hp cc800ps,
815mfp,
5500mfp,
4200 scanner

color accuracy
in a proofing
workflow

color
reproduction

Color Reproduction
for the HP Large Format Color Copier products family:
cc800ps, 815mfp, 5500mfp and 4200 scanner

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Notes about the document

The settings and examples described in this document apply to the HP Large Format Color Copiers family
with HP DesignJet Scan software version 2.6.4 or later.

Contents

1. INTRODUCTION TO THE DOCUMENT

The aim of this document is to provide customers with a simple guide to getting good color reproduction when using the HP Large Format Color Copier products. By making the process of scanning and printing easier to understand, we believe users will be able to achieve the desired color reproduction results.

This document contains two parts:

- The first part provides a set of guidelines, checkpoints, settings and troubleshooting cases that will help the owner of an HP Large Format Color Copier system in the copying experience.

- The second part (Annex) provides an introduction to color copying concepts, especially those related to the systems under discussion. In addition, the Annex includes:
  - an assessment of which colors can be reproduced,
  - a set of guidelines to assist the user in creating or validating media profiles,
  - a set of guidelines to the creation of new types of originals,
  - a set of guidelines for reproduction when using thick media originals.

Users who have a good understanding of color copying concepts can use the first part of this document as a practical guide to perform a color reproduction job and as an aid to problem solving.

Users who require more detailed information regarding color copying concepts or who seek assistance for advanced configuration of the system, should instead refer to the Annex.

This document does not include features that are not color related, such as: rotating, scaling, nesting, accounting, paneling, tiling, mirroring and alignment. It neither provides details about scanner and printer maintenance (please refer to the other guides for questions related to these features).

We hope this document will be useful for you and will help you to succeed in your business.

Best regards,

HP Designjet printers

2. COLOR COPYING GUIDELINES

The HP Large Format Color Copiers allow an original image to be reproduced using a scanner, a printer and a controller (called Touch Screen). The reproduction can be done:

- as one step (a Copy process);
- in two steps (a Scan process followed by a Print process) with an intermediate saving of the digitized data into a file.

In this document, we will not differentiate between the two cases: we will describe the Scan process and the Print process separately. If you are performing a Copy, please follow both processes consequently.

To reproduce an image accurately, the following steps should be followed:

- **Checkpoints before starting a job**: you should answer to these points before starting the job;
- **Touch Screen settings decisions**: you should take these decisions before setting up the Touch Screen;
- **Running a job**: you should configure the Touch Screen according to the settings decided in the previous step;
- **Post-job recommendations and Troubleshooting**: you can make some considerations when the job is finished and, in case the output is not as expected, you can use this part as a guide to troubleshooting.

2.1 Checkpoints before starting a job

Before starting a color reproduction job, you should answer the following questions to ensure you are in a correct state to proceed. If any of the answers are negative or uncertain, please follow the recommended actions.

2.1.1 <u>Scanner</u>

- ☐ **Is the glass plate clean and free from dust?** If not, or not sure, please follow the scanner maintenance manual to clean it. Typically, vertical lines appear in the copy if the glass plate is not clean enough.

☐ **Is the white background element of the loading mechanism clean?** If not, the grays will show a color cast in the copy and the system will behave erratically (some copies will be acceptable whilst some others won't).

☐ **Has the scanner been on for more than 1 hour?** If not the colors may vary along the scanning.

☐ **Does the scanner need to run the scanner maintenance process?** If so, follow the scanner maintenance manual. If unsure, see section 3.1.2.2 of the Annex. Typically, the scanner maintenance process should be run every 100 scans or once a month, but it depends widely on the type of originals you are scanning. If you suspect that the scanner may have a problem (colors very different from the original, grays not neutrals, broken leaned lines), then run the scanner maintenance process.

☐ **Has the original dried-up?** If the ink is still fresh, the original may be damaged and the glass plate of the scanner may be dirtied.

☐ **Is the height setting in the loading mechanism adapted to the thickness of the original?** If the original is thicker than 2 mm., please follow the guidelines in section 3.6 of the Annex and always remember to handle the original with care.

2.1.2 Printer

☐ **Is the media properly loaded and with the correct name appearing in the front panel?** If not, change the media name or reload a new media, or otherwise you risk having a deteriorated Image Quality.

☐ **Did you run the Pen Alignment and Color Calibration for the media loaded and the current set of pens?** If not, execute a Pen Alignment and a Color Calibration as described in section 3.1.4 of the Annex.

☐ **Is Color Calibration On?** Follow the steps in section 3.1.4 of the Annex.

☐ **Has the printer been inactive for more than 6 hours?** If so take into account that the first swaths (ink dropping passes) may show a duller color (less ink delivered) than the rest. To avoid this, run a small print test from the printer front panel.

☐ **Is there enough ink for the job?** You may look at the ink level indication on the printer front panel. If necessary, replace any empty cartridges; there is no need to do a Closed Loop Color or Printhead Alignment afterwards.

2.1.3 <u>Touch Screen</u>

☐ **Do you have a Media Profile adapted to the media currently loaded into the printer?** If not or not known, please follow section 3.3 in the Annex on how to create or validate the Media Profile. If it is not correct, the output image may have serious defects: too much ink (dark images, smearing, bleeding), too little ink (washed out, low contrasted images), wrong colors.

2.2 Touch Screen settings decisions

You should now decide what kind of scanning, printing or copying you would like to perform. To do so, you will have to select amongst different options provided in the Touch Screen.

This section can be used as a reference chart, where you can tick and select options that later will be used to configure the Touch Screen. The terms in bold are the actual options' names that appear in the Touch Screen menus.

1. Scanning options

1.1	<u>Color Mode:</u>
	do you want to process the image in Black&White or Color? (even if the original is a color image the copy could be B&W)
	Many settings depend on this decision.
	
	    ☐ **B&W**
	    ☐ **Color**

1.2	<u>Type of content:</u>
	what is the content of the original? Select the type of content that matches best among the followings. This decision will be related to the type of original defined in the Touch Screen (see section 2.3.1.1). The type of original is specified between parenthesis (), in black for B&W scanning mode and in *italics* for color scanning mode.
	
	    ☐ Pictorial (**B&W Photo**; ***Color Photo***)
	    ☐ Cad Drawing with clean white background (**Line**; ***Cad***)
	    ☐ Text or Line Art with clean white background (**Line**; ***Cad***)

		☐ Cad Drawing, Text or Line Art with a background that is difficult to distinguish from the lines:
		    ☐ Blueprint (blue background) (**Blueprint**; *Cad with advanced settings*)
		    ☐ Sepia background (**Sepia**; *Cad with advanced settings*)
		    ☐ Other …..
		☐ Document: mixed text (or lines) and pictures (**Normal**; *Brochure*)
		☐ Map (solid areas and lines) (**Normal**; *Map*)
		☐ Other: ……..

1.3		<u>Definition of own type of original:</u>
		do you need some extra color management or image enhancement applied to the image? If unsure refer to sections 3.4 and 3.5 of the Annex. Please remember that if you change any of the predefined values for the settings below, the final image may not be color consistent with the original or its image quality could be compromised. The *italic* items are applicable only when scanning in *Color mode*. Default values are 0.
		
		☐ **Lightness** (-3 to +6): ……..
		☐ **Saturation** (-6 to +6): …….
		☐ *Balance. Choose either RGB or CMY values (-6 to +6):*
		    ☐ *Red*: ………. ☐ *Cyan*: …………..
		    ☐ *Green*: ……… ☐ *Magenta*: ………
		    ☐ *Blue*: ………. ☐ *Yellow*: …………
		☐ **Background Cleaning** (0 to 255): ….
		☐ **Black Enhancement** (0 to 255): ……
		☐ **Blur** (*Color 0 to 12*; B&W On/Off): ……..
		☐ **Sharpen** (0 to 6): ………

1.4		<u>Scan Resolution:</u> Which **scanning resolution** do you need? High (or Best) gives higher quality but produces bigger files and has lower throughput; Low (or Fast) gives higher throughput and smaller files but lower quality. Normal is a compromise between the previous two cases. If selecting another resolution, it is recommended to choose a resolution that is a multiple, or sub-multiple, of 600dpi to avoid picture artifacts. See discussion in section 2.3.1.2. ☐ **Low** (Scan) or **Fast** (Copy) ☐ **Normal** ☐ **High** (Scan) or **Best** (Copy) ☐ Other: ………….

2. Printing options

2.1	What is the **Printer** name in the Touch Screen? …………………………
2.2	Which **Media Profile** are you going to use? (For information see section 3.3 in the Annex) …………………………
2.3	Which **Print Quality** do you need? Best gives higher quality but lower throughput; Fast gives higher throughput but lower quality. It is recommended to select Fast for drafts, Normal for non-critical tasks and Best for final presentations. ☐ **Best** ☐ **Normal** ☐ **Fast**
2.4	Do you know which inking technology has been used to produce the original? If not known select Non Inkjet: ☐ Inkjet ☐ Non Inkjet (Offset, Traditional Photography, Laser Printer, …)
2.5	(Optional) Do you think you need to **enhance grays**? If unsure, select No. For further information, see section 2.3.2.2. ☐ Yes ☐ No

2.3 Running a job: operator settings

The third step of the process, after having got through the checkpoints in section 2.1 and answered the questions in section 2.2, is to configure the Touch Screen.

Firstly, you should choose the tab corresponding to the action you are about to perform:

- **Scan**: scan the original and save the digitized image to a file on CD, hard disk, flexible disk or networked disk. This file may be printed later. We will call this option Scan to File.

- **Print**: perform a printout from a previously digitized image file. We will call this option File to Print.

- **Copy**:
  scan the original and print it immediately (no intermediate file created). In this case, the settings are a combination of the Scan and Print settings[1].
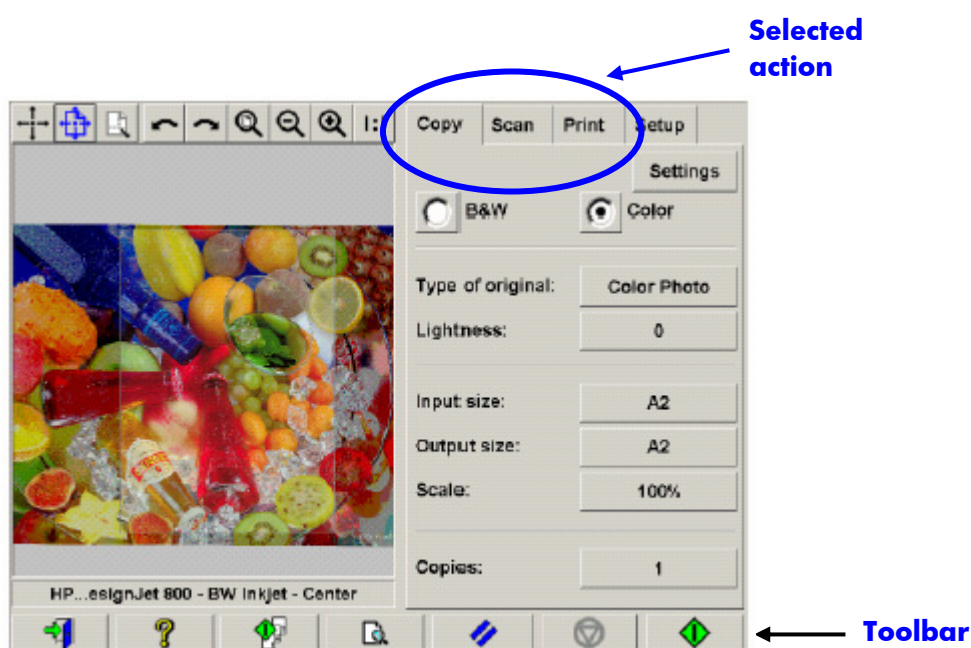
Please beware that different tabs may have settings in common (for example Lightness in the Copy and Scan tab) and most of them keep their value when you move from one

---

[1] If you select Copy you should follow the guidelines to Scan followed by the ones to Print.

tab to another. However, all settings under the **Settings** button will change their value when moving between tabs, even if their name is the same (such as Enhance gray, existing in both Print and Copy settings).

Therefore, you should first select the tab, according to the action to be performed, and then select the settings for that tab.

The settings selected in section 2.2 are herein referred to by their line number appearing in brackets (e.g. (1.1) when setting the Color mode).

2.3.1 Scanning

Scanning is the digitization of the original image. It happens either when we are Copying or Scanning to File (i.e. Copy or Scan tabs). Special attention should be paid to this process where, besides the digitization, most of the image enhancement and part of the color management take place.

It is recommended to preview the image after applying the settings, by pressing the preview button (see figure below). You can also increase the details of the image by selecting the Zoom buttons in the Preview pane.
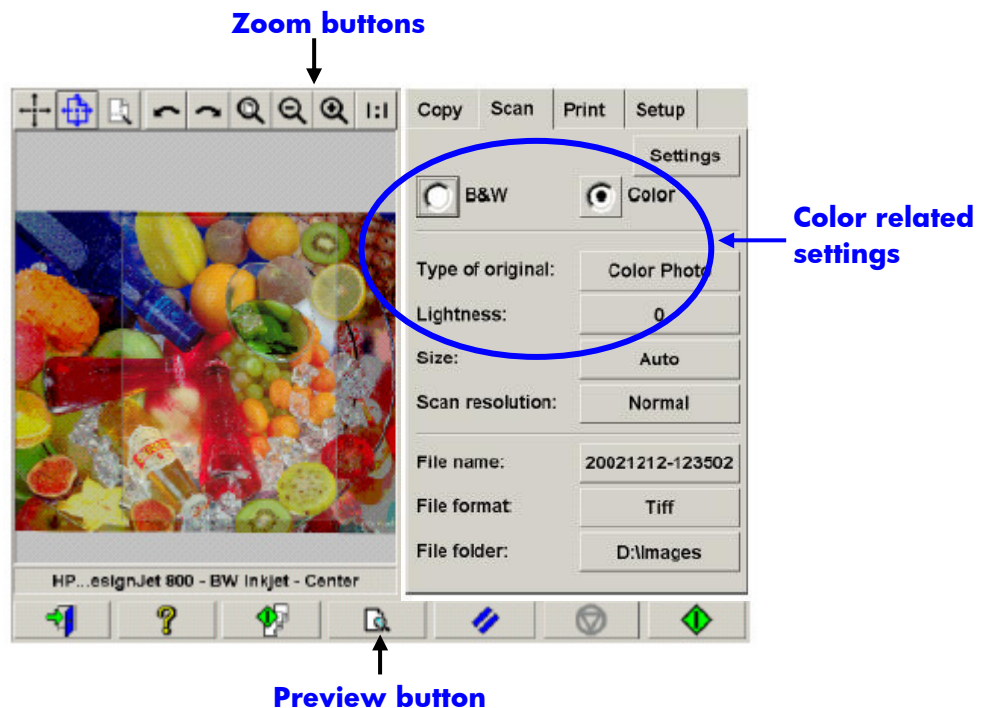
Before scanning, you will have to make three color-related selections from the main menu:

- **B&W** or **Color** (1.1): defines whether the scanning result will have color information or just grayscales.

- **Type of original** (1.2): is a template for image enhancement and color management. Please refer to the following section for more details.

- **Lightness** (1.3): allows to increase or decrease the luminosity of the overall image.

