Designing for great results

With your Xerox DocuTech® 128/155/180 HighLight Color System
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Introduction

The DocuTech® HighLight Color System is based on a single-pass highlight color printing system, which in part accounts for its production capability, reliability, and up to 180 page per minute speed. Built on two imaging systems, one for black and one for highlight color, the system prints at rated speed for black and for black plus one color. High quality black images are produced using a Xerographic laser imaging system with an output resolution of 600 x 2400 dpi. A Light Emitting Diode (LED) imaging system is used to produce the highlight color, with output at 600 x 600 dpi. The DocuTech® HighLight Color System offers outstanding input capacity and accepts a wide range of media. As the fastest cut sheet highlight color digital printer in the world, this is a solution that meets the needs of both transaction and publishing customers.

This Guide is designed to help document designers and creators take advantage of all the capabilities that the Xerox DocuTech® HighLight Color System has to offer so you can create outstanding highlight color documents. Whether you’re new to color, you’ve upgraded from the Xerox DocuPrint® 92C or another highlight color device, or you’re experienced with full color documents, this guide can provide you with the information you need to:

- Create new documents
- Modify existing monochrome documents to add highlight color
- Print existing highlight color or full color documents

Once you’re familiar with this Guide, you may want to keep it in your reference library to answer questions or refresh your understanding as you expand your highlight color applications.

MOVING TO THE DOCUtech® 128/155/180 HIGHLIGHT COLOR SYSTEM

Adding highlight color to documents can help call attention to key information. Documents from a variety of sources can be colorized to give outstanding results on any of the DocuTech® HighLight Color System products:

Monochrome documents, like those created for DocuPrint® or DocuTech® Systems, can be colorized to add impact.

Documents previously produced on Xerox 92C or other highlight color devices can be modified for optimum results.

When the cost of full color is prohibitive, highlight color is an excellent alternative.
Adding value with highlight color

What is highlight color printing?

Highlight color printing is simply printing in black plus one color. Highlight color can be used strategically to focus the document user’s attention on important messages that may include instructions, payment information, or special offers. In other words, highlight color is used to motivate the reader to take action.

EFFECTIVE USE OF HIGHLIGHT COLOR CONVINCES READERS TO ACT

After defining the documents that are critical to your business, and identifying the owner, audience, purpose, and objective for each, you must determine each document’s message. The message should reinforce the desired outcome of the document. By articulating what you want to accomplish up front, you can design documents to reach these goals more effectively.

Buy Something

*Increase response rate, order rate, revenue rate, or profit rate. For example, adding color to a marketing letter or direct mail piece may triple the rate of response.*

Pay Something

*Change timeliness, accounts receivable balance and profile, or amounts paid. By adding highlight color to invoices, you may receive payment more quickly because recipients notice and respond to highlight color.*

Do Something

*Improve return rate, error rate, call rate, or performance level. By highlighting key information, customers respond as instructed and the burden on call-in help centers is reduced.*

Understand Something

*Improve call rate, defect rate, defect cost rate, or performance level. Adding highlight color to instructions can reduce errors significantly.*
Advantages of highlight color

Research has shown that color can accelerate learning, improve comprehension, and sell products and ideas effectively. This is true for everyone regardless of job, gender, or experience. Much of what we learn we learn through our eyes so it makes sense to make the most of highlight color in business documents.

A business document is successful when a recipient reads it, understands it, and takes the appropriate action. But many documents don’t meet these criteria as we all know by the number of documents we disregard everyday.

By using highlight color, you provide your customers with easy-to-use documents that communicate your message clearly and produce the response you want—all at a lower cost to you.

In fact, highlight color can help you achieve tangible business results:

- Reduced errors
- Increased retention and recall
- Better response rate
- Enhanced business image
- Improved productivity (e.g., locating critical items in a large volume of information)

When to use highlight color

Clearly, full color printing offers a completely different set of applications and advantages. Full color is often best in pictorial documents. It can be especially effective in presentation materials, where verbal messages help decode the color message.

With long documents or those containing complex information, an investment in full color can pay off. For example, color-coding a long, complex document can enhance comprehension. However, color-coding a short, uncomplicated document can impede, rather than aid comprehension.

Developing and printing full color documents can be costly. Highlight color may deliver a great return on your investment, especially when it is strategically placed. Highlight color use on short documents with focused objectives, a simple message, and two or three critical points that require attention dramatically improves most business documents.

Xerox Highlight Color in Business Documents Practical Guide

To learn more about the effective use of highlight color, including customer scenarios and detailed usage guidelines, refer to the Xerox HighLight Color in Business Documents Practical Guide. This document offers many examples of highlight color documents across several industries as well as important production tips.

