



How to Create Color Profiles for ColorSync® 2.0



Masters of Media



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The Case for Network Color in Electronic Publishing



ColorSync® 2.0 software, part of the Macintosh® operating system, is an industry standard color management technology that delivers consistent and reliable color rendering on the monitor, the proof and the printed piece. Even color monitors in client offices can be made a part of the process for remote viewing, on-line conferences, and remote client approval. This is the definition of Network Color.

ColorSync software creates an environment where Network Color is not only possible, but reliable and affordable. As we move further into publishing by print and electronic means, the reliability of color is essential. ColorSync 2.0 makes color management consistent, predictable, and effective.

Based on the concept of device-independent color management, ColorSync 2.0 allows images and complete documents to be managed inside color systems for publishing – in 4, 6, and up to 8 colors for high-fidelity printing, direct-to-plate,

A situation out of control

The typical production scenario creates color variables that must be controlled to make computer design effective. Our “original” is represented at top.

To the right, the image as seen on the monitor shows a reddish cast introduced by that device.

The proof from a composite proof printer (bottom right) displays a yellowish cast.

What is needed is a corrective path between the original and the printed sheet. Apple’s ColorSync software, developed jointly by Apple Computer and Linotype-Hell, provides such a path.





The Macintosh Advantage: Network Color with ColorSync 2.0



With ColorSync 2.0, the monitor, the proof and the printed product are all represented similarly. The printable or displayable gamut of each device is taken into account, and the best possible image is made on each device. Electronic transmission of the same image is also reliable if ColorSync 2.0 profiles are available for the receiving computer's monitor.



Other computer systems may offer color management for image-to-monitor control, or balancing tools for proof printers. Only Macintosh supports Network Color management for every computer environment – from the designer's computer, to the prepress professional's workstation, to the commercial printer's system.

Apple's development tools make it easy for software developers to create ColorSync-compatible applications, which is why over 100 firms are offering software and hardware that support the ColorSync 2.0 standard. This means that you can get off-the-shelf color publishing systems that really work.

Macintosh system software extensions provide the "engine" for color management, while application-level controls are used to select color profiles that fine-tune the color management process to individual monitors, proof printers and printing processes including industry standards like SWOP, SNAP, Eurostandard and Japan Standard.

For professionals with an eye toward perfecting their color management, a number of tools exist that make the process of profiling easy. These include software applications and instruments for measuring the performance of computer monitors, for measuring the performance of reflective and film scanners, and for measuring the output of printers and printing presses.

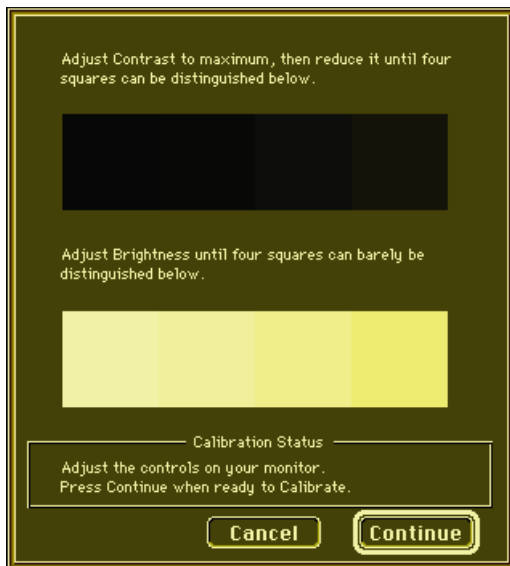
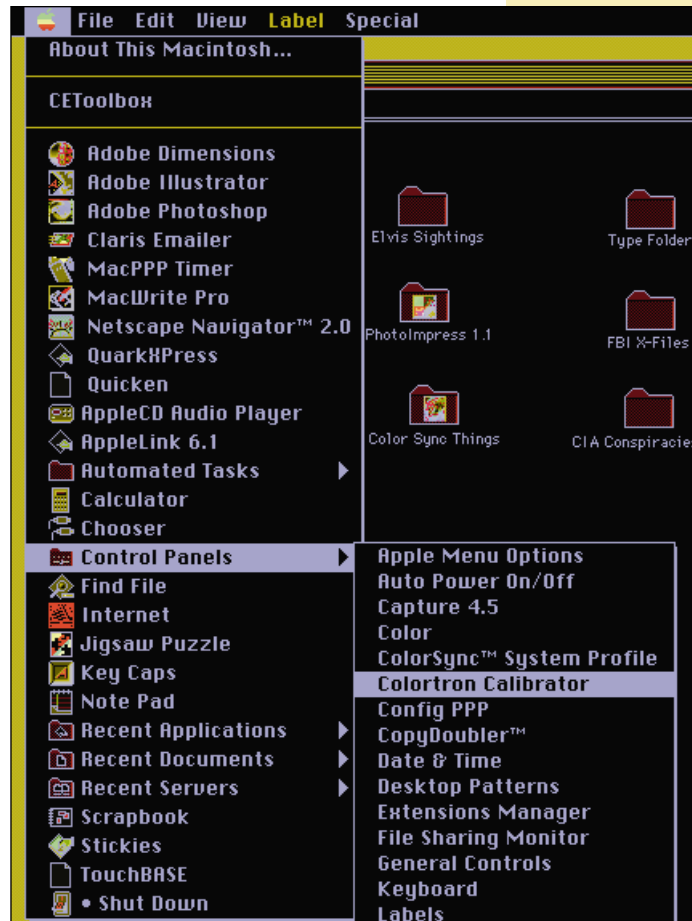
The graphic arts industry has standardized on Macintosh computers, and ColorSync 2.0 provides a powerful extension to that standard, delivering the tools and power to control color at every step of production – from conception to retail kiosk display to the printed page. For every color application there is now a color solution using ColorSync 2.0 as its core technology. The steps to Network Color management are described in detail in the pages that follow. We have featured a variety of software and hardware products that are effective for creating a color-managed environment.

1 Step

Monitor Characterization



The **Colortron™ Calibrator** software resides in the Control Panels folder. To activate the Colortron instrument as a screen calibration tool, invoke this control panel tool. The Colortron is a versatile tool, also working as a transmission and reflective densitometer and spectrophotometer.



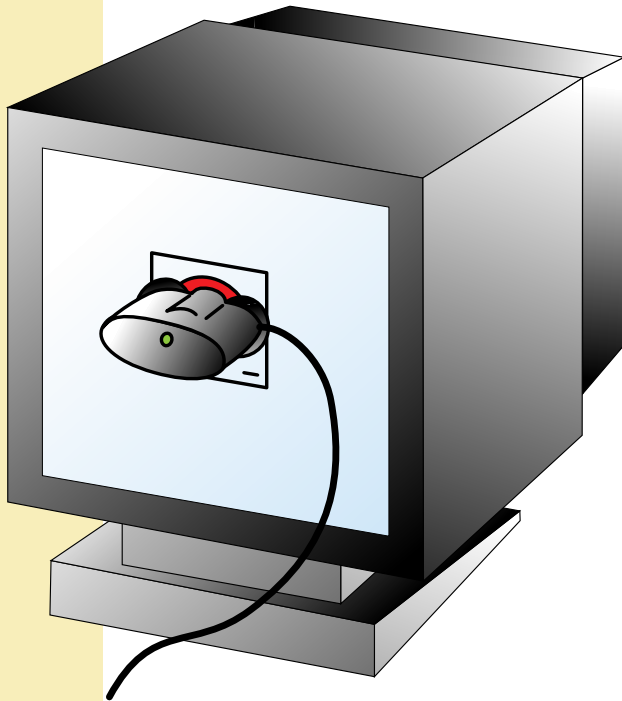
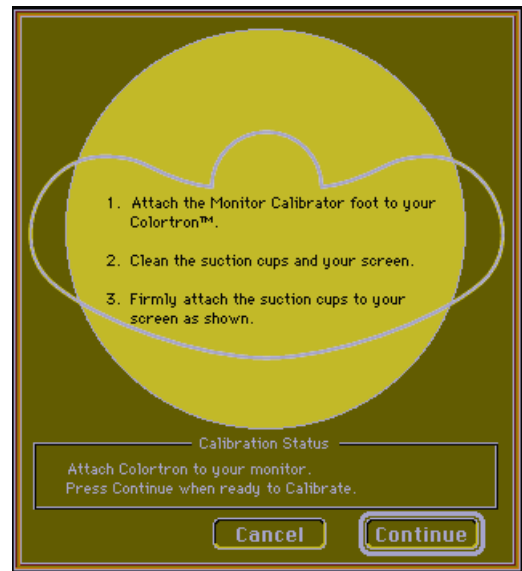
Immediately after confirming that the Colortron instrument has been calibrated recently, the monitor brightness and contrast window appears on-screen. Since most monitors are analog devices, this window prompts the user to adjust brightness and contrast controls until two sets of gray steps – one very light and one very dark – can be seen in the window.