Lightness -3   **Lightness 0**   **Lightness +6**

2.3.1.1 Type of original (1.2)

Since there are many settings to specify for image enhancement and color management, a template (or group of settings) is provided to ease this task: the **type of original**. It consists of the definition of archetypes of different originals to which specific settings' values have been associated. Depending on whether you are trying to scan in B&W or Color, you may choose between different "type of original" templates:

- Color scanning
  - **Color Photo**
  - **Brochure**
  - **Map**
  - **Cad**
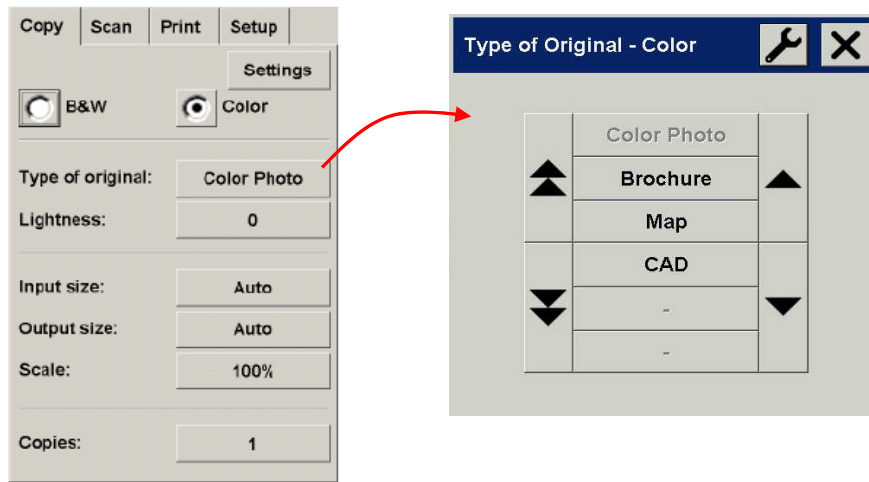
- <u>B&W scanning</u>
  - **Normal**
  - **B&W Photo**
  - **Blueprint**
  - **Sepia**
  - **Line**
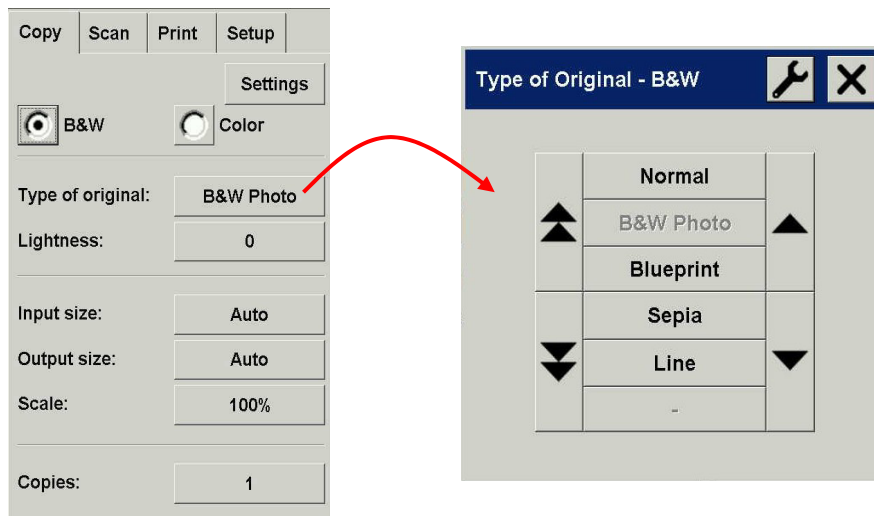
In most cases, choosing the correct type of original, as specified by point 1.2 in section 2.2, is enough to obtain a good scan and, subsequently, a good print.

A description of when each type of original should be used is provided in the following tables.

Color Mode	
Color Photo Should be used when copying color pictorial images, characterized by having many colors, transitions between colors or shadings. The main intention is to have a copy as perceptually similar to the original as possible, even though the colors are not exactly the same.	
Brochure Should be used when there is a mix of text (sharp and crisp contrast) and pictures. It is a compromise between having good perceptual reproduction of the pictures and crisp text.	
Map Should be used for maps, graphics and other documents that have area fills: areas of one color surrounded by areas of another color. The edges between adjacent color areas are enhanced (sharpened) and, assuming that the background is white, a background cleaning feature is applied.	
Cad Should be used for line drawings (architectural, mechanical, electrical drawings) or text document. Lines may be thin, and should be copied as sharply as possible. The same image enhancements of the Map type are applied.	
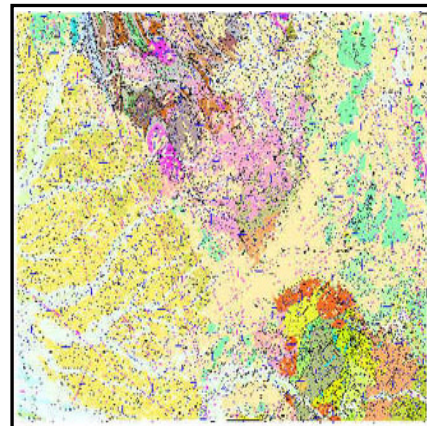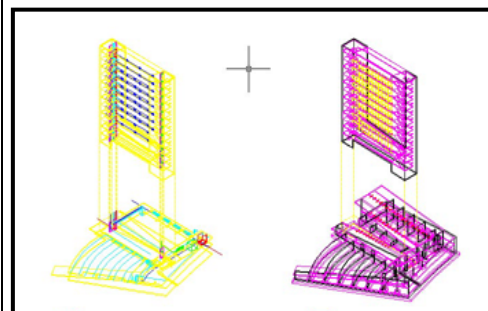
Black and White Mode	
Normal Should be used for line drawings, text and shades of gray. It is similar to the Brochure type seen before, but for black and white.	
B&W Photo Should be used for pictorial images that have many shades of gray. In principle, this is equivalent to the Color Photo type.	
Blueprint Should be used when the original has very similar bluish background and foreground. If you selected Normal or B&W Photo for this type of original the output would be very noisy and it would be hard to distinguish the lines. This type of original performs a cleaning of the background in order to make the output clearer.	
Sepia This option uses the same principles as Blueprint but it is designed for sepia color backgrounds.	
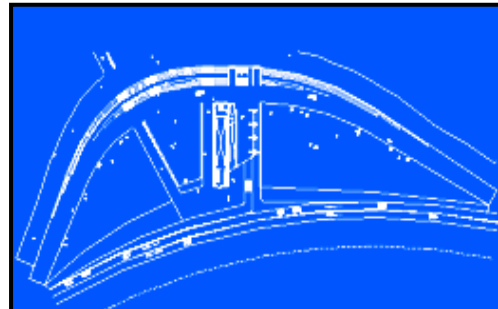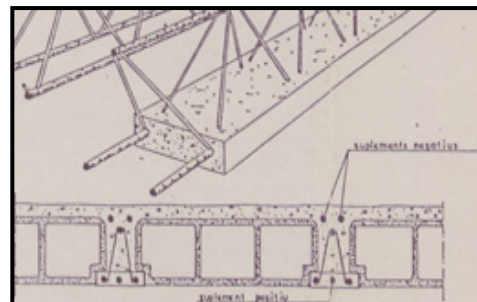
Line Should be used for line drawings and pure black text. It is not suitable for pictures and it is the equivalent of the CAD type seen before, but for black and white.	
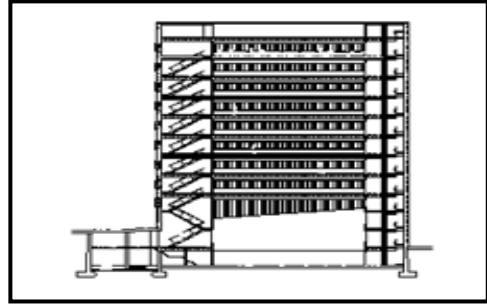
At this point, if you don't like how the original appears on the preview pane, or if you have already made a copy and the result is not what you expected, you can try to do one of the followings:

- try a different pre-defined type of original;
- modify the current type of original;
- create your own type of original (same as before, but saving the new type of original under a new name, thus preserving the pre-defined one).

To create your own new type of original, please refer to sections 3.4 and 3.5 of the Annex.

2.3.1.2 Scan Resolution (1.4)

You can specify the scanning resolution decided in point 1.4 of section 2.2 in the **Scan Resolution** setting of the Scan tab (or in the **Copy Quality** setting under the Settings button of the Copy tab).

If you select a scanning resolution other than the predefined ones, please make sure that it is a multiple or sub-multiple of 600dpi, otherwise picture artifacts may appear in the copy.

As a rule of thumb, the scanning resolution (for best print mode and large format images) should be 150dpi x (Output Size/Input Size); therefore, if the original is not enlarged (Output Size = Input Size), a 150dpi resolution is sufficient. If the original is enlarged four times, a 600dpi resolution is needed.

If the image contains fine details (CAD drawings, fine art, maps), you may consider scanning at a higher resolution.

2.3.2 Printing

Printing is the materialization of the image and can be performed whether you are in the Copy or Print tabs of the Touch Screen. Please remember that, besides the formatting required to send the image to the printer, most of the color management takes place in this phase.

With regard to color management you should define:

- which **printer** will be used (2.1);
- which **media profile** defines the media loaded in the printer (2.2);
- what **print quality** is required (2.3);
- whether the original image comes from an **inkjet printer** (2.4);
- (optionally) whether you prefer **gray enhancement** or not (2.5).

All these settings can be specified in the Touch Screen menu.

2.3.2.1 Printer and Media Profile (2.1 and 2.2)

Printer name and **Media profile** can be specified in the Setup tab, as shown in the picture below.
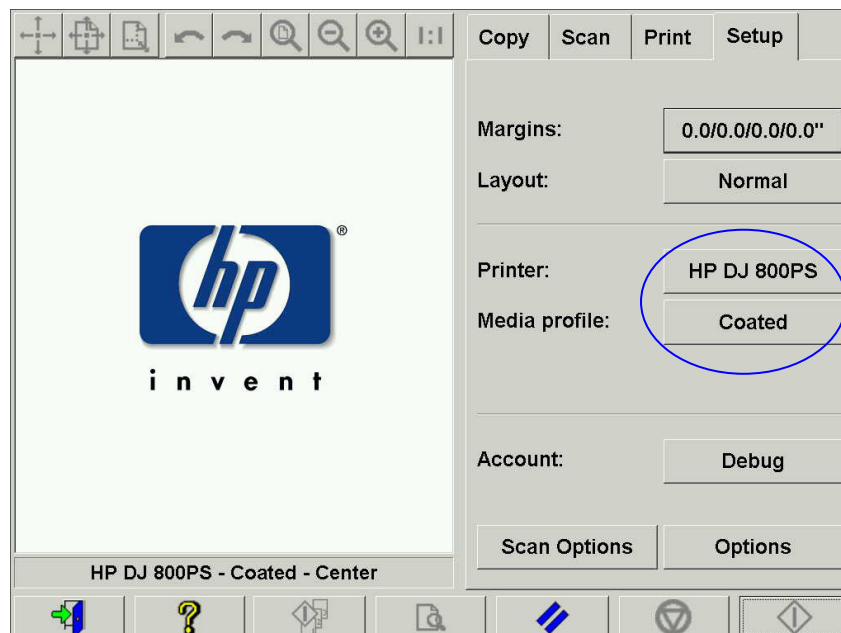
2.3.2.2 Print Quality (2.3), Ink Printer Original (2.4), Enhance gray (2.5)

The **Print quality**, the **Ink printer original** and the **Enhance gray** settings are specified under the **Settings** button in the Copy or Print tab:
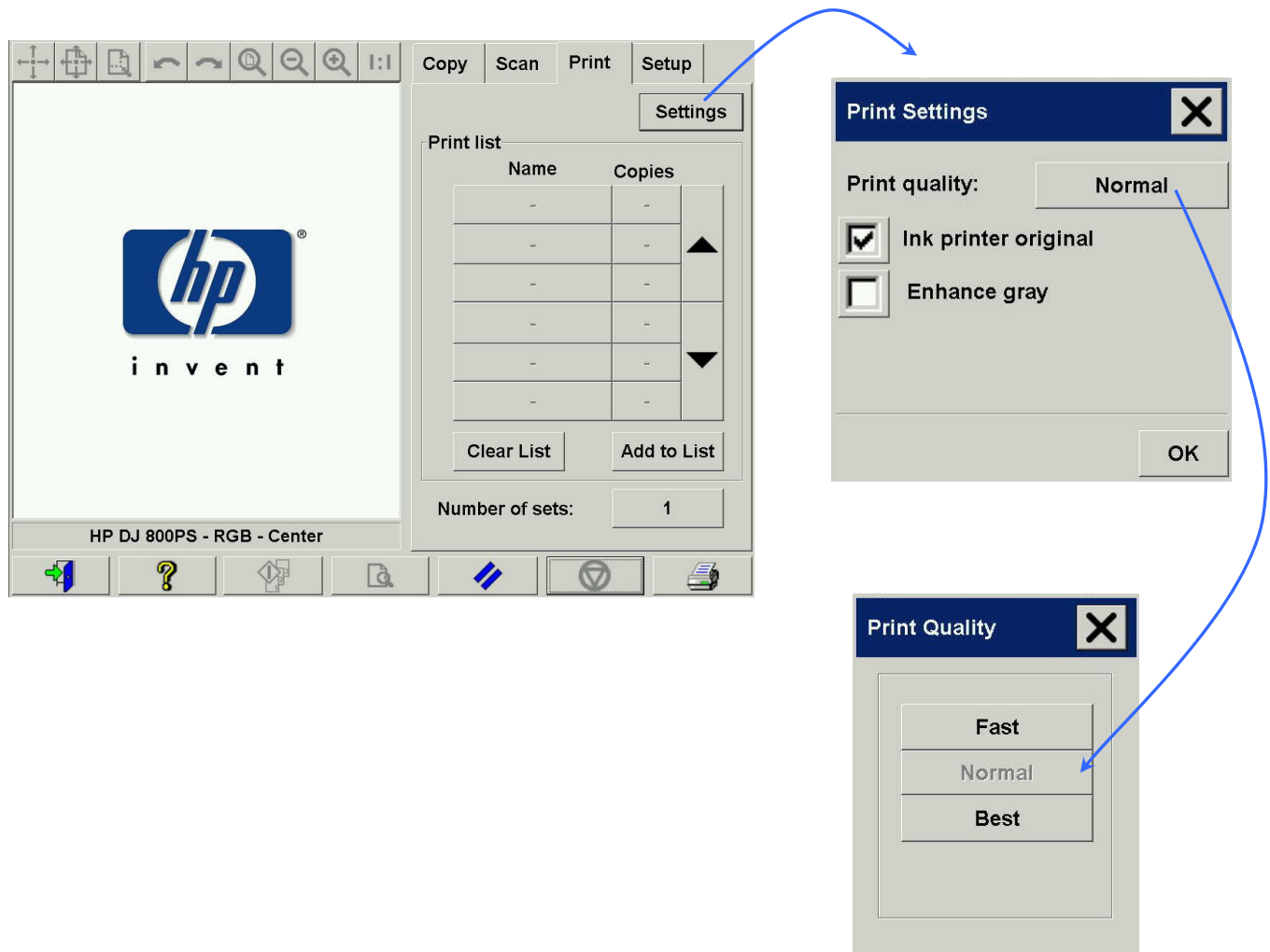
To get the best possible image quality and in order not to loose any of the reproducible colors, you should choose **Best** print quality together with a good media such as **Photo Gloss**. For all other cases, you should decide whether to favor image quality (**Best**), print speed (**Fast**) or balance the two (**Normal**).

