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## A Guide to Using Color

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# A Guide to Using Color

This guide is designed to help you gain optimal results from color printing. It includes background information on what “color” is and ideas for using color, and it explains how your computer, software applications, and printer work together to produce color output. Some of this information may be familiar to you, and some of it may be new. Read only those sections that interest you or that apply to your color printing needs.

This guide is also designed for use with different printer models under different system configurations (computer systems and software applications). Color use depends on your system configuration. Some of the information provided here may not apply to your system configuration.



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## **Welcome to Color Printing**

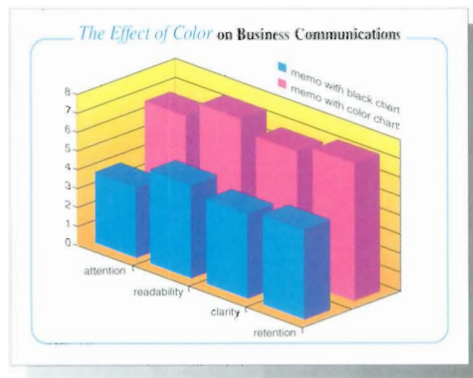
This chapter defines “color” and other color terms used in this guide and describes color relationships and the color wheel. It also provides some tips for choosing and using color to enhance your documents and presentations.

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## Why Add Color?

Color is a powerful tool for organizing ideas on paper in a visual way. In business communications, strategic use of color can mean the difference between a document that is read and one that is *not*. Long black and white documents can seem overwhelming to readers. Primary points may lack emphasis because nothing differentiates them from the details. Strategic color use in documents can aid readers skimming for meaning; important information stands out. Color also gives communication materials a finished, professional touch.



### *Emphasis and Impact*

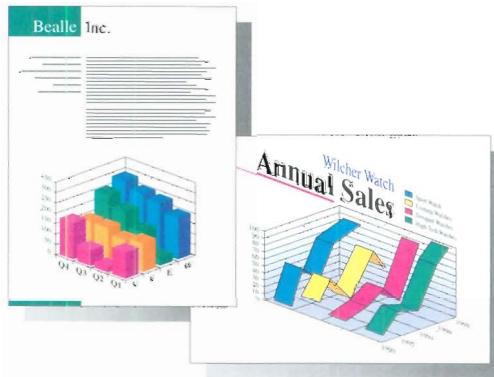
Color can highlight primary points. Your audience can focus on what's important — with background information appropriately remaining in the background.





### ***Continuity and Interest***

Color graphics in long documents add variety and renew the reader's interest. With appropriate placement and use, color can give your reader's eyes a break, dividing your documents into short, easy-to-comprehend sections.



### ***Appearance and Professionalism***

Appearance is an important aspect of any communication material. You can place text and color graphics for emphasis, enhancing the overall appearance of your documents or presentations.

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## When and Where to Use Color

Color, used effectively, can sharpen your message. It can explain, highlight, and emphasize important information. Used incorrectly, color can distract the reader. As you begin to use color in your documents and presentations, keep these helpful tips in mind:

- **Use color to explain, not to decorate.**

If you use color purely for decorative purposes, you risk losing its effectiveness.

- **Use color to establish patterns and set expectations.**

Patterns set expectations. Once you have established a system, stick to it. If you depart from it, do so only for emphasis. Put the most important information in the brightest color.

- **Use color to group similar items or concepts and to establish correlations.**

If you are trying to establish a relationship between color and meaning, use only a few carefully chosen colors.

- **Use color to differentiate.**

If you must use several colors in an image (for example, you are creating a pie chart that has many segments), enlarge the size of the image to enhance its legibility. Or, to highlight a particular segment, use color only on that segment.

*And, most importantly,*

- **Use less color — not more.**

By limiting your use of color, you maximize its impact.

The following pages show some examples of ways to use color to enhance your printed documents.



### ***Forms***

Use a subtle color blend instead of lines or boxes to define the different parts of a form. Choose colors so that even the darkest part of the blend does not make it hard to read any text in that part.

If you want to print headings in “reverse” (white type against a black or colored background), be sure to choose a simple font in a large size to make it easy to read.