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Creating documents that maximize the potential of highlight color

The more knowledgeable you are about the imaging process from document creation to output, the easier it will be to maximize your results. This chapter offers insights into the imaging process that will help you get the most out of your applications when preparing files for print on a Xerox DocuTech® HighLight Color System.

The DocuTech® HighLight Color System is well-suited for both transactional and publishing environments. Its speed, modular finishing options*, and image quality make it an invaluable tool for producing monthly statements and invoices as well as manuals and direct mail pieces.

This flexibility allows enterprise workflows and equipment to converge into a solution which allows quick and effortless printing from publishing, data center, copy/reproduction, and office environments. It delivers speed for mission-critical print jobs in a number of ways.

- The DocuSP® Controller accepts streaming jobs directly from a mainframe and begins printing as the information is still being received. There are no transforms to slow the data on its journey from mainframe to printer.

- The DocuTech® HighLight Color engines deliver unmatched reliability with superior uptime, performance, and job integrity.

- A range of inline finishing options*, enabled by the Document Finishing Architecture, quickly and easily creates finished, high-impact documents.

At every stage—from processing to printing to finishing—the DocuTech® HighLight Color System provides the speed and power to quickly meet critical print windows.

Environments and data streams

The DocuTech® HighLight Color System is able to perform so well in these multiple environments due to its handling of multiple data streams—PostScript®, PDF, TIFF, HP PCL6, ASCII, IPDS* and LCDS among them.

* Available 2005
Focus on image quality

Over a decade ago Xerox set the quality benchmark with the DocuTech® 135 print engine. Since then Xerox has focused on enhancing the image quality of all of its imaging devices—continually improving its own industry-leading image quality capabilities, and raising the bar even higher. Today, Xerox production print engines feature imaging enhancements that ensure top-of-the-line quality—from print one to print one million.

Keep in mind, though, that the first, and most important rule when discussing image quality is that it is highly subjective. Preferences differ, and what one person likes, another may not. In the production environment, the key to image quality success is to have the necessary tools to control and manipulate image quality, which allow operators to get exactly what they want.

Xerox production systems are optimized to accurately reproduce the document as it was created, but they also have built-in capabilities to make changes without going back through the prepress process. In addition, continuous automatic monitoring and adjustment guarantees consistently high quality from start to finish.

It's also important to note that independent of preferences, there are certain characteristics that define image quality. For instance, angled lines without jagged edges; consistent, mottle-free grays and tints; minimal, well-defined contours in gradual darkness changes; and the alignment and sharpness of character edges are fundamental in good image quality and are not dependent on viewers’ tastes.

Keep in mind:

- Quality is subjective. This Guide, along with the Xerox DocuTech® HighLight Color System, provides the tools necessary to manipulate font and image characteristics for you to achieve the desired results.
- Qualities inherent to exceptional image quality—regardless of the viewer’s taste—have been incorporated in the design of the Xerox DocuTech® HighLight Color System.

The following pages track the document production process from creation through printing and identify important image quality considerations at each step in the process.
Every phase of document production affects image quality—from initial concept and creation to final distribution. The final output can only be as good as the elements that compose it. Images must be created and captured appropriately for the output device. Understanding and designing for the capabilities of the DocuTech® HighLight Color System at the very beginning of a project can help assure good results during production.

There are several general topics that should be taken into consideration when creating a document to print on the DocuTech® HighLight Color System. Each topic outlined below will be covered in greater detail later in this Guide.

- **Plan for proper image capture:** When assembling the images for a document, it is optimal for a document creator to know the resolution capabilities of the printer. It is also important to understand the differences in how monitors display images versus paper. Most PC monitors display at a maximum resolution of 72-100 ppi, while printed output on paper enables a much higher resolution. Even though an image may appear crisp on screen, it still must be checked to ensure its resolution is appropriate for the target output device.

- **Document layout**
  In your document design, avoid the margins where image quality may be degraded and allow space for finishing.

  - **Live image area** is the term used to describe the area on the paper that can be used for imaging. DocuTech® imaging systems print to within 6mm of the edge of the paper with optimal quality.
  
  - **Finishing:** Designers must leave room for finishing. For instance, a designer will need to avoid placing any images on the inside gutter (margin) if the final document is going to be hole-punched or spiral bound.

  For additional document layout considerations, please see Section 4, Design Considerations.

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Image quality begins with document creation

If left unchecked, images that look great on screen at 72 ppi, such as those downloaded from the Web, will appear blurry on paper.

It is also important to plan for greater resolution during document creation if the image is going to be scaled up to a larger size. When scaling an image up or down, the image retains the number of pixels from the original scan. As a result, scaling an original up in size will decrease the clarity and detail of the image; scaling it down too much may make the image appear dark or muddy.