Toolbox:
Light Source
Colortron™ II instrument
Light Source Colortron
Calibrator software



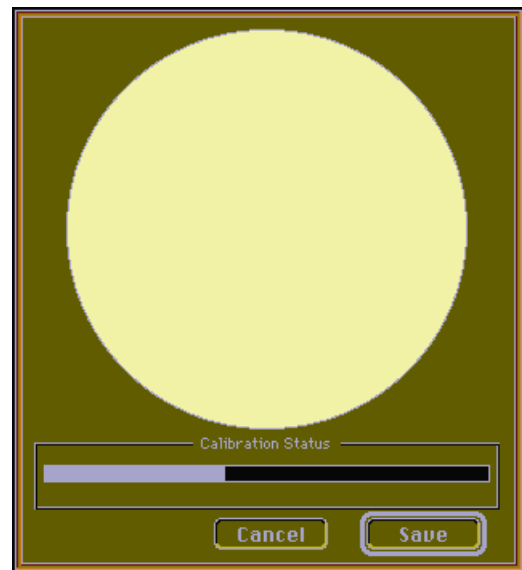
Colortron's software marks the screen for the calibrator instrument, and prompts for the operator to mount the device and begin. (Licking the suction cups helps!)



With the instrument affixed to the monitor, the software drives the guns for red, green and blue through all of their values, gathering information on color and brightness as it does.

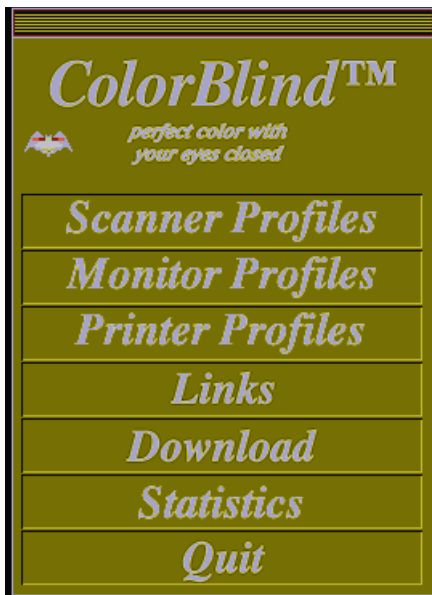


When the process is complete, Colortron prompts for a profile name, and saves the resulting file as a ColorSync-compatible monitor profile.



Step 2

Scanner Characterization



Scan either the reflective Q-60 or transmission Q-60 Kodak™ target provided with the software, and save the file in TIFF format on the Macintosh with no modification. It's important that the scanner's controls be set to repeatable positions for this scan.



ColorBlind™ ICC Print software has facilities for creating profiles for scanners, monitors and printers. It also features powerful mathematical comparison tools for analyzing the results of profiling efforts.

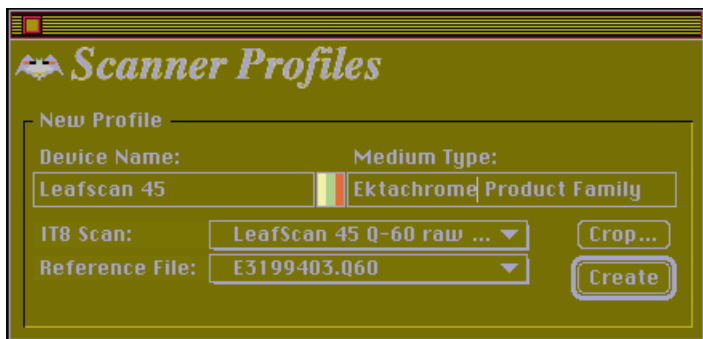


Toolbox:

Color Solutions ColorBlind profiling software
 or
 Linotype-Hell ScanOpen™ profiling software
 or
 Logo ProfileMaker Professional profiling software
 and
 Linotype-Hell Saphir desktop scanner or other scanners

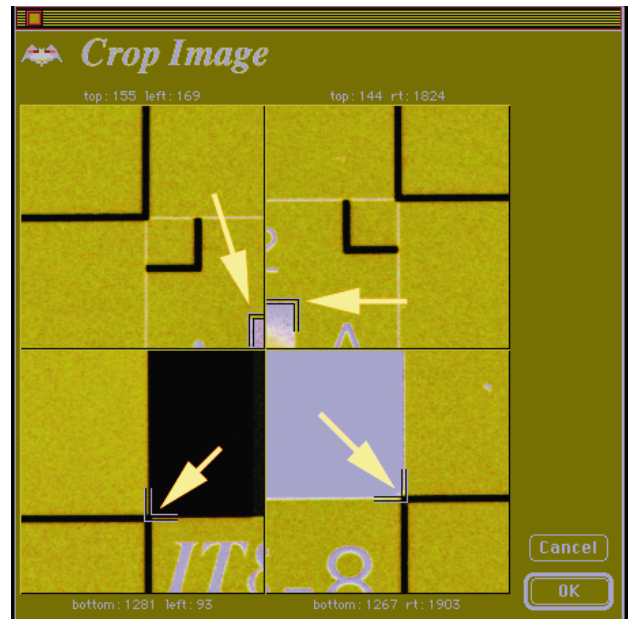


To create a scanner profile, open the source scan. A reference file provided with ColorBlind must then be loaded as a comparative file for profile creation.





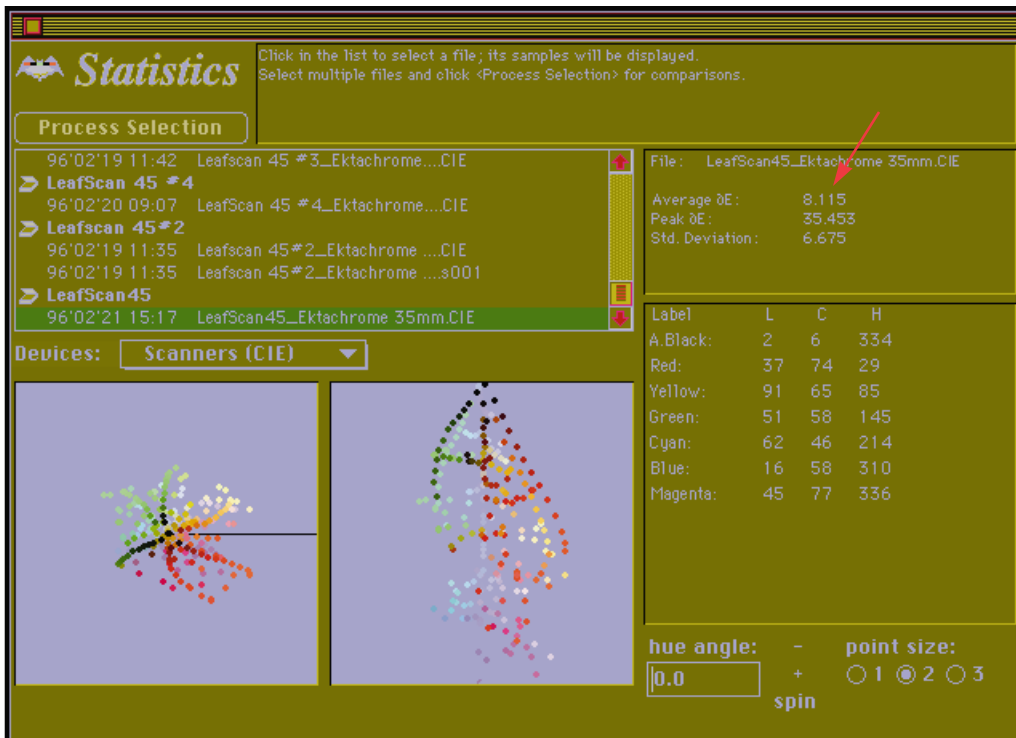
After identifying the source scan, ColorBlind needs to know where the corners of the target are located. Using the Crop Image window, shown at right, corner crop marks are placed for profile building.



When complete, the scanner profile is saved in the ColorSync 2.0 Profiles folder (inside the Preferences folder in the System folder). This profile is now available to any application that accepts ColorSync-compliant profiles.

