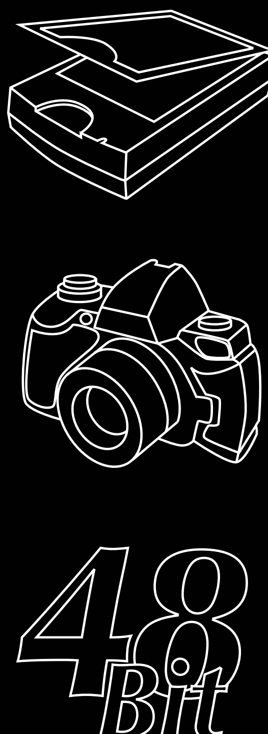
SilverFast®

Colour Management Tutorial



LaserSoft Imaging®

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Table of Contents

1.0 Overview

This tutorial outlines the ICC colour management workflow within *SilverFast* Applications and the procedures for creating ICC colour profiles.

The tutorial is broken into 4 sections:

Section 2.0 provides a basic description of colour theory

Section 3.0 outlines the ICC colour conversion workflow

Section 4.0 highlights the main colour management workflows within *SilverFast*, and

Section 5.0 explains the process for creating ICC profiles using *SilverFast*.

This document assumes that the reader has some basic knowledge of the *SilverFast* products.

2.0 Colour Theory

2.1 Visualization of Colour

The visualization of colour can be viewed as a three-part process shown in Figure 2.1.

Light Source: Light is emitted from a light source. The light source emits different amounts of light at various wavelengths.

Object: The light from the source is then placed onto an object. The object in turn selectively reflects and absorbs different wavelengths coming from the light source.

Detector: The wavelengths of light that are reflected from the object are then processed using some form of measurement-detection system.

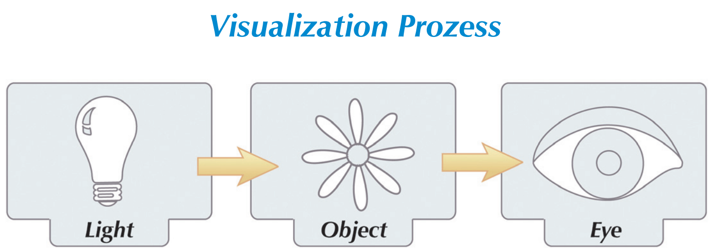

Figure 2.1
In the visualization process, the detector usually refers to the human visual system. However, the optics, measurement detectors (CCD, CMOS arrays) and associated electronics within a scanner or digital camera also represent another type of detector. The human eye, scanners, and digital cameras are considered trichromatic systems. This means that the measurement detectors contain three different "sensors" that can perceive and differentiate between colours.

2.2 Defining Colour

To define a colour, one needs to know three parameters (see Figure 2.2):

Hue: The shade of the colour (e.g. red, green, blue)

Lightness: How light or dark the actual colour appears

Saturation: How dull or vivid a colour appears

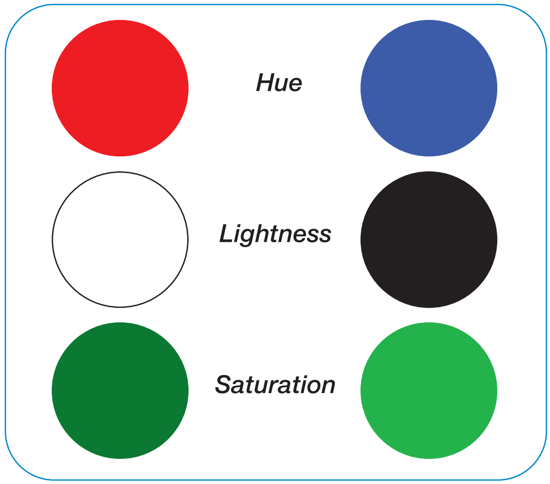

Figure 2.2

2.3 Additive and Subtractive Colour Systems

Devices used to display or print images work by using an additive or subtractive colour system.

2.3.1 Additive Colour (Figure 2.3)

An additive colour device utilizes a combination of “lights” at different wavelengths to generate a specific colour. The three primary colours in an additive colour system are red, green, and blue (RGB). In an additive colour system, the addition of red, green, and blue lights create white while the absence of light creates black. Mixing different percentages of the red, green, and blue produces other colours. For example, the combination of red and blue produces a magenta colour. Televisions and computer monitors are the best-known additive colour devices.

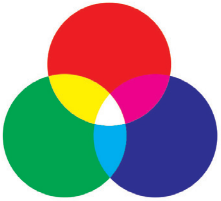

Figure 2.3

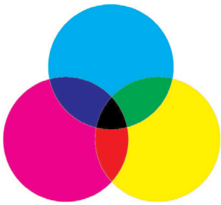

Figure 2.4

2.3.2 Subtractive Colour (Figure 2.4)

A subtractive colour device applies various amounts of colourant (e.g. dyes, pigments) onto a medium (e.g. paper). The colourants selectively reflect or absorb light, which in turn, create the sensation of colour. The primary colours for a subtractive system consist of cyan, magenta, and yellow (CMY) colourants and the combination of cyan, magenta, and yellow colourants produce black. Applying different percentages of cyan, magenta, and yellow creates other colours. Digital printers and photographic printers operate using a subtractive colour system.

In some subtractive colour devices, an additional black colourant (K) is also used. The Black colourant provides several advantages:

The black colourant produces a purer black colour than can be achieved using CMY alone,

Less ink needs to be placed on the medium, which improves image quality and reduces ink costs.

It is important to note that many printers accept data in RGB format. Printer driver software then mathematically converts the RGB image data into CMYK for printing.

2.4 Colour Spaces

2.4.1 Device Dependent and Device Independent Colour Spaces

A Colour Space can be defined as a method for systematically organizing colours for visualization and communication.

Colour Spaces are divided into three categories as shown in Table 2.1:

Device Dependent: Device dependent colour spaces define colour for a given imaging device. Examples of device dependent colour spaces include RGB and CMYK.

The advantage of working with a device dependent colour space is that the data can be easily obtained from the device and used in many software applications (e.g. web sites, graphics applications, word processors, etc.). This is especially true for RGB images. However two imaging devices, such as two scanners, can produce different RGB values for a given original. For this reason, device dependent colour spaces do not provide enough information to actually define a specific colour.

Device Independent: These colour spaces consist of mathematical representations of colour that are independent of an imaging device. Examples of device independent colour spaces include CIE XYZ, CIE Lab.

The advantage of using a device independent colour space is that colours can be easily quantified.

The obvious disadvantage is that only a few software applications can actually work with device independent colour spaces. Moreover, if you wish to display or print an image in a device independent colour space you still have to convert it back to a device dependent colour space.

Internal Colour Spaces (Working Colour Space): Internal or working colour spaces are a cross between device dependent and device independent colour spaces. To create an internal colour space, a mathematical transformation is done to convert device independent colour information to a standard set of RGB values. This essentially calibrates the RGB values. Examples of internal colour spaces include Adobe RGB and sRGB.