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The “Garbage-In, Garbage-Out” rule: An output device’s ability to print a resolution of 2400 dpi means nothing if the image was taken off the Web at 72 dpi—the final image will appear to be only 72 dpi.
Resolution Terminology

Samples per inch (spi) is generally used when referring to the resolution of scanned or bitmap images.

Pixels per inch (ppi) is commonly used when referring to the resolution on a monitor.

Dots per inch (dpi) is used when referring to output resolution.

Monitor vs. paper

72 ppi image – good on PC monitor; unacceptable on paper

600 dpi image – good on paper

To ensure that an image looks its best once printed, its resolution must be appropriate for the target output device. Just because the image looks good on screen doesn’t mean it will print well.

Scaling

300 spi scanned image printed at 600 dpi with no scaling

72 spi image scaled up by 250% and printed at 600 dpi

Scaling an image up or down spreads the samples from the original scan over a larger or smaller area. Scaling an original up in size will decrease the clarity and detail of the image.

Considerations in the design and creation phase of the document lifecycle can improve quality and reduce errors later in the production process.
Scanning guidelines

Several factors can affect the quality of the scanned image.

• **Scale (sizing) factor**: the ratio between the desired output size and the original size.

• **Bit depth (color depth)**: the number of bits used to describe the color of each pixel. Typical values are 1 for scanning black text, 8 for scanning monochrome line art, and 24 for scanning color pictures (8 bits for Red, Green, and Blue).

• **Resolution**: the number of samples per inch.

Scanning pictures

In general, pictures should be scanned at 150 - 300 spi. Use a bit depth of 8 for monochrome pictures and 24 or greater for full color pictures.

Scanning line art

In general, line art should be scanned at 600 - 1200 spi to ensure that edges are reproduced smoothly. Use a bit depth of 8 for monochrome line art and 24 or greater for full color line art.

Scanning text

Scanned text can be handled in two ways:

• **Text that will remain in bitmap form** should be scanned at 600 - 1200 spi to ensure sharp character edges and maximum readability. This is especially important for small text. Use a bit depth of 1 at a high resolution or a somewhat larger bit depth at a lower resolution to obtain the desired trade-off between sharpness and smooth character shapes.

• **Optical Character Recognition (OCR) software** converts a bitmap image file into a text file that can be edited. This software identifies patterns in the bitmap image, and it makes educated guesses about what characters the patterns might be. It then places the characters into a document that can be edited in a word processing package. OCR text output is not always exact, and must be proofread carefully. Since the bitmap is converted to character codes, the resulting files are small and independent of the resolution at which they will be printed. Text should be scanned at 300 spi or somewhat higher if the text is smaller than about 8 points. A low bit depth should be used to minimize the time required for OCR processing. Consult the documentation for your OCR software for details.

Scaling

When scaling, multiply the recommended scan resolution by the scale factor. For example, a picture to be scaled to 4 times its original size should be scanned at a minimum of 600 spi.
**A look at color capabilities**

As we’ve discussed, using highlight color in documents gives you a powerful tool to enhance your communications. You can use that tool even more effectively if you understand how the color works within the system.

The DocuTech® HighLight Color System uses black toner and a color toner to create text, graphics, and pictorial images.

### Using black plus one color: tints

A range of shades of black and tints of the loaded toner color are available on your DocuTech® HighLight Color System. Proper specification of tints in your documents will ensure that they will print predictably and reliably.

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#### Definitions

- **CMYK (Cyan, Magenta, Yellow, Black):** a device-dependent color model describing a color combination of cyan, magenta, yellow, and black.
- **Color model:** a method for representing a color by one or more numbers. Examples include RGB, representing a color by a set of 3 numbers, and CMYK, representing a color by a set of 4 numbers.
- **Color space:** the set of colors that can be represented by a color model.
- **HLS (Hue, Lightness, and Saturation):** a color model describing color as a combination of hue, lightness and saturation.
- **Hue:** pure color without added white or black.
- **Mixtures:** a halftone that contains color and black pixels (white may also be present). May also be referred to as duotones when applied to a bit mapped object such as an image or a logo.
- **Overprint:** Ability of an application to specify that overlapping objects are to be printed with overlapping colorants (toners). When using overprint, imaging an object does not knock out previously imaged objects beneath.
- **RGB (Red, Green, Blue):** a typically device-dependent color model describing color as a combination of red, green, and blue.
- **Saturation:** intensity, vibrancy, freedom from dilution with white.
- **sRGB (standardized Red, Green, Blue):** a device-independent color model describing a color as a combination of red, green, and blue.
- **HSV (Hue, Saturation, Value):** a color model describing a color as a combination of hue, saturation, and value (brightness) where value refers to how light or dark the color is; also known as HSB, hue, saturation, and brightness.
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The examples shown are intended to be representative of the range of appearances that can be produced by the DocuTech® HighLight Color System. The smoothness of the result will depend on the halftone screen frequency selected.
Making image quality adjustments

Document appearance and image quality can be affected by image processing activities that occur at the DocuSP® controller during PDL rasterization and other adjustments that affect printing of the rasterized PDL.