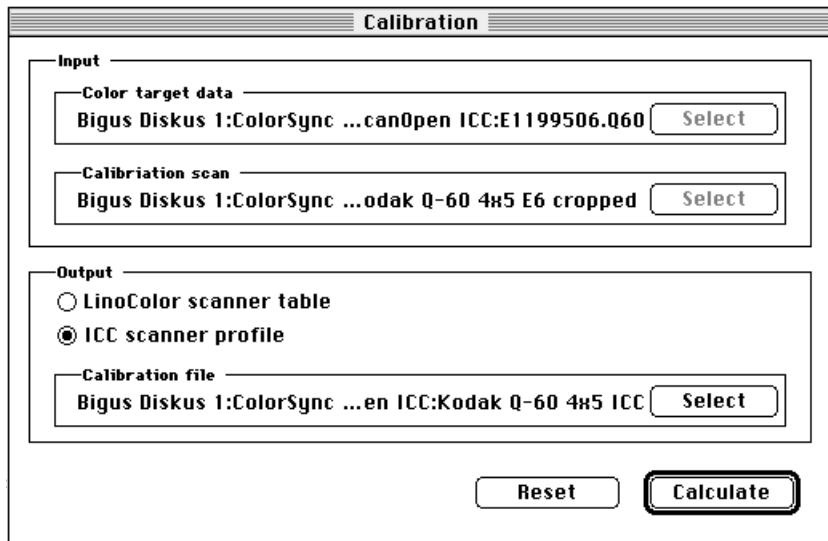
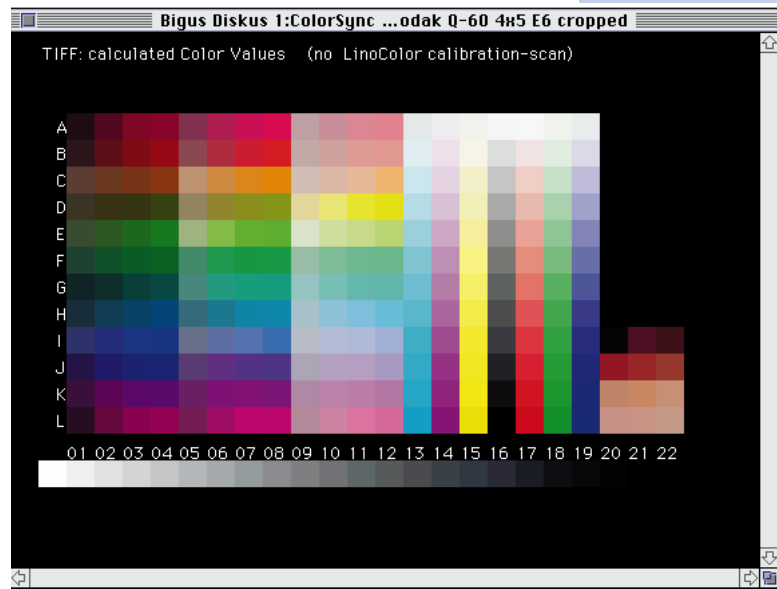


Analyzing a scanner profile entails the use of a ColorBlind function called Statistics. This compares the scanner profile with the reference file, and plots deviation. This example shows a scanner profile that is not acceptable, since its average Delta-E (difference between the target and the reference file) is 8.115 (indicated by red arrow). Acceptable scanner profiles typically have Delta-E values less than 2.0.





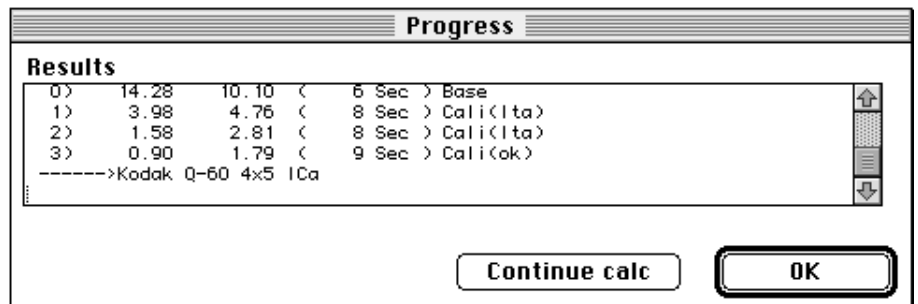
After scanning and cropping a provided target, **Linotype-Hell ScanOpen** displays the target to ensure alignment of the image to its calculation grid.

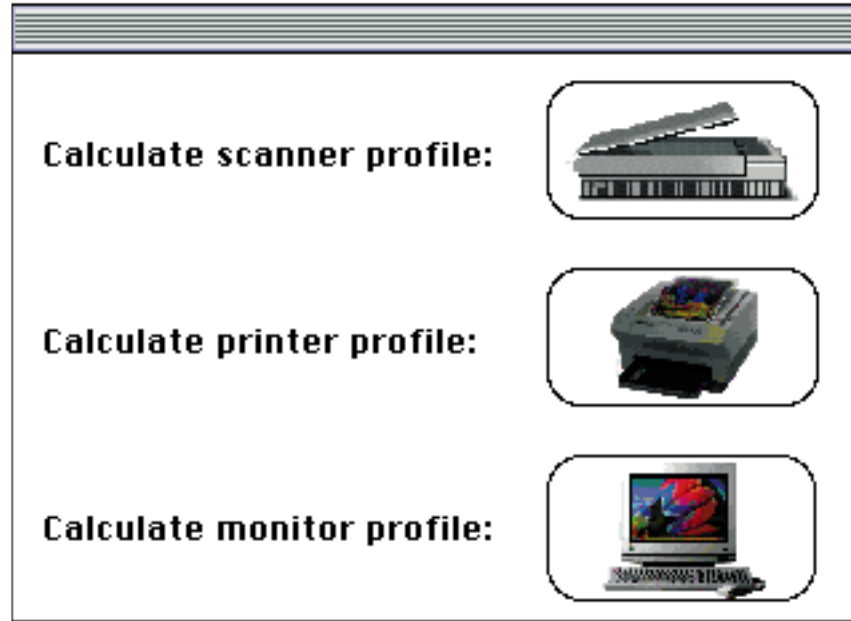


In the Calibration window you designate the scan target data file (provided on disk with the target), the scanned file, and a destination ColorSync 2.0 (ICC) profile. Clicking on Calculate will actually create the profile.



As the profile is built, the Progress window will indicate the calculation run, the average error and the standard deviation. Linotype-Hell recommends that these deviation values be 1.0 or less to create a highly accurate scanner profile, but some scanners – particularly flat-bed reflective scanners – cannot achieve this goal. By clicking on the Continue calc button, the software will make an additional process calculation, tightening the ColorSync 2.0 profile's corrections, and reducing the standard deviation values.

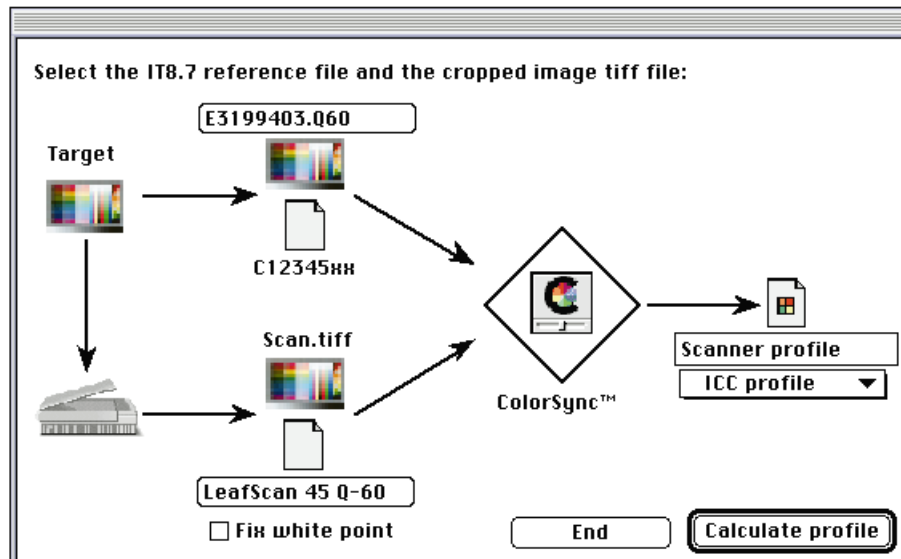




Logo ProfileMaker software will create and modify ColorSync 2.0 profiles for printers, for monitors and for scanners.



Similar to other Profile Builders, Logo's product requires that a scan of a target transparency or print be compared to supplied reference data to create a ColorSync 2.0 profile for the scanner.



3 Step

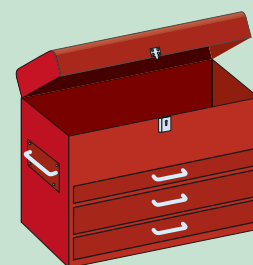
Printer Characterization



To create a printer pattern in **ColorSynergy™**, choose **Make Pattern** and then one of the three color models. In this example, the target printer is a Kodak XL7700, which converts RGB files into CMY internally (if you use a CMYK printer, you would use a CMYK pattern). ColorSynergy will create TIFF patterns according to the page size capability of the printer and settings in following windows.



The dimensions of the target are set in pixels by pixels size in the menu shown above here. Immediately following to the right is a menu for TIFF options, including resolution and byte order. The last of these windows is the Save dialog box where the filename is assigned. Typically, ColorSynergy saves two or three separate files comprised of strips of colored patches which become the measure of the printer's capabilities.