*Weekly Sales*  
by Department

DEPARTMENT	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Department 1							
Department 2							
Department 3							
Department 4							
Department 5							
Department 6							
Department 7							
Department 8							
Department 9							
Department 10							
Department 11							
Department 12							
Department 13							
Department 14							
Department 15							
Department 16							
Department 17							
Department 18							
Department 19							
Department 20							

### ***Spreadsheets***

Highlight subtotals, totals, or important features of a spreadsheet. You can assign a color to cell borders, cell shading, or the text or numbers in a cell.

If you choose colored text, remember that it doesn't stand out on the page as well as black text, so choose a larger and/or bolder font.



### ***Flyers***

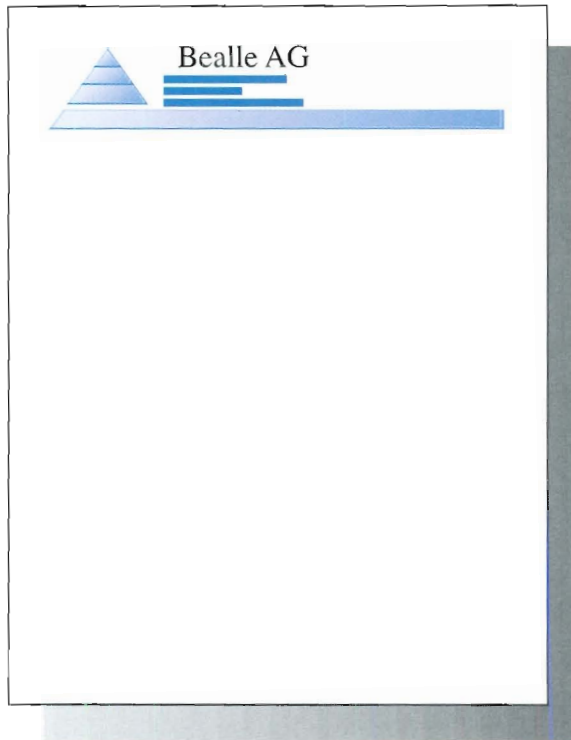
A flyer with a large, colored, single-word headline is an eye-catching way to announce an event or give important directions. Leave plenty of white space between lines of text and at the margins. This draws the reader's eye to the text.



### ***Report Covers***

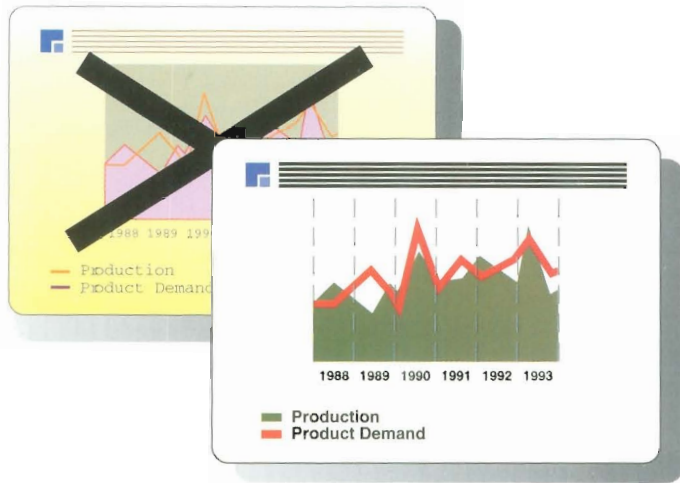
A colored graphic on the cover of a report invites people to read what is inside. Be sure the graphic is related to the report topic.

Colored headings should be set in larger and/or bolder fonts. Text of any color is harder to read than black.



### ***Letterhead***

You can print your company name and/or logo in color. When printing colored text on top of another color, use a large, simple font to make the text easy to read. Avoid extra-bold or extra-condensed fonts. In color-on-color, the areas inside the letters — the little space inside the lowercase “e,” for example — can fill up, making the text illegible.