The **Ink printer original** setting should be specified when the original image comes from an inkjet printer. If the original is a traditional silver-halide photo, or comes from an offset press, a laser printer or some other printer rather than inkjet, then this option should not be set.

The **Enhance gray** option may be used when a previous printout shows a color cast in the gray areas. This may happen either when the media profile is not well adapted to the printer + media conditions or when the viewing conditions are altered (e.g. Light bulb instead of fluorescent light).

Enhance Gray

Previous Print   **Final Print**

2.3.3 Additional operating recommendations

The following recommendations relate to color reproduction as well as to other characteristics of the system, such as collating and accounting.

> ➢ To be sure that the chosen settings are suitable, you should always do a **preview scan** before the final Copy or Scan operation.

> ➢ To **cancel** any **operation** like a Copy, Print or Collate, it is recommended that you press the Cancel button of the Touch Screen as well as the Cancel button of the printer's front panel, especially if you combine the operation with a nesting layout.

> ➢ Every time you need to **change the media roll**, you should go to "Setup-> Printer-> Printer Setup-> Unprintable Area", and update the value of the media width. If the media width value is incorrect, errors can take place in the nesting layout of a final Collate or in a Print operation. In addition, the incorrect media width may affect the result of operations like Paneling or Tiling.

> ➢ When you power back on the scanner after the maintenance process, or when the message "***No scanner was found***" appears, it is not necessary to restart the Touch Screen. Just disconnect the FireWire cable of your Touch Screen, connect it again and then press the Rescan button. You can verify the scanner detection in "Setup-> Scan Options-> Scanner-> Rescan Bus".

➢ The **Accounting** feature helps keeping track of your copy activities. It may be used to record your copy expenses and for billing your customers. The accounting system records the number of times the system scans, prints, and copies. The number of square feet or square meters for scanning and printing activities is calculated from the Input size and Output size settings. The calculations for paper usage (in square feet) take into account the full media width and not just the printed image. When using the accounting feature, please note that if you cancel a print or copy job, the accounting fields are increased as if the job was not cancelled; on the other hand, if you cancel a scan job, the corresponding fields are not increased.

2.4 Post-job recommendations and Troubleshooting

2.4.1 Post-job recommendations

➢ **Handle the copy with care, letting it dry completely**.
It is recommended not to expose it to direct sun light (or any other source of UV rays) or other extreme conditions (humidity, temperature) and, if appropriate, it is recommendable to laminate it in order to avoid scratches and to increase its "light-fastness" (i.e. durability of colors).

➢ **Clean the glass plate**
If you suspect that the original has left some dust on the glass plate, clean it with a soft cotton tissue.

2.4.2 Troubleshooting

If the output is not as expected, please check if your problem is one of those listed below, and if so, consult the following sections for a deeper diagnosis and a potential solution. Alternatively, please contact the HP Support Organization.

The most common issues in color reproduction are:

1. The colors of the copy are very different from the original:
   a. there is an overall color cast (e.g. bluish, pinkish)
   b. most of the colors are OK but certain ones are very different
2. Grays are wrong in a color copied image
3. The copy is not as shiny as the original
4. There is a big difference between right and left sides of the copy
5. The background results colored when copying newspapers
6. Vertical Bands appear in the copy
7. A B&W image appears greenish (or pinkish, or bluish)

2.4.2.1 The colors of the copy are very different from the original

1.a There is an overall color cast

```
(1)   Are you viewing the        NO →   Try viewing it with
      copy in the expected               the correct light and
      viewing conditions?                environment
              |
             Yes
              ↓
(2)   Is the Media properly       NO →   Reload the Media
      specified in the                   type in the printer
      printer front panel?               and try again
              |
             Yes
              ↓
(3)   Is it a new Media type?     Yes →  Create a new
      Needs a new Media Profile           Media Profile
      to be created?
              |
             No
              ↓
(4)   Have you validated this     NO →   Validate the Media
      Media recently?                    Profile. Make sure the
                                         glass plate is clean
              |
             Yes
              ↓
(5)   Print the gray scale in the NO →   Modify RGB
      Advanced Gray Balance              values and
      window in the Media Profile        recreate the
      Creation. Is the ramp              media profile
      neutral?
              |
             Yes
              ↓
      Scan or Copy modifying the RGB settings.
```
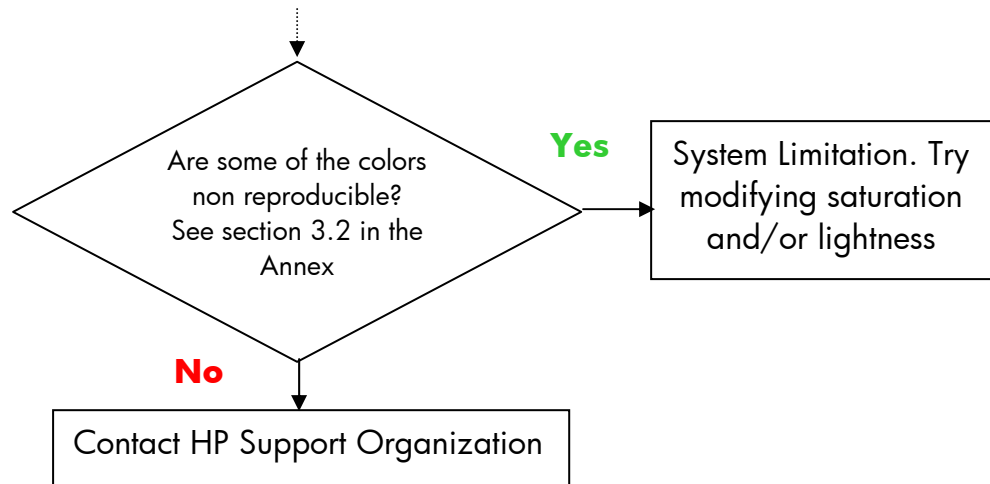
1.b Most of the colors are OK but certain ones are very different

Follow the steps 1 to 5 as in 1.a and proceed from there:

Are some of the colors non reproducible? See section 3.2 in the Annex — **Yes** → System Limitation. Try modifying saturation and/or lightness

No → Contact HP Support Organization

2.4.2.2 Grays are wrong in a color copied image

Follow steps 1 to 4 as in 1.a of section 2.4.2.1. If the problem persists, try cleaning the white background plate that is on the top assembly of the scanner over the glass plate.

2.4.2.3 The copy is not as shiny as the original

This may be due to not using the correct media: High Gloss or Semi Gloss media should be used in this case.

2.4.2.4 There is a big difference between right and left sides of the copy

This may be due to right-left cameras' miscalibration. Try performing scanner maintenance. If this does not solve the problem, please contact the HP Support Organization.

2.4.2.5 The background results colored when copying newspapers

To avoid copying the background of a background colored document (typically sepia) you should use the background cleaning option when scanning in color mode; if you are interested in B&W copying you should use either Sepia or Blueprint type of original.

2.4.2.6 Vertical Bands appear in the copy

This normally happens when the glass plate is dirty (either because it was dirty before the scanning or because the original left tiny bits of coating as it moved over it). In the first case, clean the glass plate according to the scanner maintenance procedure and in the second case, laminate the original (if possible) or place a transparent cover over it before scanning again.

2.4.2.7 A B&W image appears greenish (or pinkish, or bluish)

If you selected scanning in B&W and the output image has a noticeable color cast, then probably the problem is in the printer itself. Make sure that the printer CLC (Closed-Loop Color) has been performed and is active. See section 3.1.4 for details on the CLC process. If this does not solve the problem, consider copying in Color mode. If the problem persists, follow the steps described in section 2.4.2.2.

3. ANNEX

3.1 Color Reproduction: Theory of Operation

Color Reproduction consists of transferring an original image that resides on a substrate onto another substrate (paper or other media), as accurately as possible. With HP Color Copier systems reproduction is done by digitizing the original image with a large format scanner, applying color transformations and image enhancements, and finally sending the data to a large format printer to generate the reproduction of the image.

There are five components involved in this process as depicted by the following picture:

1) The original image
2) The image digitizer (large format scanner)
3) The color transformation and image enhancement engine (Touch Screen)
4) The image producer (large format printer)
5) The reproduced or final image
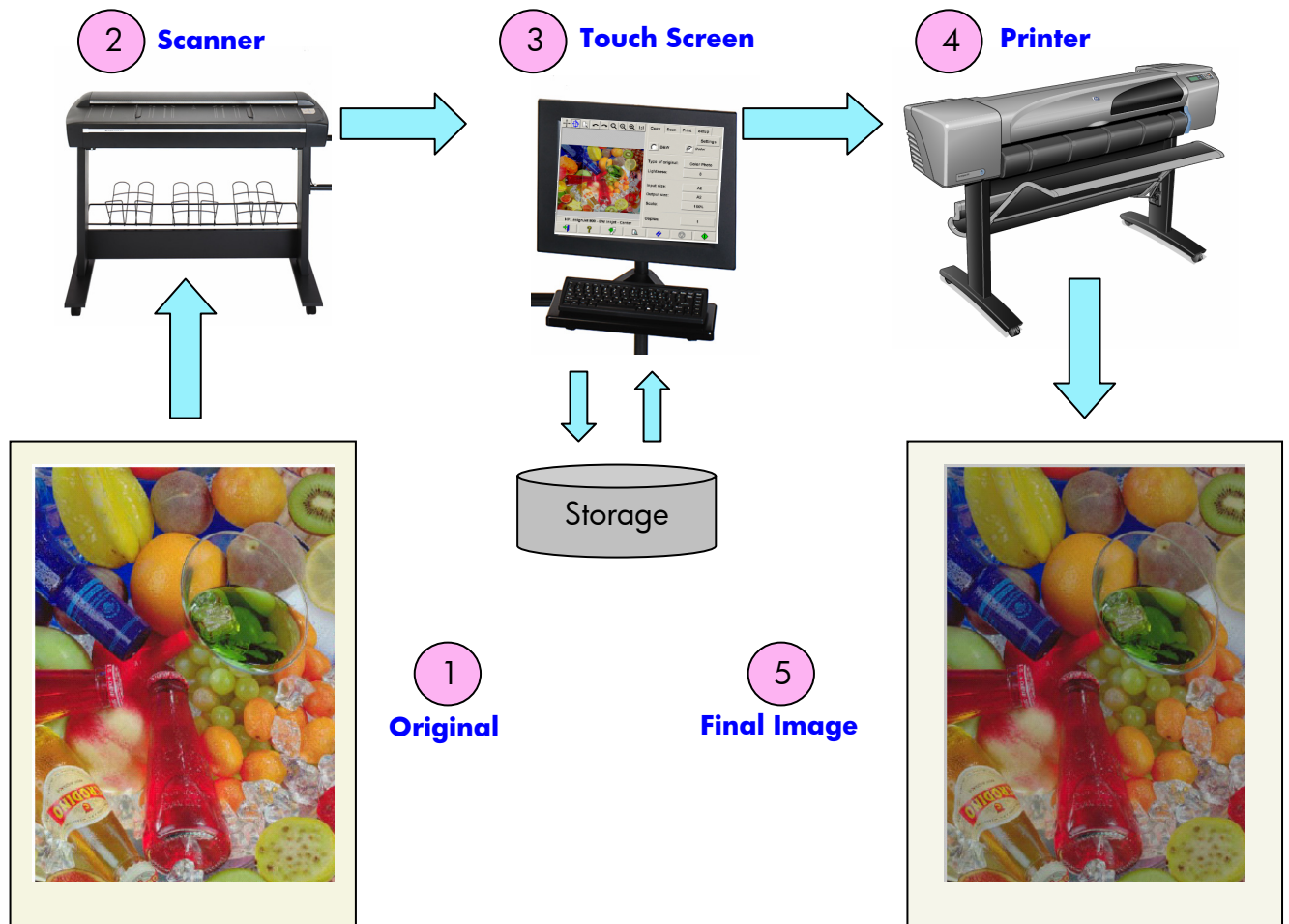
The principle behind Color Reproduction is that the original and the final image relate to each other according to the desired reproduction intent.

It is also important to underline that the process includes image enhancement. This feature is included so that when the original is noisy, badly contrasted or imperfect, the resulting output can be enhanced (smoother, better contrasted, with enhanced edges and lines). In this case, the process is mainly driven by image enhancement rather than color reproduction fidelity.

The following sections describe in more details each component of the HP Color Reproduction system.

3.1.1 Original

The original is where the image to be reproduced resides. In relation to color and image enhancement, originals can be classified as follows:

- According to the way the image was created:
  - Inkjet originals
    - Thermal Inkjet
    - Piezoelectric Inkjet
    - Continuous Inkjet
  - Non Inkjet originals
    - Press/Offset
    - Silver Halide (traditional photography)
    - Electro photography:
      - Dry ink (toner): laser printers
      - Liquid ink: Digital Press
    - Others

- According to the contents of the image:
  - Pictorial images
  - Maps and graphic images with solid areas
  - CAD and drawings with solid lines
  - Text Documents

- According to the color content:
  - Color images
  - Monochromatic images:
    - Black and white
    - Sepia
    - Blueprint

- According to the shadows or contrast levels:
  - two levels: only black and white (e.g. text document)
  - multilevel: many gray levels (e.g. picture)

- According to the original's conditions:
  - Clean image
  - Damaged or noisy original:
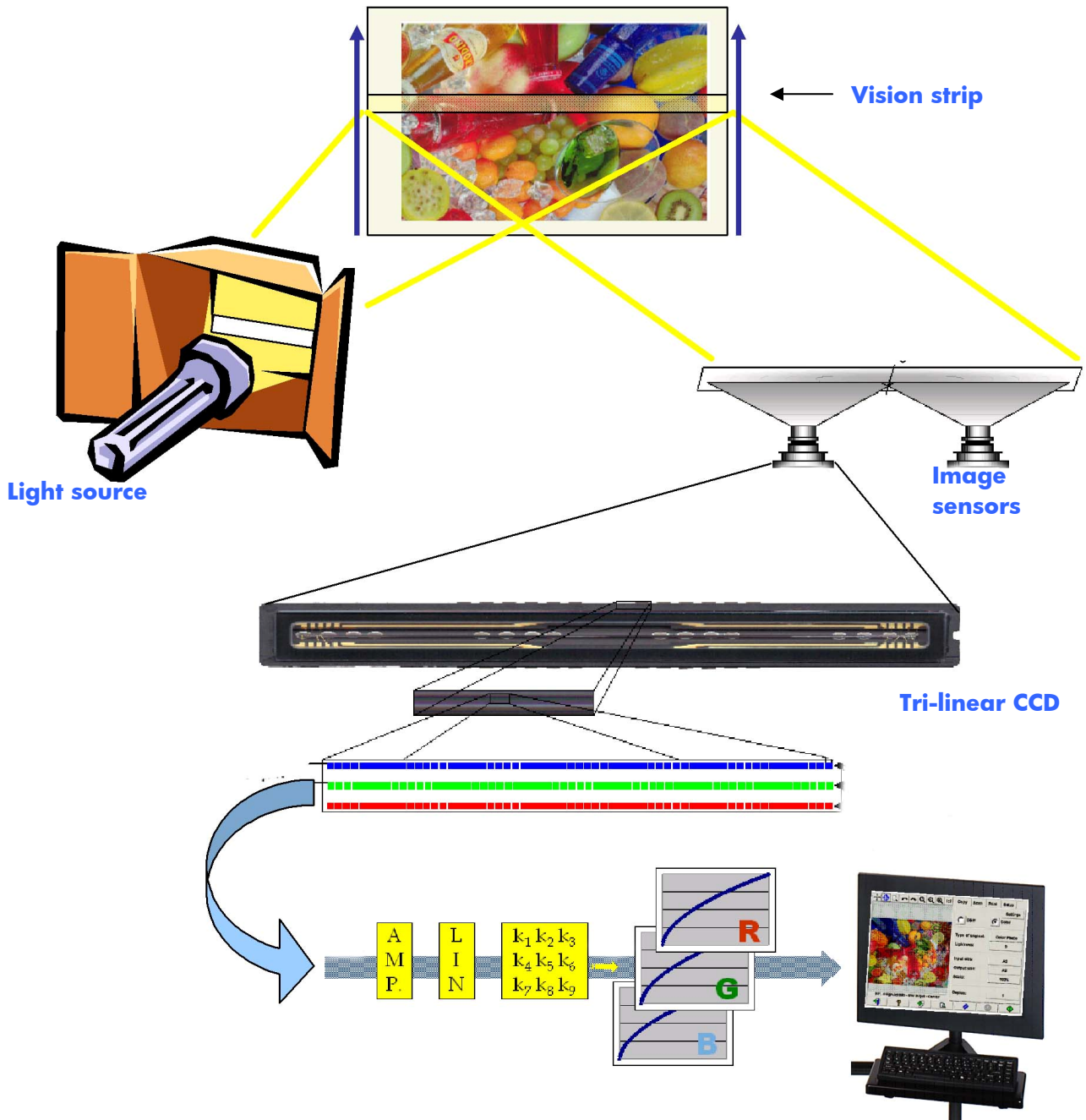   - Stained, marked, smudged, spotted, …
    - Scratched, torn, …

It is important to know what type of original you are handling in order to use the correct reproduction settings.