Rasterization:
- Highlight Color Mapping Algorithm
- Highlight Mapping Color
- Default Halftone

Printing:
- Print Darkness
- Highlight Printing Color
- Highlight Color Mismatch Action
Color mapping is the process of converting a color document to highlight color. This becomes especially important considering the number of color desktop publishing applications available to users today. Color mapping is automatically performed by the DocuSP® controller for all documents. You can select the mapping algorithm and mapping color to be used in processing your document or you can rely on default values set for the queue or system.

A mapping algorithm specifies which qualities of the document are most important to preserve. The mapping color specifies a single hue of color objects in the document which is most important to preserve as the highlight color in the conversion process. The result of mapping contains black and “generic” highlight color. The actual highlight color to be used for printing is specified separately.

Highlight color mapping of color documents

The DocuTech® HighLight Color System allows you to easily convert existing color documents to highlight color. The following sample uses the automatic highlight color mapping algorithm.
**Standard mapping colors**

The mapping color can be selected as “loaded color” or as one of a set of pre-defined colors: red, green, blue, cyan, magenta, yellow, cardinal, royal, ruby, violet, brown, and black.

**Loaded color** specifies that the highlight mapping color is the color of the loaded toner at the time the job is scheduled for rasterization.

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**Custom mapping color**

The standard mapping colors are suitable for many applications, but there are situations where a custom mapping color may need to be used to produce the desired result. For example, when it is desired to print the important elements of the document in a fully saturated highlight color and the hue of those elements is not sufficiently close to the hue of a standard mapping color.

Custom mapping color allows you to precisely specify the color to be used for highlight color mapping. There are two color spaces supported—sRGB and HSV—for custom color mapping, which can be used for specifying the custom mapping color.

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This example uses the Presentation mapping algorithm which maps BLUE, RED, and GREEN to the following highlight colors and mixtures. The highlight printing color is red.
**Highlight color mapping algorithms**

A highlight color mapping algorithm allows you to select how colors will be treated when colored objects are rasterized by the DocuSP® controller.

The following algorithms are available:

- **Monochrome**
- **Color To Highlight**
- **Presentation**
- **Pictorial**
- **Automatic**

We will look at these a bit more closely here.

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**Monochrome Mapping**

The Monochrome mapping algorithm converts each color to a gray with equivalent lightness.

**Color To Highlight Mapping**

The Color To Highlight mapping algorithm preserves spot color for emphasis. With this algorithm, the system ignores the hue information and preserves the saturation and lightness values of the input data source. Fully saturated input colors will be rendered as solid highlight color regardless of the current mapping color.
Presentation Mapping

The presentation highlight color mapping algorithm is very useful when it is necessary to distinguish between different colors. This is particularly important for documents that contain presentation graphics with different saturated hues such as diagrams and pie charts, which typically contain a few highly saturated colors. Presentation mapping allows you to maintain the visual interest of presentation graphics using highlight color.

Presentation mapping derives different appearances for different, fully saturated hues. Non-color elements and colors that have a hue matching the map color are not altered.

Pictorial Mapping

The pictorial mapping algorithm is intended to produce optimal pictorial quality for image objects such as photographic images. It preserves the lightness of the original image and ensures that there is no more highlight color present in the result than the amount present in the original. An advantage of pictorial mapping is that it will not produce any unnatural colors in graphic images or, for example, if you define the sky in your image as blue, it will not map to green.

This is accomplished in the following ways:

- Colors with a hue value matching the map color are not altered
- Colors with a hue value close to the map color are rendered with a highlight color, but the saturation level will decrease as the hue value shifts away from the hue of the map highlight color
- Colors with a hue value complementary to the map color are rendered in shades of gray
Halftoning is a method for creating the illusion of a continuous-tone image (such as a photograph) on a device that allows only binary values (ink, no ink) for the application of a limited number of colors. Halftoning was originally invented for creating the appearance of a continuous range of black to gray to white in reproductions of black and white photographs in books and newspapers. Digital halftoning was invented to solve the analogous problem for computer display devices and printers.

For a given spot on a continuous-tone image printed on a digital printer, either a dot of toner or ink of one color is applied or it is not. Dots cannot be “partially” applied. However, it is possible to apply a pattern of dots (a halftone screen) in such a way as to trick the human eye into believing it sees continuous tones. This is accomplished by varying the number of dots to be printed on a given space called a halftone cell.
Grayscale and highlight color rendering are achieved on digital printers using halftone screens to produce the desired color. The factors that define a digital halftone screen are halftone screen frequency (or line screen frequency), screen angle, and spot shape.