### ***Overhead Transparency Slides***

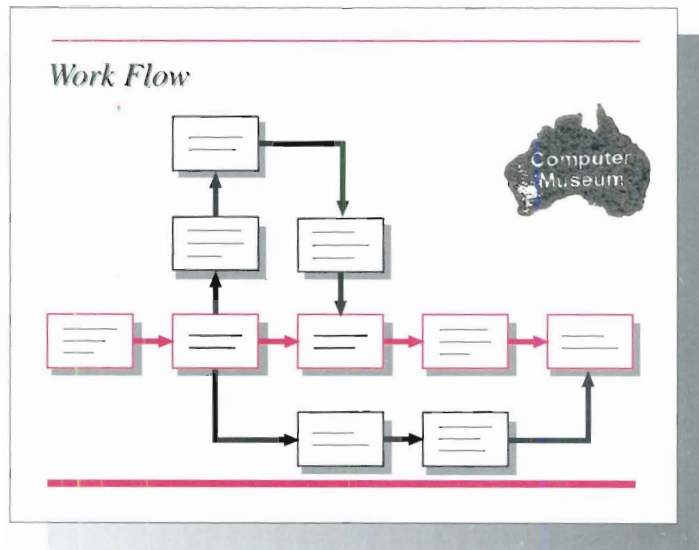
For slides and transparencies for overhead projection, use high-contrast colors to attract attention to major points and to make slides more readable. Use thick lines and solid color fills on charts and graphs with large font sizes. In the above example, the slide on the left is too pale, with text that is hard to read.

If possible, test your slides in the room where the presentation will be made. Slides with dark backgrounds work well in dark presentation rooms. Slides with light backgrounds work well in bright presentation rooms.

#### **NOTE**

To achieve best color print quality, wait 10 – 15 minutes after printing before placing transparency slides into protective sleeves. This will allow slides time to dry, preventing smearing and fading.

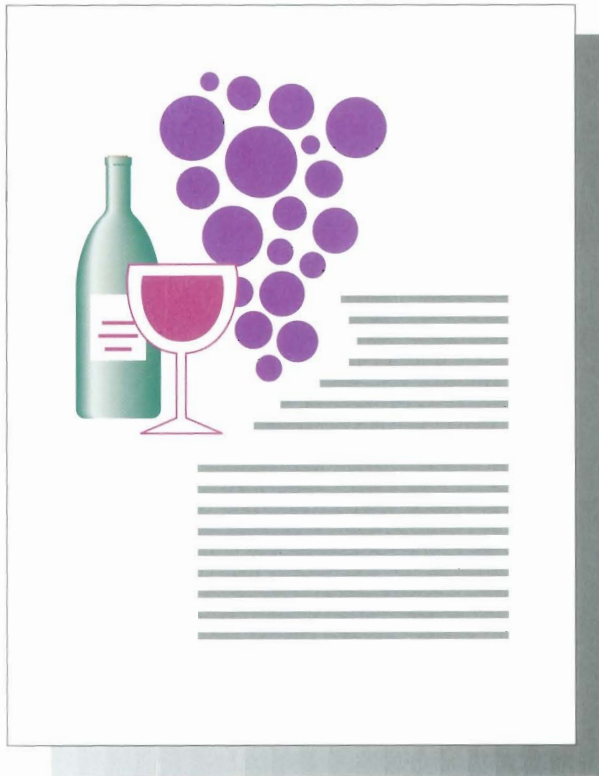




### ***Flowcharts***

Color the outlines or fills of boxes or other flowchart shapes to highlight critical paths. For text, choose a simple font in the largest size that will fit comfortably inside the shapes and color it black.

If you choose to fill the shapes with a color, delete their outlines or make the outlines the same color as the fills. "Shadows" can make a simple chart more interesting to look at, but if the flowchart is complex shadows are distracting.



### ***Color Graphics***

Add color to inexpensive electronic clip art for instant visual impact. Even simple graphics with basic shapes printed in color can add a professional touch to your documents.

As you select colors, keep in mind that black and white count as color choices, too. As you design with color, plan your use of black, white (or white space), and color accordingly.



### ***Office Newsletter***

Use a graphic with text to help readers remember important information. For example, a clock showing the time of a meeting could go with the text describing the agenda.

Color scans of photographs, especially pictures of people, catch the eye and invite the viewer to read the accompanying text. Choose sharply focused photographs with good contrast — strong differences between areas of light and shadow — and intense colors.



### ***Graphs and Charts***

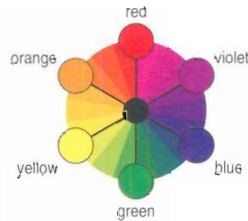
In the above example, color is used to show a relationship between the bar chart and the map. Avoid filling bars or shapes with complicated patterns. They obscure the information and confuse the reader.

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## Tips on Choosing Color

Having the ability to create virtually any color combination increases the temptation to use virtually any color combination. *Resist this temptation!* Save color use for impact and as an aid to comprehension.

Selecting colors appropriate for your work requires some understanding of color relationships. The color wheel is a useful tool for identifying color combinations that work well together and color combinations to avoid.



