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# Order of processes in color management

Technical Note Hqn069

August 2006

# 1 Introduction

This technical note serves to provide information on the order of processes in color management for the Harlequin RIP.

## 2 Profiles

Profiles are look-up tables that describe the properties of a color space. They define a mapping from a color to a device-independent color. If you do not have a profile, the trio of Red, Green, and Blue values (or CMYK) that make up a color have no particular meaning—you can say something is blue, but not exactly which shade of blue. Accurate profiles are the key to a color managed workflow.

ICC profiles provide an industry standard way to insure consistent color, communicating color information about devices such as scanners, monitors and printers. They contain information about how that device produces color.

Harlequin format profiles serve the same general purpose as ICC profiles but are different in format. They do not follow the ICC profile specification, but they do contain all the information needed to produce accurate color on the relevant output device. The Harlequin RIP can also install ICC profiles so that they are usable by color management options in the RIP.

ColorPro together with SetGoldPro™ profile making software is Global Graphics' color science solution for ensuring color quality and accuracy for proofing and emulation.

Harlequin ColorPro embraces open systems, industry standards and device independent color science, and is able to make full use of them. If you have ICC profiles with which you already achieve good results, you can use these profiles with ColorPro. You should however be aware that ColorPro contains color science that is optimized for the Harlequin RIP.

Harlequin profiles contain a particular set of calibration data and/or color characterization data for a particular output device. The variations in content allow for different device capabilities and for use with or without the Harlequin color management options.

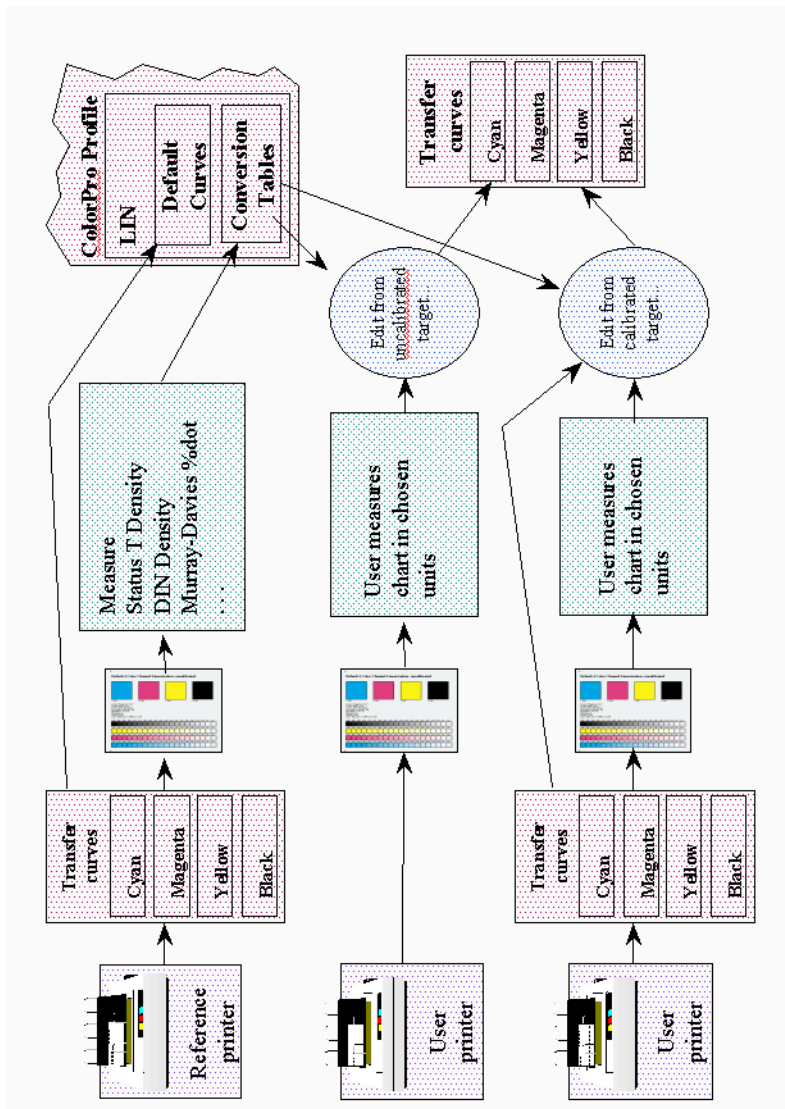
A Harlequin ProofReady profile does not require a ColorPro setup but contains a Color Rendering Dictionary (CRD) made from a set of ColorPro settings. It usually has a SWOP input profile with an Absolute Colorimetric rendering intent.

The Profile Connection Space (PCS) is the reference color space in which colors are encoded in order to provide an interface for connecting source and destination transforms.

