Printing 101

revised may 2008

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Quick Guide to Printing

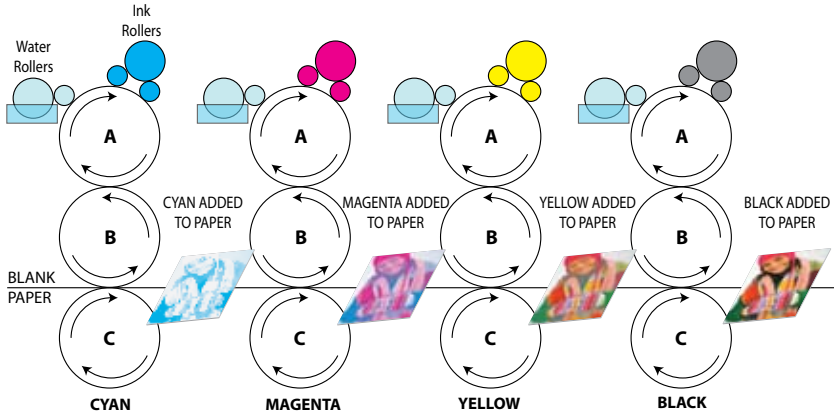
Layout to Print

1 Original artwork (photographs, illustrations and text) is scanned and entered into a computer.
2 These elements are combined into a document using page layout software.
3 Full size films of the document are output using a high-resolution imagesetter. Film in the offset printing process are negatives. (Some modern presses can eliminate the need for creating negatives by using a "direct-to-plate" process, outputting from the page layout software directly to the printing plate).
4 Printing plates are made from the films using a photochemical process. The plates are exposed to high-intensity light through the films and then chemically treated so that non-image areas are water absorbent.
5 The flexible plates are attached to the plate cylinders of a litho press and the job is printed.

Offset Printing

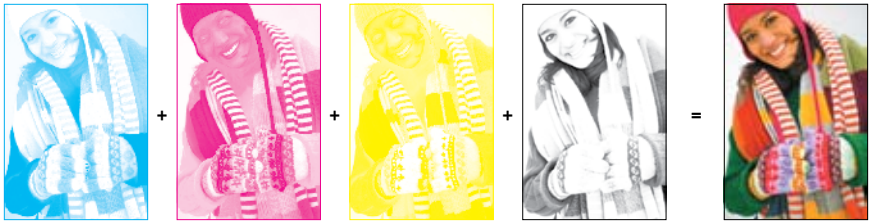
This process relies on the principle that oil and water do not mix. The image area of the printing plate is etched and treated so that oil-based ink is received onto the plate, but not water. Presses contain separate printing units for each color. A four-color press has units for cyan, magenta, yellow and black. The paper travels in succession through the separate units to complete the piece.

The printing plate is hung on the Plate Cylinder (A) where it is dampened by the Water Rollers. It then picks up ink from the Ink Rollers. The inked image is transferred onto the Offset Cylinder (B). The paper is fed through the press, squeezed in between the Offset Cylinder (B) and Impression Cylinder (C) transferring the inked image onto the paper. As the paper is fed through the press each successive color is added to printed sheet.

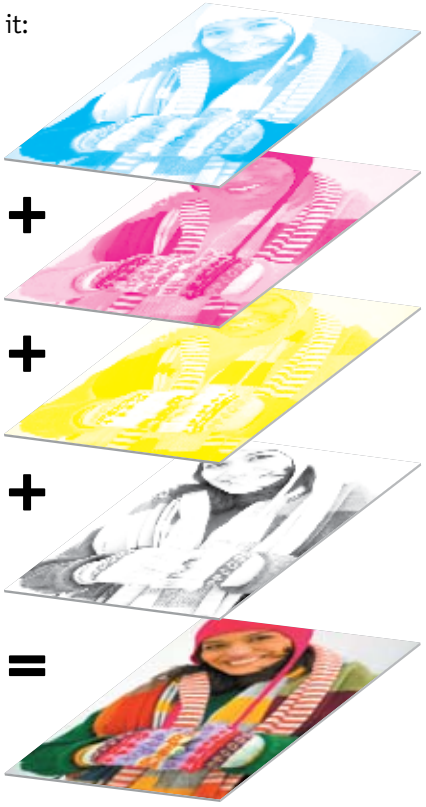


4C

Process Color (also known as Full Color or 4 color): A color mode made up of varying amounts of cyan, magenta, yellow and black (the four colors used in commercial offset printing) dots that overlap to create the illusion of a large number of different colors.



Another way of looking at it:



Spot Color

In offset printing, **spot color** is any color generated by an ink (pure or mixed) that is printed using a single run.

