WHAT YOU NEED TO KNOW

Section No. 1000

AT the risk of stating the obvious, the computer has changed the way we work. It allows us to work faster and smarter. In fact, it has literally given us a new way of seeing things. And for those who have mastered its unique technical language, it has brought the ability to do things that we often have never had either the training nor the experience to do. It has given us control of facets of the production process that have traditionally been handled by skilled specialists, and has blurred the lines of expertise and responsibility.

The purpose of this handout is not to be the most comprehensive ever published on this subject; those books already exist. The point here is to provide faster access to the right information, simplified and organized in a new way.

Within each topic, there are three levels of complexity. **"What You Need to Know"** contains the basic, practical advice required to accomplish a task. **"What You Want to Know"** includes important information not necessarily needed every day. **"What You Don't Need to Know"** is additional technical theory—interesting, but well beyond the basics.

There is one thing the computer cannot change: how much there is to learn about print production. For centuries, apprentices learned the myriad tasks involved, slowly and carefully. Today, we often think we can do it all instantly and perfectly. Unless you're fully aware of the risks, some tasks still are best left to your printer and technical experts.

With these caveats, may you have all the enjoyment and satisfaction that creating and producing a perfect job can bring.

IF THIS IS YOUR FIRST TIME

Chances are your design will end up as an electronic gleam on a silicon chip not sitting on a mounting board. The verities of print production are no longer true, so its wise to make new ground rules; which software you'll be using, how data will get to the printer and who is responsible for which tasks.

WHAT YOU NEED TO KNOW — IF THIS IS YOUR FIRST TIME

Software

Just because you work in QuarkXPress™, or PageMaker™. or even Corel Draw™, doesn't necessarily mean your printer has a copy of that software . . . or (if he does) that it is the same version as yours. Working with your pre-press partners to establish common platforms and versions not only strengthens the working relationship, it avoids problems down the road.

The intelligent use of software can eliminate output problems before they happen. For example, layout programs were designed to create layouts, not logos. Illustration or drawing programs are better suited to create artwork, rather than the meticulous page geometries that make up a layout. Using one program to do it all risks problems during output.

Another potential problem (or strength) is storage and transport media: Syquest™, magneto-optical, or DAT storage tape. Large color files require robust media. But as far as storage and transport media are concerned, compatibility is as important as memory size.

Modem

Modems are not necessarily the fastest way to deliver data; sometimes it's faster to send a messenger with a Syquest. A feasibility test—sending a file over the line—can establish the value and/or practicality of modeming images to the printer.

Responsibility

The most important thing you can do before the job begins is to establish who is responsible for the various tasks required to produce the project. Designers who take on trapping or provide separations should remember that whoever handles these tasks will be ultimately responsible for the outcome on press.

WHAT YOU WANT TO KNOW — IF THIS IS YOUR FIRST TIME

Checklist

More and more often, designers and printers are working with production checklists that ensure that the right information is transmitted in the right format. This practice has become an emerging standard that more designers and printers are considering a requirement for efficient print production.

One example is the Computer Ready Electronic File (CREF™) guideline, published by the Scitex Graphic Arts Users Association (SGAUA). This 40-page standard includes invaluable production advice, tips and tricks, and includes a four-page checklist which will help you and your printer proceed smoothly.

The checklist contains the following categories:

- ***transport***
- ***software***
- ***pre-press process***
- ***documentation***
- ***digital media***
- ***fonts***
- ***text***
- ***graphic elements***
- ***color***
- ***file construction***
- ***workflow***
- ***printing process***

WHAT YOU NEED TO KNOW
— IF THIS IS YOUR FIRST TIME

Compatibility

The basic incompatibility of application programs is a constant source of frustration. Much of this has to do with the way that code is written, the standards that it's based on and the nature of any competitive market.

Every software developer is hoping to write the "killer code" that will become the defacto industry standard—wiping out all competition. But the reality is that there's generally enough competition at large to prevent one package from dominating the market. There's nothing wrong with competition; it fuels innovation. But it can confuse consumers.