Internal colour spaces provide two main advantages. First they produce image data that can easily be handled by imaging software similar to the device dependent colour data. Secondly, they accurately define a colour under a specific set of conditions. These two factors are very convenient for users who wish to store images in a common colour space. The main disadvantage is that colour images still need to be converted back and forth between a device dependent colour space and the working colour space.

Device Dependent Colour Spaces	Device Independent Colour Spaces	Internal Colour Spaces
RGB CMYK	CIE Lab CIE XYZ	Adobe RGB sRGB

Table 2.1

2.4.2 CIE XYZ

The two major device independent colour spaces, XYZ and Lab, were developed by the Commission Internationale de l'Eclairage or better known as the CIE. As stated earlier, XYZ and Lab both mathematically define colour.

XYZ defines a colour by integrating the energy from a light source, the reflectance of an object, and the spectral sensitivity of the human eye on a per wavelength basis. The individual X, Y, and Z values are based on the assumption that the human eye contains three different sensors that perceive colour with different spectral sensitivities.

The XYZ space is hard to visualize. Because of this, the colour industry typically converts XYZ to chromaticity coordinates (x,y). The chromaticity coordinates are then plotted on a chromaticity "horseshoe" diagram (see Figure 2.5). The edges of the chromaticity diagram indicate the visual color limits for the human eye.

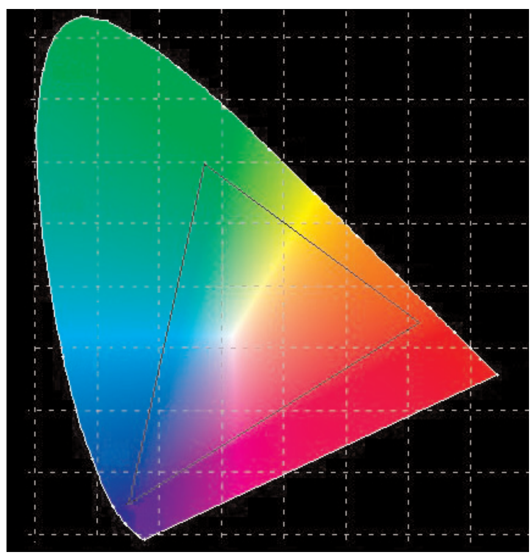

Figure 2.5

2.4.3 CIE Lab

Lab, which is derived from XYZ, further defines colour in perceptually equal units of hue, lightness and saturation. The L axis describes lightness while the a and b axes represent the hue and saturation as shown in Figure 2.6.

2.4.4 CIE LCH

LCH is the polar representation of the Lab colour space (Figure 2.7). L stands for lightness, C represents the saturation from the grey axis, and H defines the hue as an angle from 0 to 360 degrees.

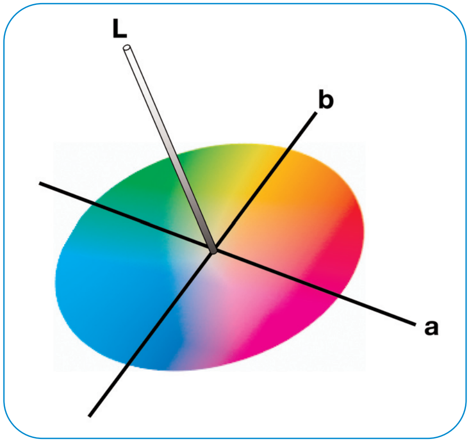

Figure 2.6

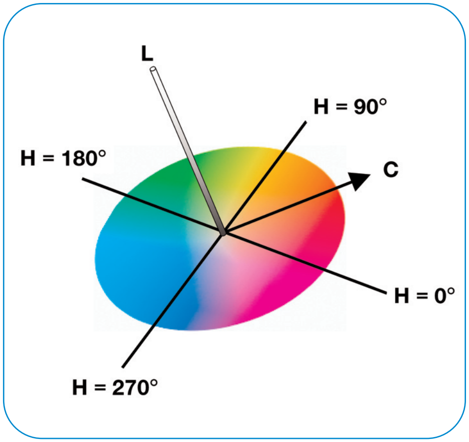

Figure 2.7

2.5 Colour Gamut

All Imaging devices have a fixed number of colours that they can capture, display, or print. When mathematically projected onto a device independent colour space, the colours form a volumetric shape known as a colour gamut. A large colour gamut implies that more saturated colours can be handled by the imaging device.

2.5.1 Gamut differences between devices

The difference in colour gamut between devices also impacts colour reproduction. Figure 2.8 illustrates the issue in the chromaticity diagram. The gold and gray triangles represent the color gamuts of two imaging devices. The area in common between both gamuts shows the colours that both devices can reproduce. The areas not shared by both triangles represent colours that can be produced on the one device but not the other.

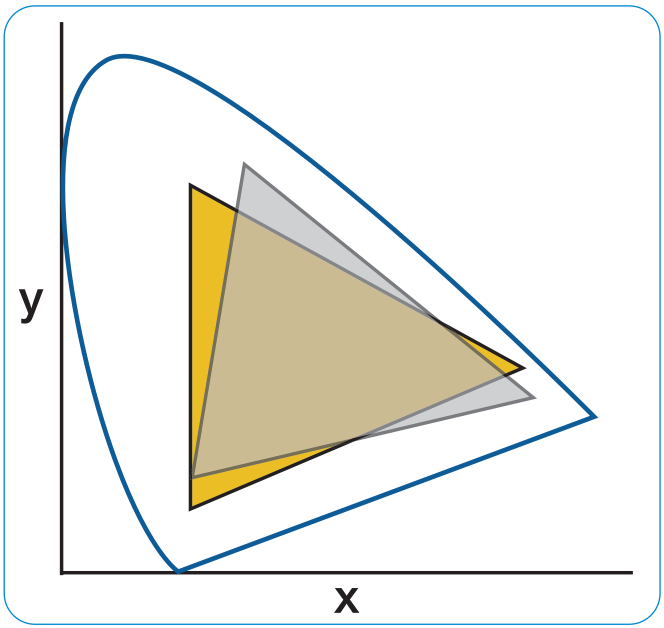

Figure 2.8

Out of gamut colors can also be shown in the Lab space as seen in Figure 2.9.

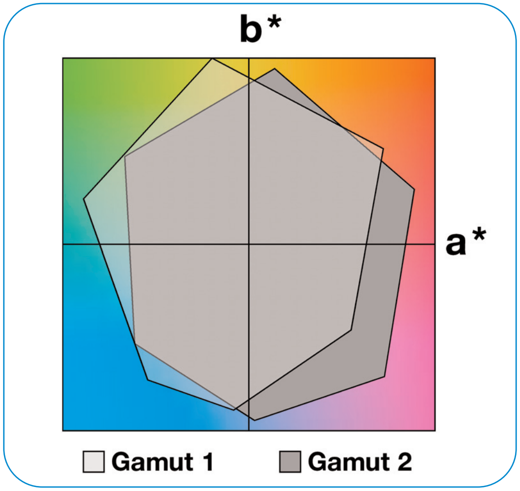

Figure 2.9

2.5.2 Gamut differences between Internal Colour Spaces

Gamut differences also occur when one converts device dependent data into different Internal Colour Spaces. Depending on the definition of the Internal Colour Space, a colour may be “clipped” which means that the Internal Colour Space cannot reproduce the requested colour.