The most common and widely used spot color system is the Pantone Matching System. Also known as PMS colors, this system contains more than 1,000 different colors created by mixing different values of the 15 base colors. PMS colors represent a far greater spectrum of color than can be reproduced in standard process (or CMYK) color. O**ften, these colors are used to help define a corporate identity.** Because process (or CMYK) printing cannot accurately represent the full spectrum of PMS colors (see example below), some companies will also print spot colors in addition to the process colors in advertisements or marketing materials. This creates a consistency and matching of the corporate identity throughout all of a company's materials.

Because MPA Media prints in process color only, additional spot colors in advertisements cause problems. Additional spot colors create additional printing plates to be generated in the printing process. Our printer, however, only generates the printing plates needed for process printing (cyan, magenta, yellow & black). If an advertiser has a logo in their advertisement that is in a spot color it will not show up in the printed piece because the printing negative needed to reproduce the color will not have been generated.

Often, the Graphics Department of MPA Media can convert a spot color to process (CMYK) color. Because of the narrower spectrum of process (CMYK) color, some of the spot colors can shift or change when converted to process. Since these colors can shift, we prefer to have the client convert the spot colors before the ad is submitted, so that they can correct and color shifts to their liking.

Pantone 374 as a spot

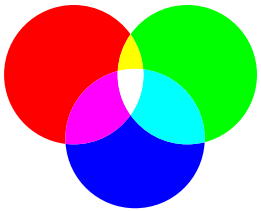
Pantone 374 converted to process (CMYK)

BW

Black & White (also known as grayscale) uses only black ink to reproduce the ad. Files supplied for black & white printing can only be in grayscale mode. CMYK, RGB and Spot Color files are unacceptable for grayscale printing.

RGB = DANGER!

Understanding the difference between CMYK and RGB is crucial when trying to match your colors for printing purposes. Colors that may display brilliantly on your monitor may look differently when you get your document back from the printer. Here's why.



RGB - Mixing red (R), green (G), and blue (B) can produce a large part of the visible spectrum. When these three colors overlap, they produce white, and hence this is known as an additive color model. Computer monitors produce colors by emitting light through red, green, and blue phosphors. Photographs and artwork brought into the computer using a scanner is captured in the RGB mode.

Since RGB is the color mode of monitors, it has to be converted into CMYK to be printed by a laser printer, ink jet printer or offset press. When artwork is converted from RGB to CMYK, a color shift can occur. CMYK is a narrower spectrum of color and cannot represent all of the colors used in RGB. Because of the possibility for color shift, RGB to CMYK conversion should always be done by the person preparing the artwork. That person has the best idea of how the colors should look and can adjust the artwork to reflect their desired result. When files (pdf or otherwise) are converted by the printer, poor color quality can occur.

RGB file

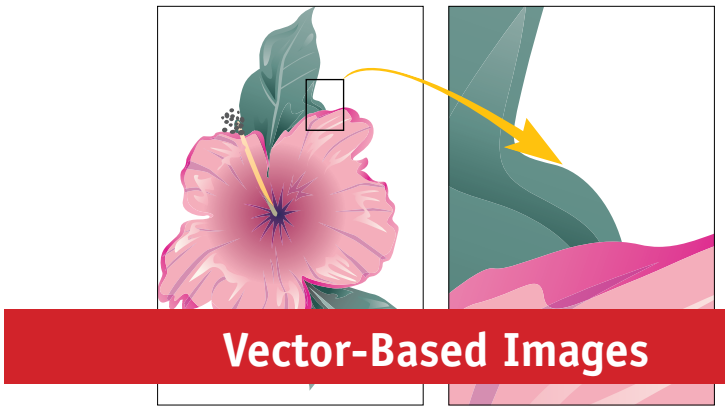
Converted file

*Side note for you clever folks out there: because you cannot actually print RGB files, both of these files are actually CMYK – they've just been adjusted to reflect the poor quality that can happen upon conversion.

Creating Artwork on the Computer
(the Cliff Notes version)

Graphic design programs work in two different environments - Raster-Based art and Vector-Based art. Programs such as Photoshop and Elements are Raster-Based. Programs such as Illustrator, Freehand or Corel Draw are Vector-Based. Layout programs such as InDesign, Quark Xpress, or Pagemaker are primarily Vector-Based, but allow for importation of Raster-Based artwork. An explanation of the two different environments follows.