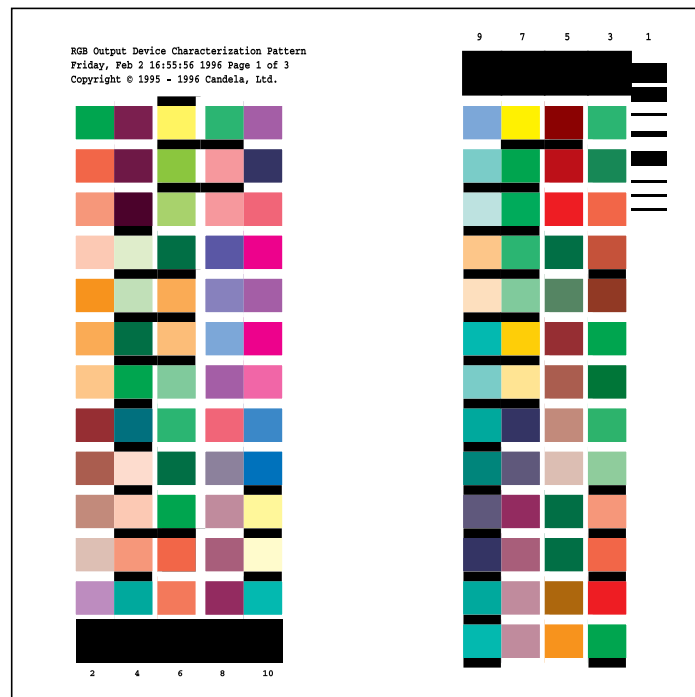


Toolbox:

- Candela ColorSynergy profiling software
- or
- Color Solutions ColorBlind profiling software
- or
- Linotype-Hell PrintOpen™ profiling software
-
- X-Rite® DTP-51 Auto Scan Colorimeter
- or
- Light Source
- Colortron II instrument



ColorSynergy generates strips of color patches like these when the software is set up for the X-Rite DTP51 Auto Scan Colorimeter. In this example, three pages of strips were generated (a total of 270 patches) and printed on the Kodak XL7700 printer for evaluation. The columns of color patches are numbered for sequential insert into the DTP51 colorimeter.

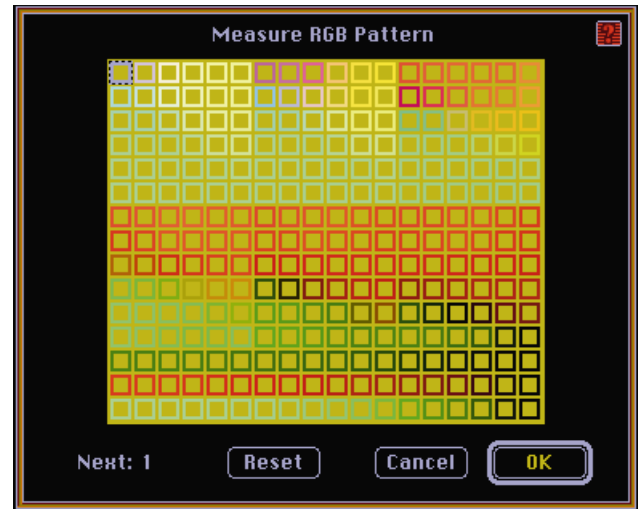
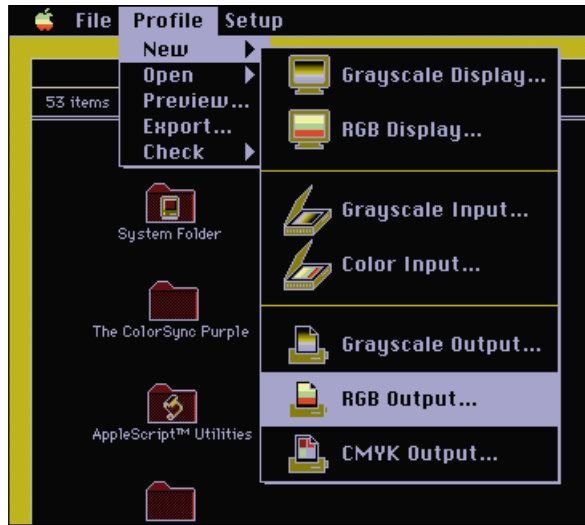


X - R I T E D T P - 5 1

With the **X-Rite DTP-51 Auto Scan Colorimeter**, the readings take about ten minutes because the machine reads in strips of ten or more patches per row. The X-Rite instrument can be connected through either the serial or printer receptacles in the Macintosh. ColorSynergy allows you to suspend a reading session and return later to complete the task. These readings can be composed for any RGB, CMY, CMYK or grayscale printing device – including printing presses. The resulting profiles become printer profiles for use in applications that are ColorSync 2.0 compatible.

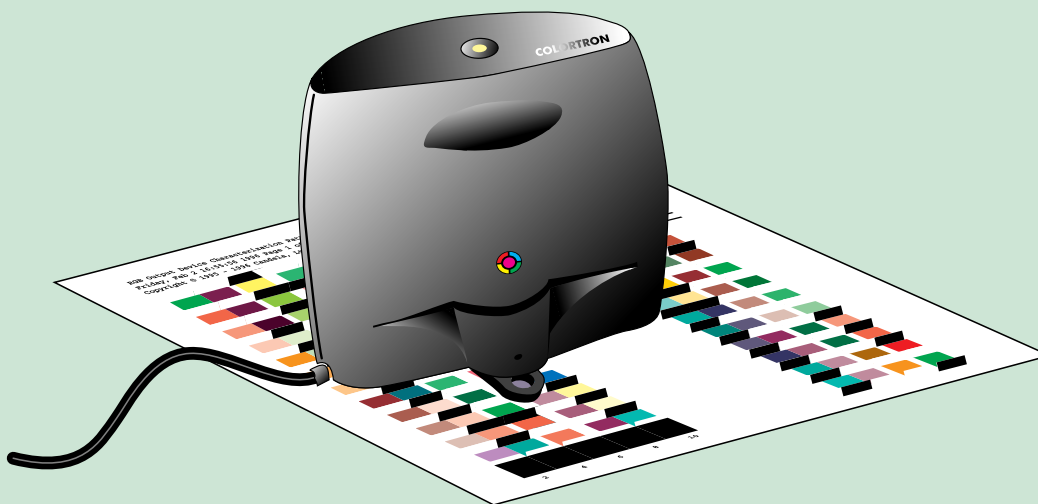


4



After the test patterns are printed, they are read into the ColorSynergy program either individually or with a strip-reading instrument.

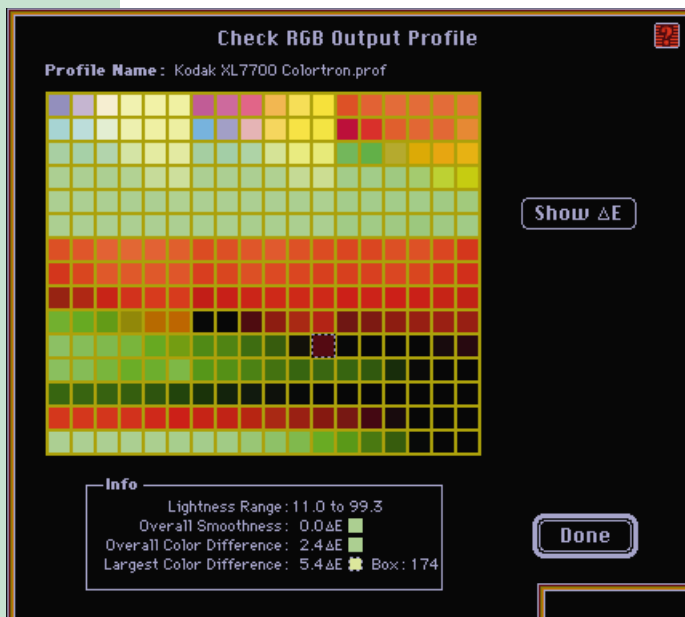
C O L O R T R O N I I



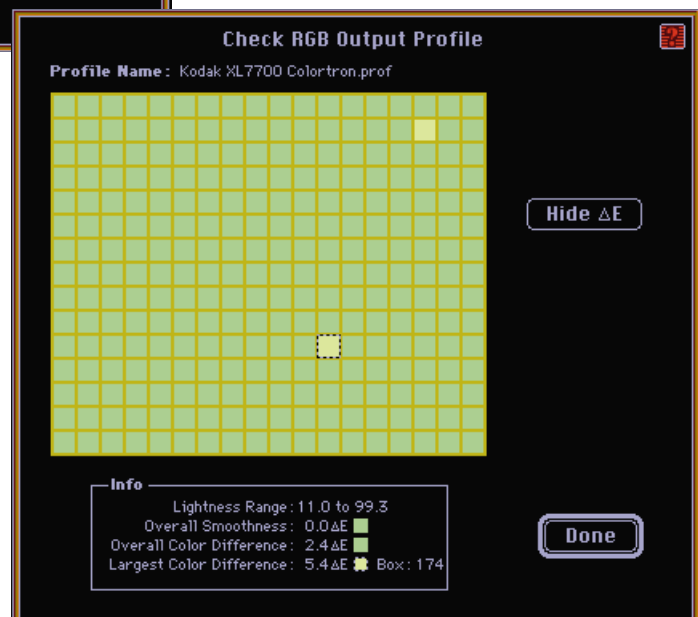
Reading the 270 patches with **Colortron II** took 51 minutes (exactly the length of Beethoven's Ninth Symphony – Ode to Spectrophotometry). It's important with the Colortron II that all readings be made in the same fashion, eliminating variables that could result in incorrect readings. For the best results, face the Colortron II the same direction for all readings.