When using a Color Reproduction system it is also very important to handle the original with maximum care in order not to damage it and to be able to generate a good copy.

Finally, it is very important to make sure that, if the original has been recently printed, it is completely dry before using it.

3.1.2 Large Format Scanner

The scanner is the device that digitizes the original and sends it to the processor for further digital treatment. It consists of a light source, a paper movement mechanism, two RGB image sensors (cameras) and the electronics required to process the data from the sensors.

Vision strip

Light source

Image sensors

Tri-linear CCD

A M P.   L I N $k_1 \, k_2 \, k_3$
$k_4 \, k_5 \, k_6$
$k_7 \, k_8 \, k_9$

R
G
B

3.1.2.1 Light Source

The light source provides enough light along the vision strip so that after being modified by the original image[2], there is sufficient reflected light to reach the image sensors.

The light source (lamp) stabilizes after the scanner has been on for approximately one hour. Therefore, if the color reproduction is critical and you don't want to see differences from one end of the copy to the other, it is advisable to start scanning one hour after powering on the scanner.

3.1.2.2 Paper Movement and glass plate

Since only one strip of the original image at a time is "seen" by the color sensors, either the sensors are moved to scan the original (as in most home/office scanners) or, as in the case of a large format scanner, the original is moved through a looking glass by a roller mechanism.

As the paper is moved over, small fragments of the original media or dust stuck onto the glass plate may cause image quality problems, like undesired vertical bars appearing on the copy. To minimize this problem make sure that your original is completely dry before loading it into the scanner and, as previously mentioned, handle it with care, choosing the proper document height in the loading mechanism. If the original is thicker than 2mm., please refer to section 3.6 for guidelines on how to handle it.

Before starting a new color reproduction job it is recommended to clean the glass plate, following the guidelines provided in the maintenance manual, as well as to clean the white background element (white plate) that is in the removable top assembly. This element is used from time to time by the scanner to self-adjust the sensors and if it is not clean, some colors may be scanned incorrectly, particularly the grays.

3.1.2.3 Cameras

There are two cameras to digitize the full width of the original image. Each of them consists of an optics part[3] and a tri-linear CCD (Charge-Coupled Device), which are the same active elements found in digital cameras. The CCD is able to digitize the color of the pixels in three components: Red, Green and Blue. When scanning in Black and White mode a combined signal is produced from the Red, Green and Blue signals.

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[2] Red patches absorb more light in the blue, green and yellow parts of the visible spectrum than in the red part.
[3] The optics part of a camera is a series of mirrors and lenses that enable the small CCD to see 22" of the original.
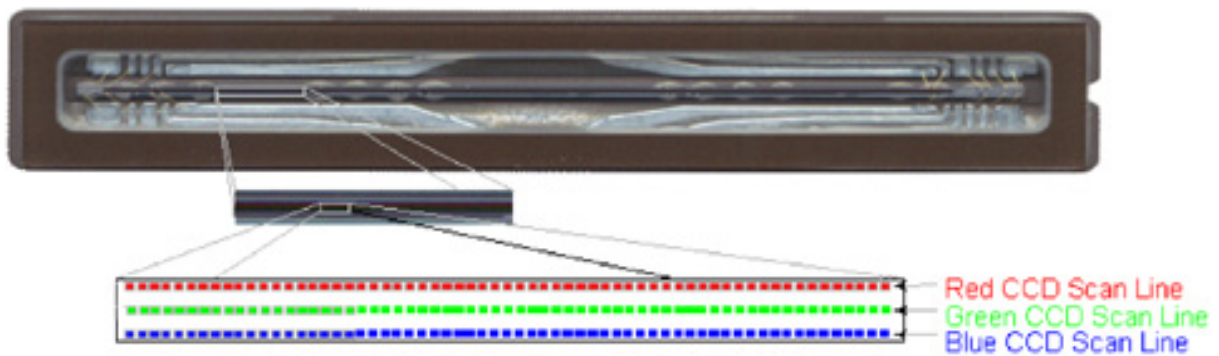
The cameras must be periodically calibrated in order to avoid undesired geometrical distortions in the final copy, as well as ensure a correct color capture. Calibration can be performed using the scanner maintenance tool provided with the system. It is advisable to run the scanner calibration every time the system warns the user to do so, or when any of the following defects appear: jagged lines, blurry images, modified colors (with respect to previous copies).

3.1.2.4 Electronics

After each strip has been digitized, the electronics compose the whole image and apply several image treatments and linearizations to correct geometrical and color space distortions. The result is a digital image ready to be sent to the Touch Screen, which in turn will either store the image or send it to the printer.

During the scanner maintenance process, the electronics calibrate all the responses from other elements (light, optics and CCDs) and between the CCDs themselves to obtain an accurate response. From time to time, the electronics performs a check to correct small deviations, using the white background when no image is in the media path.

The scanner maintenance should be run whenever you suspect that copies are loosing image quality due to the scanner maladjustment or periodically (e.g. once a month), depending on:

- number of hours of usage,
- types of original loaded (some originals dirt the glass plate more than others),
- variations of temperature and humidity.

3.1.3 Touch Screen

The Touch Screen has several roles:

- acts as a user interface to the operator (takes orders and provides feedback on the processing);
- communicates with the scanner to send orders on scanning and to get the scanned image;
- communicates with the printer (or printers) and sends the print jobs;
- stores information either onto its hard disk, on a CD, on a floppy disk or somewhere on the network;
- processes the original image information, according to the operator's settings, to make it ready for printing.

The application that performs all these tasks is the HP Designjet Scan software, the GUI of which is divided in three parts (see picture below):

- the Control Section, with four main control tabs: Copy (from original to final output), Scan (for scanning to a file), Print (for printing from a file) and Setup;
- the Preview Window, where you can see how the image will look like in the final output;
- the Toolbar, a set of command buttons at the bottom, used to start/stop various actions (e.g. see a preview image, start copying).
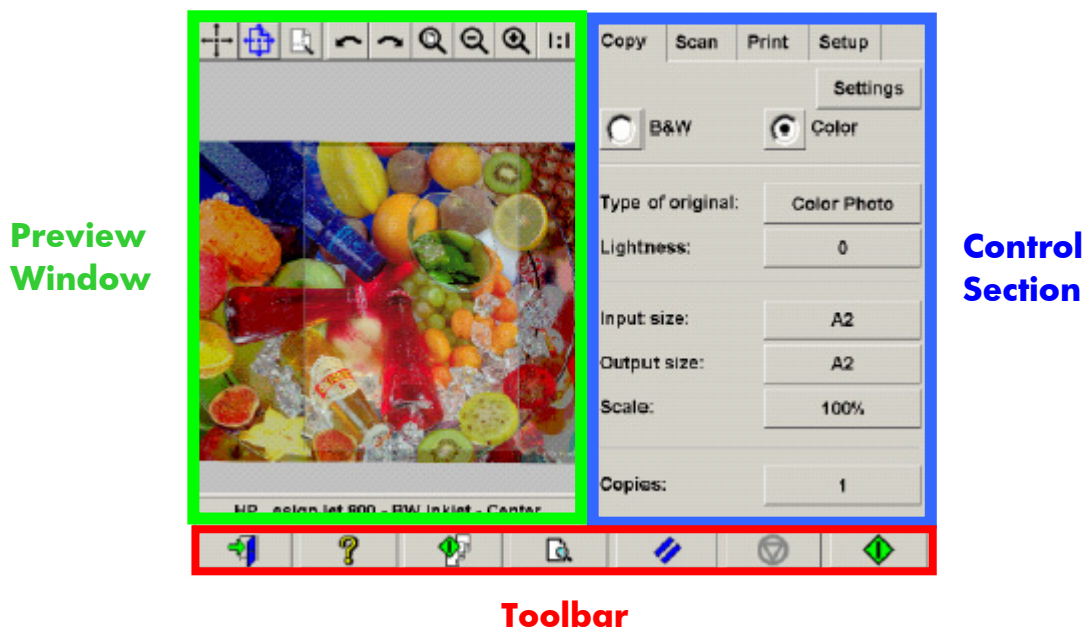
3.1.4 Large Format Printer

The task of the printer is to gently send tiny drops of ink to the media (paper or other substrate) in order to form an image that corresponds to the data file received.
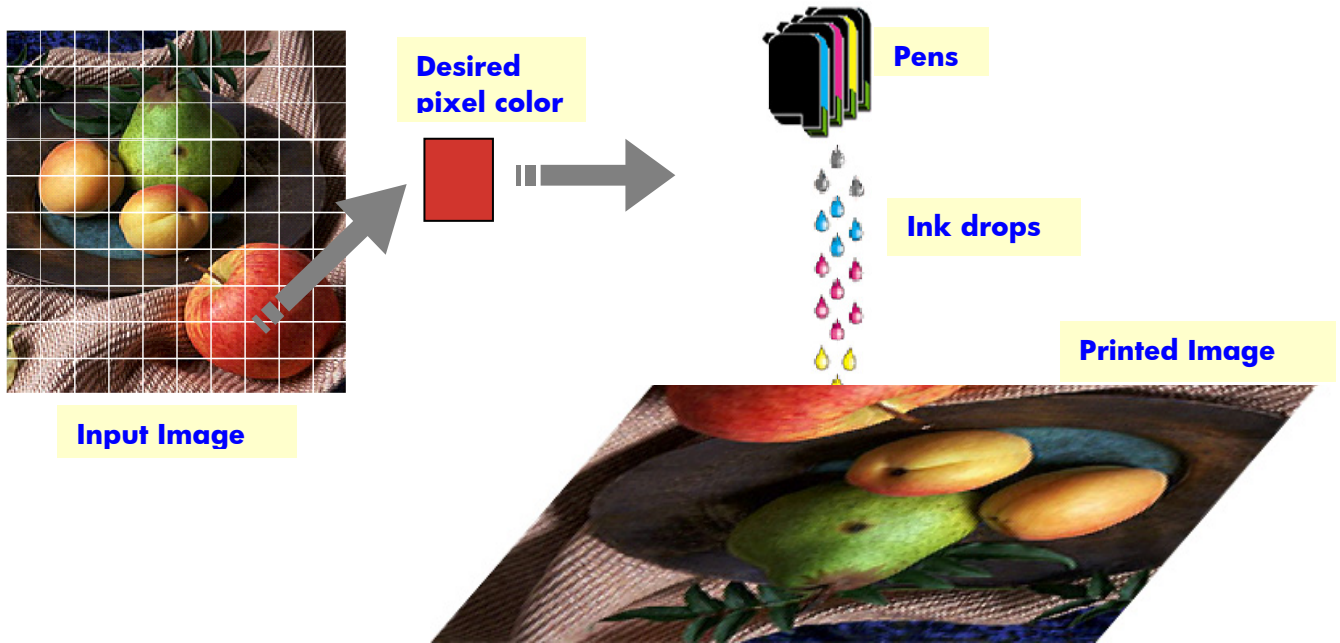
The HP Large Format Copier systems family includes the following models:

- HP Designjet 500/800 series
- HP Designjet 105x series
- HP Designjet 5500 series

All of them are thermal inkjet printers, which means that little drops of ink are heated up to the boiling point and sent to the media. The amount of ink that reaches the media is controlled by the writing system of the printer (the printer's controller) and depends on the type of media and desired print quality (e.g. Coated media accepts less ink than Photo Gloss media and Best quality mode requires more ink than Fast mode).

As the type of media loaded into the printer cannot be modified by any command on the Touch Screen, it is very important that the media name appearing in the printer's front panel corresponds to the currently loaded media.

The real amount of ink dropped may be different from what the printer's controller requested, due to dissimilar performance of the printheads: a printhead may drop 12pl[4]

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[4] A picoliter is equal to one millionth of one millionth of a liter. It is similar to a nanogram of ink (one millionth of a milligram).

whilst another may drop 14pl, thus resulting in different final colors. Another nuisance is that different media lots may behave differently: one lot may allow more ink than others to reach the inner part of the substrate, thus resulting in "duller" (washed-out) final colors.

The HP Large Format Printers have a way to compensate for these problems: the Close-Loop Color Calibration (CLC). This process consists of calibrating the printer by applying a color value table, which is built by printing a color ramp for each ink and measuring it with an internal color sensor.

Depending on the printer model, there are different ways to access this feature:

HP Designjet 500/800	To calibrate and use CLC	**Ink menu -> Color Calibration -> Calibrate Paper**
HP Designjet 105x	To calibrate	**Printer menu -> Utilities-> Printhead Alignment**
	To use CLC	**Printer menu -> Image Quality -> Color Calibration -> On**
HP Designjet 5500	To calibrate	**Printer menu -> Utilities -> Calibration -> Color Calibration**
	To use CLC	**Printer menu -> Internal RIP settings -> Color Calibration -> On**

Each time a new printhead is replaced, a printhead alignment should be run to avoid registration problems in the output (this is automatically started in most cases).

If these basic rules are followed, the final printout will almost certainly fulfill the expectations.

3.1.5 Final Image

The final image is the outcome of the printer. It should be handled with care, ensuring that the ink is completely dry before using it.