Formats

Software code between programs is inherently incompatible; you can't take the code that describes a page in QuarkXPress™ and expect it to work in PageMaker. However, you can output both on the same printer. The PostScript page description language, introduced by Adobe in the mid 1980s, standardizes the way the page is described for output devices, so that you do not need a separate printer for each program you own.

Other standard file formats help you transfer images between programs: TIFF, RIFF, EPS. PICT. PICT2, PCX, WMF, GIF and BMP, etc. Each was designed to carry a certain type of visual information for a different kind of program, from bitmapped artwork to vector files, even to images transmitted over the Internet.

TECHNICAL TERMS AND DEFINITIONS

GLOSSARY

The glossary, is positioned somewhat uncommonly in this hook. Hopefully, it will help with some of the more technical terms and definitions that are used in the sections that follow and which are key to understanding the often complex world of electronic pre-press.

Additive Primaries

Red, green and blue light that produce white light when equally mixed. Compare with subtractive primaries.

Artifact

A visible defect in an image, usually caused by limitations in the input or output process (hardware or software).

Banding

A visible stepping of shades in a gradient.

Bezier Curves

In object oriented illustration programs, a curve whose shape is defined by mathematical formula.

Bit

(Binary Digit) The smallest unit of information in a computer, representing one of two conditions, on or off.

Bitmapped

An image. Formed by a grid of pixels. The computer assigns a value to each pixel, from one bit of information (black or white), to as much as 32 bits per pixel for full color images

Byte

A unit of measure equal to eight bits of digital information. The standard unit measure of file size. See also megabyte and kilobyte.

Camera-ready Art

Any artwork or type that is ready to be submitted for pre-press and printing.

Calibration

Setting equipment to a standard measure for predictable results.

Calibration Bars

On a negative, proof, or printed piece, a strip of color/tonal values used to check quality.

CIE

(Commission Internationale de l'Eclairage) An international group that developed a universal set of color definition standards in 1932.

CMYK

(cyan, magenta, yellow, black) The subtractive primaries or process colors, used in full color printing. Black (K) is added to enhance color and contract. Theoretical result when combined equally at 100% of value would be black.

Color Correction

The process of adjusting an image to correct for scanner or process camera color imbalances or for the characteristics of the chosen imagesetter.

Color Proof

A representation of what the final printed job will look like. Prepared in advance of actual printing.

Color Separation

The division of an image into its component subtractive colors for printing.

Comp

Comprehensive artwork. Used to indicate general color and layout.

Cromalin™

A color proofing system developed by DuPont that uses powdered pigments instead of ink.

Crop Marks

Printed lines used for final trimming, showing the trim size of the final printed piece.

CT

(Continuous Tone) A file format used to describe high-resolution scan information. An image which has not been halftoned.

DCS

(Desktop Color Separation) A color file format which creates five PostScript files for each color image: C, M, Y, K, and a data file about the image.

Density

The degree of opacity of an image on paper or film.

Dot Gain

A printing artifact in which dots print larger than desired, causing changes in colors or tones.

dpi

(Dots Per Inch) A measure of the output resolution produced by printers, imagesetters, or monitors.

EPS

(Encapsulated PostScript) A file format used to transfer PostScript data within or between compatible applications.

Four-Color Process

The use of cyan, magenta, yellow, and black dots to simulate a wide variety of colors.

GCR

(Gray Component Replacement) A technique for adding detail by reducing the amount of cyan, magenta, and yellow in chromatic or colored areas, replacing them with black.

Gradation

A smooth transition between black and white, one color and other, or color and no-color.

Halftone Screen

A fixed frequency device used to create a pattern of dots of different sizes in negatives or prints to represent variable tonal densities in an image. See also lpi.

Hue

The wavelength of light of a color in its purest state (without adding white or black).

Imagesetter

A device used to output a computer layout file or composition at high resolution onto photographic paper or film.