Following are a few tips on combining colors effectively:

- Selecting one hue from the color wheel unifies your documents. To add visual interest, you can vary the lightness or darkness of the color you choose.
- Selecting two hues that are near each other on the color wheel creates harmony, because colors that are close together on the color wheel are related.
- Selecting hues with three colors between them on the wheel creates contrast. Examples are red and yellow or green and violet. For contrasting color schemes, use duller colors in the background and brighter colors in the foreground.
- Using complementary colors, such as red and green, is not recommended. These colors appear to “vibrate” when viewed together. You can, however, change the saturation or value of one of the complementary colors to achieve harmony.

- Keep color choices simple. In general, readers can easily remember two colors plus black.
- Use colors in a manner consistent with your company's standards or generally accepted conventions. For example, in some cultures red connotes stop, danger, or no; yellow, caution or warning; and green, go or all's clear.
- If you choose not to follow accepted conventions for color use, provide a legend as to color and meaning.
- Use color to lead the eye to important information. Readers will look at the brightest area first, so use the brightest color on the most important material.
- All colors vary in appearance relative to their surroundings. The same color looks darker on a light background and lighter on a dark background.
- If the background is black, use green, white, or yellow and avoid blue, magenta, and red.
- If the background is white, use black, blue, or red and avoid cyan and yellow.



## Improving Color Printing

Color print quality depends on several factors: color settings, the type of media you choose, the amount of ink printed on the page, how the ink is printed on the page, and the relative humidity of the environment. This chapter explains the factors affecting color print quality and the trade-offs between color print quality and printer performance.

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## About ColorSmart

The quality of color printing depends partly on how the three print cartridge ink colors — cyan, yellow, and magenta — are placed on the printed page. See chapter 3, “Color and Your Computer System,” for more information about color blending patterns.

ColorSmart makes it easy for you to produce high-quality color output. If you are using a Macintosh computer or Microsoft Windows, Hewlett-Packard ColorSmart technology is built into the printer drivers. When you select “Print” from your software application, ColorSmart scans your document and automatically adjusts the color settings for great-looking output.

For each type of object on the page — text, simple graphics, or complex images — ColorSmart chooses just the right color settings for optimum results. In most cases, ColorSmart provides the best output, so you don’t have to select other color options.

You can, of course, override the ColorSmart choices whenever you wish and select exactly the color settings you want from the options available in the printer driver.



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## Selecting Print Media

Media selection plays an important role in color print quality. Most 25% cotton bond papers and plain photocopier papers work well for color printing. Follow these tips to maximize color print quality:

- Use only the recommended HP LX JetSeries transparency film for printing transparency slides. This transparency film was designed specifically for use with your printer. To achieve best color print quality, wait 10 – 15 minutes before placing transparency slides into protective sleeves.
- Always print on the print side of the media. Load your media with the *print side down*. See your printer user's guide for more information on identifying the print side of the media and on loading media.
- Use either HP CX JetSeries special paper\* or HP LX JetSeries Glossy Paper when you need premium color print quality. These media types are recommended for optimal color printing results. Try them for vivid colors.
- Experiment with your printer's intensity settings available through the Macintosh or Microsoft Windows printer driver. If intensity is set too high, media may wrinkle and colors may run into each other. You may need to override ColorSmart settings.

See your printer user's guide for more information on selecting and using media appropriate for your needs.

\* CX JetSeries CutSheet Special paper is only recommended for color (composite black) only printing. See your printer user's guide for more information on selecting and using media.

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## Using Print Cartridges

The information in this section is provided for two types of printers: printers with a single print cartridge cradle and printers with two print cartridge cradles. You can use either the black or color print cartridge in single print cartridge printers. See the following section for more information on how single cartridge printers print black in documents containing black and color. Two print cartridge printers allow you to print black ink and color on the same page using both black and color print cartridges.

### ***Black Versus Composite Black***

When you print using the black print cartridge, the black that appears on your output is black ink. When you print black using the color print cartridge, the black that appears on your output is composite black: it is composed of a mixture of cyan, yellow, and magenta ink. When these three ink colors are combined together, they appear almost black on the page. Because each “dot” of composite black contains a dot each of cyan, yellow, and magenta ink, using composite black in your output means using a large amount of color ink.