Raster-Based Images



Vector-Based Images

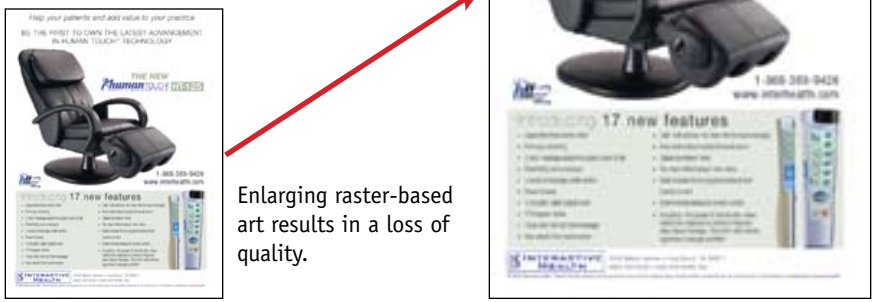
Raster-Based Artwork

A raster image is made up of thousands of little dots or pixels. Creating or editing an image with dots allows you to provide for rich detail in an image. Because every dot can be a different color, you can allow for any kind of color change. Raster images are wonderful for rendering rich, full-color images, like photographs.

Raster-based programs do have some drawbacks, though:

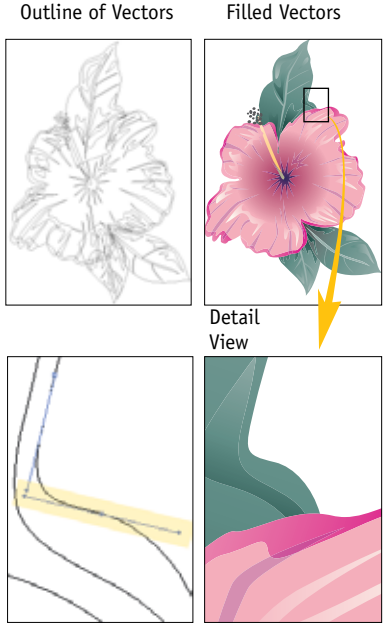
- Raster images do not render type well. Because the type is created using dots, the smoothness of the curves in the letters can become ragged. The smaller the point size of type, the more exaggerated this raggedness can become. Any mis-registration* can cause the type to be fuzzy or illegible.
- Because they are not scalable without a loss of quality, it is crucial that raster-based images be set up at the exact size and resolution of their finished output.
- Because of the amount of information stored within, raster images produce large files. These large files take longer to e-mail or transfer via the Web.
- Rasters do not resize well. When you resize a raster image, the pixels just get larger, making the image appear distorted and chunky/grainy.

*See page 9



Enlarging raster-based art results in a loss of quality.

Vector Based Artwork



Vector-based programs approach image creation in an entirely different manner. A vector-based program does not render images on a pixel-by-pixel basis. In a raster-based image creation program, a square would be made of thousands of pixel dots. In a vector-based program, the same square would be made of only four points, one on each corner. These "vector points," basically allow your computer to play connect-the-dots. Each vector point has information in it telling your computer how to connect each point with straight or curved lines, and with what color to fill in the closed shape. In the printed image, the vector points would be invisible.

Because the computer only has to keep four points in its memory, it is much easier for the computer to edit vector-based images. If you resize a vector-based image, it loses little or no detail. The vector points spread out and the computer just redraws the image. You easily can color, or recolor, a vector-based image very easily using a drawing program. Vector images can also result in smoother lines because the lines are not hand drawn.

- Because vector-based artwork does not use pixels, it is ideal for rendering text. The text will print with smooth edges and curves and can be scaled with no loss of quality.

Vector images do have some drawbacks:

- They are generally filled with a solid color or a gradient but can't display the lush color depth of a raster.
- They also work better with straight lines or sweeping curves.

*Registration

(and it's evil cousin, Mis-Registration)

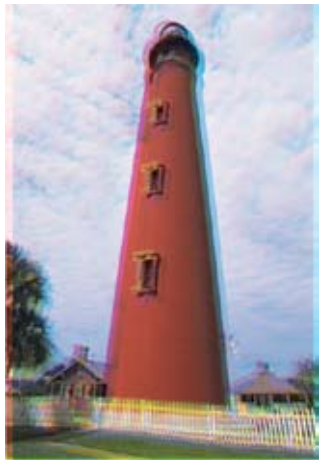
When printing with two or more colors, it is necessary to align the different colors. This is known as register. On the edges of an untrimmed sheet you will see small target shapes called register marks which are used for accurate positioning. A printed piece out of register will have an unfocussed look. When using "reverse" type or white type in a colored box, registration becomes even more crucial. Here are some examples of registered type and images, and mis-registered type and images:

