scene in a different color space, click on the pulldown menu in the View Transform section of the tool bar (Figure 57) and select your desired other color space.

5. If you preview a scene and some imported element has incorrect color, test the incorrect element's original file to see if it was created using a different color space. Set a matching profile for each item individually that doesn't match the default import profile by manually setting Color Space in its attributes. This custom profile assignment will change back to the default if you reapply the rules to it. To prevent this, activate Ignore Color Space Input Rules in the item's settings.

   If you find that you're having to change assigned profiles too often, consider using a second rule for certain types of images, as previously discussed.

Great Displays for Great Work–Best Solutions for Color Workflows

At the center of a great digital color workflow is a great display. The Cintiq 27QHD Pen and Cintiq 27QHD Pen and Touch displays deliver superb quality for all your professional color needs. Advanced color technology and bundled software join with beautiful ergonomics and design to support multiple color workflows in comfort and style. The addition of touch support to augment direct, on-screen stylus input will make you even more productive while enhancing your experience using the display.

Add a full set of professional color tools for color management, helping you manage your color on multiple displays as well as multiple workflows quickly and automatically, and it's clear these displays are the perfect choice for creating and proofing great color.

Productivity

Wacom technology makes artists more productive as they use their Cintiq display with a stylus for fine-detail work. The display's surface has a very subtle texture providing perfectly balanced interaction between glass and stylus, giving the feel of pen and paper. The ability to create directly on the screen speeds up your work dramatically. On each Cintiq stylus, two programmable switches let you customize buttons to your own specific workflows.

The seventeen application-specific programmable ExpressKeys™ speed up your workflows even more. Up to 5 different users can share the display, each having their own set of customized keys. If you're familiar with previous Cintiq displays, you'll be pleased to see the new approach to the Cintiq 27QHD ExpressKeys. Previous Cintiq displays had the ExpressKeys built into the bezel of the display, with matching sets of keys on both sides. With the new ExpressKey™ Remote (Figure 58 & 59), these keys have been placed in a device which can be positioned where it's most convenient for you.
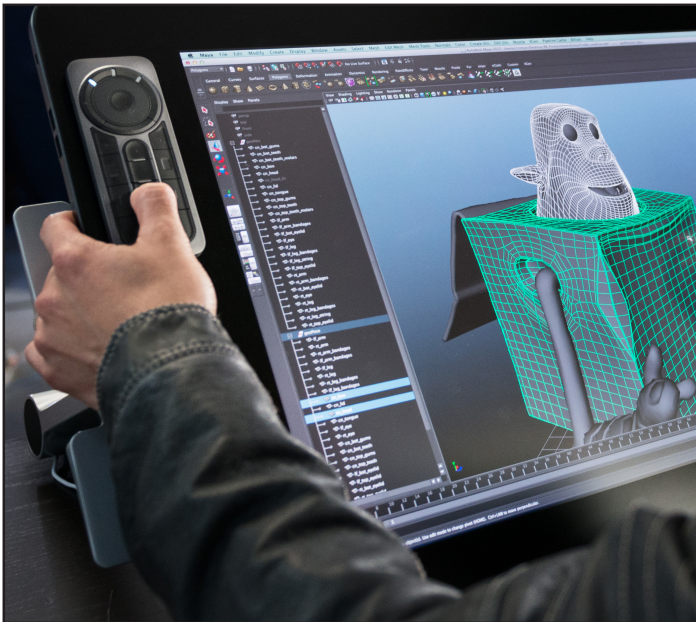

Figure 58

Figure 59

If you prefer having the keys directly on the screen or the display's bezel, great. The ExpressKey Remote is magnetized to stay where you put it. If you work better with the keys on your desk, or in your lap, fine! Put them where they work best for you. The battery has a projected life of 160 hours before needing a recharge, and quickly recharges from one of the 4 USB 3.0 ports built into the Cintiq displays.

Figure 60

Wacom Cintiq displays enabled with Touch technology deliver an even higher level of productivity (Figure 60). Artists can access the display's hardware controls on-screen, pan, zoom, and rotate their creations, and even type on an on-screen keyboard. You'll work even more smoothly and intuitively in many of your favorite applications, using touch just as you would a mouse or stylus.

Color informs our lives. Artists use great color to touch our hearts. This color guide has discussed the essential tools and knowledge artists need to create the best color possible in digital workflows, featuring the best Cintiq display Wacom has ever made. We hope you'll use the knowledge in this guide to configure your color for greatness—and if you do it on a Wacom Cintiq 27QHD display, so much the better. Here's to great color around the world.