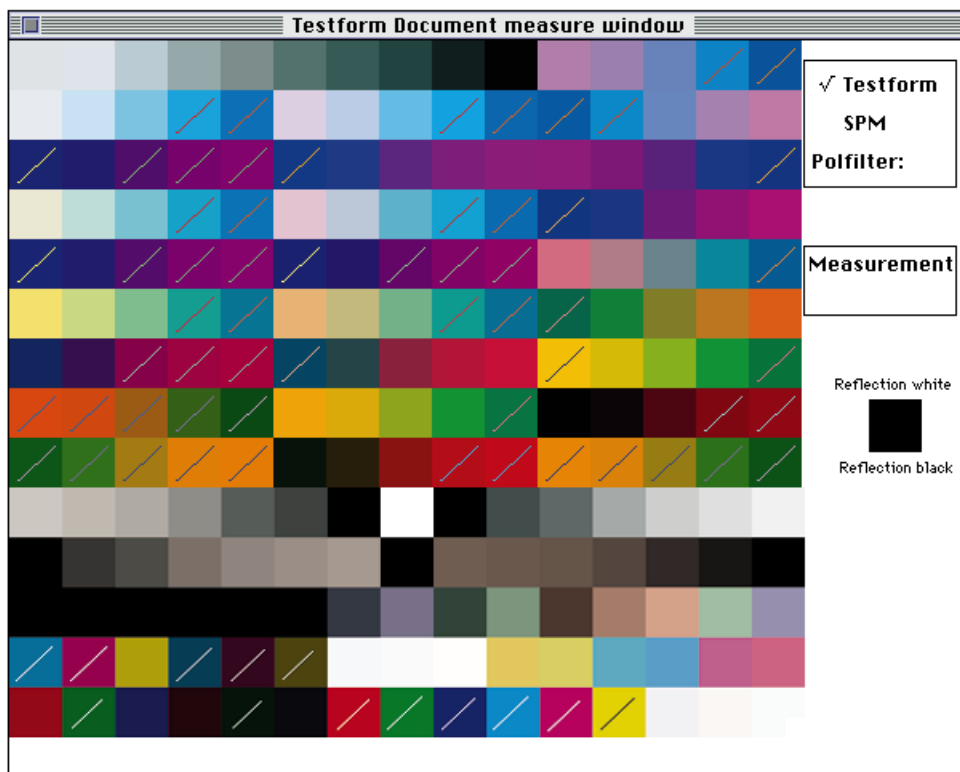
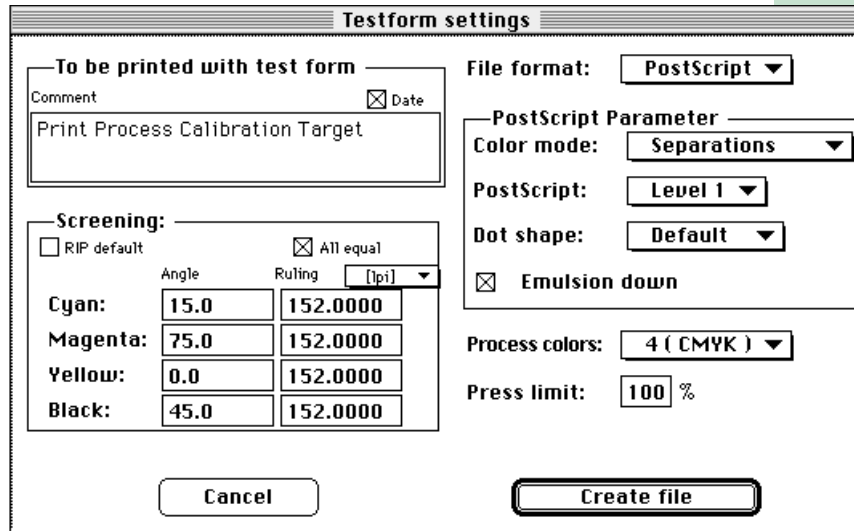
After completing the 270 patch readings, ColorSynergy creates an output profile. The calculations it makes are based on comparison of the values requested for the patches versus the color actually printed by the device. The profile, then, is a corrective device that adjusts subsequent output for the measured response of the test patterns.



When complete, ColorSynergy includes a check profile feature, which indicates the greatest deviation from the target patches in a graphical window pictured here. Combined with accurate values for Delta-E deviations, the program allows identification of potential problem areas in output. This sample shows a modest Delta-E deviation from the proof on the Kodak XL7700 printer.



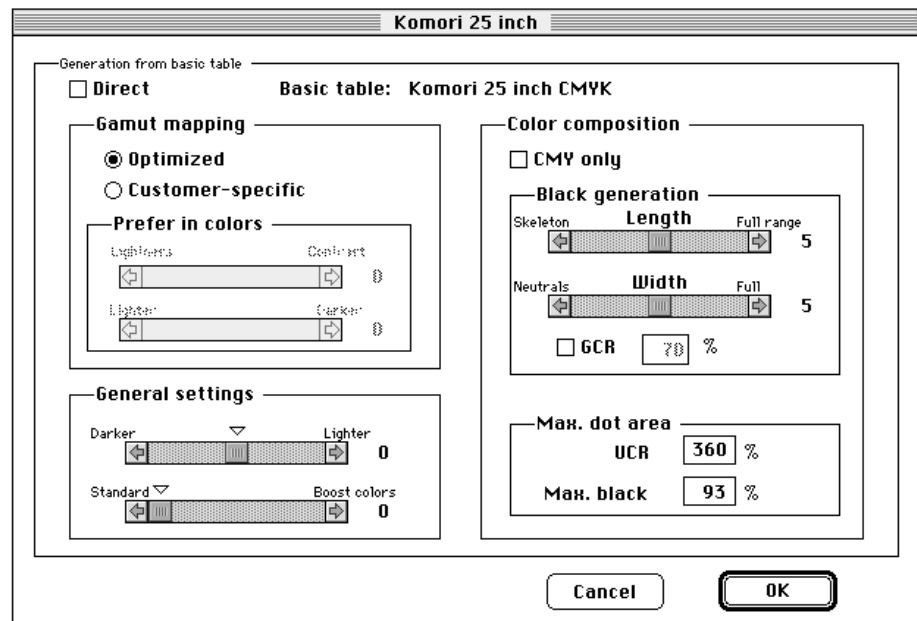
To create a test patch document in **Linotype-Hell PrintOpen** software, use the Testform settings window. Here, one designates the screen frequency and angles, the type of file (TIFF or PostScript), and whether the file should be made up of three (CMY) or four (CMYK) colors for printing, or RGB for film recorders and similar display devices. When Create file is clicked, a Save Dialog box comes up, asking for a file name and destination folder.