## 3 Calibration

Regardless of the accuracy of an output device, the media and other consumable items can vary and have an effect on the output. For example, an imagesetter may produce an accurate and stable exposure of the media on which it is imaging but the reaction of that media varies from paper to film, and from one media manufacturer to another. Also, laser dots are never square (as in an idealized raster), they usually overlap, often cannot resolve a single pixel, and cannot always be turned off between adjacent pixels. Similarly, in direct output devices, overlap of toner dots in laser printers or ink spreading in inkjet

devices often produces a deviation of some kind between required gray levels and those actually output.



**Figure 1** Process of calibration

Whatever the physical reason, the result is variability or non-linearity and some adjustment is almost always necessary to compensate for these factors. This is called calibration. Figure 1 shows the stages in the process of calibration for different types of printer.

Calibration is important in color work, but it is not a complete answer. Calibration is sufficient only where the originally requested colors are prepared with the final output device in mind; calibration can adjust the individual color values. A color management system is required to make adjustments which change hues, as for example in digital proofing or to cope with device to device variations.

The RIP allows calibration sets to be built for particular configurations. By choosing appropriate calibration sets, you can make the RIP correct for variations caused by different output devices, line frequencies, exposure values, dot shapes, and negative / positive setting.

The calibration facilities allow several ways of working:

- You can measure calibrated or uncalibrated targets. This means that you can print a calibration target with the previous calibration applied and enter only the values that are in error—possibly saving time and materials. Alternatively, you can start again with an uncalibrated target as if no calibration exists.
- You can create separate calibration curves for each channel of multicolor devices, for example color ink jet printers and printing presses. If the output device or printing press supports additional colorants, you can create separate calibration curves for spot colors.

Although an imagesetter is not a multicolor device, you can create a separate calibration curve for each color, to take account of the different screen angles.

- If you are preparing a job for a printing press, you can create separate calibration curves for output to film and output to a printing press. You can retarget a job from its intended printing press to another printing press, using a separate calibration set to remove the compensation for the gain of the intended press.

## 4 Order of operations

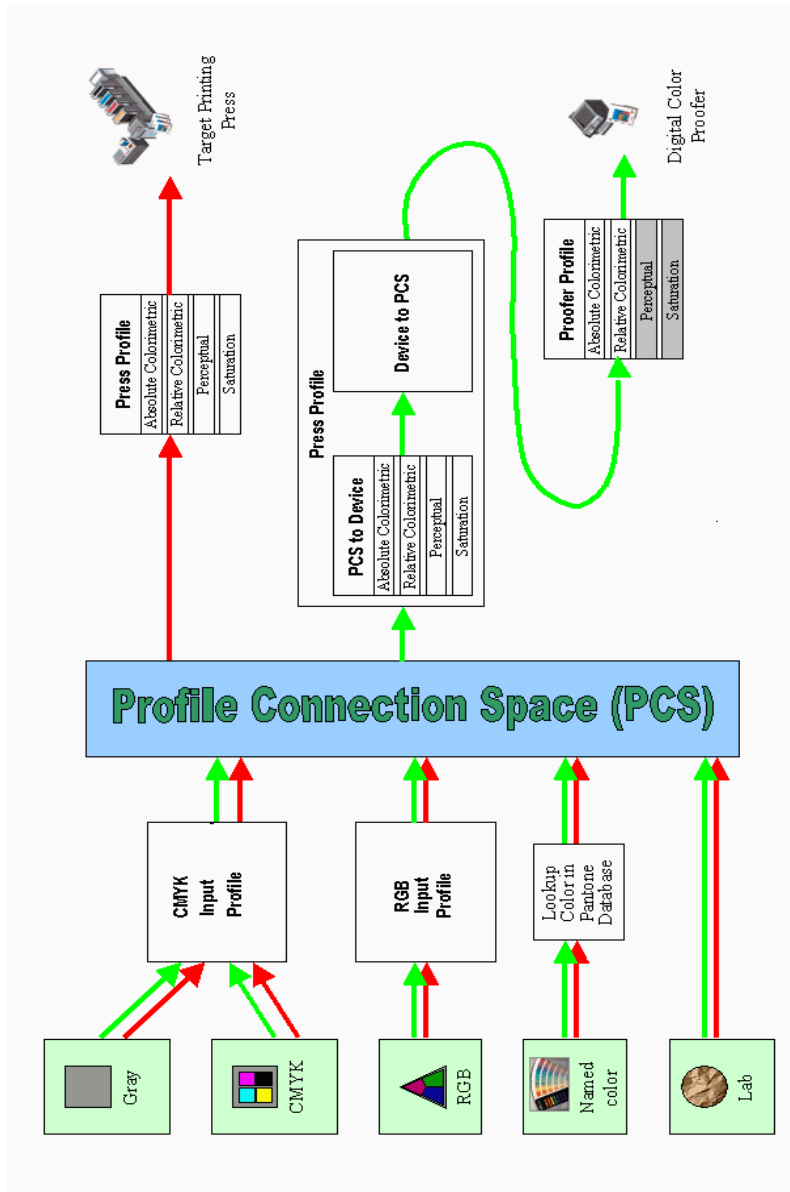
1. When a job is received the RIP converts RGB or CMYK data in the CIEXYZ in the Profile Connection Space (PCS) to CIEXYZ device independent color using the input profile.
2. The output profile is applied to convert to the color space of the output device to deal with device to device variation.