Kilobyte

(K, KB) A measure of digital information, equal to 1024 bytes. Abbreviated and referred to as K.

lpi

(Lines Per Inch) A measure of the frequency of a halftone screen (usually ranging from 55-200).

Megabyte

(MB) A Unit of measure of stored data equaling 1,024 kilobytes or 1,048,576 bytes.

Moiré

An undesirable artifact created in printing when halftone screen fixed frequency screen patterns interact across their deterministic grid structures.

Monitor calibration

The process of correcting the color rendition settings of a monitor to match desired colors of printed output.

Monochrome

A black and white display monitor, with no greyscale values.

Object-Oriented

A type of artwork that defines images mathematically rather than as pixels or a bitmap.

Overprinting

Printing over already printed areas. When type is placed over a halftone photo, percentage screen or gradient tint, it is called surprinting.

PICT/PICT2

A common format for defining bitmapped imaged on the Macintosh. The more recent PICT 2 format supports 24-bit color.

Pixel

(Picture Element) The smallest distinct unit of a bitmapped image.

PMS

(Pantone Matching System) A commonly used system for specifying ink colors.

ppi

(Pixels Per Inch) A measure of the amount of image information density.

Process Colors

The four colors (cyan, magenta, yellow, and black) that are combined to print a wide range of colors. When blended, they reproduce only some of the colors found in nature. See CMYK.

Proof

A reasonably accurate representation of how a printed job is intended to look.

Rasterization

Converting mathematical and digital information into a series of dots by an imagesetter for the production of negative or positive film.

Registration Marks

Small crosshairs on film used to align individual layers of film negatives.

Registration

The precise alignment of different films or printing plates to produce a final printed image.

Reflective Art

Opaque artwork prepared so that it may be photographed or input into a computer by scanning.

RGB

(Red, Green, Blue) The additive primary colors used to create images on a computer monitor or other transmitted light device.

RIP

(Raster Image Processor) Part of an output device that rasterizes information so that it may be imaged onto film or paper.

Rosette

The pattern created when color halftone screens are placed on conventional screen angles. Actually a minimized form of moiré.

Scanner

A electronic device used to read the densities of original copy or images and convert the data into digital information so it can be manipulated, output or stored on a computer.

Screen Angles

The angles used to offset the different film layers in conventional process color separations.

Screen Frequency

The number of lines or dots per inch in a halftone screen.

Service Bureau

A business that specializes in outputting computer files on high resolution imagesetters.

Stripping

The preparation and assembling of film prior to platemaking.

Subtractive Primaries

The inks (cyan, magenta and yellow) used in printing to approximate the visible spectrum.

TIFF

(Tagged Image File Format) A file format for exchanging bitmapped images (usually scans) between applications.

Trapping

A pre-press technique which allows for slight variations in registration during the press run. A trap is created by overlapping adjacent colors in type and line work.

UCR

(Undercolor Removal) A technique for adding detail by reducing the amount of magenta, cyan, and yellow in neutral areas and replacing them with black.

LAYOUT AND DESIGN

Technology should never be in the business of telling design what it can and cannot do. Not so long ago, however; output technology was actually dictating design concepts. That was before PostScript Level 2, which truly advanced the case for WYSIWYG work. It provided an environment that truly made “what you see” on your monitor “what you get” in your output.

WHAT YOU NEED TO KNOW

LAYOUT AND DESIGN

Image Capture

There is a dividing line between the desktop and the high end, beyond which technically aggressive design concepts will require expert help. Placing text over a blend, then layering a graphic that throws a feathered drop shadow onto it will require a high-end image manipulation system—and a talented operator. Desktop programs are not facile at placing soft-edged shadows on transparent images.

When capturing images for output, you should be careful to scan them in the appropriate resolution for the end use. Scanning a PhotoShop™ file at 1200 dpi, for example, is unnecessary. If the press prints at a 300 line screen (which is high resolution for conventional jobs) scanning at any setting above 600 dpi simply wastes valuable memory.