Registered

T

TEXT REVERSED IN A BOX CAN BE TROUBLE WHEN NOT REGISTERED

Mis-Registered



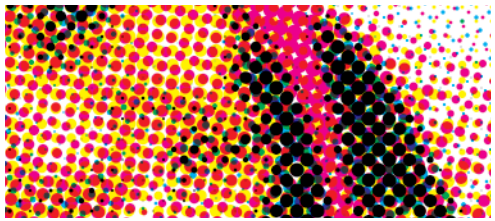
T

TEXT REVERSED IN A BOX CAN BE TROUBLE WHEN NOT REGISTERED

An Explanation of Halftone

Halftone is the method by which photographs and other Raster-Based images are printed by using cells of dots to simulate the tones between light and dark. A printing press is not able to change the tone of ink, therefore dots of color are used to trick the eye into seeing a continuous tone image. To accomplish this, the photo is processed with a screen that breaks the image into tiny dots. The closer the lines of the screen, the smaller the dots and the more dots per inch, leading to a crisper image.

Exaggerated examples of halftone spots in process color (CMYK).



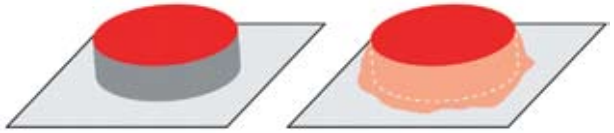
An Explanation of Dot Gain and Ink Density

What is Dot Gain?

Dot gain is the effect of halftone dots growing in area between the original image data and the printed sheet. What causes dot gain? Dot gain is caused by ink spreading around halftone dots. Factors contributing to this increase in halftone dot area include:

- Ink absorbing into the paper
- Ink spreading out onto the paper

Different papers cause dot gain from absorption to a varying degree. Coated papers resist absorption, while uncoated sheets allow a great deal of absorption – and thus show more gain.



The theoretical halftone dot, at left, does not print at its true value. Instead, a tiny amount of ink surrounds the dot, and causes it to grow slightly. The greater the circumference, the greater the amount of gain. In addition, ink can spread on the paper, or be absorbed into the paper (or both), adding additional area to the dots, and causing the measured and illusory dot gain to be greater.

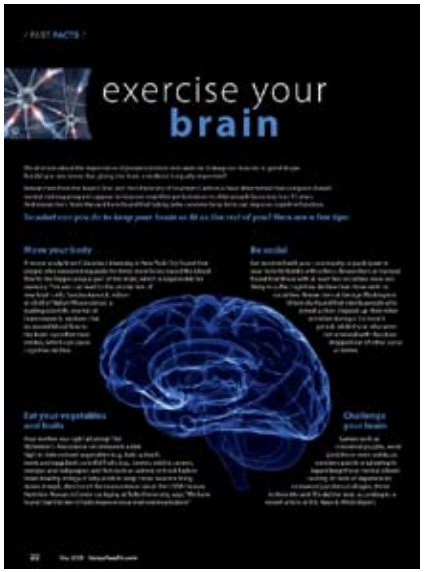
What is Ink Density?

In four-color process, total ink density refers to the maximum percentages of cyan, magenta, yellow and black that can be combined in the image's darkest areas. The theoretical maximum is 400%—that would be each of the four colors printing solid—a situation that no printer could handle.

In practice, the maximum total ink density varies based on several factors, including the type of press (web-fed vs. sheet-fed), the paper stock (coated vs. uncoated), and the line screen used. For instance, a sheet-fed press, printing on glossy stock at a high line screen, may be able to accommodate a total ink density well over 300%. However, a newspaper running on a web-press, printing on newsprint at a low line screen would want the total ink density to remain below 240%.

An Explanation of Rich Black

Ink percentages of cyan, magenta, yellow and black that are combined to make a deep rich black. Using only 100% of black ink alone will appear more faded or bland.



Rich Black

C= 60%
M= 60%
Y= 60%
K= 100%

100% Black only

C= 0%
M= 0%
Y= 0%
K= 100%

Ink Density:
280% (for gloss)

260% (newsprint)

Rich Black used for small type

Using rich black is fine for images but NOT for text smaller than 12pts. because of possible registration problems.

100% Black only

Rich Black (C,M,Y,&K)

Supported Software / File Formats for All Publications

We do not accept files from the following applications: Microsoft Publisher (.pub), Microsoft Powerpoint (.ppt).

We do not accept files in the following formats: Graphics Interchange Format (.gif), Windows Bitmap Graphics (.bmp)

We accept files with the following extensions (please see list below for details): .pdf, .tif, .jpg, .eps, .indd, .qxd., .p70.

