

*Chapter 7*

*Color Management*



## 7. Colour Management

*This chapter describes the concept of colour management, how to set up the appropriate settings in SilverFast, and how to calibrate your scanner to get precise colours.*

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# 7.1 Colour Management

## Introduction

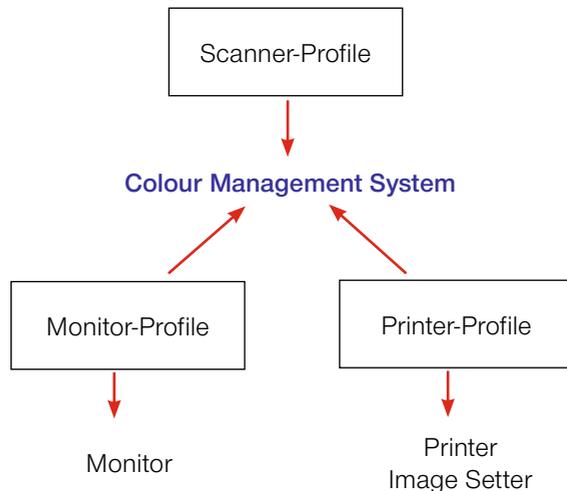
In the past getting professional results with colour reproduction was only achieved by highly educated professionals. There have been two major reasons for this:

1. Devices for colour reproduction demanded high investments
2. Operation of devices was complicated - complex Know-How was necessary.

Luckily the above mentioned reasons are not valid any more today, because the devices needed as, scanner, PC, printer have become affordable for almost everyone. Also operation has become easy with intelligent software and colour management matured.

### Objective of Colour Management System (CMS)

Professional workflow without colour management is not conceivable any more today. To save time and money it is desired to see the result of the final scan on the monitor or printer already on the preview. Since every input- and output-device has its own colour gamut, one cannot assume colours to be consistent.



### What is an ICC Profile?

An ICC profile characterizes the colour space behaviour of a device. An ICC profile is a data file and will be used to calibrate the device.

### What is IT8?

IT8 is an industry standard test-form designed to measure the performance of input devices and generate ICC profiles.

This is where a CMS becomes relevant. A dedicated ICC profile has to be generated for every input- and output device describing their colour space behaviour. Within the workflow the colour management System compares two profiles, that of the data sender, i.e. a scanners, with that of the data receiver, i.e. a monitor, and calculates a relation for the conversion, which will translate the image data into the right colour impression.

## Objective of the *SilverFast* Colour Management

*SilverFast* differs from the majority of scan software by its functional power. With reference to colour management *SilverFast* offers three significant functions:

### 1. Automatic Matching with Photoshop

The high level of integration of *SilverFast*'s architecture into the Adobe Photoshop 5 architecture, assures matching of the *SilverFast* preview with the final result in Photoshop. This is a very important highlight of *SilverFast*, because only this function makes sure that the user can predetermine (and control) his final result from the *SilverFast* preview.