Nested Files

In general, it is better to copy and paste the elements of a complex illustration than to "place" them. For example, if the intent is to create an EPS file made up of numerous elements, saving each elements as a separate EPS file and using the "place" command to import it into the next element's file will create a "nested EPS file" which can be difficult to output. It is better to copy and paste the elements from file to file, and then save the final illustration as a single EPS file.

Fonts

It is vitally important that you furnish a complete listing of all fonts used in the document. All fonts have I. D. Numbers to help printers clarify which font has been used. Fonts that are embedded in vector art files should be listed separately.

Type styling such as "bold" or "italic" offered within layout programs' toolbars or style menus can create confusion. For example, shadow attributes from the layout programs make kerning awkward and limit color usage. Instead, use the style offered in the font menu item at the very top of the screen.

Type created in pixel-based image editing programs like PhotoShop requires much more resolution than continuous-tone images, but rendering typography with sharp outlines requires at least 600 ppi in available resolution.

Blends

An element featuring a graduated color or tone is often called a "blend"; most printers still refer to this effect as a "degrade" or "vignette." Using the blend/gradient creation tools in the page layout software can created banding and other undesirable artifacts. It is better to create the gradient effect required within a vector based graphics program and import it into the layout as an EPS file. Banding artifacts will be most visible in darker colors and tones.

Rules of thumb:

Blends in general, the greater the change in tonal value and the smaller the length of the vignette, the better it will perform.

Hairline Rules

Using a layout programs "hairline rule" setting can he risky; it tells the output device to use the thinnest line it can. The hairline rule will look fine on a laser printer, but when the job goes to a high-resolution imagesetter, it will set a rule so fine it won't be visible.

WHAT YOU WANT TO KNOW
LAYOUT AND DESIGN

Type Formats

The TrueType™ fonts furnished with the Macintosh and Windows operating systems can create more problems than their Type-1 counterparts. The safest route is to remove the TrueType fonts from the System Folder, and replace them with the equivalent PostScript™ Type-1 fonts. It is critical that you not remove any fonts reserved for the operating system uses–consult your computer's manual.

Type created in vector-based drawing programs like Illustrator™ and Freehand™ can be converted to "outlines" which are treated like any other kind of drawn elements in your work. These converted types outlines are treated as conventional EPS files.

Rules of thumb:

• Type: Never mix more than two colors and make one of the colors 100% value.

• Type "knocked out" from a process black should be both larger and sturdier than type knocking out against a single or spot color.

Postscript

PostScript is a device-independent page description language (PDT) developed by Adobe in the mid-1980s that provides a link between input and output devices. It converts everything on the page (type, graphics, scans, colors) into code, which the output device reads and interprets. The ability to quickly turn that data into hard copy is dependent upon the efficiency of the Raster Image Processor (RIP).

A Way to Mix Type and Illustrations

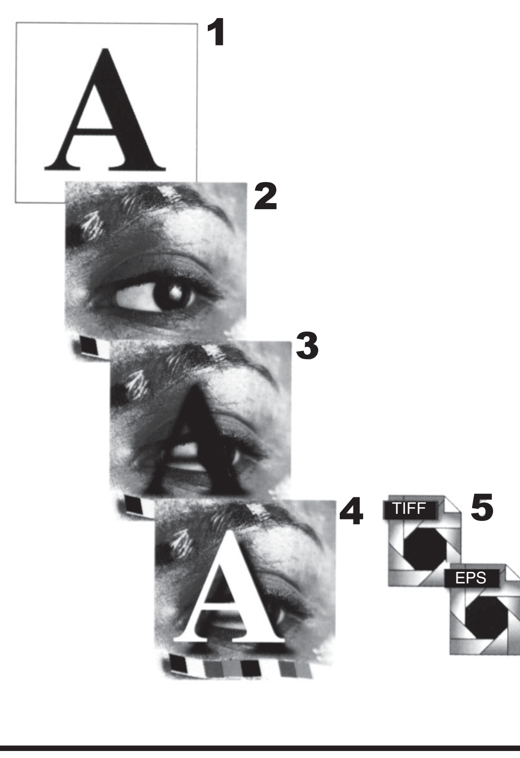
1. Create the basic typographic or illustrative effect in a vector-based illustration program like Freehand or Illustrator.