Files that have been compressed may have the following extensions: .zip • .sit • .bin • .sitx. Native files with multiple links may be placed into a folder and compressed to reduce file size and prevent corruption.

Acceptable File Formats:

Adobe InDesign 1.0 – CS3 (file extension - .indd)

Adobe PageMaker 6.5 – 7.0 (file extension - .p65, .p70)

QuarkXPress 4.1 – 7.0 (file extension - .qxd)

Adobe Photoshop 6.0 – CS3
(B/W & 2/C spot & 4/C Tiff, EPS or Duo-tone 2/c Spot EPS)
(file extension - .psd, .tif, .eps)

Adobe Illustrator 8.0 – CS3 (EPS Format) (file extension - .eps)

Macromedia Freehand 9.0 (EPS Format) (file extension - .eps)

Corel Draw 8 (EPS Format) (file extension - .eps)

* **Microsoft Word** (File should be text only. Text should be saved as an ASCII Text file or Rich Text (RTF) format. **Graphics must be sent separately.** PC fonts will be matched as close as possible with Mac fonts. (file extension - .doc)

* Most PC formatted files matching the software applications listed should convert to our format using our MacLink conversion application. This does require extra time; therefore, ads sent in these formats may be subject to conversion and/or formatting charges. **ALL Microsoft Word files will be reformatted to meet our ad requirements (Additional charges will apply).**

MPA Media PDF File Requirements

When sending PDF documents for publication by MPAmedia, the following specifications are required:

1. All fonts must be embedded.
2. No OPI tags on images/artwork or any profiles of any kind (such as ICC).
3. Images/Artwork should be at least 200 dpi (300 dpi recommended).
5. Black type should be 100% Black/Grayscale, NOT values of CMYK.
6. It is recommended that REVERSE TYPE (white type) be no smaller than 10 points. REVERSE TYPE in colored boxes is not recommended. Due to the registration tolerances of newsprint/web presses, we cannot guarantee the quality of REVERSE TYPE smaller than 10 points.
7. The Total Ink Density of your advertisement should not exceed 260% for newsprint, 280% for glossy. Ink density exceeding 260%/280% will oversaturate, causing your advertisement to appear darker and muddier than you intend.

4-Color Ads:	CMYK and B&W images/artwork only.
Black & White Ads:	Black & White images/artwork only.
2-Color Ads:	Black & White or Duotone images only. Vector artwork can be 2/c spot but must only be BLACK and only one PANTONE spot color. Spot color will be converted to CMYK process because the entire DC and AT issues are all 4-color (CMYK). **2 COLOR ADS ARE FOR DC/AT ONLY**

Please Note:
Due to conditions beyond our control, MPA Media cannot be responsible for the print quality for any ad that does not meet these requirements. Therefore, MPA Media does not accept responsibility for any ad that does not adhere to these requirements.

Glossary

Black & White: A color mode that uses only black ink. Also known as grayscale.

CMYK: The acronym for the four basic ink colors used in "process" color printing: Cyan, Magenta, Yellow and Black.

Dot Gain: The effect of halftone dots growing in area between the original image data and the printed sheet.

D.P.I. (Dots per Inch) The standard of measurement for the resolution of images. The higher the DPI, the higher the resolution.

Fonts: Files in a computer which define the appearance of text on screen and to the printer.

Line Screen: A measure of the distance between the rows of dots in a printed halftone, usually expressed in lines per inch. The higher the line screen, the better-quality the reproduction.

Links: Any graphic placed into a page layout document that has not been embedded.

Native Files: The original computer files, in their original application forms, for a digital graphic or publication; as opposed to an export format or other transformed format which can no longer be opened and edited.

Pantone: A worldwide color matching system for printing ink, primarily used for spot colors.

Process Color: A color mode made up of varying amounts of cyan, magenta, yellow and black. Also known as CMYK or 4 Color.

Raster-Based Artwork: A raster image is made up of thousands of little dots or pixels.

Registration: The process of aligning the impressions of plates (or colors) on the same sheet of paper.

RGB: The color space of Red, Green and Blue. These are the primary colors of light, which computers use to display images on your screen.

Rich Black: Ink percentages of cyan, magenta, yellow and black that are combined to make a deep rich black. Using only 100% of black ink alone will appear more faded or bland. Using rich black is fine for images but NOT for text smaller than 12pts. because of possible registration problems.

Spot Color: A color mode that uses two, or more, colors of ink to create a multi-colored piece.

Total Ink Density: The maximum percentages of cyan, magenta, yellow and black that can be combined in the image's darkest areas.

Vector-Based Artwork: Graphics defined by groups of lines, circles, text, and other objects.