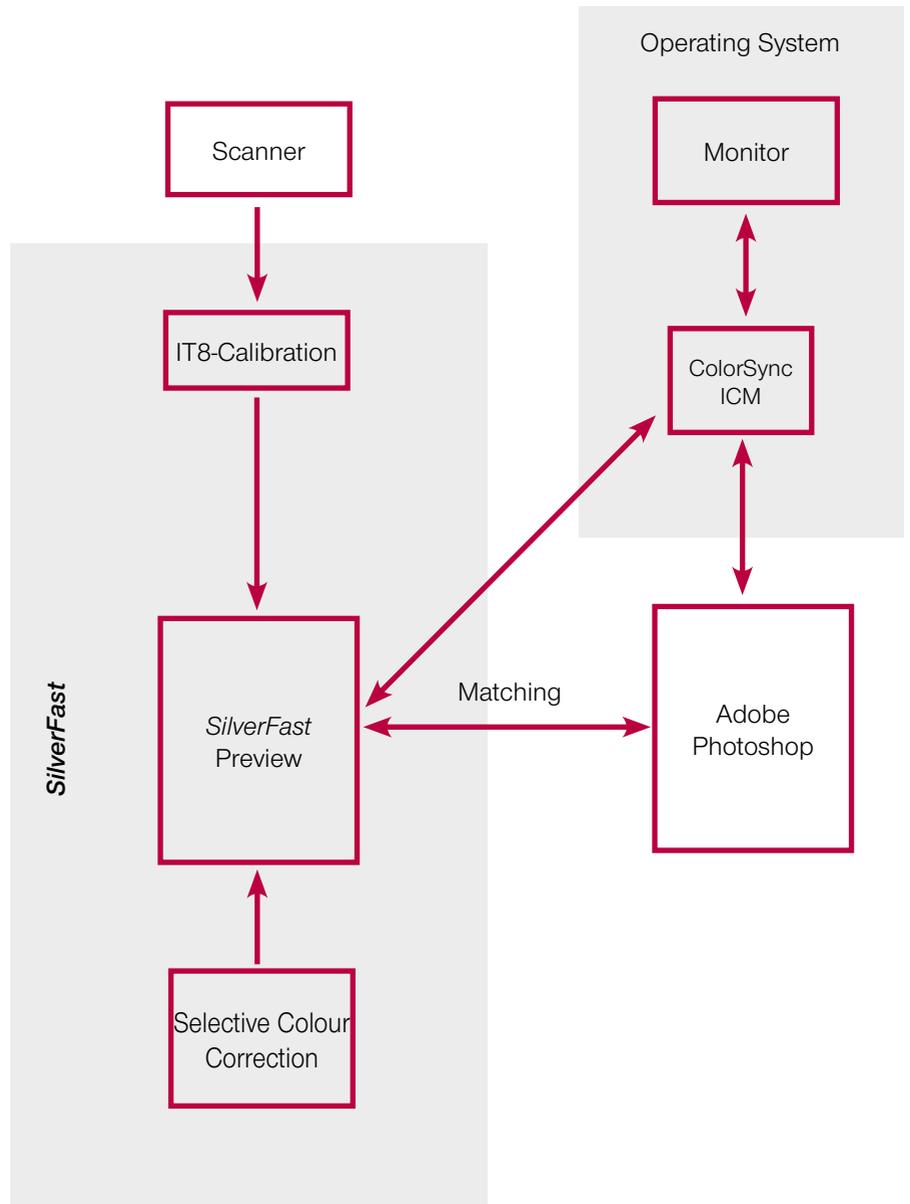
### 2. Safe IT8 Calibration (optional) with ICC Profiler

With *SilverFastAi* you can create a dedicated ICC profile for your scanner so your scanner can be used within the colour management workflow. *LaserSoft Imaging AG* offers (optional) IT8 calibration for all full versions of *SilverFast*.

*SilverFast*'s IT8 calibration is integrated into the *SilverFast* application in such a way excluding any possible mis-operation.

### 3. Individual Colour Control with Selective Colour Correction

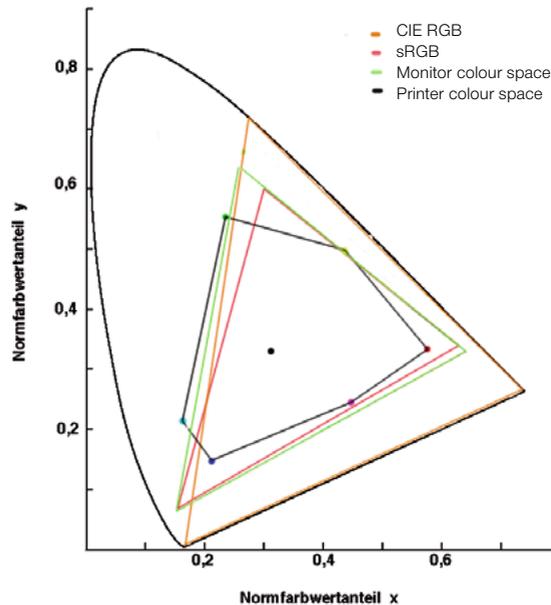
*SilverFast*'s selective colour correction enables the user to change individual colours independently on the *SilverFast* preview. Controlling the colours of the final result at a very professional level without trial and error and integrated with the colour management, is a real boon for any level of user.



### Note!

Do not select sRGB as your default colour space in Photoshop if you intend to do colour reproduction with printing.

Obviously there are limits to the ability to display the same data on different devices the same way. The different colour spaces have varying dimensions, i.e. displaying different amount of colours. Also the colour shades they can display are varying. This is resulting in colour deviations from the conversion. The colour space "sRGB", which Photoshop offers as a default colour in its set up is very small, so that even the small colour space of a printer will not be properly rendered. sRGB colour space is still big enough for any monitor. Making sRGB a suitable colour space for the internet. For any documents containing images, which have to be printed, sRGB is not suitable. Use Apple RGB or Adobe RGB instead.



### Comparing the colour spaces

Shown is a projection of the colour spaces on to a surface. The „curved triangle“ represents the L\*a\*b\* colour space, which contains all visible colours.