When you use composite black, the intensity or darkness of the composite black that appears on your output depends on the intensity setting and the print quality mode you select through your printer driver. Using the darkest intensity setting and the highest print quality mode available through your Macintosh or Microsoft Windows printer driver produces the “blackest” composite black on your output. If media wrinkles, see suggestions in the “Correcting Color Printing Problems” section.

If you use DOS applications with two print cartridge printers, printing either black and color or color only (composite black) depends on your software application. Some DOS applications such as Harvard Graphics 3.0, Lotus Freelance Graphics 4.0, Lotus 1-2-3 (WYSIWYG mode), and Quattro Pro 3.0 and 4.0 support composite black printing only. Many other applications such as Microsoft Word 5.5, WordPerfect 6.0, WordPerfect Presentations 2.0, Harvard Graphics 3.05, and WordStar allow you to print documents containing black and color ink. Contact your software application manufacturer to find out if your software application has a printer driver for black and color printing.

## Using Grayscale for Draft Copies

If you use a Macintosh computer or Microsoft Windows, print draft copies of your color documents in grayscale with the black print cartridge. Grayscale printing is significantly faster than color printing, and it gives you a good approximation of your final output.

For printers with one print cartridge cradle, install the black print cartridge and select the highest print quality mode through your Macintosh or Microsoft Windows printer driver.

For printers with two print cartridge cradles, select Grayscale printing through your Macintosh or Microsoft Windows printer driver.



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# Correcting Color Printing Problems

When printing color documents, you may experience print quality problems such as hue changes, print cartridge alignment problems, black ink mixing with color ink, or other print quality problems. This section explains how you can correct such problems.

As you print color documents with different media types, you may notice one or more of the following print quality problems:

- Two different color inks, when printed side by side, run into each other.
- Ink spreads beyond the ink dot size applied to the page or running through the other side of the paper may occur when the ink is absorbed into the paper.
- Ink spreads along a fiber or fibers in the paper, creating a “spiderweb” effect.

Follow these tips to improve print quality:

## **Change your printer’s intensity settings.**

Darker intensity settings print more ink. Lighter intensity settings print less ink. Reducing the amount of ink printed is especially helpful in high-humidity environments, where the ink requires more time to dry. In this case, you may want to reduce intensity manually instead of letting ColorSmart adjust it automatically.

## **Change your printer’s print quality mode.**

Printing in the highest print quality mode available slows printing time but improves output quality.

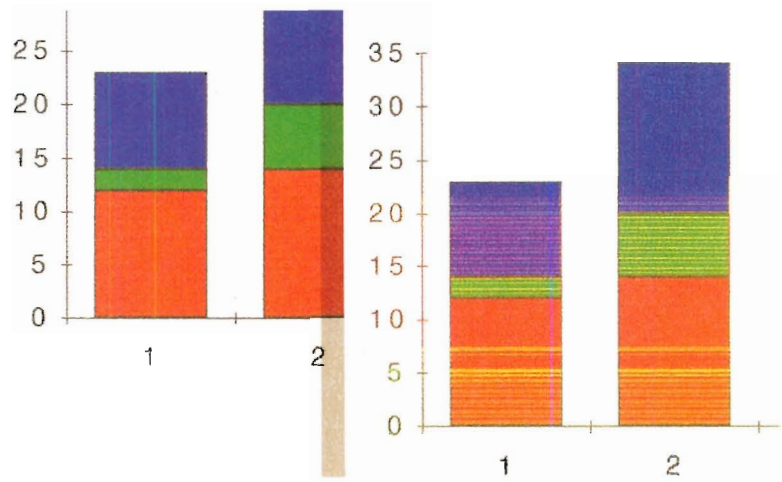
## **Change your media type.**

First, try printing on the other side of the paper if you are using plain paper or 25% cotton bond. Then try another brand. Print quality varies with paper from brand to brand. For premium color printing results, use either HP CX JetSeries CutSheet Special paper\* or HP LX JetSeries Glossy Paper.

\* CX JetSeries CutSheet Special paper is only recommended for color (composite black) only printing. See your printer user’s guide for more information on selecting and using media.

## Hue Changes

When you use single cartridge printers and two cartridge printers to print color documents, you may sometimes notice hue changes because you typically use the three inks in the color print cartridge at different rates. These changes may indicate that one or more colors of ink are running out in your color print cartridge. See the example below.



When this occurs, replace your color print cartridge with a new one. For two print cartridge printers, be sure to do a print cartridge alignment test whenever you replace a cartridge.