Please note that the perceived color is a result of the ink, media, light and air physical or chemical interactions, and it can, therefore, change unexpectedly when conditions differ significantly: direct sun light, temperature, humidity, air contamination, etc. In order to avoid fading, it is recommended to cover the copy with a glass or transparent film and not to expose it to direct sunlight.

3.1.6 <u>Overall system</u>

The previous sections have described each of the components of the Color Reproduction system. This section talks about the interactions between these components.

If you were to print directly what has been captured from the scanner (without the intervention of the Touch Screen), the output would be unacceptable. It would have several image quality issues: too low or highly contrasted, too light or dark, too noisy, etc. To prevent this, the Touch Screen should be used to perform two very important tasks: Color Management and Image Enhancement.

3.1.6.1 Color Management

To obtain a good color reproduction, the color definitions coming from the scanner have to be adapted to the color definitions needed by the printer. For example, a specific green color may be reported by the scanner as:

```
Red: 60%, Green: 70% and Blue: 40%
```

but can only be reproduced identically by the printer if defined as:

```
Red: 42%, Green: 81% and Blue: 38%
```

There is therefore a need to convert the scanner's RGB green color to the printer's RGB green color, and, analogously, all colors in the original image need to be converted. This conversion is done automatically by the Touch Screen using the media profiles.

The media profiles define the relationship between the colors the scanner sees and the colors the printer is able to print. For each printer type there is a set of pre-installed media profiles (High Gloss Photo, Coated, Bright White, etc.). However, if you need to print on other media, or desire a color reproduction system that better matches your media, it is advisable to create new media profiles, as specified in section 3.3.

A new media profile will ensure that the scanner and the printer are perceptually better adapted to each other. It is recommended to create a new media profile every time a printhead is replaced (just the printhead, not the cartridge) or a new media type, for which no media profile already exists, is loaded into the printer.

In addition to the always-active color conversion provided by the media profile, there are some optional settings in the Touch Screen that allow the operator to modify the colors of the printed output. Any modification to such settings may produce a copy that is not perceptually similar to the original, but may be desirable for some other reasons (more vivid colors, darker or lighter image).

These settings are:

- **Lightness**: it makes the whole image darker or lighter.
- **Saturation**: intensifies or weakens the colors. The final image results more vivid or grayer.
- **Color Balance**: corrects the Red, Green and Blue of the whole image. For example, if the image has a yellow color cast, increasing the blue color balance may reduce it.
- **Black Enhancement**: it makes all areas over a specified threshold of darkness completely black. This feature should be used when text that should be black appears in the copy as gray.
- **Background Cleaning**: it makes all areas below a specified threshold of lightness completely white. It is useful when copying drawings that have a colored (not white) background, like blueprints.
- **Enhance Grays**: makes the unsaturated colors (colors that are very close to gray) to be gray. This feature is used to improve the appearance of gray areas of the image, when the copy has previously shown a light colorcast in these areas.

To see these settings in action, please refer to section 3.4. An example of how to use the Enhance Grays setting is provided in section 2.3.2.2.

3.1.6.2 Image Enhancement

Image enhancement is used to improve the original image or a portion of it. The final image will not be an exact copy of the original but, rather, a re-interpretation of it that corrects some of the original's shortcomings (e.g. stains, fuzziness).

There are two types of image enhancement available in the Touch Screen:

- **Blur**: smoothing of the whole image. It is used, for example, when the original is worn out and has spikes or stains that you don't want appearing in the copy.
- **Sharpen**: enhancement of the edges. It is used, for example, when a drawing has smudged text or lines.

Blur and sharpen are not mutually exclusive, good results are sometimes obtained by combining both of them: an application example is provided in section 3.4.

Image Enhancement is optional and should only be selected if necessary, as the final image may result not coherent with the original.

3.2 Which colors can be reproduced?

The colors that can be reproduced vary between different printers and different printing media. At HP, we analyzed various environments and reached the following conclusions:

- Glossy media (such as High Gloss Photo) has a much wider "gamut" (amount of reproducible colors) than matte media, such as Heavy Weight Coated. Typically, the main difference resides in the darkest tones (those found in shadow areas of pictorial images) and in the most saturated colors (vibrant Red or Blue).
- The cyan ink is not as saturated as the cyan found in traditional silver-halide pictures. This may lead to problems when reproducing saturated cyan (sky blue) or dark blue (navy blue).
- The darkest blacks are difficult to reproduce, especially on coated media. Sometimes, the problem is to achieve the desired darkness; in other cases, the darkness is correct but has a color cast (green or pink tint).

In any case, the fact that an original image shows colors that cannot be matched exactly does not mean that the copy will be unacceptable. It will depend on the relation of these colors with the surrounding ones and their "criticality". If the affected colors are not well reproduced, but the surrounding ones are, the result is normally acceptable (the difference may be barely noticeable). On the other hand, when a color must be reproduced as accurately as possible (such as colors in a company logo) even a small deviation may cause the job to be rejected.

The following images show the non-reproducible colors for certain printers and media as patches surrounded by a white square. This test has been based on the IT8.7/2 target provided in the scanner maintenance tool, which is a silver-halide picture and has been scanned and reproduced with the HP Designjet 500/800, HP Designjet 105x and HP Designjet 5500 printers on High Gloss Photo and Heavy Coated media. Please note that the result may vary if a different original, a different media or a not well-calibrated printer is used.
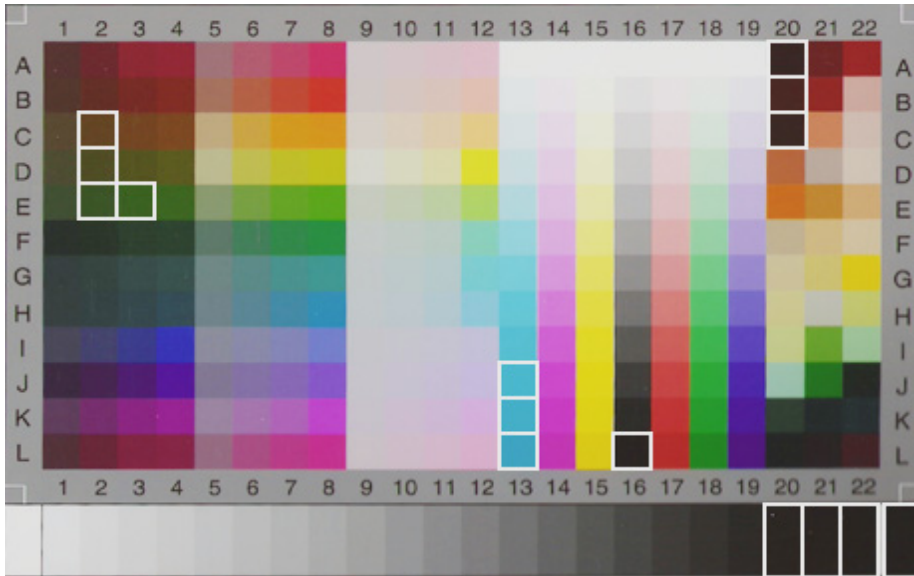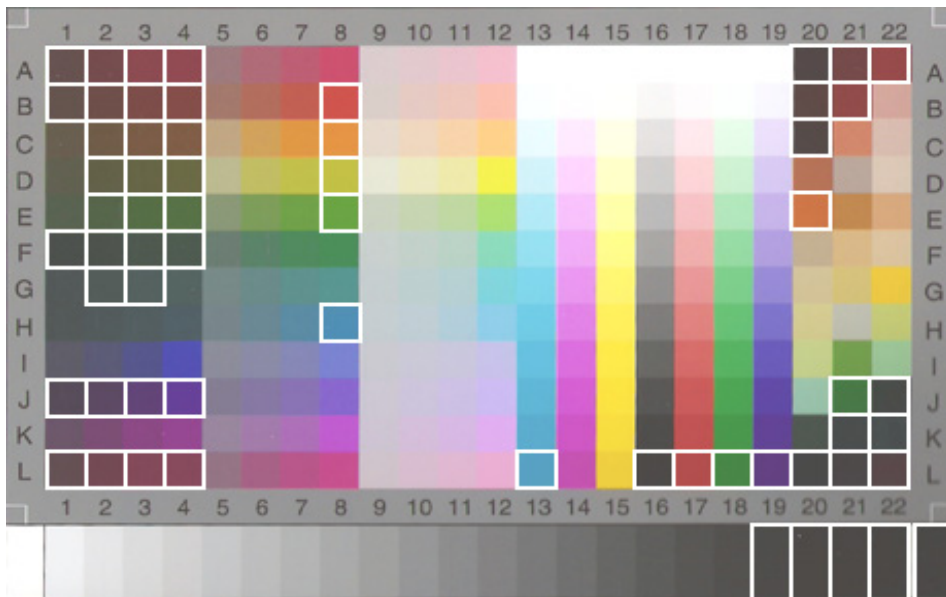
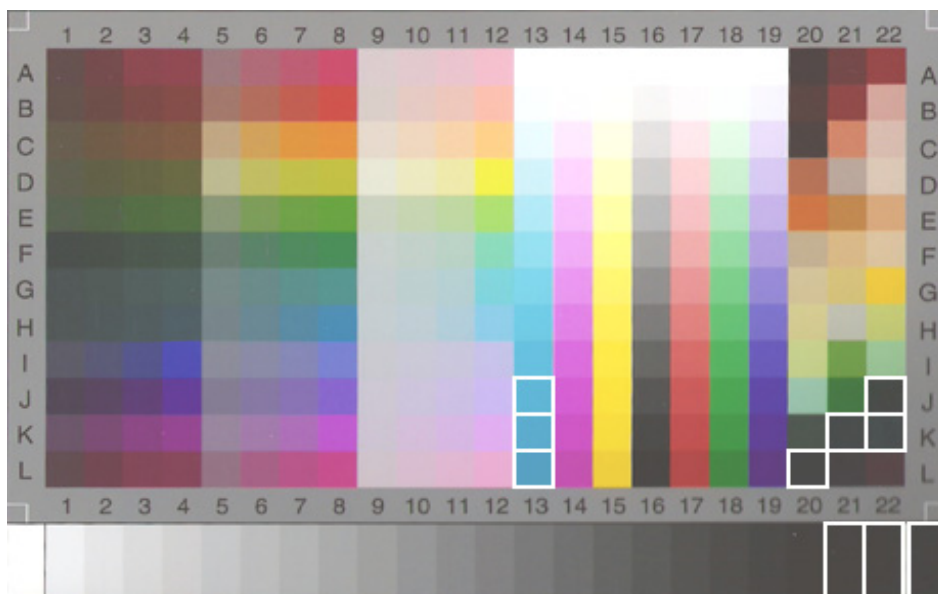**HP Designjet 500/800 with High Gloss Photo paper (HP Q1427A)**
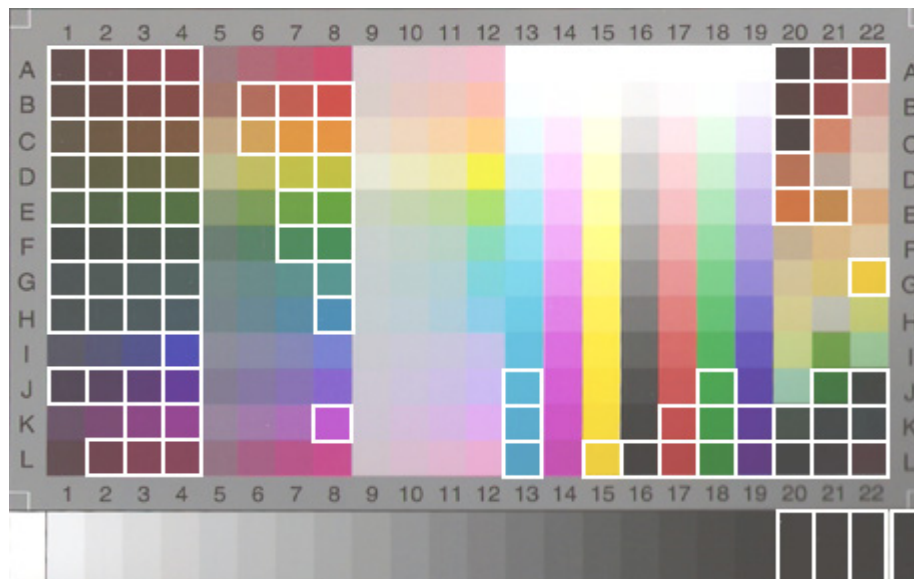
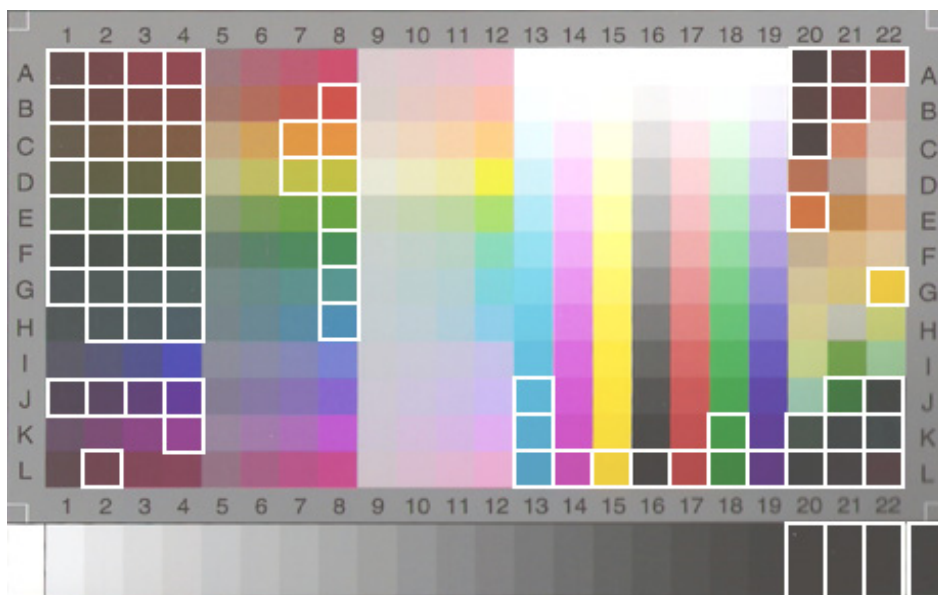**HP Designjet 500/800 with Heavy Weight Coated paper (C6030A)**
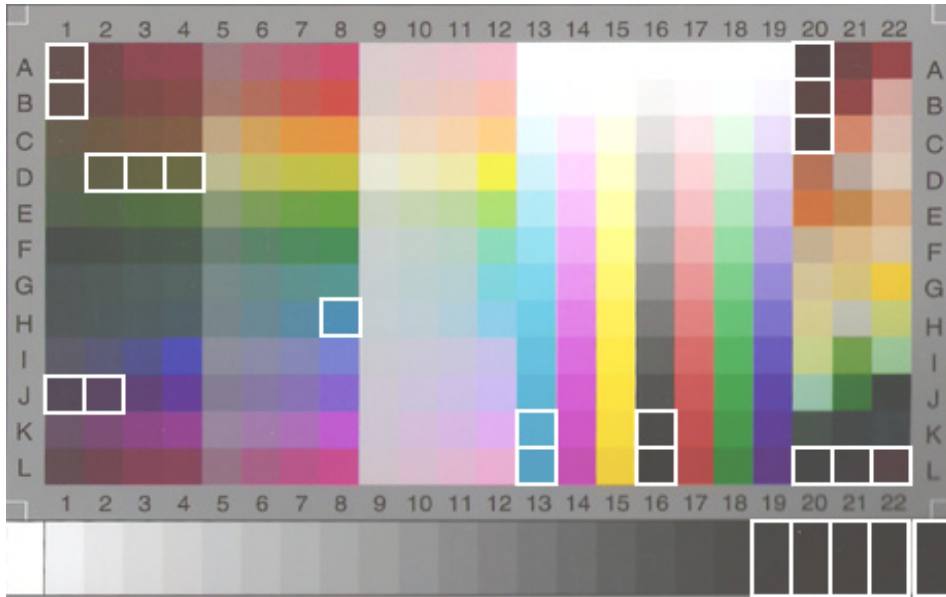
HP Designjet 105x with High Gloss paper (Q1427A)

HP Designjet 105x with Heavy Weight Coated paper (C6030A)

HP Designjet 5500 with High Gloss Photo paper (C6963A)

HP Designjet 5500 with Heavy Weight Coated paper (C6030A)

3.3 Guidelines to create or validate a media profile

Many of the color problems appearing in the HP Large Format Color Copiers products are related to the mismatch between the media's color characteristics set up in the Touch Screen and those of the real media that is loaded into the printer. If there is such a mismatch, colors may not be reproduced correctly, grays may have some color cast or some colors may be lost.