**SilverFast** offers different possibilities for work flow integration. On the system level under ColorSync (Mac) or ICM (Windows98/2000/XP), or in with integration into the application - in general as realized with Photoshop. CMYK output can already on the preview be checked by *SilverFast's* softproof function.

## The CMS Dialogue



Clicking on the “Options...” button in the “General” palette brings you to the basic settings dialogue. Among others you will find the CMS card, where you can adjust the colour management settings.

### The “CMS” Palette has Four Different Sections

#### 1. Colour Management

Here you can define whether and how *SilverFast* will communicate with its imaging functions and the different devices (scanner, digital camera, monitor, printer).

#### 2. Profiles for ColorSync (ICM)

In case you have chosen ColorSync (Windows: ICM) as your preferred colour management system, you have to define the in- and output profiles for the different devices here.

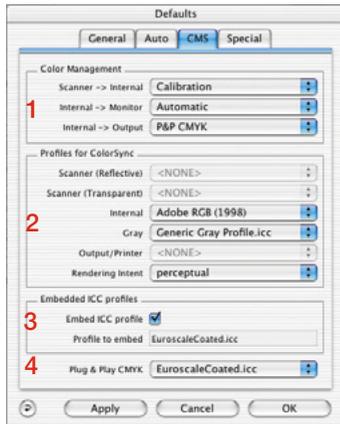
#### 3. Embedded ICC Profiles

Here you will define whether *SilverFast* will embed a profile into the output data in order to render colours on another output device correctly at a later instant.

The name of the embedded profile in the current image is also displayed in ***SilverFastHDR...***, ***-DC...***

#### 4. Plug&Play CMYK

When using P&P CMYK you have to choose a separation ICC (CMYK) output profile to separate your images for the printer.



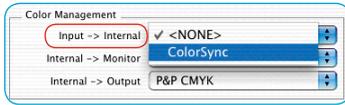
CMS palette in SilverFastAi



CMS palette in SilverFastHDR

## 1. Colour Management

### Scanner -> Internal

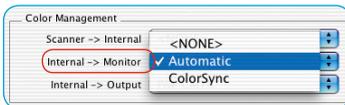


Here you define how your scanner's colour space will be matched to your system. You decide whether the original scan will be transferred to the imaging application with accurate colours.

**<NONE>:** You renounce matching of the scanner colour space to the colour space of the imaging software. Colours on the monitor may deviate from the image sample.

**ColorSync / ICM:** You decide to integrate the scanner into the operating system's colour management. By selecting the right ICC profile images will be scanned colour-exact. With *SilverFast's* IT8 calibration you can generate a profile describing your scanner (your scanner's colour gamut).

### Internal --> Monitor

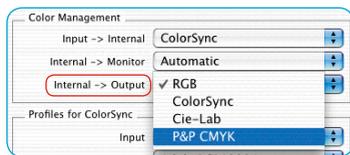


Here you define whether and how the monitor is matched to your system. You have to make sure that the work flow is consistent with the colour settings in your imaging application (e.g. Photoshop).

**<NONE>:** Data will be passed on to the monitor without any matching. You do omit colour management. Specially with Photoshop 5 it is very likely, that the *SilverFast* preview will deviate significantly from the results in Photoshop.

**Automatic:** You rely on Photoshop to do the matching to your monitor. It is advised, to set the same colour space (e.g. Adobe RGB) under "Profiles for ColorSync (ICM)" in the field "internal", you have defined inside Photoshop. Otherwise the colour of the scan data could deviate. Since the Twain-standard does not support such functions, it is not available with the *SilverFast* Twain-module!

**ColorSync / ICM:** You are integrating the monitor into the OS's colour management. The appropriate ICC profile for your monitor will be required. More sophisticated monitors get one supplied on disk or CD, if not, you might get it through the internet from the manufacturers web site, last resort would be to create one with a spectro-photometer. Adobe Photoshop 5 enables you to do your own monitor calibration (ICC profile). For this, utilise the installed Photoshop tool „Adobe gamma“ or, as a professional solution, use respective measurement tools.



### Internal ->Output

Here you can define what type of data the printer will get from **SilverFast**. Data to be transferred to the imaging application (e.g. Photoshop), can be in different formats. CMYK- and RGB-files can have profiles embedded, so the data will be matched to the printer's colour space accordingly.

**RGB:** You can output data in RGB-data format. This setting is recommended for users having no Postscript- but other printers or have no printer ICC profile, or for those using their scans merely for internet- or multimedia projects.