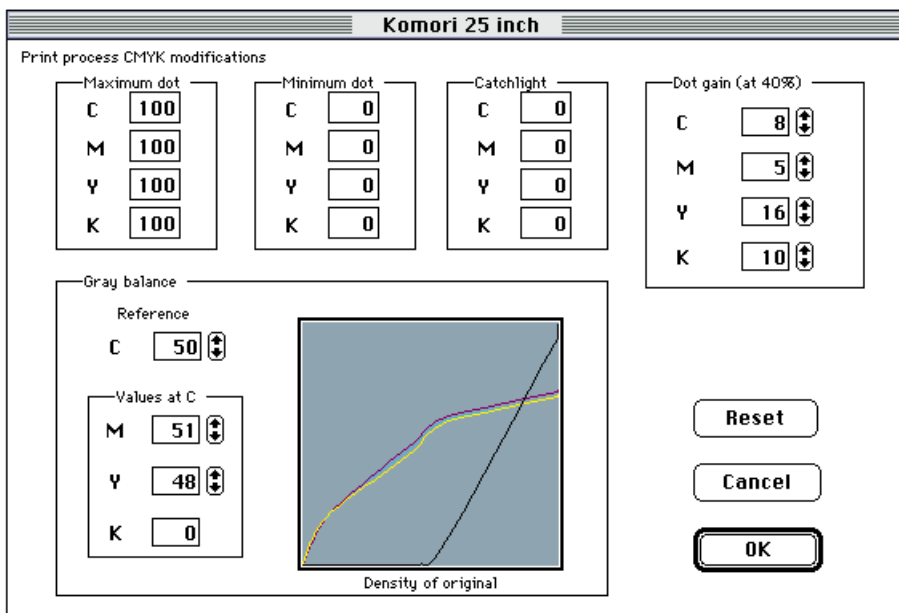
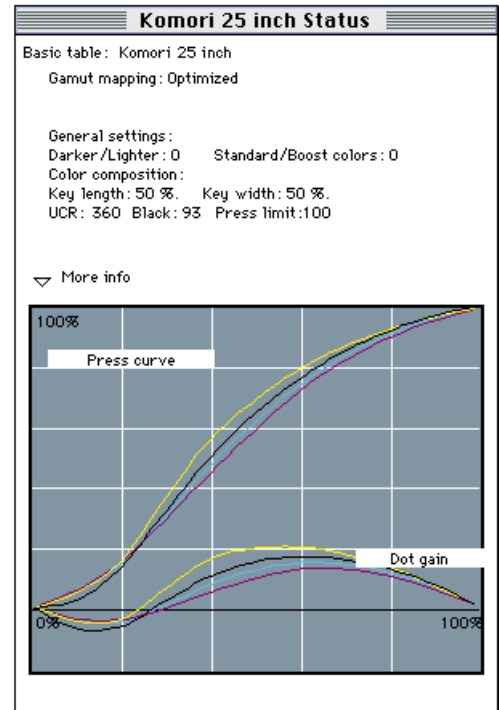
After creating the testform document and printing it on a proof printer or printing press, the color patches are read with an instrument and then imported into PrintOpen for further analysis. In the example shown, the 210 patches were read with a Colortron II instrument, and the results of these readings were copied through the Clipboard as ASCII text into PrintOpen.



Once the 210-patch scale is imported into PrintOpen, a color analysis is made to prepare a color table in the application. That table can be used to produce an ICC color profile (which is a ColorSync 2.0 profile).



After the color table calculation is complete, you may view the color curve of the analysis. A second window, Modify, will then allow changes to be made to the table.



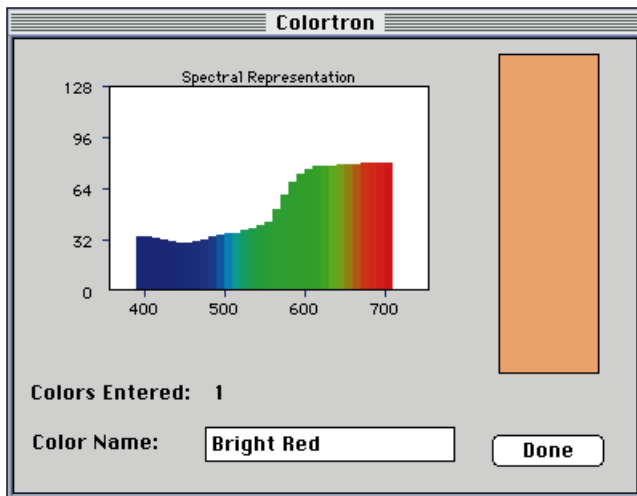
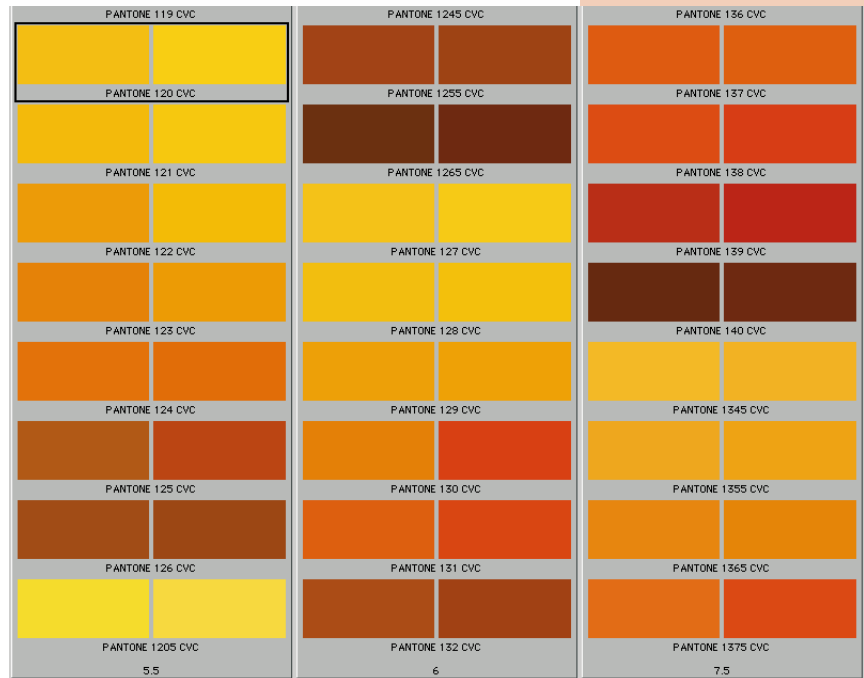
The Modify window allows a calculated table to be modified before being converted into a ColorSync 2.0 profile. These controls give prepress professionals the ability to adjust the performance of any color table, and thus, create ColorSync 2.0 profiles that are correct for any printing process.

4 Step

Utilities



Pantone ColorDrive™ allows any of the Pantone color libraries to be opened for selection or analysis. From these libraries a custom color palette is built.



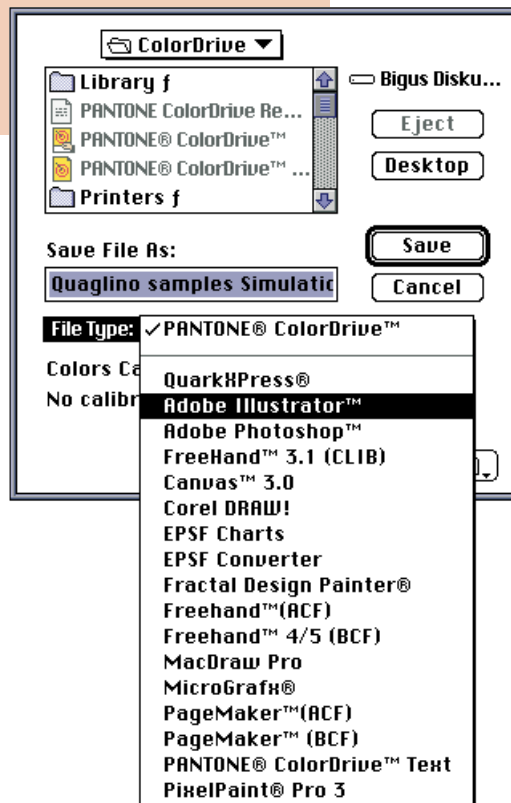
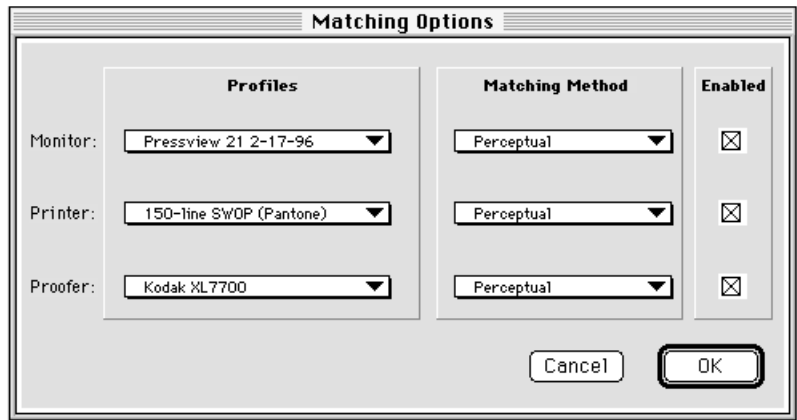
Using a colorimeter, new colors can be measured and added to color palettes. In this example the Colortron II instrument is used to bring a new color into the palette. Once there, colors can be modified, compared to any color library for closest match, and viewed in simulation using ColorSync 2.0 monitor, proof and printer profiles.



Toolbox:
Pantone ColorDrive software



The real strength of ColorDrive is its ability to simulate the color performance of any device using ColorSync 2.0 profiles. Monitor, proof and printer profiles can be loaded, and viewing methods can be set for each. Perceptual viewing is recommended for photographic images, while Absolute Colorimetric is useful for accurate color matches, and Saturation is recommended for graphics like bar charts and graphs.