The characteristics of the media are defined in the media profile and are selected by the media profile setting under the Setup tab. There are a number of predefined media profiles (e.g. High Gloss Photo, Bright White, Heavy Weight Coated); however, if you are using a media type that is not included in the list, a new media profile has to be created. By using a media profile that does not correspond to the characteristics of the interaction between the printer, the media and the ink, you risk having color copies that do not correspond to the original.

It is recommended to check the media profile in use from time to time, for example, once a month or when you suspect the overall system has changed its "behavior" (e.g. you see colors that are consistently substituted with other colors). This is done through the media profile validation.

3.3.1 How to create a new media profile

1. Select the **Setup** tab.

2. Press the **Printer** button.
   If "Setup tab -> Options -> Quick select lists"
   is selected then press the Tool button.

3. Press the **Add Media Profile** button.

4. Press the **Calibrate RIP** button that will take you to the "Calibrate Raster Image Processing" window.
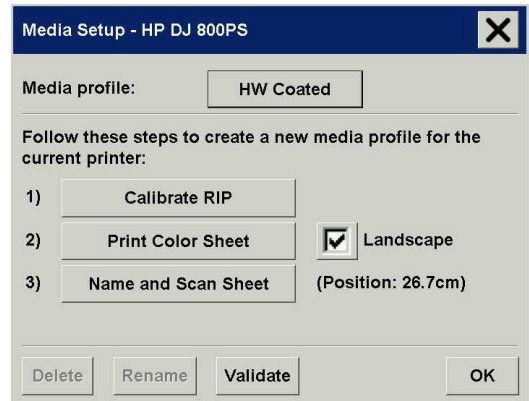
5. Set the **Ink level** (HP Designjet 105x series only):

Print the **Ink Level Sheet** at different ink levels starting by 100% and choose the value that gives good results: not too much ink (in order to avoid quality problems such as cockle, bleeding, cracking or other), not too little (colors should be vivid enough). Take into account the amount of time the printout takes to dry.
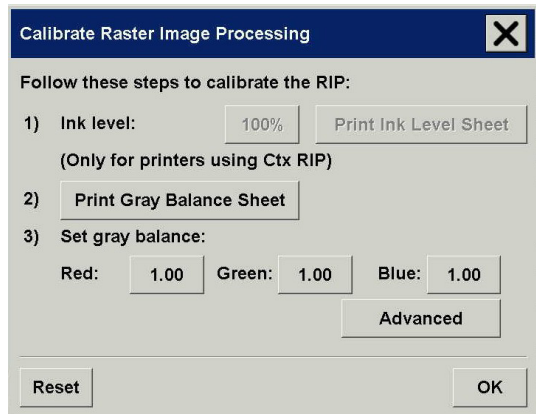
6. Specify the **Gray Balance** in order to ensure a 100% neutral appearance of the printed grays. The values to specify are the relative "strengths" of Red, Green and Blue.

To help specifying these values you can:
- **Print the Gray Balance Sheet**. It consists of 25 "gray" ramps, according to various values of Red and Green ranging from 0.6 to 1.4. Blue is arbitrarily chosen to be 1.0.
- Choose the ramp that appears more neutral to the final image viewing conditions.
- Specify the preferred values for Red, Green and Blue in the **Set gray balance** boxes of the Calibrate Raster Image Processing window. You may also specify values that are between the printed ramps (e.g. if you think that the ramp at position 0.8 is too bluish and at 1.0 is too reddish, you can specify 0.9)
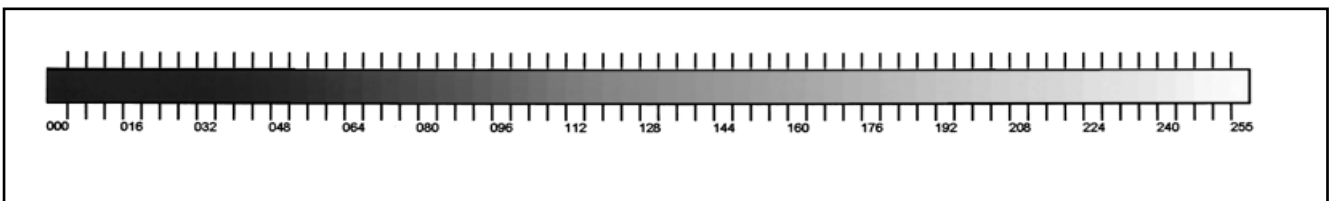
7. (Optional step)

If you are not satisfied with your choice of gray ramp (e.g. not neutral enough) you can fine-tune it. To do this press the **Advanced** button in the Calibrate Raster Image Processing window.

Press the **Print Gray Scale** button.

Advanced Gray Balance

☐ Use gray balance LUT file

File name: -

Print Gray Scale

OK
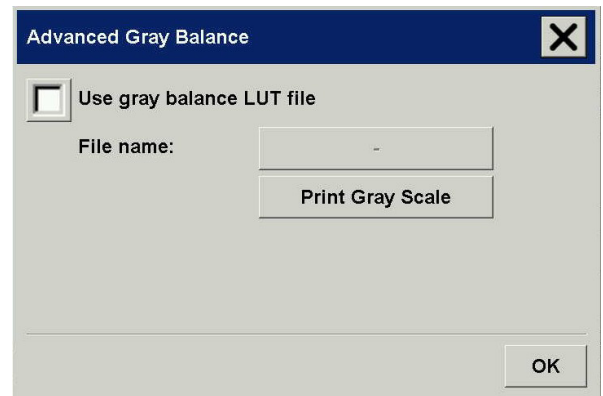
A printout like the following will appear:

Check the 255 levels ramp under the final image viewing conditions and decide whether it is good enough or it has some color cast (greenish, bluish, reddish).

If the ramp is OK proceed with step 8; otherwise, find out new values for Red, Green and Blue and go back to step 6. If after several attempts you are still not satisfied, proceed as follows.

Construct a **Look-Up Table (LUT) file**: whilst the standard Gray Balance adjusts the shape of the RGB curves with simple gamma curves, with the Advanced Gray Balance option and the LUT file you can adjust the RGB curves to any desired shape.

Before proceeding with the LUT creation please note that this procedure is prone to errors and you will probably have to make many attempts before getting the desired result, so only proceed if you are really not satisfied with the steps taken so far.

If you decide to proceed, create the LUT file according to the following guidelines:

a. The LUT file should be a CSV-file (comma separated values file).
   The "//" sign indicates that the line is a comment and shall be ignored.
   Each line in the file has the format "*Index,RedValue,GreenValue,BlueValue*", where all values range from 0 to 255.
   Index is the gray tone value: in the sample file, for example, the gray tone value 64 should be created using Red=Green=Blue=118. Note that the file does not need to contain 256 entries: the entries are taken as fix points for a transfer function, meaning that values in between them will be calculated by the LUT

A sample LUT file:

// Gray balance LUT file
0,0,0,0
64,118,118,118
128,174,174,190
176,195,195,221
208,227,227,233
255,255,255,255

file interpreter. The file should always include entries for indexes 0 and 255.

b. The LUT file should be placed in the *Customer Color Maps* folder, which is under "*D:\system\Custom Color Maps*". Since *system* is a hidden folder, you should go to Windows Explorer's main menu, under "Tools->Folder Options->View" and select the option "Shown hidden files and folders" from the Advanced Settings, then press **Apply** and **OK**.

c. To use a LUT file for Gray Balance settings, you need to select the **Use gray balance LUT file** check box and specify the **File name**.
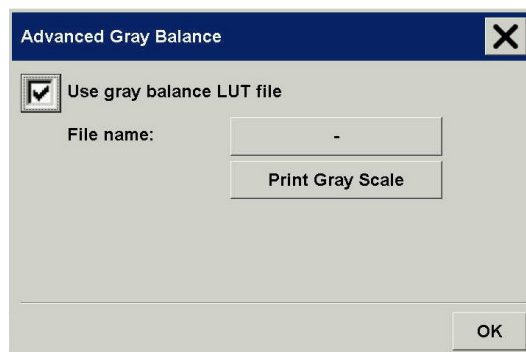
d. Check the results by pressing **Print Gray Scale**.
   Modify the LUT until you have a good result and press **OK** when completed.

8. Press **OK** on the Calibrate Raster Image Processing window to return to the Media Setup menu.

9. Press the **Print Color Sheet** button to print a color patch reference sheet.
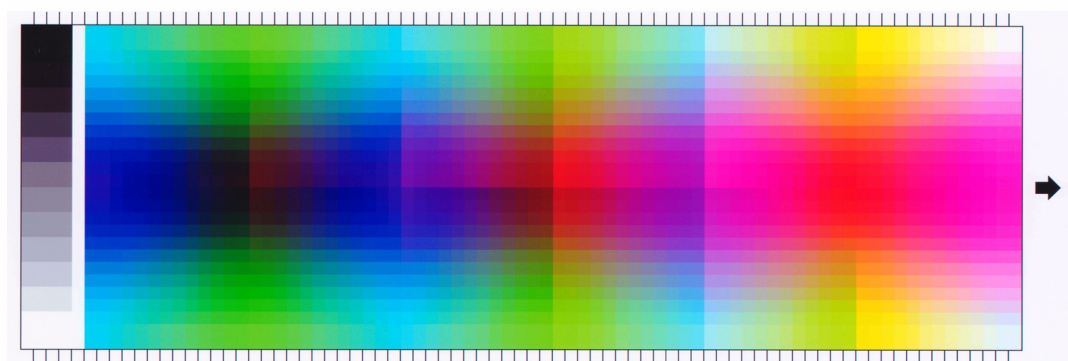
10. Load the color sheet into the scanner face down, aligning the arrow to the 10.5-inch mark (26.7 cm) from the right side of the scanner. **The ink must be dry before loading the color sheet in to the scanner.**

11. Press the **Name and Scan Sheet** button to assign a name to your new media profile.

12. Press the Enter key to accept the new name and start scanning the color sheet. When completed, the new media profile will be in the list of available media profiles.
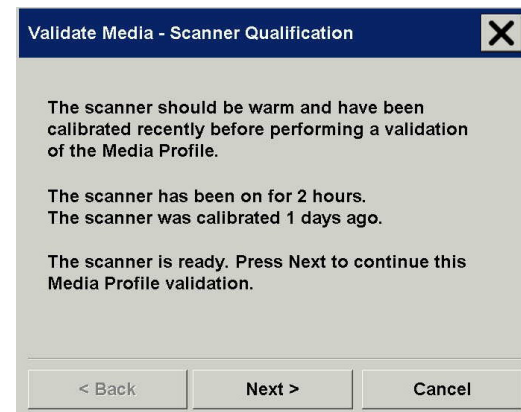
3.3.2 How to validate an existing media profile

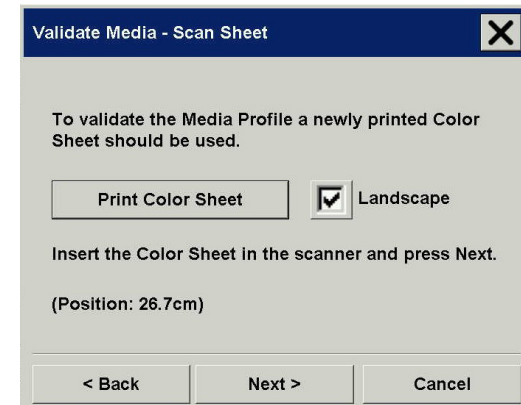1. Follow steps 1 to 3 of the procedure in section 3.3.1.

2. To validate a media profile, press the **Validate** button.

Media Setup - HP DJ 800PS
Media profile: HW Coated
Follow these steps to create a new media profile for the current printer:
1) Calibrate RIP
2) Print Color Sheet ☑ Landscape
3) Name and Scan Sheet (Position: 26.7cm)
Delete Rename Validate OK
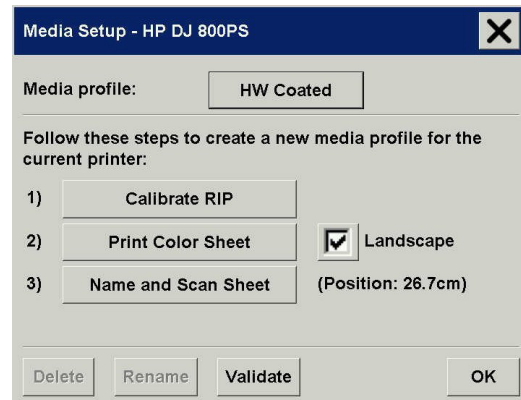
3. If your scanner is in optimal conditions to work (as stated in the window) press the **Next** button.

Validate Media - Scanner Qualification
The scanner should be warm and have been calibrated recently before performing a validation of the Media Profile.
The scanner has been on for 2 hours. The scanner was calibrated 1 days ago.
The scanner is ready. Press Next to continue this Media Profile validation.
< Back   Next >   Cancel

4. Press the **Print Color Sheet** button to print a color patch reference sheet as the one that appears in step 9 of the procedure in section 3.3.1.

Validate Media - Scan Sheet
To validate the Media Profile a newly printed Color Sheet should be used.
Print Color Sheet ☑ Landscape
Insert the Color Sheet in the scanner and press Next.
(Position: 26.7cm)
< Back   Next >   Cancel

5. Once the Color Sheet is dry, load it as pointed out in step 10 of the procedure in section 3.3.1 and press **Next**. The scanning will Start.