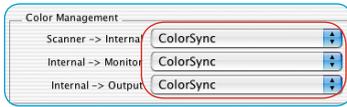
**ColorSync / ICM:** You are integrating your printer into the OS's colour management. The appropriate ICC profile for your printer will be required.

**Lab CIE-L\*a\*b\*** is a device-independent colour space, representing all visible colours. Colour differences are not rendered very detailed, and many colours cannot be displayed on a monitor (see also graphic in introduction: the "curved rectangle" represents Lab).

**P&P CMYK:** High quality system to get CMYK data directly from the 4-colour separation built into **SilverFast**. To get precise colours it is vital to select the same CMYK colour space in Photoshop, (defined by the same ICC profile), as in **SilverFast**.

## 2. Profiles for ColorSync (ICM)

Only when you have chosen ColorSync (ICM) for colour management, you will have to select under “ColorSync profiles” the appropriate profiles for your device here. Exception is with the menu option “Internal ---> Monitor” which has to have an ICC profile allocated to under “Internal”.

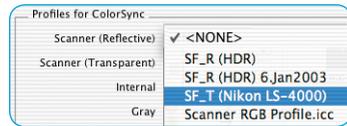


### Scanner (Reflective), Scanner (Transparency)

Here you allocate the appropriate (input) scanner profiles, which you have created with *SilverFast* or you have received from the scanner manufacturer. The profiles generated by *SilverFast* have the following naming convention:

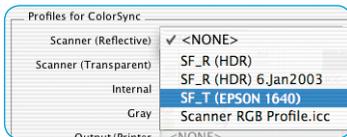
SF\_R (Scanner name) or SF\_T (Scanner name)

Where the “R” stands for reflective, and the “T” for transparency. In brackets after these again are the scanner names. Profiles of hardware manufacturer do not follow standard structure. You will mostly find the name of the device where the file-suffix is „.icc” or „.icm”, does not have any significance, since the internal format is fully compatible.



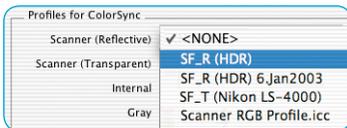
#### Film scanner

Only then option “Scanner (Transparency)” is available



#### Flatbed scanner with transparency unit

Both options are available here:  
“Scanner (transparency)” as well as  
“Scanner (reflective)”



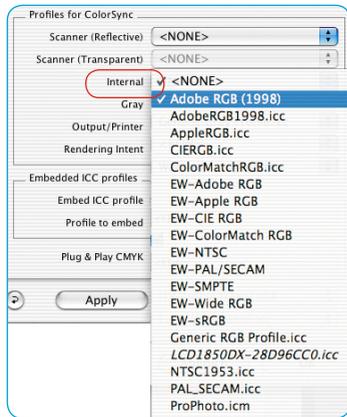
#### Flatbed scanner without transparency unit as well as SilverFastHDR, -DC, -PhotoCD.

Again, only one option is available:  
“Scanner (reflective)”

## Internal

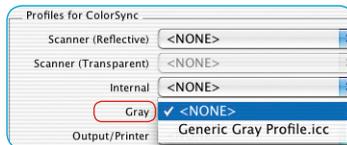
The internal colour space is independent from any device connected and is defined by a profile. This defines the colour matching foundation the colour management is building upon.. For the majority of users it is advised to select the monitor colour space in order to unburden the computer.

Once you have selected Internal --> Monitor ColorSync (ICM) you have to define the internal colour space by a profile you can select freely. In case you have chosen "Automatic" under "Internal", select the profile of the application's internal colour space. The Photoshop plug-in leaves the monitor matching to Photoshop.

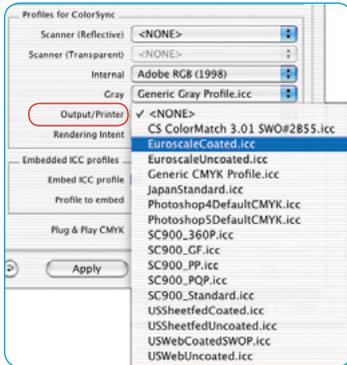


## Grey

Here you can select a grey profile for greyscale scans, which can also be embedded into the image file.