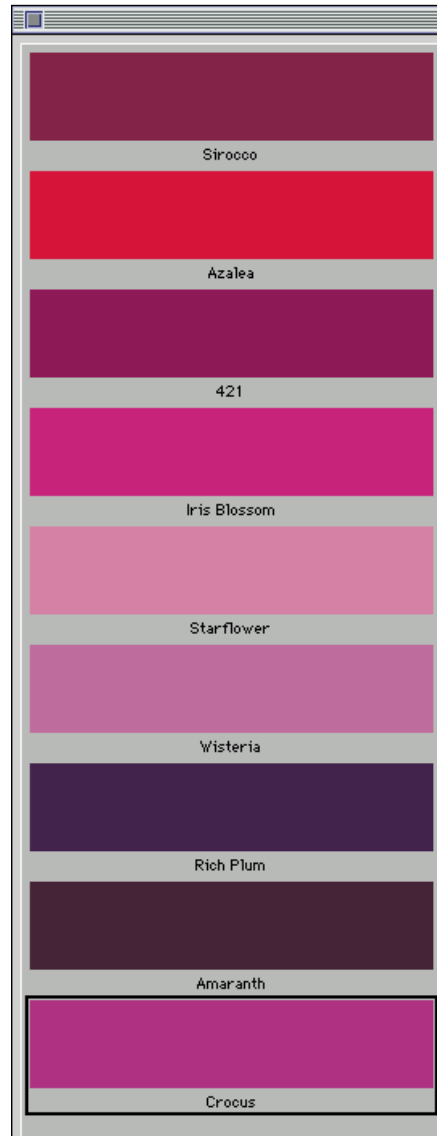
Once a color palette is built, it can be exported in a number of formats, making it readily available to most popular Macintosh graphic arts applications such as Adobe® Photoshop™ and Illustrator™, Macromedia® FreeHand™, and numerous others.

S A M P L E P A L E T T E S

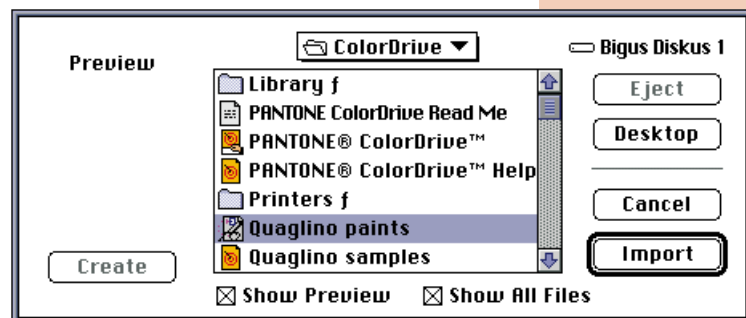
In programs like Adobe Illustrator 6.0, it is possible to import ColorDrive palettes. Shown here is the method for importing a custom palette of colors into an Illustrator 6.0 document.

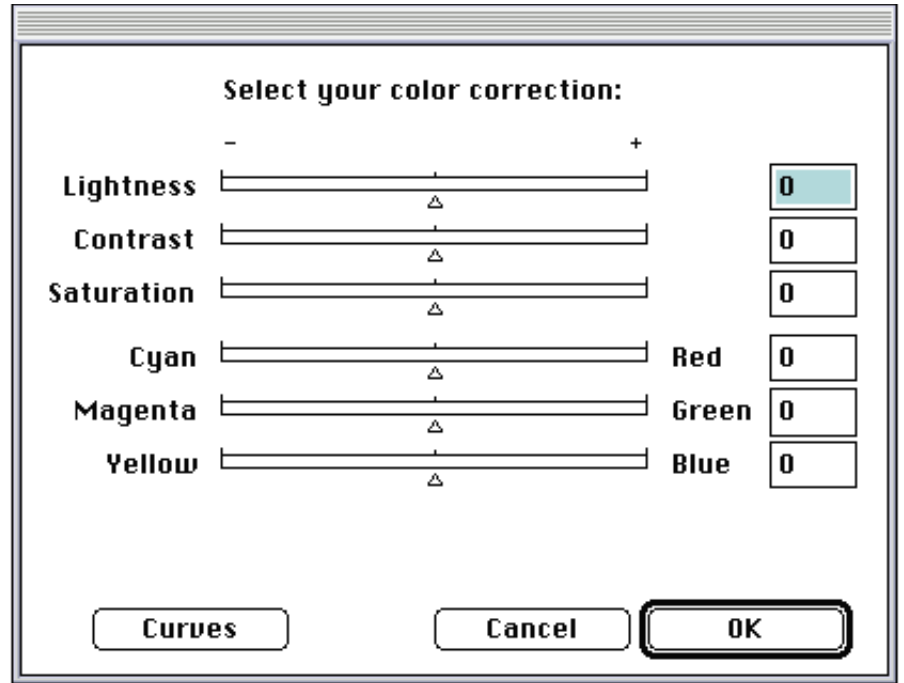


Illustrator 6.0 and other applications allow the ColorDrive color palette to be imported as colors into its custom colors menu.

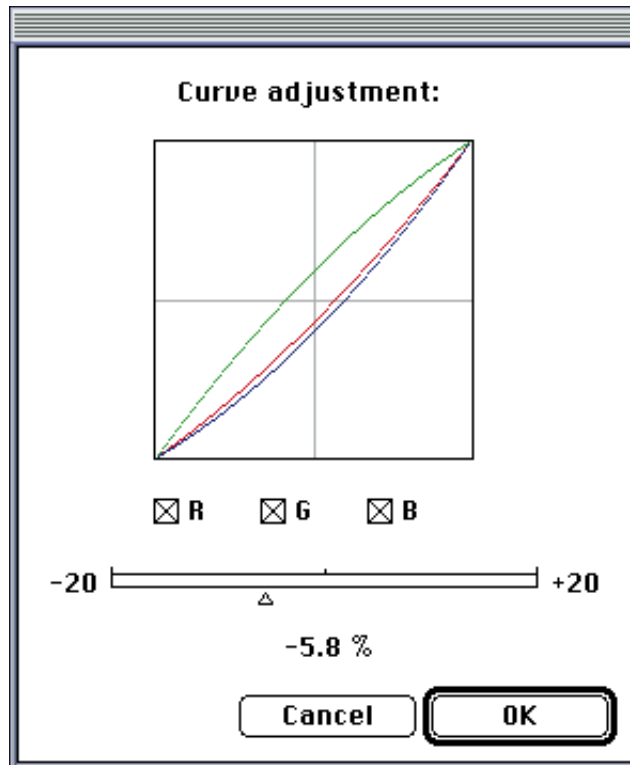


This custom palette was created in ColorDrive from color measurements of printed samples. The colors and names were adjusted in ColorDrive to please the designer by viewing in Simulation mode for a preview of their printed qualities.





Logo ProfileMaker software will edit any existing ColorSync 2.0 profile, modifying the performance of that profile in its designated task.



Further adjustments to profiles can be made visually with the Curve adjustment window. Here, curve modifications can be applied to any ColorSync 2.0 profile.



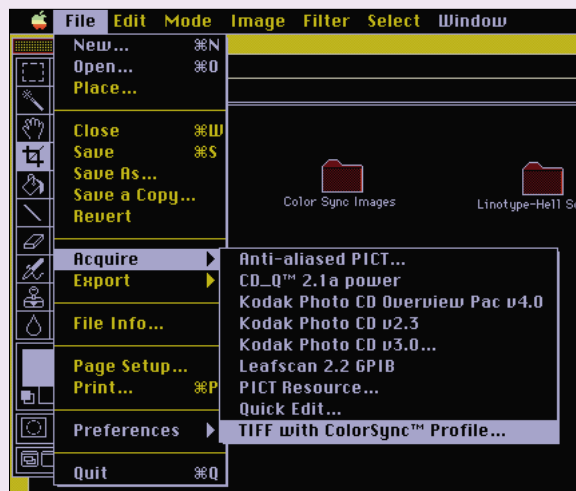
Toolbox:
Logo ProfileMaker
Professional

5 Step

Putting ColorSync 2.0 to Work in Production

A D O B E P H O T O S H O P

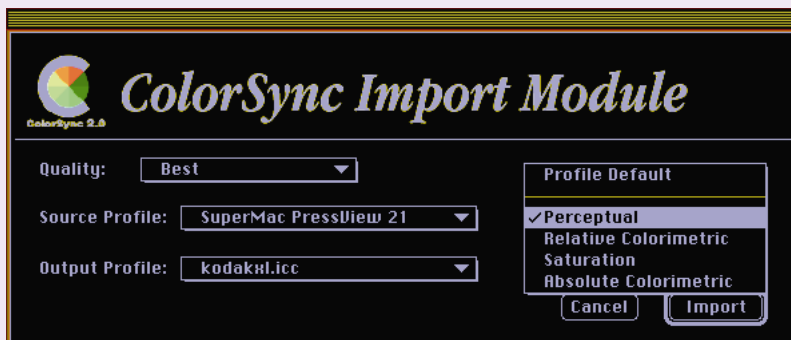
Apple Computer provides, free of charge, ColorSync 2.0 Plug-Ins for Adobe Photoshop. These software tools allow Photoshop to import images using ColorSync 2.0 profiles, to export images with profiles applied, or to apply profiles to an image already on-screen in Photoshop.