In the case where an emulation profile is used, the input tables of the emulation profile are used to convert back to the PCS and then the proofer profile is used to

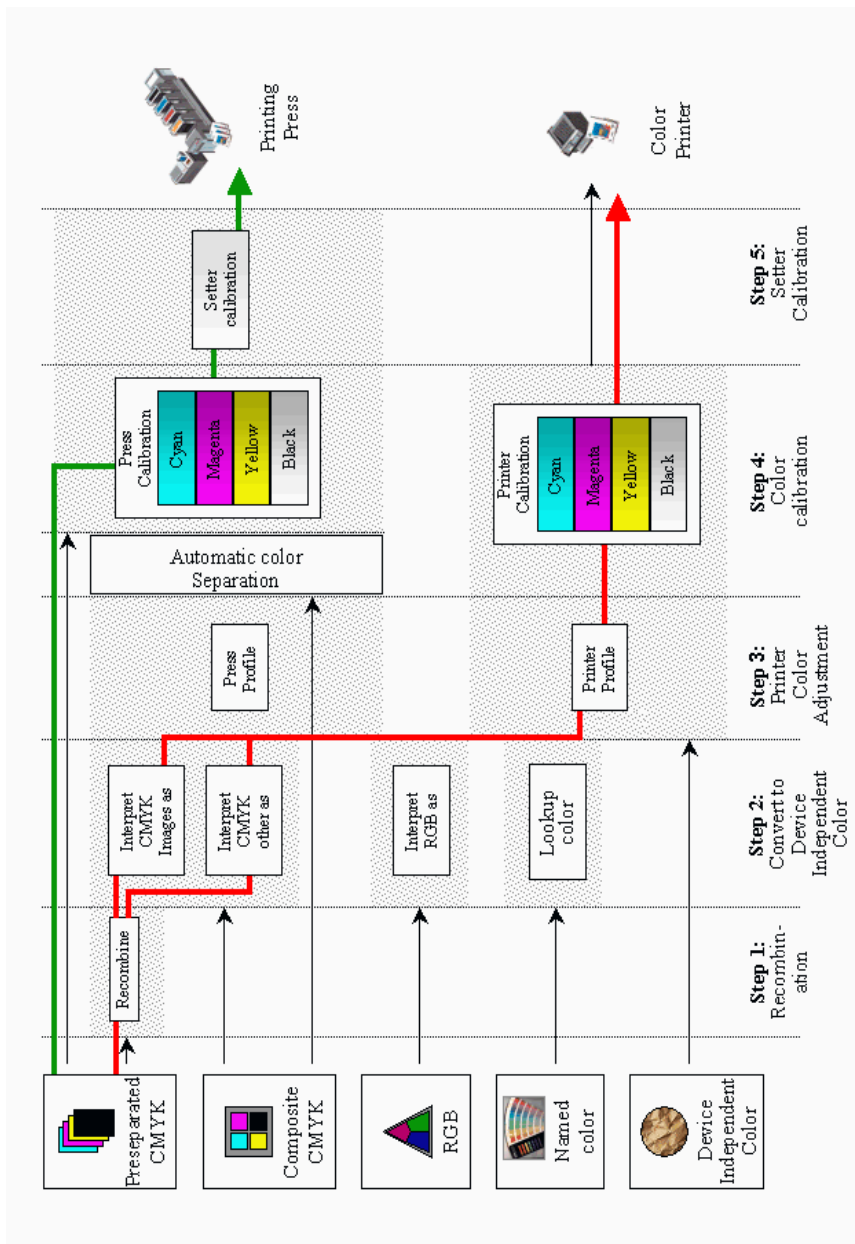
convert to the device space of the proofer. Generally, for digital proofing one would select colorimetric rendering.

Calibration is applied as a final step.

Figure 1 below shows the stages involved in sending jobs, with one of a number of color input types, to either press or proofer via an emulation profile. Figure 2 gives further details of some of the stages involved in sending print jobs, but with no emulation profile involved in the process.



**Figure 1** Workflow with Emulation Profile



**Figure 2** Workflow overview



## 5 Document history

Change history		
v1.0	17.08.2006	New Document



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Version 1.0: August 2006

Part number: Hqn069

Document issue: 103

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