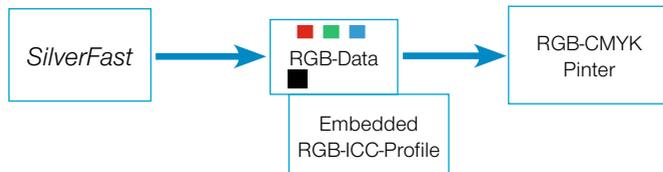


## Output/Printer

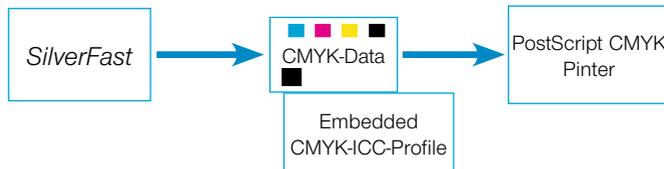


The integration of the printer into the colour management is the highlight, but also the part inducing the most difficulties. The scanner's colour space and the monitor's are the same in principle – RGB – there may be small differences in size, and the related white points are shifted against each other. The printer behaves differently: the output is not only depending on the inks but also on the paper stock - how is the paper white, how is the paper absorbency. All this information has to be considered by the profile. The modern inkjet printers are equipped with drivers, which generally take these issues into account, but they can not so well be integrated with ColorSync .

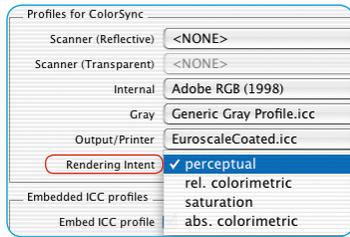
After having chosen Internal-->Output ColorSync (ICM) under colour management, you have to select the output profile of your printer or imagesetter here. This profile can be embedded into the file at your request.



*Profile-Embedding with Output on Non-PostScript-Printer*



*Profile-Embedding with Output on PostScript-Printer*



## “Rendering intent” for ICC-Profiles

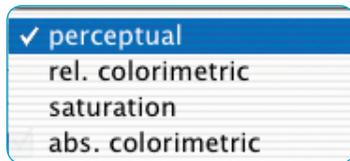
“Profiles for ColorSync (ICM)” now has an additional popup menu in the “CMS” tab of the “Options...” dialogue. Now *SilverFast*’s “Rendering Intent”, which can be utilized for all ColorSync / ICM operations, can be switched on.

A differentiation of the Rendering Intent for various operations (i.e., input, monitor and output matching) is not possible.

Prior to this, *SilverFast* has utilized the Rendering Intent which was preset in the profile, thus generally “Perceptual Match.”

Instead of this default setting, one of the three other Rendering Intents supported by ColorSync / ICM, such as “relative colourimetric,” “saturation” and “absolute colourimetric” can be chosen. In comparison, the effect, when choosing “absolute colourimetric” appears to be the most similar to prior behaviour, because of the differences of the Media white points that appear here.

Image data, which has been produced from computer graphics or from renderings might require adaption of the Rendering Intent.

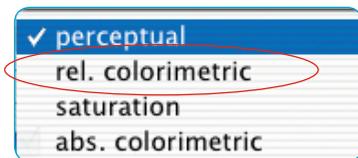


## Rendering Intents

### 1. Perceptual

Relative colourimetry is used. A reproduction which provides a perceptual or pleasing appearance. This general means both in- and out-of-gamut colours are modified from their colourimetric representation.

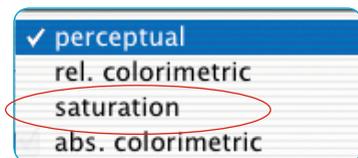
Example usage would be for scanned images.



## 2. Relative Colourimetric

Relative colourimetry is used. For reflection print this means that “y” of paper (paper white) is taken to be “1”. All colourimetric measurements are normalized based on the paper’s colourimetry. A colourimetric reproduction is provided for in-gamut colours. Out-of-gamut colours are mapped to the border of the reproducible gamut. This has the advantage of providing a larger effective gamut so that bright colours will more likely to be in-gamut. It has the disadvantage of sacrificing exact colour matches for printers with different paper white points.

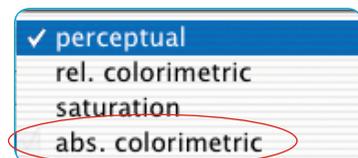
Example usage would be for spot colours where a colour reproduction relative to the paper’s white is desired.



## 3. Saturation

Saturation relative colourimetry is used. A reproduction in which saturation is emphasized. In-gamut colours may or may not be colourimetric.

Example usage would be for business graphics where saturation is the most important attribute of colour.