### ***Print Cartridges Are Out of Alignment***

If you use a printer with two print cartridge cradles, you must do a print cartridge alignment test when you replace or reinstall print cartridges. This procedure aligns the newly installed print cartridge with the currently installed print cartridge. Misaligned cartridges result in misaligned black and color printing. See your printer user's guide for information on replacing, reinstalling, and aligning print cartridges. Following are examples of misaligned text and graphics.

Duis autem vel eum tisi amet, consectetur  
adipiscing elit, sed diam nonummy elusmod  
tempor, incididunt ut labore et dolore magna  
aliquam erat voluptat. Ut enim ad minimim  
veniam quis nostrud exercitation ullam  
corpro suscipit laboris nisi ut aliquip ex ea  
commodo consequat.

### ***Black Ink Is Mixing with Color Ink***

If you use a printer with two print cartridge cradles and you print documents with black and color areas close together or touching, you may notice black ink mixing with color ink. ColorSmart minimizes this problem; however, if you are not satisfied with your output, you can experiment with the tips for improving print quality provided in this chapter. Following is an example of black ink mixing with color ink.





## **Color and Your Computer System**

This chapter identifies the differences between the color values on your computer monitor and the color values in print. It also explains the technology of color printing and your computer system: how color is generated through your computer and software and then how it is printed on the page.

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## Screen Color Versus Printed Color

As we have used the word “color” in this guide, we have been referring to

*the combination of color phosphors on a computer monitor or inks on paper that one perceives as “color.”*

What do we mean when we describe color as “the combination of color phosphors on a computer monitor or inks on paper”? How does color work on the screen versus in print?

### ***RGB***

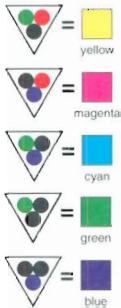
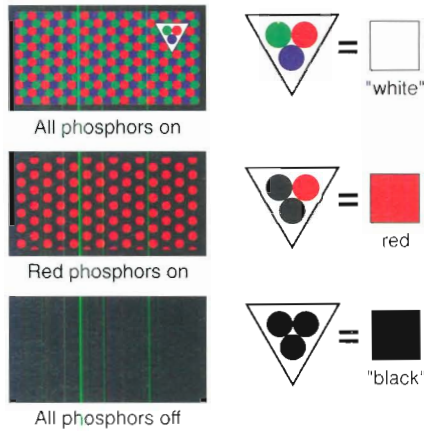


On your computer, color is specified using RGB color values. RGB is the acronym for red, green, and blue. It refers to the way these three colors of light are combined at different intensities to produce the appearance of many different colors on a color computer monitor.



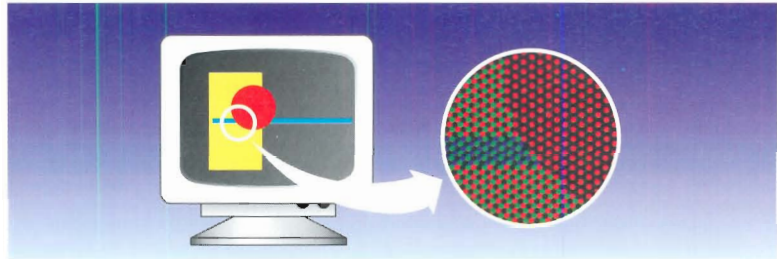
Each pixel on a color computer monitor is made up of three phosphor colors: red, green, and blue. Each phosphor emits only one color of light. The intensity of the light emitted can be varied individually for the three phosphors comprising each pixel. Combinations of these three phosphor colors, where each phosphor color is either on or off, produce eight basic colors: “black,” red, green, blue, cyan, magenta, yellow, and “white.” All phosphors on produces “white.” All phosphors off produces “black” (the color of a blank computer monitor).





Each red, green, or blue phosphor on most color computer monitors is capable of producing up to 256 intensities of the phosphor's color, depending on the type of computer monitor and video card. By varying the intensities of the three phosphors in each pixel, a color computer monitor can display millions of different colors.