2. Create background artwork in your pixel-based image-editing software like PhotoShop.

3. Import the vector artwork into PhotoShop. Using the artwork as a mask, offset it and create a drop shadow. Remove the mask.

4. Since output resolution of type is better in a vector-based program, import the newly created background, with drop shadow, from PhotoShop back into Illustrator or Freehand. Place the type over the drop shadow.

5) Save the resulting composite file in either TIFF or EPS format for inclusion in your layout.



PAPER

Specifying the paper for any project requires care and forethought. The objective is to select a paper grade that is not only appropriate to the job at hand, but will perform consistently on press. The decision should be made earlier rather than later, and at every stage in the process, you should plan the design and mechanicals with the paper stock in mind.

WHAT YOU NEED TO KNOW

PAPER

Specifying Paper

There are three basic decisions necessary for specifying paper. They are grade, surface, and weight.

Papers are categorized by the AFPA (American Forest and Pulp Association) into #1, #2, #3, #4, and #5 grades, based on brightness, as the following chart indicates.

Quality	*Brightness*
Number 1	*85.0 to 87.9 inclusive*
Number 2	*83.0 to 84.9 inclusive*
Number 3	*79.0 to 82.9 inclusive*
Number 4	*73.0 to 78.9 inclusive*
Number 5	*72.9 and below*

Brightness is reflected light. With lower brightness, overall contrast is reduced, and highlights are dulled. Brighter papers cost more, in general, since brightness is a result of adding costly additives like titanium dioxide to the stock.

Not all papers within a given grade category are equal, however. Differences in ink holdout, smoothness, opacity, the amount of coating, side to side consistency, and runability must be taken into account as well.

Papers come in a variety of surface types, and once again, individual stocks vary within a classification. The most common coated surfaces are cast-coated, gloss, dull, matte, and embossed; uncoated grades come in a wide variety of finishes such as smooth, linen, vellum and felt. Each of these surfaces will provide different print quality and overall appearance. Each has its strengths and appropriateness for a particular job.

Most grades come in a variety of weights for both cover and text. Having a dummy made before you specify weights is invaluable, since it allows you to check for opacity (put a page of type behind one of the unprinted pages) and for the overall "hand" of the piece.

Before you choose a stock, look at printed and unprinted samples and talk to your printer, paper merchant, and/or mill representative.

Runability

Each grade of paper behaves differently on press. A paper's ability to absorb ink uniformly (absorbency), printed ink gloss (holdout), dimensional stability, and surface texture are all important factors to consider when preparing your design. For example, a paper with excellent opacity will present crisp, full-color images without "showing through" on the back of the sheet, and can provide more flexibility when designing and laying out the printer's form.

Holdout

Holdout refers to a paper's ability to hold ink on the surface consistently, so that it will dry in a sharper, more clearly defined dot and produce higher ink gloss. When ink is absorbed into the sheet, it spreads, creating a phenomenon referred to as "dot gain."

Recycled Paper

It has become a design statement to use recycled papers with flecks of dark coloring. The irony is that you need not compromise image quality for the sake of recycling correctness.

There are many good examples of smooth, clean, and white recycled paper—and it can be indistinguishable from virgin fiber paper.

WHAT YOU WANT TO KNOW

PAPER

Fingerprinting

Printers "fingerprint" their presets with a variety of different papers. In fact, they often have specific performance data for the combination of paper, press, and pre-press techniques being used. Printers can be invaluable in helping specify a sheet.