## 4. Absolute Colourimetric

Absolute colourimetry is used. For reflection print this means that “y” (paper white) of printed paper is less than “1”. A colourimetric reproduction is provided for in-gamut colours. Out-of-gamut colours are mapped to the border of the reproducible gamut. This has the advantage of providing exact colour matches from printer to printer. It has the disadvantage of causing colours with “y” values between the paper’s white and “1” to be out-of-gamut.

Example usage would be for spot colours where an exact colour reproduction is desired.

### 3. Embedded ICC Profiles

Nowadays, digital images are transferred in various channels onto different computers. To assure the rendering of colours to be true without knowing from where they came and how they have been processed, images get a profile attached which will assure a basis for the colour reproduction process.

If you want to embed the ICC profile into the data, you have to check this field accordingly. You will automatically see which profile will be embedded.

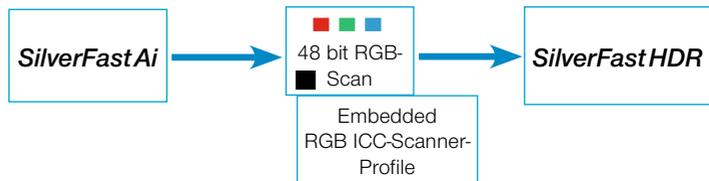
There are four possible origins for an ICC profile:

1. When selecting RGB in the section colour management under Internal->Output the profile originates from the field Profiles for ColorSync --> Internal (e.g. Adobe RGB).
2. When selecting ColorSync (ICM) under Internal-->Output, the profile originates from the field Output/Printer in the field "Profiles for ColorSync". (e.g. "Euroscale coated.icc").
3. If "P&P CMYK" is selected, it is the profile that was chosen under "Plug&Play CMYK".
4. When scanning in 48 bit mode and having selected the scanner-profile under "Profiles for ColorSync", the scanner profile will be embedded into the file.



#### Working in 48 bit mode?

*SilverFastAi can embed a scanner profile (which describes the deviation of the scanner) into the Tiff data during the output of 48 bit data. The scanner deviations can then automatically be corrected during later processing with SilverFastHDR.*



*Embedding a Scanner-Profile into the 48bit RGB-File*

## 4. Plug&Play CMYK

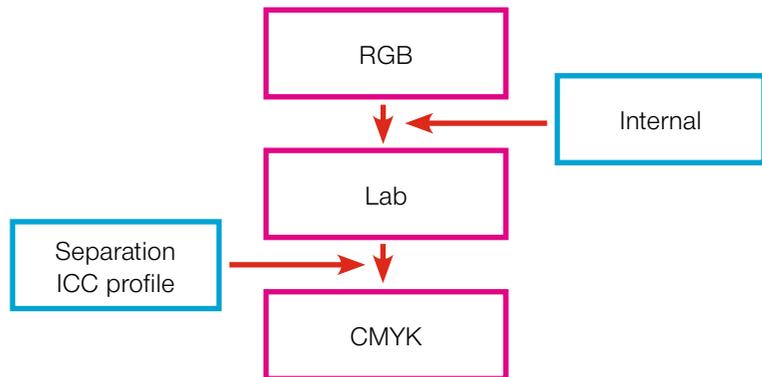
### Scanning with Colour Separation

**LaserSoft Imaging AG** has developed a new solution for high-end separation through Plug&Play CMYK. A new and revolutionary technique solved the problem of separation because the CMYK preview always used to look too different from the final result. Not so with **SilverFast!**

The following diagram explains the functionality of the new separation:

1. RGB data is internally calculated to the hardware independent Lab colour space. Monitor settings are taken into account. The monitor should therefore always be adjusted properly (see below).
2. By using **SilverFast separation** as well as the Photoshop separation profiles with help of the ICC profile, we calculate via the Lab format into CMYK.

### SilverFast Plug&Play Separation



## CMYK Output with Colour Management

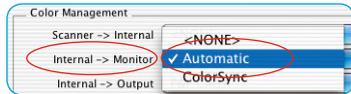
### Plug&Play CMYK Separation

In order to activate the P&P CMYK separation, proceed as follows: Select Internal->Output” “P&P CMYK” under the **SilverFast** colour management dialogue. Under "Plug&Play CMYK" at the bottom of the dialogue, select the appropriate profile.

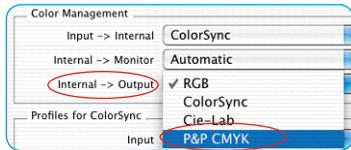
The ICC-CMYK output profile can be chosen at the base of the CMS dialogue.

Make sure you have loaded the same profile in Photoshop under "Colour Settings -->CMYK setup".