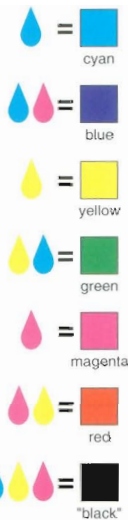
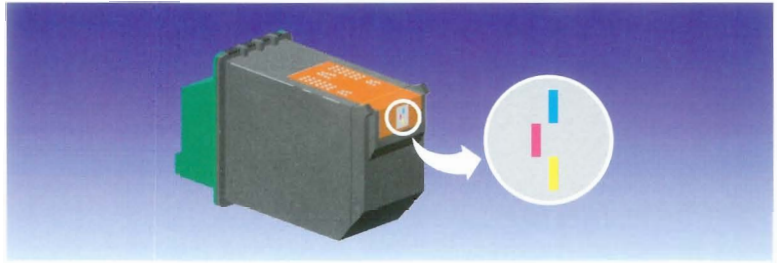
RGB color is an "additive" process, adding (or combining) different intensities of red, green, and blue light to produce the appearance of various colors.





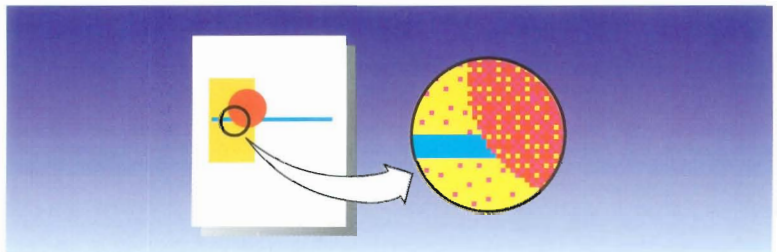
## CYM/CYMK

For two print cartridge printers, color is specified using CYMK color values. CYMK is the acronym for cyan, yellow, magenta, and black. ("K" is used instead of "B" to avoid confusion with blue.) CYMK refers to the way these ink colors are combined to produce different colors on your output. Single cartridge printers specify color using CYM (cyan, yellow, and magenta) color values.



The black print cartridge that came with your printer produces black ink. The color print cartridge that came with your printer contains equal amounts of cyan, yellow, and magenta ink. When dots of these three inks are printed in combination with each other, they produce pixels of the eight basic colors: "black," red, green, blue, cyan, magenta, yellow, and "white." No ink produces "white" (the color of the paper being used). In this guide, the term composite black is used to refer to the color produced when a mixture of cyan, yellow, and magenta ink is combined.

By varying the amount of each ink applied to the page and combining the eight basic colors in a variety of dot patterns, your printer can produce virtually any color desired. CYMK color (used in two cartridge printers) is a "subtractive" process, absorbing (or subtracting) some of the light and reflecting the remaining colors of light to produce the appearance of various colors on the page.



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## Color Imaging

Viewed as a whole, your computer system is made up of three elements: input devices such as a scanner, mouse, or keyboard; output devices such as a monitor, printer, or plotter; and the software, hardware, and electronics in between. Each of these elements can enhance or limit the ability to select and produce color with your computer system.

On a black and white computer monitor, color values are indicated by shades of gray. This method of mapping color to gradations of black to white is referred to as grayscale. Colors are selected through the software applications used.

### ***Software's Role in Producing Color***

Just as the hardware determines, in part, your ability to select and produce color, the software applications you use also affect your ability to select and produce color graphics and text. Software allows the input devices to describe colors, move color information through the computer system, and communicate it to output devices either for display on a monitor or as printed output.

Your computer system may be able to produce from only a few to millions of colors, depending on the software applications you use. Also, some applications do not save color information. Color graphics may lose color information when copied into other applications. Check the indexes of your software application documentation for information about “color,” “graphics files,” and “importing graphics.”

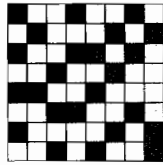
## ***Halftoning Techniques***

Now that you know a bit about how color information is entered into and described by a computer system, how does the printer produce color output on the page?

### **“Millions of Colors”**

As described earlier, your printer can produce eight basic colors. Using these eight colors, the printer driver can use various halftoning techniques to produce more shades of color.

These techniques are called “halftoning.” Pattern and scatter are two of the halftoning methods used by Macintosh computer and Microsoft Windows printer drivers. In pattern mode, your printer driver produces more shades of color or grayscale by defining a new, larger pixel size called a dither cell.



**Using an 8- by 8-square dither cell, the printed pattern is perceived as the solid color below:**



Scatter works in a manner similar to pattern, producing more shades of color or grayscale, but it randomizes the placement of dots of ink, reducing the geometric dot patterns sometimes seen with the pattern halftoning method.