Next to producing accurate colours, addressing colour gamut differences remains one of the primary goals and challenges for any colour management process.

3.0 Colour Conversion

3.1 Colour Conversion between Devices

In most cases, one typically needs to take an image captured or modified on one imaging device and output that image on another device. The problem as described in Section 2.0 is that most imaging devices work in their own device dependent colour space. This means that some method is required to take images created in one colour space and transform the image data into another colour space with minimal loss in colour and tone reproduction.

3.2 International Colour Consortium - ICC

To address this issue the International Color Consortium, known as the ICC, developed a set of standards for open colour communication between imaging devices. Colour conversions before ICC (e.g. from a scanner to a printer) were handled using software with proprietary algorithms that could create the colour conversion as a closed system. With the advent of ICC, a standardized process and open architecture for handling colour image files became widely adopted for colour imaging products.

3.3 ICC Colour Management Workflow

The basic idea behind the ICC colour management workflow is to take image data created in one device dependent space, convert these files into a device independent colour space, and subsequently convert from the device independent colour space to another device dependent colour space.

The ICC colour management workflow for a scanner, monitor, and printer is shown in Figure 3.1.

The scanner produces device dependent RGB values

A transformation needs to be done to convert the RGB data to XYZ or Lab (device independent colour spaces),

To display the colour correctly on the monitor, the XYZ or Lab data needs to be converted into the monitor's device dependent RGB colour space.

To print the right colours on a printer, the XYZ or Lab data needs to be transformed into the printer's device dependent CMYK colour space.

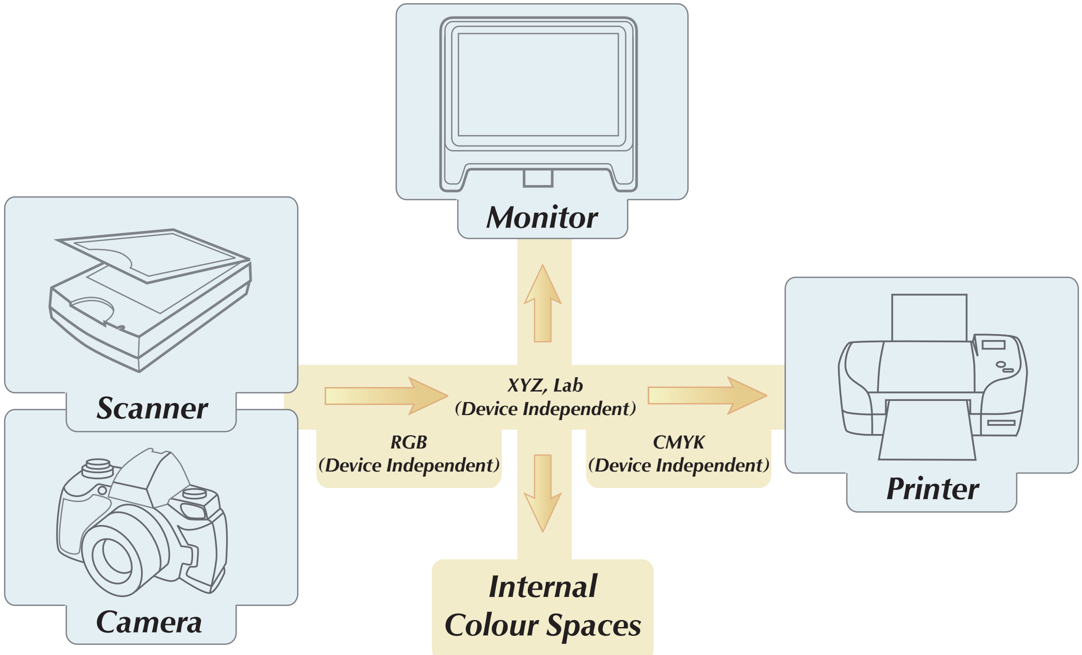

Figure 3.1

3.4 ICC Profiles

To perform the transformation from a device dependent colour spaces to device independent colour spaces, ICC defined a set of transformation tables called ICC profiles.

ICC describes three types of profiles:

Input Profiles convert device dependent image data into a device independent colour space (Figure 3.2).

Output Profiles convert image data from a device independent colour space into an output device dependent colour space (Figure 3.3).

Display Profiles convert device dependent image data into a device independent colour space and can also perform the reverse transformation (Figure 3.4). SilverFast refers to these profiles as Internal Profiles.

Figure 3.2

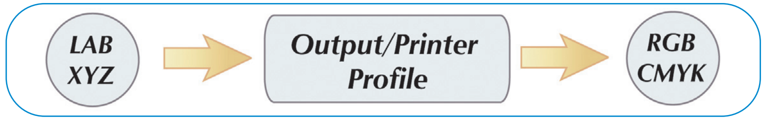

Figure 3.3

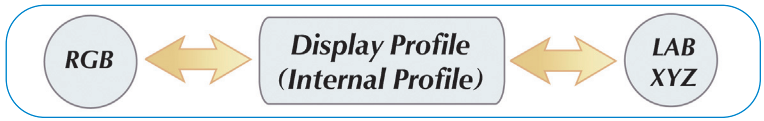

Figure 3.4

The ICC profiles can be stored as separate files or can be embedded within an image file.

3.5 Profile Linking

Since converting from one colour space to another colour space and then back to yet another colour space becomes a time consuming process, the ICC colour management workflow utilizes a concept known as device profile linking. When an input and output profile has been selected and the transformation is to be done, the two profiles are "linked" together. The linking process significantly improves the speed of the conversion process.

Within an ICC workflow, the linking is accomplished using a tool known as a CMM (Colour Management Module) as shown in Figure 3.5. Both Apple and Microsoft integrated the CMM into their operating system. On the Macintosh, the CMM is known as ColorSync while the Windows refers to the CMM as the ICM. Other applications (e.g. Adobe Photoshop) additionally provide a CMM within their application.

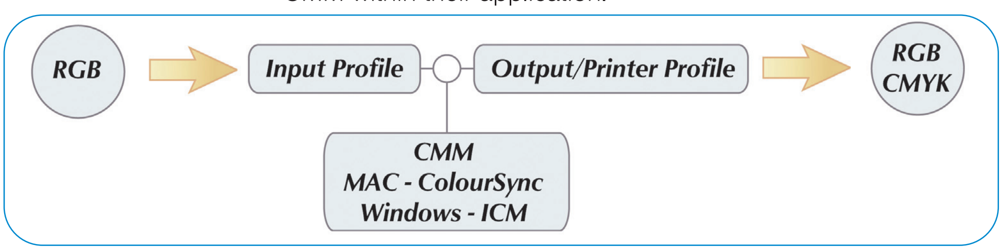

Figure 3.5

3.6 Gamma Correction

Gamma correction refers to a set of lookup tables that adjust the overall tone reproduction of the image. An ICC profile needs a specific gamma correction to produce optimal colour results. SilverFast provides the user with the ability to adjust the gamma correction as discussed in Section 5.0.