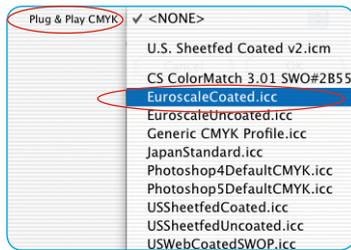
When leaving the "Options..." dialogue, the button "Scan RGB" will now show "Scan CMYK".



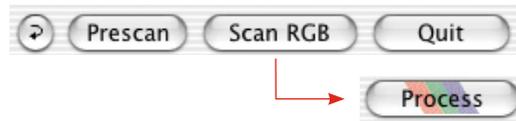
Selection of monitor setting



Selection of P+P CMYK



Selection of same profile or separation table



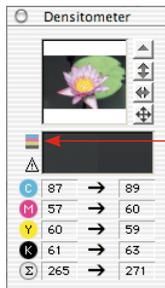
You may also switch **SilverFast** from RGB to CMYK by keeping the "CTRL" key pressed and click on the "Scan" button. A small popup window will appear in which the choice can be made. (refer also "Permanent softproof" Pages 87 and 191) If you have not selected a separation table or ICC profile previously, the selection will be grey and cannot be activated.

### RGB-CMYK Toggling

Under Windows press right Mouse-button

### Softproof - CMYK Simulation

"Alt"-command and click into preview



Button for switching on / off the softproof function

## Example Settings SilverFast/Photoshop 5.02

Following is a selection of example settings for the **SilverFast** CMS dialogue with reference to Photoshop 5.02:

### RGB Output under Photoshop without Colour Management

Under „Photoshop File/Colour Settings/ RGB Setup” you have selected e.g.: ❶ Adobe RGB as your working colour space. An ICC profile for this colour space should be exported, so you can select it later in *SilverFast*. To do this, you can save the settings with „save” into the ICC folder of the operating system.

Now bring up *SilverFast* (from the Photoshop “Import” menu). Go to “CMS” under “Options...” in the *SilverFast* main dialogue.

In “Colour management” select ❷ “Automatic” under “Internal --> Monitor”. Select ❸ “RGB” under “Internal --> Output”. In this case select ❹ <NONE> or “Calibration” under “Scanner->Internal”. You can only use Calibration with *SilverFast*’s own IT8 calibration. In this example we left it at <NONE>.

Select ❺ Adobe RGB under “Internal” in section “Profiles for ColorSync” as the RGB profile, which you have selected previously in Photoshop.



### RGB-Output with Colour Management

You have selected an RGB colour space (e.g.: Adobe RGB) under “Photoshop /Colour Settings/ RGB Setup”. For this you should have an ICC profile defining this colour space in which you can select later in the *SilverFast* CMS dialogue under “Profiles for ColorSync / ICM” - “Internal”. (If you do not have this profile, use “save” to save the profile into the System’s profile folder.)

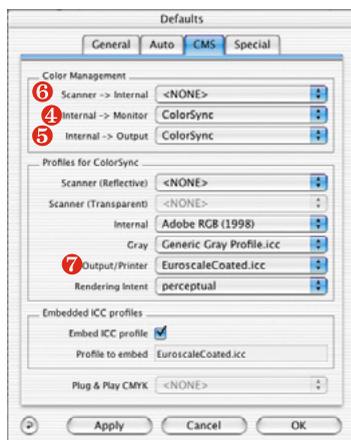
Now bring up *SilverFast* (from “Import menu”) .

Go to “CMS” under “Options...” in the *SilverFast*’s main dialogue. Select ❶ “ColorSync”(ICM) in the “Colour management” section under Internal -> Monitor and Internal --> Output. Scanner->Internal is also set to ❷ “ColorSync” (ICM) in our example. This is only possible, if you have a Scanner ICC profile - either from *SilverFast*’s IT8 calibration, or supplied from the scanner manufacturer. The profiles of the hardware manufacturer are not very accurate, since they are more generalized instead of scanner specific.





Select the scanner profiles ③ (reflective/transparency) of your scanner in section “Profiles for ColorSync” and under Output/Printer your printer profile. Select the profile of the internal system colour space under “Internal”. *SilverFast* assumes your image application supports complete colour management . Please check for this feature in the manual of your software manufacturer.



### CMYK-Output with Colour Management (CMS Separation)

You have selected a CMYK colour space under “Photoshop / CMYK setup”. For this you should have an ICC profile you can select later in *SilverFast*. If not, you can save the settings with “save” into the System profile folder.