Media Profile
Scanning color sheet for media profile: Validate
Cancel
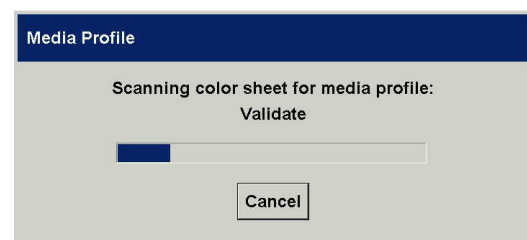
6. After processing the image, a new window will recommend whether it is necessary to update the media profile with the new calculated values or not.
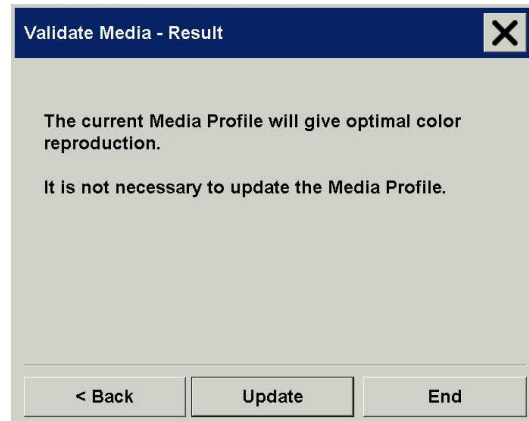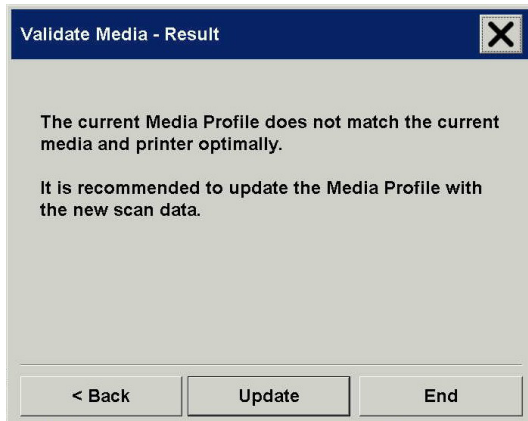

Note:

- ➤ You can use the Delete button to delete media profiles (only user created profiles can be deleted).
- ➤ You can use the Rename button to rename media profiles (only user created profiles can be renamed).

3.4 Creating a new Type of original: Color

To create or modify[5] a type of original you need to select an existing one (Color Photo in this example) and press the tool button .
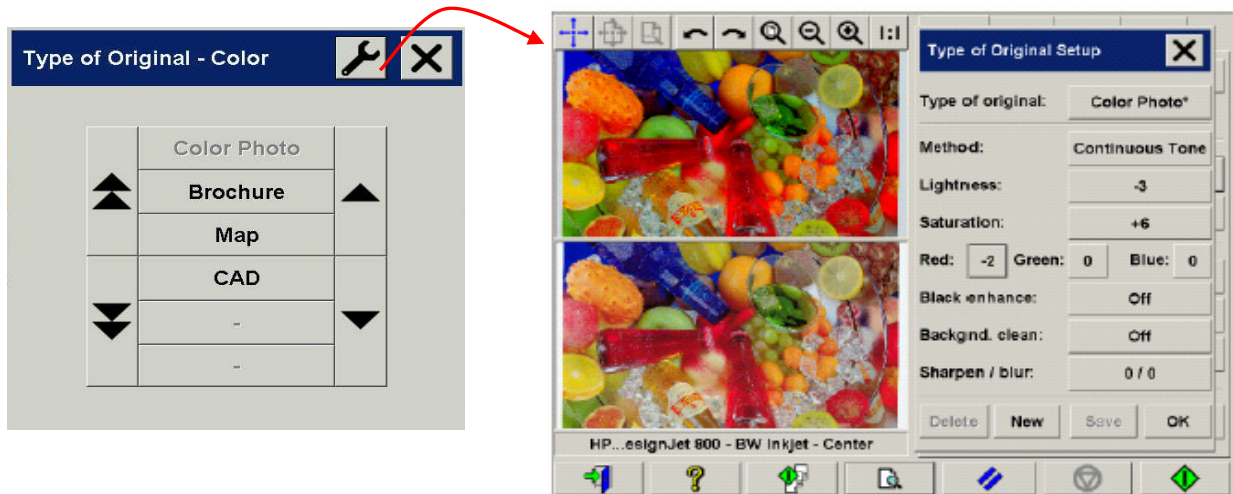
In the preview pane you will see two copies of the image: the bottom one is the original and the top one is the image modified by the settings of the selected type of original. Therefore, when modifying the settings you can immediately see the effect on the image. You will also see an asterisk (*) on the upper right side of the type of original name (as in the picture above), to show that some settings have been modified.
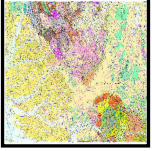
If you plan to scan many originals of the same type, it is advisable to store the newly created type of original under a meaningful name.

The following sections describe the settings that can be modified and their possible values. Please also refer to the values defined in paragraph 1.3 of section 2.2.

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[5] Please note that when creating or modifying a type of original, the color accuracy between original and copy can be compromised.

3.4.1 Method

Method defines the basic image enhancement to apply. It has one of the following values:

Continuous Tone: used when the image has many colors and transitions among them. This method is used in the "Color Photo" type of original.	
Graphics: used for images where lines and edges should be sharp. Used in "Map" and "CAD" types of original.	
Mixed: used when the original contains both text and pictures. Used in the "Brochure" type of original.	

3.4.2 Lightness

This setting is used to increase or decrease the lightness of the image. It can be used to compensate for dull or faded originals. Possible values range from -3 to +6.

3.4.3 Saturation

When positive, this setting increases the colors' saturation (i.e. colors become more vivid); when negative, it makes the image duller (grayer). It can be used to compensate for faded originals. Possible values range from -6 to +6.
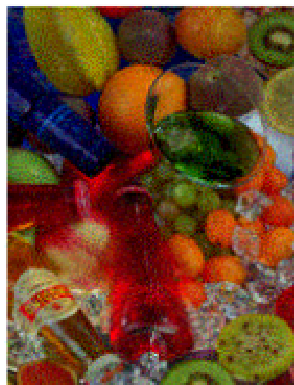

| Saturation - 6 | Saturation 0 | Saturation + 6 |

3.4.4 Color Balance

This setting is used to adjust the colors' balance for the whole image. If you find that the overall image has a color cast (e.g. it is too greenish) then you may correct it by modifying the color balance. You may set the Color balance value to RGB (Red, Green and Blue) or CMY (Cyan, Magenta and Yellow), depending on the selection made in the "Setup tab -> Options button -> Color Balance".
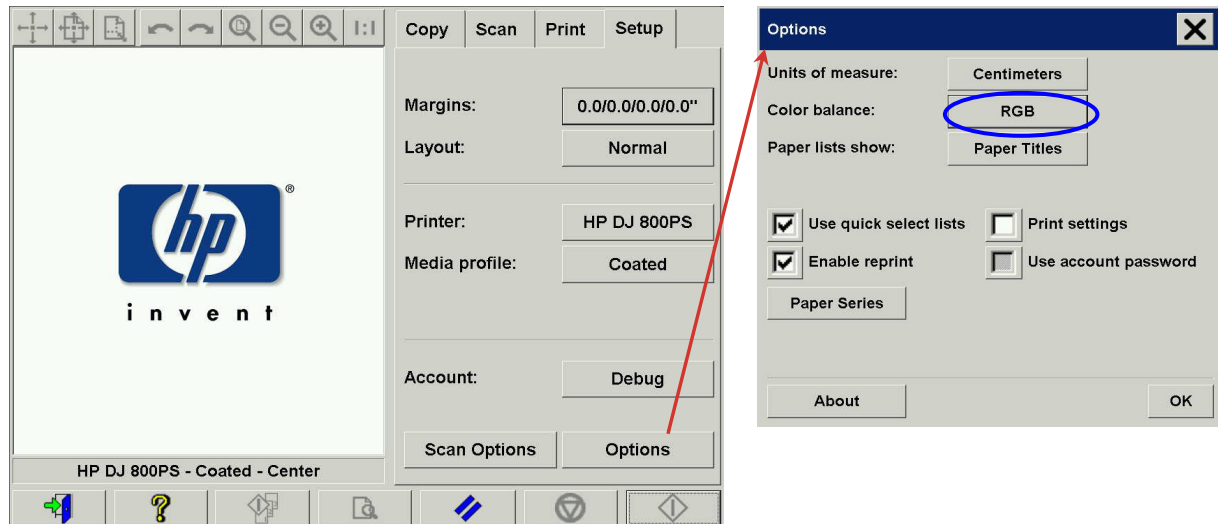
Please note that same results can be obtained either using RGB or CMY. The following table explains the relationship between the variations of such colors:

Setting	positive value results in a … image	negative value results in a … image
Red	Redder	"Cyaner", turquoise
Green	Greener	"Magenter", pinker
Blue	Bluer	Yellower
Cyan	"Cyaner", turquoise	Redder
Magenta	Magenter, pinker	Greener
Yellow	Yellower	Bluer

As you can see, the same effect (e.g. having a redder image) may be achieved by increasing the Red value (in RGB mode) or by decreasing the Cyan value (in CMY mode). In addition, increasing (or decreasing) the value of one color has the same effect as decreasing (or increasing) the values of the two remaining colors of the same set. For example, to make the image bluer you may increase the Blue value or decrease both the Red and Green values.

The entity of the color change differs depending on the direction you are heading. In other words, when moving towards positive values in RGB mode the appearance of the image changes slightly, whilst when moving towards negative values, the image

endures a much bigger change. In CMY mode, it is the opposite: moving towards positive values produces greater changes than moving towards negative values.

This behavior is shown in the table above where the Cyan, Magenta and Yellow boxes are more saturated (i.e. stronger) than the Red, Green and Blue boxes. This does not exclude the possibility of having slight increases in the amount of Cyan, Magenta and Yellow. These are achieved through the usage of the complementary colors: for example to produce a slight increase of Yellow, you will need to modify Red and Green (in RGB) or Cyan and Magenta (in CMY).

It is advisable to use only one system (either RGB or CMY) and not to mix them. If in doubt about which system to choose, you should consider that RGB is, in most cases, more intuitive. The following table is a guideline to the correct actions required to obtain the desired color balance:

| Color Balance Needs:		Should move to … values			Should move to … values		
Increase in	Strength in change	Red	Green	Blue	Cyan	Magenta	Yellow
Red	Hard		-	-		+	+
Red	Soft	+			-		
Yellow	Hard			-			+
Yellow	Soft	+	+		-	-	
Green	Hard	-		-	+		+
Green	Soft		+			-	
Cyan	Hard	-			+		
Cyan	Soft		+	+		-	-
Blue	Hard	-	-		+	+	
Blue	Soft			+			-
Magenta	Hard		-			+	
Magenta	Soft	+		+	-		-

Please remember that Orange and Brown lie between Red and Yellow, and Violet is between Magenta and Blue.

The following picture shows the effects of increasing the RGB values of an image:
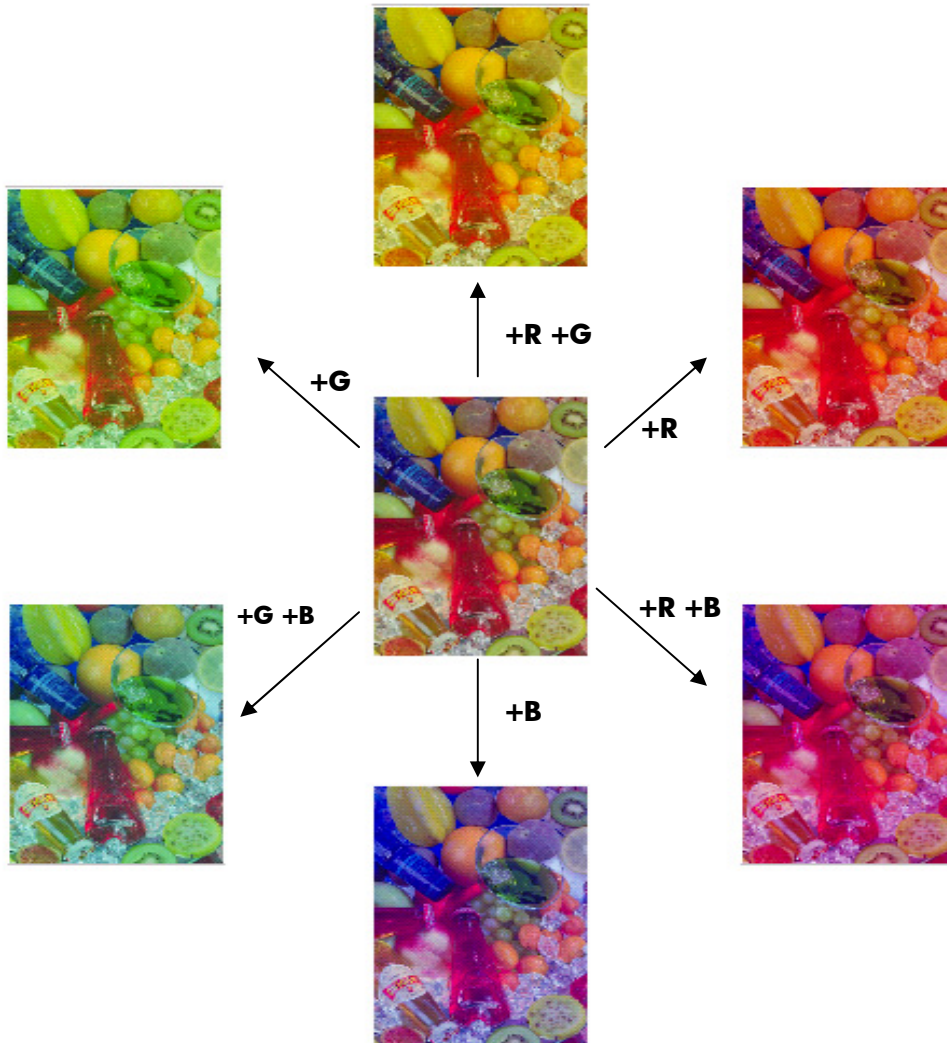
3.4.5 Black Enhancement

This setting is used to blacken all areas below the defined lightness level. It is employed to enhance the text parts of a document, when black text is copied as gray. Valid values range from 0 to 255. If 0 is selected, the image is not modified; if 255 is selected the whole image will be black.
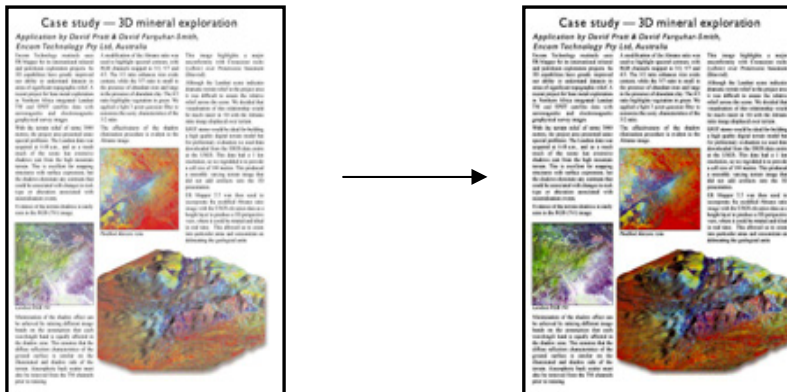