3.7 Rendering Intent

As outlined in the previous section, the colour gamut of two devices can be vastly different. To address this issue, ICC profiles can contain various methods for handling the gamut differences. ICC refers to these methods as rendering intents.

The choice of rendering intent becomes largely dependent on the individual preferences. In many cases, a user typically works with the "Perceptual" rendering intent to maintain acceptable colour reproduction and neutral whites with some loss in colour accuracy. The user may also apply an "Absolute Colourimetric" rendering intent in cases when one wishes to tradeoff better tone and colour reproduction for greater overall colour accuracy.

3.8 ICC Profile Generation

A user creates an ICC profile for a specific device using an ICC Profile Generation Tool. In the case of SilverFast, an ICC profile can be produced with the colour calibration tool. One can also produce ICC profiles using a number of third party ICC software applications.

The overall creation process (see Figure 3.6) consists of the following steps:

Calibration Target: A calibration target is selected for producing the profile. The most commonly used target is one that follows the IT8 scanner input target specification. The target itself consists of patches with a variety of colours.

Target Scanner Data: The calibration target is scanned with a specific digital scanner or captured with a digital camera to determine the RGB values for patches on the target. The resulting RGB image data provides the device dependent colour information for the profile.

Target Reference Data: The calibration target is measured with a spectrophotometer to obtain XYZ or Lab data for each target patch. The measured values become stored in a Reference Data File and represent the device independent colour information for the profile.

ICC Profile Creation: The ICC Profile Generation Tool utilizes a series of mathematical algorithms to compute the ICC input profile from the scanner and reference data.

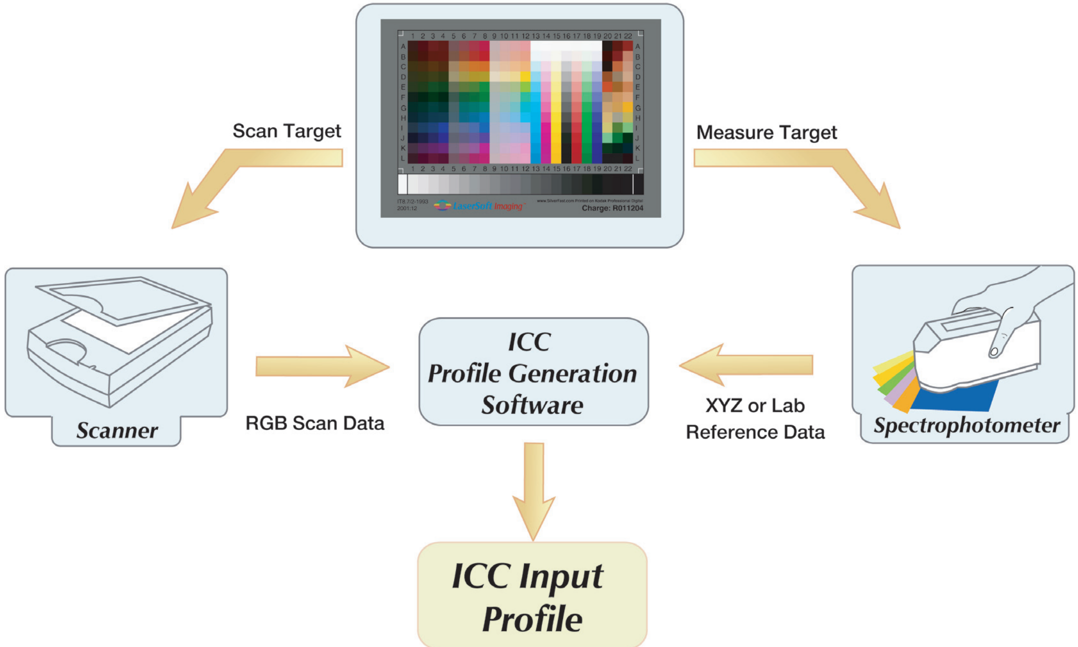
Scan Target
Measure Target
Scanner
RGB Scan Data
ICC
Profile Generation
Software
XYZ or Lab
Reference Data
Spectrophotometer
ICC Input
Profile

Figure 3.6

4.0 SilverFast Colour Management Workflows

4.1 The CMS Panel

SilverFast offers a variety of colour management workflows to address the diverse requirements for colour output. Some users need images to be processed to a specific RGB colour space while other users may wish colour correct images for a given printer or press.

This section outlines different colour management workflows available within SilverFast and additional information required for achieving acceptable colour results. Adjustments to the colour management workflow are performed in the Options Menu under the CMS panel. As stated in Section 3.0, the names ColorSync and ICM are used in the Macintosh and Windows operating systems respectively to describe the CMM.

CMS panel consists of three main sections shown in Figure 4.1.

Colour Management permits the user to choose the desired colour management workflow.

Profiles for ColorSync/ICM gives the user the option to select the desired ICC profiles and rendering intent for the colour management workflow.

Embedded ICC Profiles provides information about ICC profiles that are embedded in an image before and after processing.

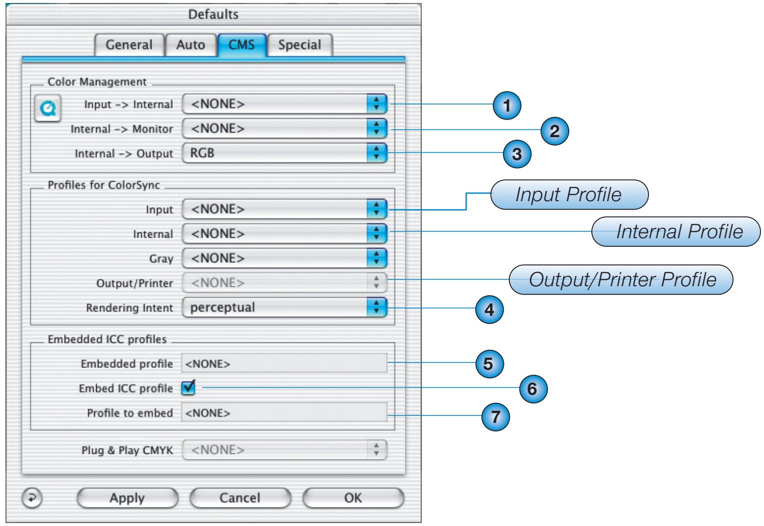

Figure 4.1
1. Input to Internal Workflow options
2. Internal to Monitor Workflow options
3. Internal to Output Workflow options
4. Rendering Intent options
5. Name of ICC profile embedded within the Image
6. Selection to embed an ICC Profile into the image
7. File after processing
8. Name of ICC profile embedded after processing

4.2 Input to Internal Workflow

4.2.1 Purpose

The Input to Internal workflow converts RGB image data from a device dependent colour space to an Internal Colour Space. The Input to Internal settings can be used in conjunction with the monitor and output workflows.