Halftone screen frequency is described in terms of the number of lines of halftone cells per inch (that is, lines per inch or lpi). A lower halftone screen frequency has a larger halftone cell.

- The range of grayscale or colorscale appearances is greater.
- Shading is coarser.
- There’s a greater range of contrast and shadows.

A higher halftone screen frequency has a smaller halftone cell.

- The range of grayscale or colorscale appearances is smaller.
- Shading is smoother.
- The image is sharper.

The halftone screen to be used can be selected at the DocuSP® queue and at the client. This halftone will be used for halftoned objects unless a different halftone screen is selected or applied by the document creation application.

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**HALFTONES AND SCREENS**

**Halftone Cells**

*At the pixel level, this is how a halftone cell fills in to represent different shades of gray or tints of color.*

**Halftone Screens**

*The HighLight Color System offers a range of screens that are supported at 600 dpi to accommodate a variety of imaging needs: 53, 71, 85, 85+ (enhanced), 106 (default), 106+ (enhanced), 120, 141. Halftone screens supported at 300 dpi are: 42, 53 (default), 71, 85.*

*For most applications, including large areas of uniform shading, line art, text, and continuous-tone images, the default 106 screen or the optional 106+ screen is recommended.*
### Printing adjustments

#### Printing considerations

Documents should be designed for the nominal (default) settings of the printer, however, in practice adjustments may be made to the output using available printer manager controls.

Document appearance may also be modified using control parameters available at the DocuSP® queue and the client.

Additionally, printer controls can also be used to more closely approximate the output of other Xerox devices.

**Potential adjustments:**
- *Print darkness*
- *Highlight printing color*
- *Highlight color mismatch action*

#### Print darkness

Documents should be designed for the nominal (default) settings of the printer, however, in practice minor adjustments may be made. Additionally, the printer darkness control can also be used to more closely approximate the output of other Xerox devices. Separate adjustments are provided for black darkness, highlight color solid darkness, and highlight color line darkness.

#### Highlight printing color

This option selects the color to be used to print the document and is independent of the color used in color mapping when the document was rasterized. Specify a value of Loaded Color if you do not require a specific color output.

#### Highlight color mismatch action

When the system job scheduling mode is set to resource-based scheduling, this parameter determines what action is taken when the loaded highlight color is not the same as the selected highlight printing color.

Select one of the following values:
- **Use Loaded Color**: The job prints using the highlight color currently loaded at the printer. This is the default selection.
- **Cancel Job**: Cancels the job if the highlight color specified is not loaded at the printer.
- **Operator Intervention**: The operator is prompted to load the selected highlight color before the job can print.
There are two aspects of registration that we need to consider—image-to-paper and black-to-color image registration.

**Image to paper registration**

Output devices must be able to position the contents of a page so that they are properly aligned on the page.

**Black to Color Image Registration**

With the HighLight Color System, the black and monochrome color images are built on the photoreceptor sequentially and transferred to the page simultaneously. As a result, the black and highlight color toners are laid down adjacent to each other. Color image to black image registration will vary from page to page and within a page. Detailed recommendations for document creation can be found in the following section.
Design considerations

Make the most of your DocuTech® HighLight Color System

This chapter provides production tips and design considerations to help you produce the best possible results. It includes detailed guidelines to help you convert monochrome, full color, and existing highlight color documents into high-impact, high-value highlight color documents for your DocuTech® HighLight Color System.

Every phase of document production affects image quality—from initial concept and creation to final distribution. The final output can only be as good as the quality of the elements that compose it. That is, images must be created appropriately for the output device. Understanding and designing for the capabilities of the output device at the very beginning of a project can help assure good results during production. There are several things to do when creating a document to achieve the desired outcome.

Live image area

Live image area is the term used to describe the area on the paper that can used for imaging. DocuTech® imaging systems print to within 1/4 inch or 6 mm of the edge of the paper with optimal quality.

Paper capabilities

Full bleed documents, where images extend to the very edge of the paper, must be printed on sheets larger than the final trim size. Being aware of the printer’s paper capabilities up front will avoid many potential problems.
When deciding on the type of media to use for a job, the first, most obvious rule to remember is that the better the media, the better the results. Both productivity and print quality suffer when flimsy, inexpensive paper is used. Using smooth papers with good formation (uniform fiber distribution) will help attain the best image quality. Two-sided printing requires paper that is more opaque so that show-through of images and text from one side of the sheet to the other isn’t a problem. Well-cut papers with no ragged edges are recommended to maintain a dust-free system. Contamination in the system over time can cause imaging problems.

Many paper characteristics affect the quality of a document produced on the HighLight Color System:

- **Texture:** toner adheres better to uncoated papers because it “sinks in” to the paper’s fibers, but paper with an abundance of texture can produce a mottled look to images.
- **Opacity:** high opacity is desired to prevent show-through.
- **High brightness:** brighter white papers are generally preferred because a high contrast between the white paper and the toner makes the image “pop”. Of course, some designers prefer low brightness papers for effect.
- **Weight:** papers that are too heavy or too light will not run reliably.