3.4.6 Background cleaning

This setting is used to whiten all areas above the defined lightness level. Valid values range from 0 to 255. If 0 is selected the image is not modified; if 255 is selected the whole image will be white.
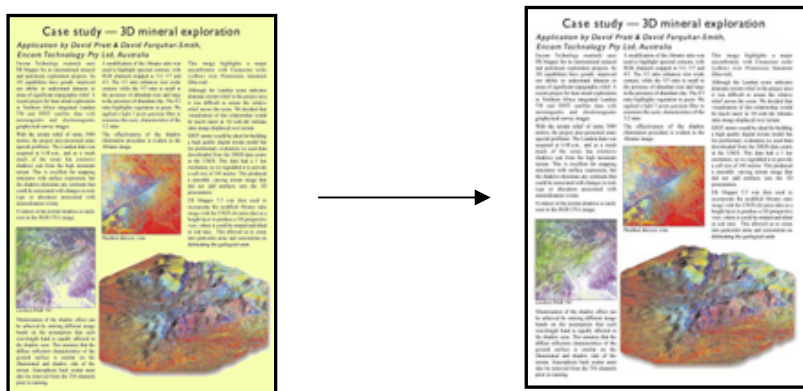
3.4.7 Sharpen

This setting is used to sharpen the image. It enhances the edges between areas of different colors, thus resulting in better-defined text and edges. The strength of the sharpening is controlled by its value. Valid values range from 0 to 6.
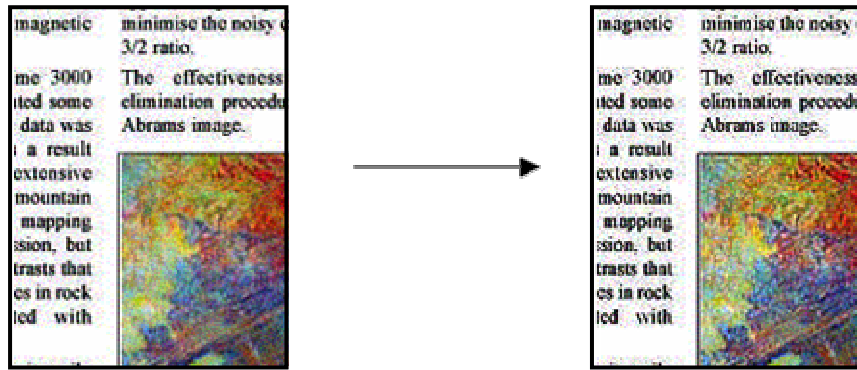
3.4.8 Blur

This setting is used to smooth the image. It is useful when the scanned original is "noisy" (i.e. color disturbance, graininess and non-area uniformity). Valid values range from 0 to 12.
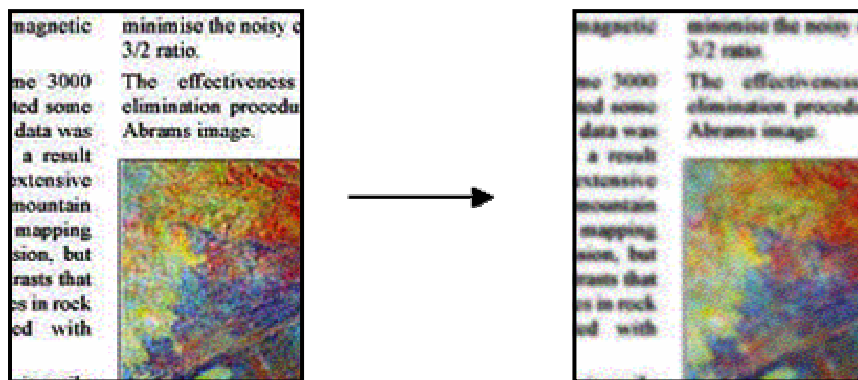

Blurring is not the opposite of sharpening: sharpening works on the image's edges only, whilst blurring smoothes out the whole color or gray tone areas. In fact, these two settings combined, by blurring away noise in the image first and then sharpening the result, may be used to further enhance the image. Observe below the same example as before, with blur and sharpening applied. Note that now there is no "augmented noise" in the text area, with respect to when only sharpening was applied.
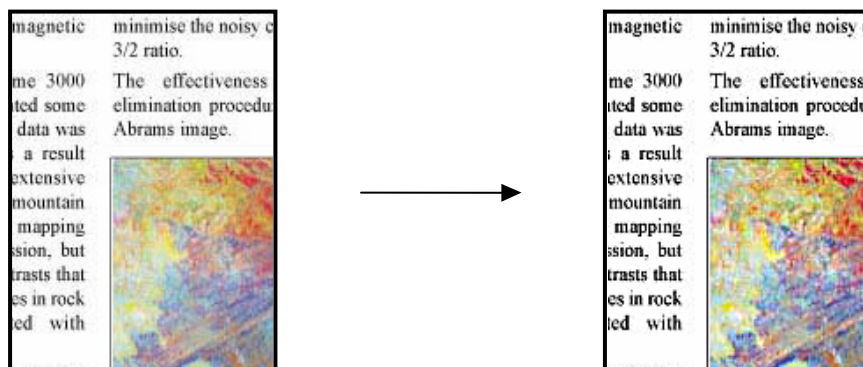
3.5 Creating a new Type of original: B&W

As described in section 3.4, to create or modify a type of original you have to select an existing one and press the tool button [tool icon].
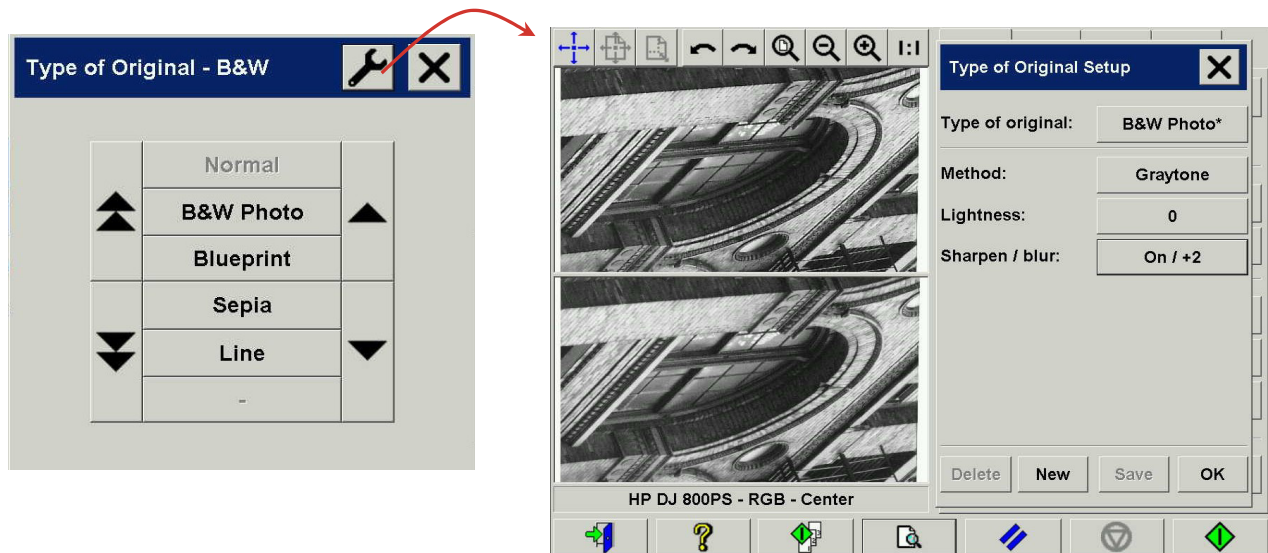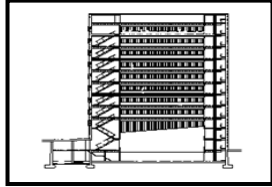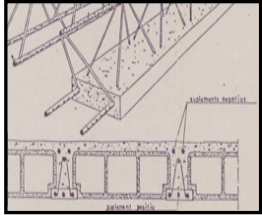

If you plan to scan many originals of the same type, it is advisable to store the newly created type of original under a meaningful name.

The settings that can be modified and their possible values are described in the following sections.

3.5.1 Method

Method defines the basic image enhancement to apply. It has one of the following values:

Graytone: used for pictorial images (pictures with many gray shades).	
B&W Threshold: used for pure B&W clear CAD drawings and/or text only documents, where the background is pure white and the text or lines are well defined. It only distinguishes two elements, black and white, and they are defined depending on a threshold value (which is the user specified lightness value described in section 3.5.2). There will be no gray levels in the output.	

Normal: used when the original contains both text/CAD lines and pictures/graphics.	
Photo: this method exists for historical reasons and was designed for pictures; however, better results are obtained with Graytone and there is no predefined type of original that uses this method.	
Adaptive: used for CAD or text documents where the background is barely distinguishable from the lines or characters, where, for example, the original is a blueprint or an old and worn out document. This method is similar to Normal but extracts the background gray level from the input image.	

3.5.2 Lightness

This setting increases or decreases the lightness of the image. It can be used to compensate for dull or faded originals. Possible values range from -3 to +6

3.5.3 Sharpen

This setting is used to sharpen the image; it enhances the edges between areas of different colors (see the explanation in section 3.4.7). Valid values are On or Off.

3.5.4 Blur

This setting is used to smooth the image. It is useful when the scanned original is "noisy" (see the explanation in section 3.4.8). Valid values range from 0 to 12.
All comments made in section 3.4.8 regarding the combined usage of sharpening and blurring apply here as well.

3.6 Working with Thick Media

Scanning thick media may require enlarging the insertion slot (see *"How do I change the insertion slot height?"* in the On-line Help or in the Users reference guide).

To facilitate the scanning of thick originals in the extended media thickness positions it is important to insert the original aligned in the center, as the scanner transport rollers grip more evenly with central loading. Bulky thick media need to be supported with both hands. This should be done at both the entrance and exit side of the scanner. Specially designed support tables can be attached behind the scanner for users who perform many thick media scans.

Normally, only stiff media will affect stitching. Flexible media will usually be stitched correctly regardless of thickness.

Thick stiff originals will rest on top of the scanner rollers and thus raise a small distance over the glass plate, which will lead to changes in the stitching of the image at some points between the two cameras (overlapping pixels). The stitching parameters will need to be modified in order to correct this. Stitching errors are more evident on an image with one or more clear diagonal lines.

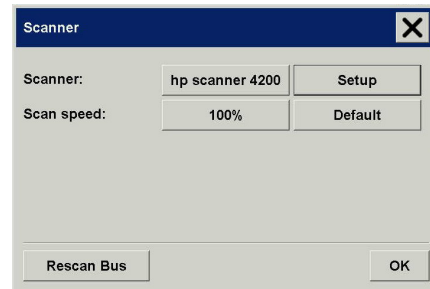If the lines are uneven, do the following:

1. Select the **Setup** tab and press the **Scan Options** button.

2. Press the **Scanner** button.
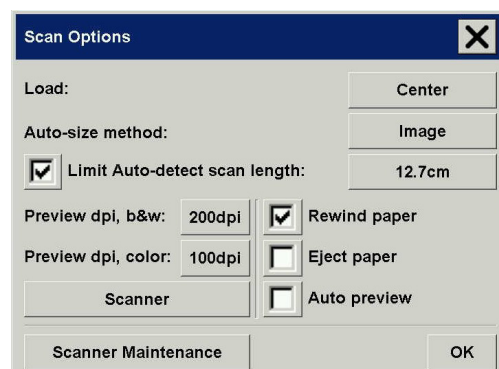
3. Press the **Setup** button.

4. Select the **Extended Thickness** tab.

5. Change the value of the **Camera A-B** field. Normally, only positive values should be used.

6. Run test scans and readjust the values until you are satisfied that the lines are stitched correctly.

7. Scanning thick originals can give distorted results at the top and bottom edges of the image, where the edge meets the scanner's rollers. You can omit edge distortion by letting the scanner skip the leading and trailing edges. Check the box **Use extended thickness paper handling** to enable skipping of the image edges.

8. Click **OK** to accept your settings.

9. Repeat the above steps until you are satisfied with the results.

Note:

> Auto-adjustment of the scanner's light profile, stitching and other functions only take place with the insertion slot in the Normal position. When in extended media thickness position, the last auto-adjustment is stored and utilized. This means that you should from time to time, and especially when powering on the scanner, return to the Normal position to allow it to auto-adjust.

➢ The Normal position gives the highest scanning speed. In the extended media thickness position, scanning speed is automatically reduced.

➢ When combining thick media handling (paper guide in extended position) with Auto Size Detection, the size detection should be done separately by running a preview scan before the final copy or scan.

4. GLOSSARY

Background Cleaning   Image enhancement feature that whitens all areas above a defined lightness level. Typically used to avoid noise, stains or wear marks.

Black Enhancement   Image enhancement feature that blackens all areas below a defined lightness level. Typically used to enhance text.

Blueprint   A white print on a blue background; especially used for copying maps, mechanical drawings and architects' plans.

Blur   Image enhancement feature that makes the image softer and less sharp.

CAD Drawing   Computed Aided Design technical drawing: mechanical, electrical/electronic, architectural.

Color balance   Adjustment of the ratio of Red, Green and Blue (or Cyan, Magenta and Yellow) components, which aims at producing a copy free from any unwanted color cast or color bias.

Color Calibration (CLC)   The process of bringing the color printer system to standard operating conditions.

Color Management   The process of controlling colors to obtain what expected from a color reproduction device.

Copying   Reproducing an original image onto a substrate.

Gray Balance ramp   Sequence of gray patches, ranging from very light (white) to very dark (black) shades, in a constant decrease of lightness.

Gray Enhancement   Color transformation feature that makes all the colors that are close to gray to be exactly gray.

Hue   Attribute of color that determines whether it is red, yellow, green, blue, or some combination of pairs of these (e.g. an orange can be 30% red and 70% yellow).

Image Enhancement   Any process which aims at improving the appearance of an image. This can be done using filtering, transformation or "threshold" techniques, e.g. edge enhancement, blurring, sharpening, blunt masking, etc.

Inkjet printer   A type of printer that shoots fast drying drops of ink through tiny nozzles to create an image on paper or other material.

Lightness   The attribute of visual perception in accordance with which an area appears to emit or reflect more or less light. It distinguishes light from dark areas.

LUT file	A Look-Up Table (LUT) file. It correlates n-dimensional entries to m-dimensional outputs. In this instance, it correlates a 1-dimensional entry (the lightness) with a 3-dimensional output (the corresponding Red, Green and Blue values).
Media	The physical material on which an image is formed (printed).
Media Profile	A description of the media and printing system's behavior, including which colors can be reproduced on the media and how to reproduce them.
Non-reproducible color	A color that cannot be reproduced by the system either because the color is not correctly "seen" by the scanner (which detects it as a different color) or because it cannot be printed by the printer (ink/media limitation).
Original	The printed media that has the original image formed on it.
Pen or Printhead Alignment	The process of setting printer parameters to minimize ink drops placement errors when printing. It is performed automatically each time a printhead is replaced or may be started manually.
Printing	The transfer of ink onto paper or other media to reproduce text and images.
Saturation	The purity of a color's hue, moving from gray to the pure color. A high saturation corresponds to a strong color. Conceptually equivalent to a scale from pale/weak (low saturation) to pure/strong (high saturation).
Scan Resolution	The resolution at which the scanner digitizes the original image. It is reported as dpi (dots per inch).
Scanning	The digitizing of the original image.
Sharpen	To enhance the contrast at the edges of light and dark areas, with the effect of making an image appear better defined, more in focus.
Stitching	The process of aligning the two cameras of the scanner so that when the two images are composed the differences along the overlapping area are minimized. It is executed every time the operator performs scanner maintenance.
Thick media	Media that is thicker than 2mm.
Touch Screen	The interface between the user, the scanner and the printer.
Type of original	A template that describes the characteristics of an original image and the color management and image enhancements it requires.