4.2.2 Workflow

A gamma correction factor is applied to the RGB image data.

The gamma corrected image data is passed through an Input and Internal Colour Space ICC profile linked using ColorSync or ICM.

Additional colour corrections (Gradation curves, Selective Color, Histogram changes, etc.) are then applied to the image data.

If desired, the Internal profile can be embedded in the processed image file.

4.2.3 CMS Parameters

Set the Input to Internal option to ColorSync or ICM.

Set the Internal to Output option to RGB.

Select the desired Input and Internal Colour Space profiles.

Select the desired rendering intent with the Rendering Intent option.

Select Embed ICC Profile to optionally embed the Internal ICC profile into the image.

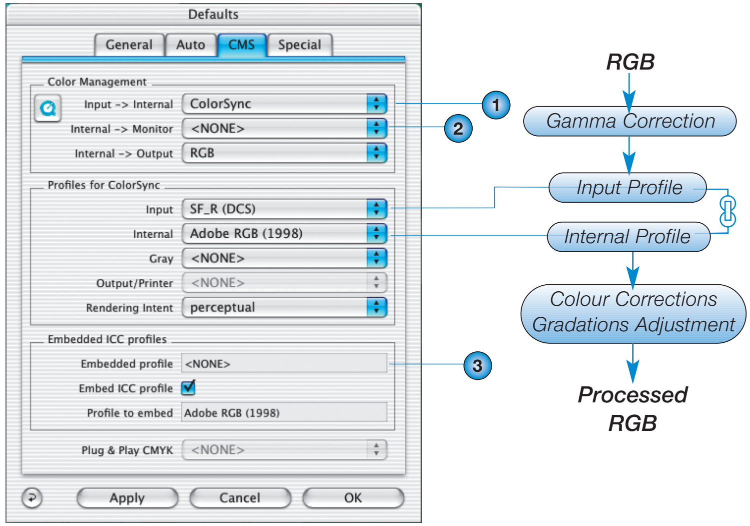

Figure 4.2
1. Set Input to Internal to ColorSync/ICM
2. Set Internal to Output to RGB
3. Embedded Profile is set to the Internal Profile

4.3 Embedded to Internal Workflow

4.3.1 Purpose

In many cases, an ICC profile may already be embedded in an image file. SilverFast also contains several default profiles that act as embedded profiles. This workflow demonstrates how to work with an embedded profile within SilverFast. The Embedded to Internal settings can be used in conjunction with the monitor and output workflows. It is important to note that this workflow is only supported in SilverFast HDR, SilverFast DC-VLT, and SilverFast DC Pro

4.3.2 Workflow

A gamma correction factor is applied to the RGB image data

The gamma corrected image data is passed through an Embedded and Internal Colour Space ICC profile linked using ColorSync or ICM.

Additional colour corrections (Gradation curves, Selective Colour, Histogram changes, etc.) are then applied to the image data.

If desired, the Internal profile can be embedded in the processed image file.

4.3.3 CMS Parameters

Set the Input to Internal option to *Use Embedded Profile*.

Set the Internal to Output option to RGB.

Select the desired Internal Colour Space profiles.

Select the desired rendering intent with the Rendering Intent option.

Select *Embed ICC Profile* to optionally embed the Internal ICC profile into the image.

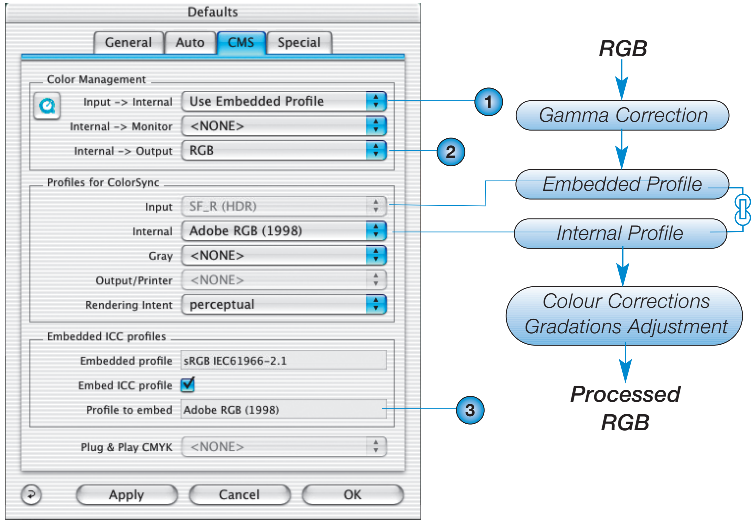

Figure 4.3

1. Set Input to Internal to ColorSync/ICM

2. Set Internal to Output to Cie-Lab

3. No profile is embedded

4

4.4 Input to Internal with Monitor Profile Workflow

4.4.1 Purpose

This workflow processes images from the Input to Internal Colour Space and also then adjusts the colour for display on an ICC calibrated monitor. SilverFast works with the ICC profile being used by the operating system to calibrate the monitor. The Internal to Monitor settings can be used in conjunction with the other workflows.

4.4.2 Workflow

A gamma correction factor is applied to the RGB image data.

The gamma corrected image data is passed through an Input and Internal Colour Space ICC profile linked using ColorSync or ICM.

Additional colour corrections (Gradation curves, Selective Color, Histogram changes, etc.) are then applied to the image data.

The colour corrected information to be displayed is then passed through the Internal and System Monitor ICC profile linked using ColorSync or ICM. The Monitor ICC profile does not modify the processed image data.

If desired, the Internal profile can be embedded in the processed image file.

4.4.3 CMS Parameters

Set the Input to Internal option to ColorSync or ICM.

Set the Input to Monitor option to ColorSync or ICM.

Set the Internal to Output option to RGB.

Select the desired Input and Internal Colour Space profiles.

Select the desired rendering intent with the Rendering Intent option.

Select Embed ICC Profile to optionally embed the Internal ICC profile into the image.