Paper Checklist

It is critical to look at printed samples when evaluating the following paper characteristics. Only when a dot pattern is on the paper can a comparison be made:

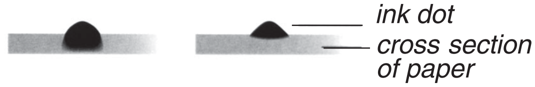
• Brightness: the paper's ability to reflect a volume of light.
• Whiteness: the ability to reflect all colors of light equally.
• Holdout: the ability to uniformly hold ink on the paper's surface. Higher holdout means a sharper dot and increased ink gloss.
• Opacity: the ability to hold an image without its showing through the other side of the sheet.
• Smoothness: the even and consistent continuity of the surface.
• Finish: ascertain the appropriateness of the paper's finish to the desired end result. For example, a gloss finish offers the ultimate in reproduction detail, while dull and matte finishes offer easier reading for large quantities of text.

WHAT YOU DON'T NEED TO KNOW

PAPER

Opacity

There are two types of opacity: "apparent opacity" refers to the actual opacity of the unprinted paper itself: "printed opacity" is affected by holdout, in that the lessened opacity is actually caused by absorption of ink.



Left: *as ink is absorbed into a sheet of paper the printed opacity of the page decreases, causing the image to show through on the back.* ***Right:*** *better holdout helps prevent show-through.*

IMAGE

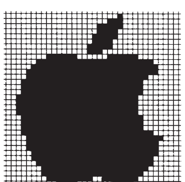
Every full color image that comes off a press is performing a rather elaborate trick on your mind. The printed image of a photograph may appear to be an infinite array of colors in a continuous play of light and tone. In reality, every one is a series of dots, which fool your mind into thinking that you are looking at a photograph. Capturing these images for use in your computer, and turning them into dots, is the subject of the next section.

WHAT YOU NEED TO KNOW

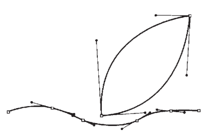
IMAGE - IMAGE CAPTURE

Bitmaps and Vectors

Today, the single most important tool for image capture is the scanner which translates still images from film or paper into electrical impulses. Scanners describe images by dividing them into grids called "bitmaps." Bitmaps allow computers to process images by recreating the tone and color values of each square in the grid. Each of these squares is called a "pixel," or "picture element," which is the electronic version of a printed dot.



Bitmap



Vector

Bitmaps, also called "raster files" usually describe photographic images, while "vector" files typically describe illustrations. Remember that bitmap files store images as grids, while vector files (labeled ".EPS files" or object-oriented artwork) store images as equations, lines, Bezier curves, and fills. Work you perform in PhotoShop is stored as a bitmap file, while that created in Adobe Illustrator or Freehand is saved as a vector file. Vector art will always provide the highest-quality images your output device is capable of. Vector files are smaller than bitmap files, and are easily used by all page layout programs.

Scanning

It's common and quite acceptable to use desktop scans for FPO (for position only) images. Some designers are even using desktop scans as backgrounds in composite images they create on high-end image manipulation systems, in partnership with system operators. Desktop scanners have come a long way, but only the very expensive ones even begin to rival the high end scanners.

Most desktop scanners simply cannot capture shadow density and highlights adequately—not at the same time, anyway. You can try to compensate by adjusting brightness and contrast in the software settings. This will change the image dramatically but still will not provide acceptable shadow density and highlights. When working on an important project with an adequate budget, plan for high-quality scans up front.

Planning for proper resolution is the key to getting the most from a desktop scan, assuming you want to put on press. As a rule of thumb, scan resolution should be twice the screen frequency you will be printing, when the reproduced image will be the same size as the original. Plan for even greater resolution if you are going to be enlarging the image when it is printed.

WHAT YOU WANT TO KNOW

IMAGE - IMAGE CAPTURE

Device-independent resolution is the major strength of vector-based graphics. Any vector art can be infinitely scaled up or down, with no effect on the resolution of the final printed image. The ultimate resolution of the artwork is determined by the device that prints it.

File Size

A 4 x 5 transparency scanned at 300 pixels per inch (ppi), same size, will fill 5.5 megabytes—before conversion to CMYK. An image with enough data for a full-bleed magazine cover might occupy 25 megabytes on a hard drive, or more. To figure out how large your image files are going to be, simply use the equation:

$$\text{Image size} \times (2 \times \text{ls})^2 \times 4 = \text{file size}$$

where ls = line screen, and the factor of 4 is for C, M, Y, K. Your file may be a little smaller due to the fact that the real image area of a 4 x 5 transparency is actually a little smaller, but this formula is a good rule of thumb.