The number of colors your printer can print is determined by the computer system and software applications you are using. Once the colors available through the software application are determined and the dithering method is specified, your printer driver prints dots of ink on the page in the appropriate color combinations.

ColorSmart through the Macintosh or Microsoft Windows printer driver automatically chooses the best halftoning method for the elements on the pages you want to print.

You can, of course, override ColorSmart and select the halftoning methods and other color settings you want from the available options.

See the printer software guide that came with your printer for more information on using your printer's color controls.

## ***Matching the Screen Colors***

The ColorSmart feature included with your printer's Microsoft Windows or Macintosh printer driver automatically examines your document and selects settings that optimize your output by matching screen colors and adjusting them to produce vivid colors suitable for the elements you are printing.

## ***What's Next?***

Specific information about using your printer's color settings is given in your printer user's guide. Suggested references for more information about designing with color are listed in the following bibliography. Other reference books about color use are available from your local library or bookstore.

Most important—Experiment with your printer and **have fun using color!**

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# Glossary

## **additive process**

A process where colors are formed by the emission and combination of different intensities of red, green, and blue light, such as color phosphors on a computer monitor, to produce the appearance of various colors.

## **bleeding**

A print quality problem where two different color inks printed side by side run into each other. *See also* **mixing**.

## **blooming**

A print quality problem where ink absorbs into the paper, spreading beyond the ink dot size applied to the page.

## **color**

The combination of color phosphors on a computer monitor or inks on paper that one perceives as color.

## **color wheel**

A useful device for determining color relationships, the color combinations to use, and the combinations to avoid.

## **complementary colors**

Colors that lie opposite one another on the color wheel. Red and green are complementary colors.

## **composite black**

A black composed of a mixture of cyan, yellow, and magenta ink from the color print cartridge. When these three colors are printed on top of each other, they appear almost black on the page.

## **contrast**

The degree of difference between the lighter and darker colors. The greater the degree of difference, the greater the contrast.

## **CYMK**

Acronym for cyan, yellow, magenta, and black. CYMK refers to a method of specifying color using CYMK color values.

## **dither cell**

A matrix made up of single dots of the eight basic colors that is perceived as a color shade when viewed at a distance.

## **dithering**

*See* **halftoning**.

## **gradations of black**

The range of tones from black to white. *See also* **grayscale**.

## **grayscale**

Representing color in black and white. Different colors and saturation levels of color appear as different shades of gray.

## **halftoning**

The method by which dots of the three colors from a color print cartridge are combined on the page to produce millions of colors. Also known as dithering. Pattern and scatter are two color blending methods. *See* **pattern** and **scatter**.

## **hue**

Hue is the color name, such as blue, red, or violet.

## **intensity**

The amount of color. More intense or more saturated colors are more pure. Less intense or less saturated colors are less vivid.

## **line weight**

The thickness of the lines used in a graphic image or the stroke weight of text characters.

## **mixing**

The result when black ink printed next to or touching color ink runs into the color ink.

## **pattern**

A color blending method where dots of ink are dithered in geometric patterns and then printed on the page to produce millions of colors.

## **phosphor**

A substance that emits light when excited by radiation. Phosphors on a computer monitor emit either red, green, or blue light.

## **pixel**

Abbreviation for "picture element." A picture element is the smallest element on a computer monitor or in print. On a computer monitor, a pixel consists of three color phosphors.

## **related colors**

Colors that lie close to one another on the color wheel. Blue and violet are related colors.

**resolution**

The number of dots available to represent graphic detail in a given area. On a computer monitor, resolution is measured in pixels per inch. In print, resolution is measured in dots per inch.

**reverse**

White type against a black or colored background.

**RGB**

Acronym for red, green, and blue. RGB refers to a method of specifying color using RGB color values.

**saturation**

The vividness or amount of a color. *See* **intensity**.

**scanner**

A device for converting continuous-tone and line artwork into digitized data.

**scatter**

A color blending method where dots of ink are dithered in a random manner and then printed on the page to produce millions of colors.

**shade**

One color that varies slightly from the next.

**subtractive process**

A process where colors are formed by the absorption of certain colors of light and the reflection of the remaining color of light to produce the appearance of various colors on a page.

**value**

The relative lightness or darkness of a color with respect to black.

**wicking**

A print quality problem where ink spreads along a fiber or fibers in the paper, creating a "spiderweb" effect.

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