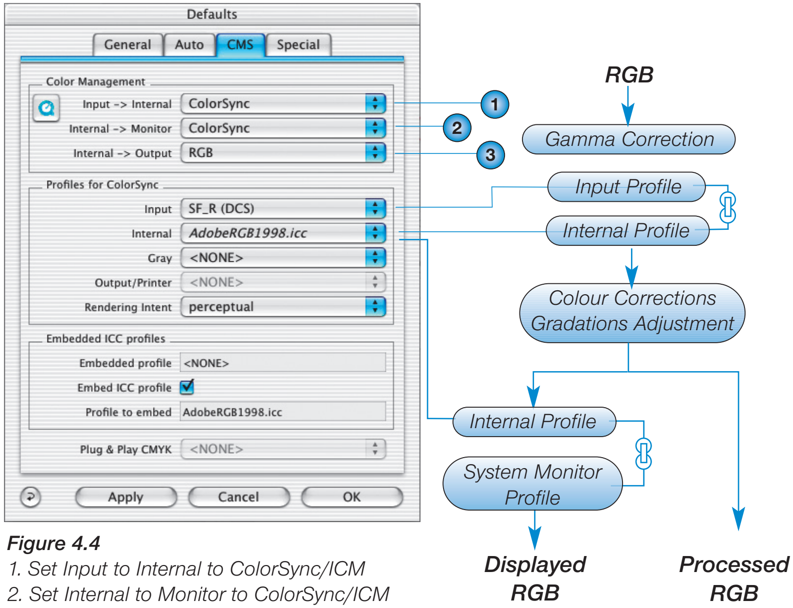

Figure 4.4

1. Set Input to Internal to ColorSync/ICM

2. Set Internal to Monitor to ColorSync/ICM

3. Set Internal to Output to RGB

4. Embedded Profile is set to the Internal Profile

4.4.4 Automatic Option

When SilverFast runs as a plug-in in Photoshop, one has the capability to use Photoshop's internal colour settings for the monitor display. Choosing Automatic for the Internal to Monitor option enables this feature (See Figure 4.5). It is important to note that the Internal profile in SilverFast and Photoshop must be the same to achieve the correct colour results.

4.5 Input to Output Workflow

4.5.1 Purpose

The Input to Output workflow converts RGB image data from a device dependent colour space to the output RGB or CMYK device dependent colour space of a printer or press. It is important to note that one can utilize a similar workflow without an Input to Internal conversion.

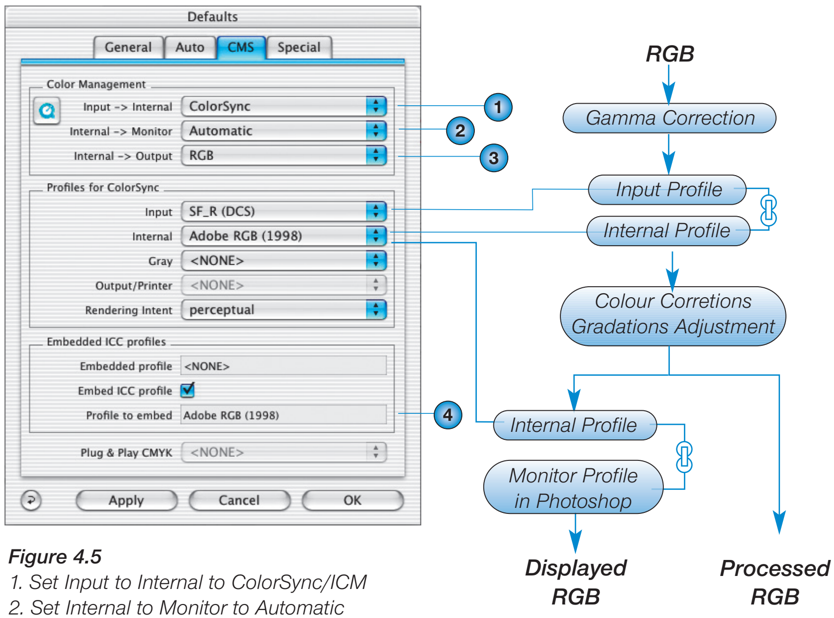

Figure 4.5
1. Set Input to Internal to ColorSync/ICM
2. Set Internal to Monitor to Automatic
3. Set Internal to Output to RGB
4. Embedded Profile is set to the Internal Profile

4

4.5.2 Workflow

A gamma correction factor is applied to the RGB image data.

The gamma corrected image data is passed through a set of Input and Internal Colour Space ICC profiles linked using ColorSync or ICM.

Additional colour corrections (Gradation curves, Selective Colour, Histogram changes, etc.) are then applied to the image data.

The colour corrected information is then passed through Internal and Output ICC profiles linked using ColorSync or ICM to convert the image data to the output RGB or CMYK values.

If desired, the Output ICC profile will be embedded in the processed image file.

4.5.3 CMS Parameters

Set the Input to Internal option to ColorSync or ICM.

Set the Internal to Output option to ColorSync.

Select the desired Input, Internal, and Output Colour Space profiles.

Select the desired rendering intent with the Rendering Intent option.

Select Embed ICC Profile to optionally embed the Internal ICC profile into the image.

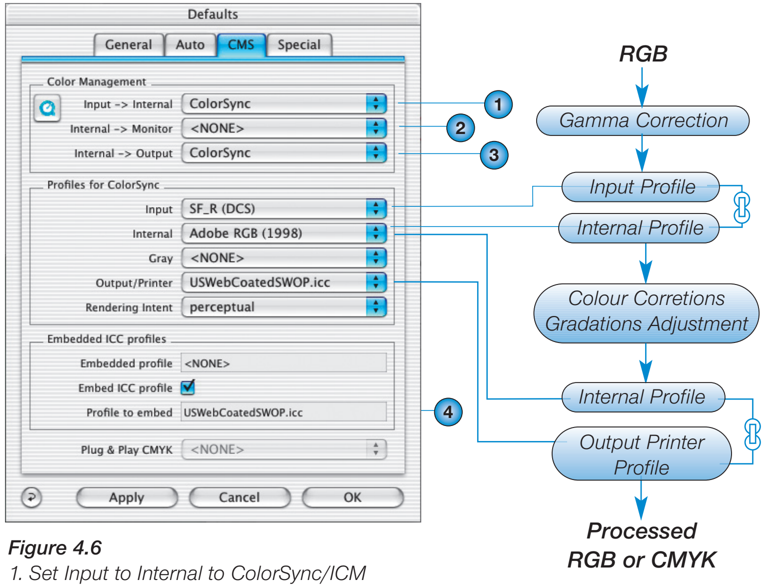

Figure 4.6
1. Set Input to Internal to ColorSync/ICM
2. Set Internal to Monitor to Automatic
3. Set Internal to Output to RGB
4. Embedded Profile is set to the Internal Profile

4.6 Input to Lab Workflow

4.6.1 Purpose

The Input to Lab workflow transforms RGB image data from a device dependent colour space to Lab. The processed file can then be used by applications with Lab file support (e.g. Adobe Photoshop).

4.6.2 Workflow

A gamma correction factor is applied to the RGB image data.

The gamma corrected image data is passed through a set of Input and Internal Colour Space ICC profiles linked using Color-Sync or ICM.

Additional colour corrections (Gradation curves, Selective Colour, Histogram changes, etc.) are then applied to the image data.

A colour conversion is performed to convert the RGB data into Lab. The conversion process is based on the Internal ICC profile.

4.6.3 CMS Parameters

Set the Input to Internal option to ColorSync or ICM.

Set the Internal to Output option to Cie Lab.

Select the desired Input and Internal Colour Space profiles.

Select the desired rendering intent with the Rendering Intent option.