You can adjust paper stock and toner to get your message across.

The paper handling of the DocuTech® HighLight Color System is identical to that of the DocuTech® 6180 and DocuPrint® 180 systems. These printers can reliably handle paper ranging from 16 to 110 lb (60 to 200 gsm). You can use a wide variety of paper stocks, including plain, drilled, color, perforated, and preprinted forms. The use of color stock can add character to the design of a document. Adding color toner to color stock greatly expands the available color range and achieves a distinctive result.

For more information about supported papers and guidelines for using specialty stocks such as, but not limited to, hole-punched, perforated, preprinted forms, or labels, please see "Helpful Facts About Paper," 721P82493 and use the application information provided for the DocuTech® 6180 and DocuPrint® 180 products. Additional information on paper and substrates can also be found on www.xerox.com/supplies, under the Xerox DocuTech® HighLight Color product family.
Finishing
Designers must leave room for finishing. For instance, a designer will need to avoid placing any images on the inside gutter (margin) if the final document is going to be hole-punched or spiral bound.

Printing performance
The speed at which you can expect your documents to print depends on the document design.

There are two measures of speed:
• **Rated speed**: Maximum rate at which the print engine can deliver paper to the output tray.
• **Effective speed**: Speed at which jobs print under production conditions.

When designing the document, consider:
• Whether the document contains only text, or a combination of text and graphics.
• Number of graphic images, fonts, and inks.
• Efficiency of the data stream encoding.
• Whether the job is transmitted a number of times, or is reprinted from the system disk.

Area coverage
Use of an average area coverage greater than 35% on an 8.5” x 11” page slows down the print job. Follow these guidelines to ensure that the system prints at the highest effective speed:
• For large areas, use a light gray or color tint for the most pleasing appearance and low area coverage.

• Make sure pages exceeding 35% solid ink coverage are run only occasionally and intermixed with pages with much smaller ink requirements.
• Avoid long, repetitive jobs that have large solid area coverage.

Double pass printing is not recommended
Double pass printing (printing on throughput material that has already passed through the printer once) is sometimes used to create preprinted forms or to allow for the use of more than one color toner on a document. Although double pass printing is possible with your printer, the print performance cannot be guaranteed and the practice is not recommended. It can result in an increased number of paper jams, reduced image quality, a higher frequency of service calls, and an increased service cost.

Black and color layout considerations
With the HighLight Color System, the black and monochrome color images are built on the photoreceptor sequentially and transferred to the page simultaneously. As a result, the color image and black image registration may vary from page to page and within a page. To provide the best possible quality output, it is recommended that you follow the design rules provided for your specific situation.
CREATE NEW HIGHLIGHT COLOR DOCUMENTS

Create your document using black plus one color

To achieve a solid or saturated color:

- Using RGB, select:
  - pure Red 255, 0, 0
  - pure Green 0, 255, 0
  - or pure Blue 0, 0, 255
- Using CMYK, select:
  - 0 C, 100 M, 100 Y, 0 K for red
  - 100 C, 0 M, 100 Y, 0 K for green
  - 100 C, 100 M, 0 Y, 0 K for blue
- If using CMYK insure that black is specified as pure black: 0 C, 0 M, 0 Y, 100 K (not a combination of CMY)
- The closest Pantone match is Warm Red U for red; 354 U for green and 300 U for blue.

To achieve a tint of the highlight color:

Create a solid or saturated color (spot color) as described above. Select a tint of the color typically 0 to 100%. See Black Shade and Highlight Color Tint Examples on page 10.

To achieve a shade of black (gray):

Select desired shade typically 0 to 100%. See Black Shade and Highlight Color Tint Examples on page 10.

Create margins that work with the System

Allow for a margin of 1/4 inch or 6 mm on all 4 sides of the document if possible. (The printer is capable of printing to the edge of the page, however, to insure optimal print quality a 1/4 inch or 6 mm border is desirable)

Printing Tip:

Using the preflight capabilities of your application or a separate tool, such as Enfocus Pitstop, you can determine how many separations are present in the job. The desired state is black plus one separation.
### Considerations for Text

Text layout for optimum results:
- Allow for spacing between objects which are black and color. The spacing should be 2 - 4 points; 1/32 - 1/16 inch; 0.75 - 1.5 mm. (This is a general guideline and applies to other objects, in addition to text.)
- Place black and highlight color text on separate lines.
- Use different margins for black and highlight color text.
- Underline black text with black and highlight color text with highlight color.

When using text with tinted/shaded background:
Use color text on a tinted background (the text should be the same hue as the background); white text on a tinted or gray background; or black text on a gray background.