Specifications

Cintiq 27QHD Pen and Cintiq 27QHD Pen and Touch Displays

Product Type: Creative pen and touch display

Size: 770 x 465 x 54.5 mm; 30.3 x 18.3 x 2.1 in

Weight: 19.8 lbs. without stand (9 kg); 55.1 lbs. with stand (25.1 kg)

Screen Size: (Measured Diagonally) 68.6 cm; 27 inch

Technology: AHVA LCD (proprietary IPS)

Displayable Colors: (maximum) 1.07 billion (Requires DisplayPort and video card supporting 10-bit color)

Aspect Ratio: 16:9

Viewing Angle: 178° (89°/89°) H, (89°/89°) V

Contrast Ratio: 970:1

Brightness: 330 cd/m2

Response Rate: 12ms

Active Area: 596.7 x 335.6 mm; 23.5 x 13.2 in

Color Gamut: 97% Adobe® RGB

Industry Standard Pre-sets: Adobe® RGB, 6500° K whitepoint default; DCI, REC 709, sRGB

Graphics Input: DisplayPort (required for 2560x 1440 resolution), HDMI (depends on computer)

Multi-Touch: Yes (Cintiq27QHD Touch only)

Pen: Pro Pen

Pressure Levels: 2048, both pen tip and eraser

Tilt Range: 40 degrees

Tilt Recognition: ±60 levels

Type: Pressure-sensitive, cordless, battery-free

Switches: Tip switch, 2 side switches, eraser

Nibs: 6 standard, 3 felt, 1 stroke

Pen Box: No

Pen Stand: Yes

Grip: Latex-free silicone rubber

Pen Model: KP-503E

Pen Technology: Patented electromagnetic resonance method

Pen Resolution: 5080 lpi

ExpressKeys™: 17 customizable on ExpressKey Remote

Touch Ring: Yes, on ExpressKey™ Remote

Touch Strips: No

Radial Menu: Yes

Precision Mode: Yes

Display Toggle: Yes

Dedicated Pan, Scroll, Zoom, Brush Size: Yes

ExpressKey™ Remote Dimensions: 135 x 52 x 10 mm; 5.3 x 2.0 x .4 in

ExpressKey™ Remote Continuous Operation: Up to 160 hours

ExpressKey™ Remote Charge Time: Up to 2 hours

Stand Adjustability: Built-in stand (5° w/o legs or 20° w/ legs); optional Cintiq Ergo stand sold as accessory

Orientation: Right or left-handed use

Size: 32.3" W x 20.1" H x 15.4" D; (820 x 510 x 390 mm)

Cables Included: DisplayPort, HDMI, USB 3.0, Micro USB (ExpressKey Remote);

Adaptors: DVI-D TO HDMI, Mini DisplayPort to DisplayPort

PC And Mac Connection: USB

Display Connection: DisplayPort and HDMI

Peripheral Connections: Five USB 3.0 ports

Power Supply Input: 100 to 240 VAC, 50/60Hz

Power Supply Output: 24 VDC, 5.0A (max)

Power Consumption: 80 W, .5 W in sleep mode, .5 W off mode

System Requirements PC: Windows®7 (32/64 bits), 8, 10

System Requirements Mac: Mac OS X 10.8 and above

What's Included:

    Cintiq 27HD Creative pen and touch display

    Pro Pen

    Pen stand with 10 replacement nibs & nib removal tool

    ExpressKey™ Remote

    Cables: DisplayPort, HDMI, USB 3.0, Micro USB (ExpressKey Remote);

    Adaptors: DVI-D TO HDMI, Mini DisplayPort to DisplayPort

    AC power adaptor

    Installation CD

    Quick start guide

Certifications: VCCI Class B, FCC Part 15 Subpart B (class B) and C, CE, IC ICES-003 and 210, RCM

Available Accessories: Airbrush, Art Pen, Classic Pen, Pro Pen

Model Number: DTH-2700/DTK-2700

Limited Warranty: 2-years in USA and Canada; 2-years in Latin America

Specification numbers like display size, active area and weight are approximate

Appendix A:
How to Install Color Profiles

Profiles you create for your display are automatically stored in the right location by the profiling software. However, you may receive profiles from an output provider, or you may download profiles from paper and printer manufacturers. These profiles must be installed in the correct location in order to use them for your work. Here's how to do this quickly and easily. Once you've installed a new profile, restart your application to use it.

Mac OS

In the Mac OS, copy profiles to one of two destinations:

/Library/ColorSync/Profiles, or

/Users/[username]/Library/ColorSync/Profiles

By default on Mac OS 10.7 (Lion) and later, the user Library folder is hidden. To reach the folder, hold down the Option key and select the Go Menu. Choose Library to follow the path above.

Windows

In Windows, right-click on the profile to be installed and select Install Profile. You can also copy the profile(s) into:

WINDOWS\system32\spool\drivers\color

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www.wacom.com