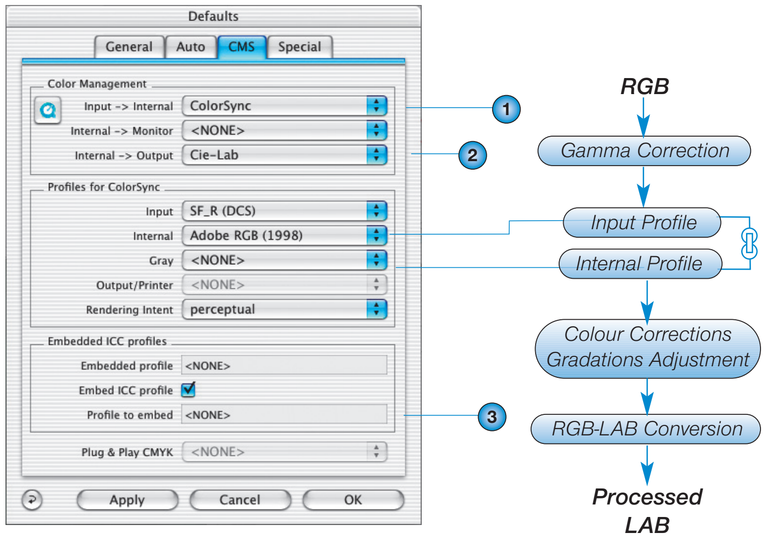

Figure 4.7

1. Set Input to Internal to ColorSync/ICM

2. Set Internal to Output to Cie-Lab

3. No profile is embedded

5.0 SilverFast ICC Profile Generation

Many versions of SilverFast offer the option to generate custom ICC input profiles for a scanner or digital camera. The calibration process consists of setting the proper gamma correction and then obtaining scan and reference data to create the ICC profile.

5.1 Gamma Correction

As discussed in Section 4.0, SilverFast first applies a gamma correction to RGB image data before adjusting the data with the Input and Internal ICC profiles. The proper gamma setting depends on the type of image data and previous gamma adjustments stored or applied to the image data.

The gamma settings can be found in the Options Menu under the General Panel (see Figure 5.1)

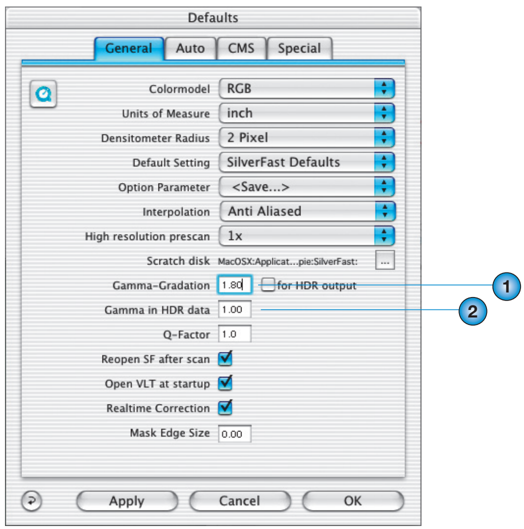

Figure 5.1
1. Sets the Gamma Gradation to be used for calibration
2. Adjusts the Gamma Gradation if a gamma correction was previously applied to 48 Bit/48 Bit HDR image data

5.1.1 Gamma Correction for 48 Bit and 48 Bit HDR Images

SilverFast assumes that the gamma correction within 48 Bit or 48 Bit HDR images is set to a value of 1.0. To generate an accurate ICC profile, the application then applies a gamma correction factor to the image data defined by the Gamma Gradation setting.

However, some 48 Bit/48 HDR files may have been previously processed with a gamma correction. The value in the Gamma Expected in 48Bit/HDR option must then be set to the previous gamma correction value in order to achieve acceptable results. Figure 5.2 shows the correct setting for a 48 Bit HDR file previously processed with a gamma of 1.8.

5.1.2 Gamma Correction for 24 Bit Images

SilverFast default gamma settings for 24 bit image data is 1.8 for scans of reflective materials and digital camera images and 2.0 for film scanners. However, the best gamma settings should correspond to the recommended gamma correction values associated with the internal colour space profile. Table 5.1 outlines the gamma settings for various internal colour spaces.

The gamma values can be changed before creating the ICC profile by adjusting the Gamma Gradation shown in Figure 5.3.

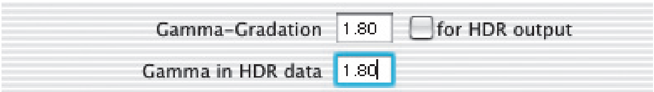

Figure 5.2

Internal Colour Space	Suggested Gamma Correction
Adobe RGB Apple RGB	2.2 1.8
CIE RGB	2.2
Colour match RGB	1.8
sRGB SMPT E-C Wide RGB	2.2 2.2 2.2

Table 5.1

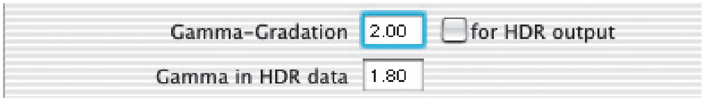

Figure 5.3

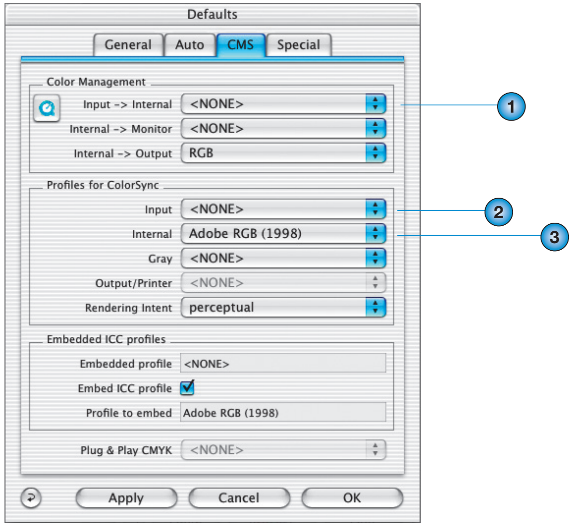

Figure 5.4
1. Set the Input to Internal Option to <None>
2. Set the Input Profile to <None>
3. Select the desired Internal Profile

5.2 SilverFast Colour Calibration Process

After setting the appropriate gamma correction for the image data, the colour calibration process can be started.

5.2.1 Initial CMS Settings

In the CMS dialog, the Input to Internal option and Input profile should also be set to <None> (See Figure 5.4).

The Internal profile should be selected at this time in order to immediately apply the profile to the image. If the Internal profile is set to <None>, then the message shown in Figure 5.5 will be displayed.

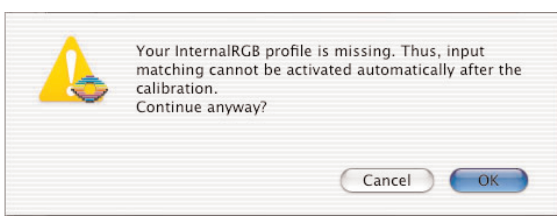

Figure 5.5

5.2.2 Colour Calibration

After making the adjustments in the Options Menu, the next step involves performing the colour calibration.

Scan or capture an image of an IT8 target. For LaserSoft Imaging targets, make sure to include the barcode in the scan or digital image.