Black text on a colored background can be used with good results for PCL, LCDS, and IPDS. For PS/PDF, to ensure good results for black text on a colored background, colors must be expressed in the Separation color space and overprint must be turned on.

<table>
<thead>
<tr>
<th>Preferred</th>
<th>Less Desirable</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOR SALE</td>
<td>FOR SALE: Used car, good condition</td>
</tr>
<tr>
<td>Used car, good condition</td>
<td>CALL: 555-1234</td>
</tr>
<tr>
<td>CALL: 555-1234</td>
<td></td>
</tr>
</tbody>
</table>

### Images

Images (pictorials, logos) should be a single separation (monochromatic), either gray or tints of the highlight or spot color.

### Graphical objects

When outlining individual objects (slice of pie chart or bar of a bar chart or text box), tinted objects should be outlined with the same hue and gray objects outlined with black. (Avoid outlining color objects with black or black objects with color.)

Use the flexibility of the application to avoid adjacencies by using exploded pie charts, etc. Follow the outlining rule above.

<table>
<thead>
<tr>
<th>Preferred</th>
<th>Less Desirable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred sweeps:</td>
<td></td>
</tr>
<tr>
<td>White to color, tint, black, or gray</td>
<td></td>
</tr>
<tr>
<td>Color, tint, black, or gray to white</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferred</td>
<td>Less Desirable</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferred</td>
<td>Less Desirable</td>
</tr>
<tr>
<td>Color to gray or black</td>
<td></td>
</tr>
<tr>
<td>Gray or black to color</td>
<td></td>
</tr>
<tr>
<td>One hue to another hue</td>
<td></td>
</tr>
</tbody>
</table>
Moving your monochrome document to black plus one color

To achieve a solid or saturated color:
- **Using RGB**, select:
  - pure Red 255, 0, 0
  - pure Green 0, 255, 0
  - or pure Blue 0, 0, 255
- **Using CMYK**, select:
  - 0 C,100 M, 100 Y, 0 K for red
  - 100 C, 0 M,100 Y, 0 K for green
  - 100 C,100 M, 0 Y, 0 K for blue
- If you are using CMYK, make sure that black is specified as pure black: 0 C, 0 M, 0 Y, 100 K (not a combination of CMY).
- The closest Pantone match is Warm Red U for red; 354 U for green and 300 U for blue.

To achieve a tint of the highlight color:
Create a solid or saturated color (spot color) as described above. Select a tint of the color, typically 0 to 100%.

To achieve a shade of black (gray):
Select desired shade, typically 0 to 100%.

Identify the portion of the black image plane that you wish to change to highlight color and transform it using the steps defined by your application. (For example in Adobe Photoshop: Click on the gray channel and cut the image from it and click on the Highlight channel and paste the image into it.)

Depending upon the actual application, the order of the above steps may vary.
CONVERTING FULL COLOR DOCUMENTS TO HIGHLIGHT COLOR

Moving your full color document to black plus one color

A full color document is automatically converted for printing on your highlight color printer using highlight color mapping. If you desire to enhance the results, the document can be modified using the following guidelines.

Modify or replace full color text with black (gray) or highlight color (tint).

When using text with tinted or shaded background, use color text on a tinted background (the text should be the same hue as the background); white text on a tinted or gray background; black text on a gray background. Black text on a colored background can be used with good results for PCL, LCDS, and IPDS. For PS/PDF, to ensure good results for black text on a colored background, colors must be expressed in the Separation color space and overprint must be turned on.

Convert your full color images to single separation (either grayscale or highlight color).

Adjust the spacing between black and color elements.

Modify sweeps using the design considerations for graphical objects described previously on page 24.

Printing Tip:

If the document to be converted contains one or more hues and it is not important to retain the differentiation between the hues, printing the document using the color to highlight mapping may yield satisfactory results.

CONVERTING EXISTING HIGHLIGHT COLOR DOCUMENTS

Moving existing highlight color documents to the DocuTech® Highlight Color System

Of course, an existing highlight color document, including one created for the 4850, 4890, and DP92C, can be printed on the DocuTech® Highlight Color System. If you desire to enhance the results, the document can be modified using the following guidelines.

Adjust the spacing between back and color elements.

Ensure that objects are a pure highlight color, tint, black or shade of gray. Also see the guidelines described on page 24.

Printing Tip:

If mixtures appear on the output and are not desired, it is possible that the document contains multiple hues. Try using color to highlight mapping. Alternately, you can modify the document using the design guidelines.
FreeFlow™ Makeready

FreeFlow™ Makeready provides an easy method to support coloring monochrome documents or modifying existing color applications. The following steps will help to ensure that jobs are properly colorized for the DocuTech® HighLight Color System.