Now bring up *SilverFast* (from the “Import” menu).

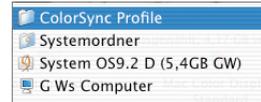
Under “Options...” go to “CMS” in the *SilverFast* main dialogue. Under the section “Colour management” select ④ “ColorSync” under Internal-> Monitor and ⑤ “ColorSync” under Internal --> Output.

Under Scanner-> Internal in our example it is again ⑦ <NONE>. In the section “Profiles for ColorSync” select the same CMYK profile under – Output/Printer, which you have allocated in Photoshop. Under Internal, select the profile of the internal system colour space.

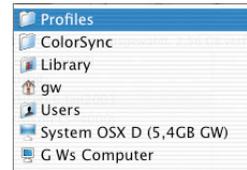
## How to save Profiles from Photoshop 5.02

Go to “File”, Colour Settings: RGB Setup. In this dialogue you can prepare your own settings and “Save...” them. Make sure, the profile goes into the right folder, so the System and *SilverFast* can access (load) it.

The path to save it into using **MacOS 9** is «.:System folder: ColorSync Profiles» and to save the file into.



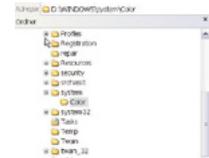
The path to save it into using **MacOSX** is: «...: user : *user-identification* : Library : Color-Sync : Profiles ...».



The path to save it into using **Win98** is:

«C:/Windows/System/Colors»

Note: Profiles in *SilverFast* have a different name from the file name!

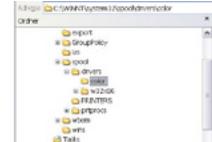
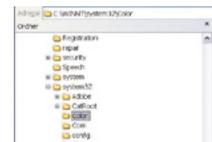


The path to save it into using **Windows 2000** is:

«C:/WinNT/System32/Color»

or

«C:/WinNT/System32/Spool/Drivers/Color»

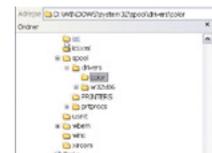
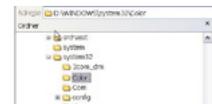


The path to save it into using **Windows XP** is:

«C:/Windows/System32/Color»

or

«C:/Windows/System32/Spool/Drivers/Color»



### Attention!

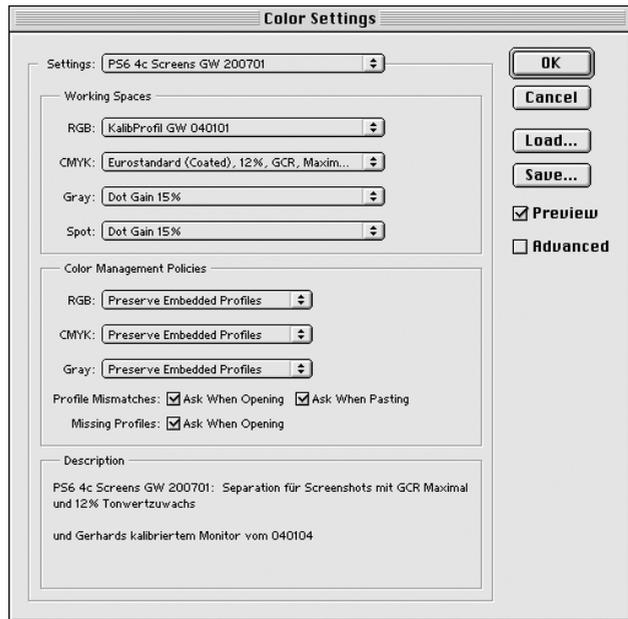
Under Windows profile descriptions do not correspond to profile name. To make sure you do not involuntarily select profiles you do not want, move those profiles temporarily out of the Windows / System Colour directly into a new directory (folder).

## Example Settings SilverFast / Photoshop 6

In ADOBE Photoshop 6 all colour settings have been integrated into one menu under “Colour Settings”. It seems more complicated on first look but has become clearer structured in reality.

Once set up, you can save all as one setting and if required exchange with other settings.

Please carefully read the corresponding pages in your Photoshop manual.



## Example Settings SilverFast / Photoshop 7

In ADOBE Photoshop 7 all colour settings have been integrated into one menu under “Colour Settings”. It seems more complicated on first look but has become clearer structured in reality.

No changes were made to Photoshop 6. The same presets may be used.

Once set up, you can save all as one setting and if required exchange with other settings.

Please carefully read the corresponding pages in your Photoshop manual.