Click on the Colour Calibration Icon on the Preview Window. The IT8 Calibration dialog is shown and the colour calibration frame appears in the preview window (See Figure 5.6)

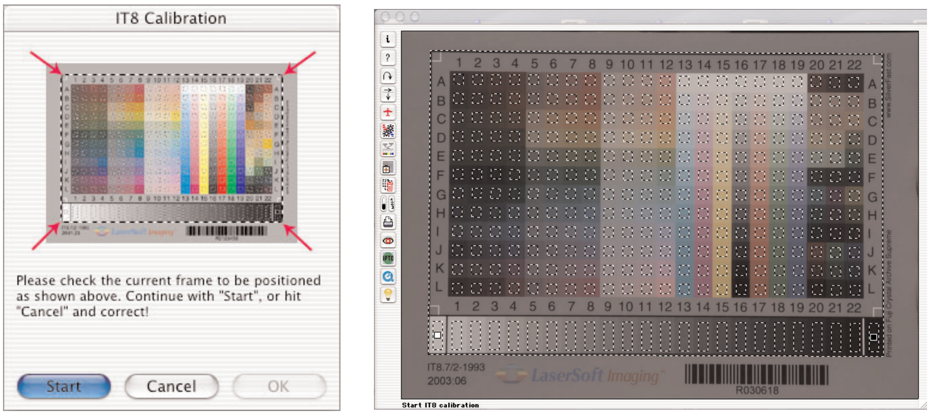

Figure 5.6

Align the colour calibration frame to the edges of the IT8 target as shown in the IT8 Calibration dialog. The frame size can be adjusted by dragging on the corners of the frame. The white and black squares in the frame should be aligned with the lightest and darkest patches on the gray scale portion of the target.

Click Start in the IT8 Calibration dialog to begin the colour calibration process. The application scans the barcode on the target to locate the colour reference data file for the target. If the Reference data file cannot be found or the target does not contain a barcode, a dialog window appears asking for the location of file.

Once SilverFast completes the calibration, the Save Profile window appears to change the name of the ICC profile (see Figure 5.7). Make the desired changes in the file and click Save.

Click Ok in the IT8 Calibration dialog to end the IT8 Calibration. If an internal profile was selected, the image in the preview window will be colour corrected using the new calibration.

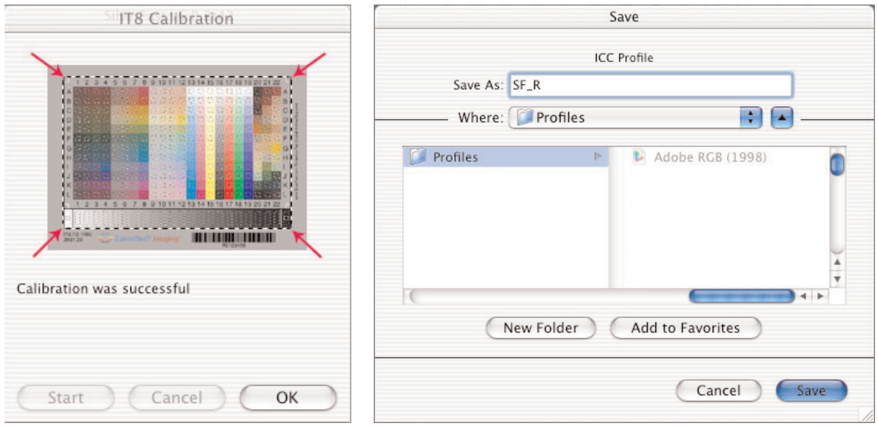

Figure 5.7

5.2.3 CMS Panel After Calibration

After successful colour calibration, the CMS panel will have the Input to Internal option set to either ColorSync or ICM. The Input profile will be also displayed in the Input Profile option.

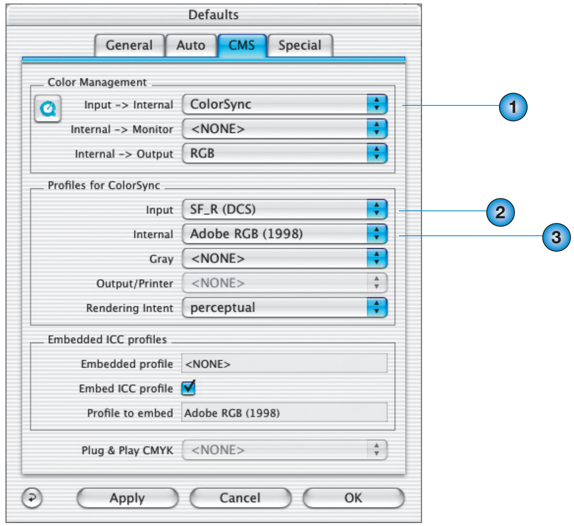

Figure 5.8

1. Input to Internal Option set to ColorSync or ICM
2. The Input Profile created by the colour calibration
3. The Selected Internal Profile

When colour management is enabled the Image Automatic Button in the Tools Palette contains the letter “C” (see 5.9).

Figure 5.9

If an Internal ICC profile was not selected before calibration, the CMS will be similar to Figure 5.10.

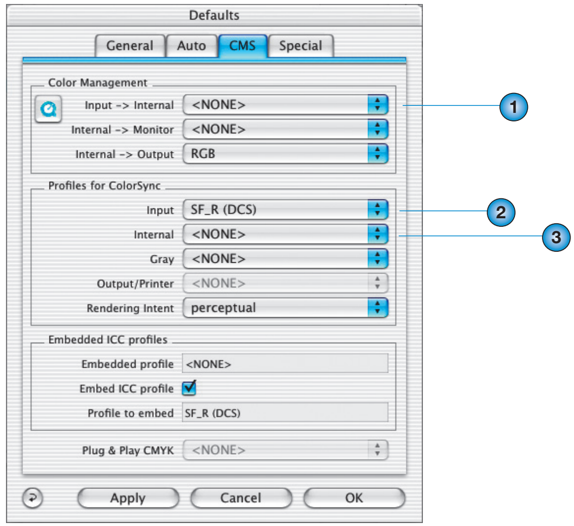

Figure 5.10
1. Input to Internal Option set to <None>
2. The Input Profile created by the colour calibration
3. The Internal Profile set to <None>

6.0 Additional References

Books

SilverFast: The Official Guide, Taz Tally, Ph.d, Sybex, Inc., ISBN: 0782141978

Real World Color Management, Bruce Fraser et al., Peachpit Press, ISBN: 0201773406

Measuring Color, Robert W. G. Hunt, Fountain Press,

ISBN: 0-86343-387-1

Digitales Color-management (In German), Jan-Peter Homann, Springer, ISBN 3-540-66274-X

Websites

Ian Lyon's SilverFast Tutorial:

www.computer-darkroom.com/sf5-negafix/sf5_cms.htm

The ICC Home Page:

www.color.org

Apple's ColorSync Site:

http://www.apple.com/macosx/features/colorsync

Microsoft's ICM Site:

msdn.microsoft.com/library/default.asp?url=/library/en-us/icm/icm_6ulv.asp

European Color Initiative:

http://www.eci.org/