- In Makeready, open the document to be colorized.
- Within Document Properties, select the DocuTech® 128/155/180 HighLight Color as the Printer Family.
- Select the desired color in the Document Highlight Color pull down.
- Colorize objects or regions on a page by selecting the desired color from the displayed highlight color palette located in Properties of the Selected Object.
- Refer to the guidelines described in the previous sections for color selection, layout, etc.

FreeFlow™ Variable Information Suite

The FreeFlow™ Variable Information Suite provides a series of named colors that can be used to colorize a job. For optimum results, follow these guidelines:

- Use only a single hue in your document.
- Darker colors which will print as mixtures should be used with caution. These include: DMRED, DMGREEN, DMBLUE, DRED, DGREEN, DBLUE, XDRED, XDGREEN, XDBLUE, KHAKI, and BROWN.
- 3-D bar and pie charts should be used with caution as mixtures are used for the 3-D effect. The appearance of 2-D graphics may be preferred.

Third party offerings

Consult your Xerox representative when selecting Xerox partner and third party applications.
Frequently asked questions

FAQ: The text on my document does not appear crisp.
   • For best readability check the text to ensure it is 100% black or 100% highlight color.
   • Text could be a mixture – change properties to make the text a pure hue
   • Text may be printed using a low frequency halftone – increase the halftone screen frequency

FAQ: For PS/PDF, black text on a color background has a white halo.
   • Overprint is not turned on and a Separation color space has not been used in the PS/PDF application. If the application does not support overprint try using 100% color text in the color text box.

FAQ: An object appears to have a gray or tinted halo.
   • Change the color of the object to a tint of the highlight color or a shade of gray.

FAQ: The alignment between black and color objects on the page appears to change.
   • Modify the layout of the document to make the differences less noticeable.
   • Adjust the spacing between objects.
   • Use different margins for black and highlight color text or objects.
   • Put black and highlight color text on separate lines.

FAQ: Image looks blocked (pixilated) or blurry.
   • Re-scan the image using the recommendations in the Scanning Guidelines section found on page 8.
Glossary of highlight color terms

**color model**—A method of representing a color by one or more numbers. Examples are RGB, representing a color by a set of 3 numbers, and CMYK, representing a color by a set of 4 numbers.

**color space**—The set of colors that can be represented by a color model.

**CMYK (Cyan, Magenta, Yellow, Black)**—A device-dependent color model describing a color as a combination of cyan, magenta, yellow, and black.

**colorant**—In Xerographic printing, a colorant is a toner, giving color to the printed page.

**duotone**—An image using two colors, one of which is typically black.

**gray**—A color formed by adding white to black. Gray does not contain any highlight pixels.

**halftone**—A pattern of black and highlight pixels used to simulate the appearance of a color. More generally, a pattern of pixels for each colorant that is used to simulate the appearance of a color on a device with a limited number of colorants.

**HLS (Hue, Lightness, Saturation)**—A color model describing a color as a combination of hue, lightness and saturation.

**HSB (Hue, Saturation, Brightness)**—A color model describing a color as a combination of hue, saturation, and brightness.

**HSV (Hue, Saturation, Value)**—A color model describing a color as a combination of hue, saturation, and value (brightness).

**hue**—Pure color without added white or black.

**ink catalog**—An LCDS data structure containing palettes of colors and the halftone patterns to be used to create each color.

**mixed halftone**—A halftone that contains both black and highlight pixels and may contain white pixels.

**mixture**—A halftone that contains color and black pixels (may also contain white). May be referred to as a duotone when applied to any bit mapped object such as an image or a logo.

**overprint**—Ability of an application to specify that overlapping objects are to be printed with overlapping colorants. When using overprint, imaging an object does not “knock out” previously imaged objects beneath.

**palette**—A collection of colors. A palette document shows the correspondence between color model parameter values or color names and printed appearance. In LCDS, a palette is also a collection of colors (inks) within an ink catalog.

**RGB (Red, Green, Blue)**—A device-dependent color model describing color as a combination of red, green, and blue.

**re-screening**—Removing any existing halftone and applying a specific halftone. To optimize image quality of halftoned images, the existing halftone must be removed (de-screen the object) and optimized halftones must be applied (re-screen the object).

**saturation**—intensity, vibrancy, freedom from dilution with white.

**shade**—A color formed by adding black to a pure hue (the highlight color).

**sRGB (standardized Red, Green, Blue)**—A device-independent color model describing a color as a combination or red, green, and blue.

**tint**—A color formed by adding white to a pure hue (the highlight color). A tint does not contain any black pixels.

**trapping**—When abutting objects of different colors are not precisely registered, a halo and/or shadow may be visible between the two colors. Trapping attempts to minimize this effect by intentionally overlapping the edges of the objects to mask any registration errors.

**twin tone**—See duotone.