Toolbox:

Apple ColorSync 2.0 Plug-Ins for Adobe Photoshop or Helios ColorSync XTension for QuarkXPress® or ColorSync Additions for Adobe PageMaker™ 6.0 or Live Picture™ 2.5

Once the profiles have been created, they may be applied to an image as it is imported into Adobe Photoshop. Using the Acquire command, the image can be selected, and both source and output profiles applied to that image as it is imported. The ColorSync 2.0 Plug-Ins also allow the export of images already in Photoshop through both input and output profiles.



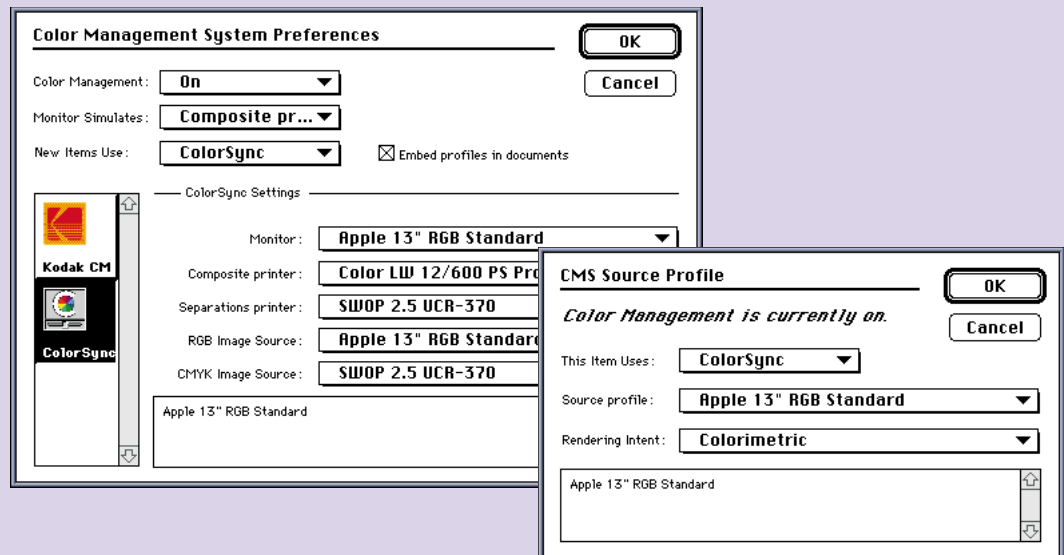
Q U A R K X P R E S S

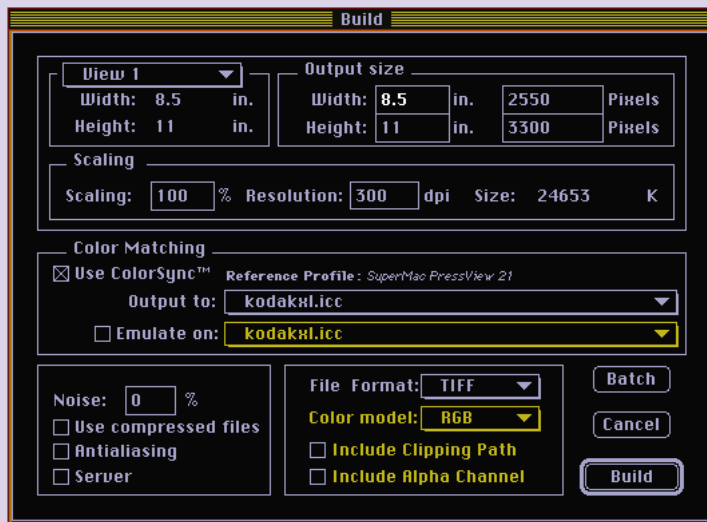
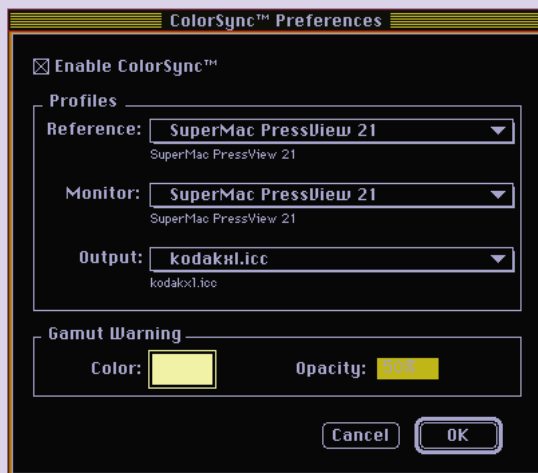
The **Helios XTension** for QuarkXPress allows ColorSync 2.0 profiles to be applied to imported images and to colors created within QuarkXPress. The ability to create and manage colors in CIELAB color space assures that a minimum of gamut compression will take place at the time of output, as the colors are always managed in LAB color by ColorSync 2.0.



A D O B E P A G E M A K E R

New additions to **Adobe PageMaker 6.0** allow the selection of a color management system, including Apple ColorSync 2.0. Once the ColorSync 2.0 selection is made, profiles for source, output and proofing can be specified, as well as choices for rendering, giving the designer control over the “weighting” of images – for perceptual, or exact match rendering.





Live Picture 2.5 offers support for ColorSync 2.0 profiles, accessed through the program's ColorSync 2.0 Preferences menu.

By selecting a monitor profile, an output profile, and a reference profile, images processed through this application can be color-managed from acquisition through output. Live Picture's support of ColorSync 2.0 allows complete control over color management for images destined for the printed page in CMYK, as well as those destined for film recorders or multimedia presentations in RGB. Consult the user manual for each of these applications for more details on the application of ColorSync 2.0 profiles.



LIST OF SUPPLIERS

ColorSync 2.0

ColorSync Plug-Ins for Adobe Photoshop

Apple Computer, Inc.
1 Infinite Loop
Cupertino, California 95014 USA
Telephone: 408 996-1010
ColorSync info on the World Wide Web:
www.apple.com

Colortron II Instrument

Light Source
17 Sir Francis Drake Blvd.
Larkspur, California 94939 USA
Telephone: 800 994-2656
Fax: 415 461-8011

PrintOpen ICC

ScanOpen ICC

ScanOpen Lite

Linotype-Hell Company
425 Oser Avenue
Hauppauge, New York 11788 USA
Telephone: 800 842-9721
Fax: 516 434-2720

ColorSynergy

The Color Partnership
2002 Jimmy Durante Blvd., Suite 315
Del Mar, California 92014 USA
Telephone: 800 554-8688
Telephone: 619 259-8688
Fax: 619 259-8709

ColorBlind

ColorBlind ICC Print

ColorBlind Edit

Color Solutions, Inc.
120 Birmingham Drive, Suite 210
Cardiff by the Sea, California 92007 USA
Telephone: 619 436-6593
Fax: 619 436-6594

Logo ProfileMaker Professional

Logo Kommunikations und Drucktechnik GmbH
Wilhelmsplatz 1
D-48565 Steinfurt, Germany
Telephone: 49 5519351-0
Fax: 49 5519351-99

Logo is distributed in the U.S. by:

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4501 Clausen
Western Springs, Illinois 60558 USA
Telephone: 708 784-0524
Fax: 708 784-0522

and by:

Pantone, Inc.
590 Commerce Boulevard
Carlstadt, New Jersey 07072 USA
Telephone: 800 888-PANTONE
Telephone: 201 935-5500
Fax: 201 896-0242

Helios ColorSync 2 Extension for QuarkXPress

Helios Software GmbH
Lavestrasse 80
D-30159 Hannover, Germany
Telephone: 49 511 36482-0
Fax: 49 511 36482-69

Pantone ColorDrive

ColorDrive XTension for QuarkXPress

Pantone, Inc.
590 Commerce Boulevard
Carlstadt, New Jersey 07072 USA
Telephone: 800 888-PANTONE
Telephone: 201 935-5500
Fax: 201 896-0242

X-Rite DTP51 Auto Scan Colorimeter

X-Rite DTP92 Monitor Calibration Instrument

X-Rite Digital Swatchbook Colorimeter

X-Rite Incorporated
3100 44th Street SW
Grandville, Michigan 49418 USA
Telephone: 800 248-9748
Telephone: 616 534-7663
Fax: 616 534-7722

Live Picture

Live Picture, Inc.
2425 Porter Street, Suite 13
Soquel, California 95073 USA
Telephone: 408 464-4200
Fax: 408 464-4202