Line Screen and Resolution

Lets start with a 4 x 5 transparency we want to reproduce at the same size in print at 155 lines per inch (lpi). We must scan the original at 300 ppi to capture enough data for the halftone conversion process (if 155 x 2 - 310, call 300 ppi “close enough”). But scaling the original up in size will diminish the amount of data available. For example, if scaling the original to 200% (8 x 10), we will need twice the data, so our scan must capture 600 pixels per inch. Conversely, if scaling the original down, you can scan at a correspondingly lower frequency.

Dynamic Range

Some new scanners aimed at the desktop production market are capable of some truly stunning results. But most popular desktop scanners have limited “dynamic range” – they cannot capture as much subtlety in tone and detail as their professional counterparts.

APR and DCS

Before the new output standard called PostScript Level 2, skewing and rotating images on desktop systems was not advisable because of processing time, Now, workflow systems like Automatic Picture Replacement (APR™) and Desktop Color System (DCS™) work more efficiently. APR and DCS allow designers to take low resolution files from the printer’s high-resolution scan, manipulate them on the desktop and reunite them with the high-resolution parent files at the printer’s facility.

WHAT YOU DON'T NEED TO KNOW

IMAGE - IMAGE CAPTURE

Dynamic Range

Dynamic range is typically discussed in terms of "D-Max," a measure of the tonal range available from your scanner. Most professional level scanners have a D-Max rating of 3.7 to 4.0, while consumer desktop scanners usually have a rating of 3.0 or lower. However, the latest drum-style and flatbed desktop scanners are rated at 3.2 to 3.4—a definite breakthrough for desktop designers.

Nyquist Requirement

The "twice-times line screen" rule is called the Nyquist requirement. It generally holds true for conventional halftoning and color separation techniques. Some of the new halftone binar-ization algorithms claim to require less data to be effective. Some of the very newest frequency modulated-based screening algorithms may require dramatically less information to render at a comparable level of quality. Talk to your printer/separator to understand your options.

WHAT YOU NEED TO KNOW

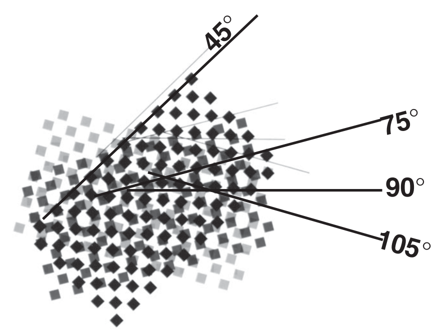
IMAGE - SCREENING

Imagesetters

Imagesetters create dots by very precisely placing spots on RC (resin-coated) paper or film. The process of converting digital information into dots is call rasterization. While the printed dot is the smallest amount of ink that can be put on paper, an imagesetter can place a spot of such remarkable precision that it is possible for one printed dot to be made of many imagesetter spots. To successfully create the illusion of continuous tone, those spots need to be placed very precisely—that's why calibration of the imagesetter is so important.

Moiré and Screen Angles

One of the main things printers and separators try to avoid is screen conflicts. A moiré is an example of how screens come into conflict and ruin the illusion by imposing an accidental pattern. The four screens in a color image (C, M. Y, K) must be placed at precise angles to avoid the screen conflicts while creating a perfect, printed rosette. The most common screen angles used are 90° for yellow, 75° for magenta, 105° for cyan and 45° for black. If you're handling your own separations, be sure that the screen angles you select are right for the press. To be certain, you should talk to your printer or separator.



NORMAL 4-COLOR PROCESS SCREEN ANGLES FOR OFFSET LITHOGRAPHY

WANT TO WANT TO KNOW

IMAGE- SCREENING

Screening

"Screening" refers to the now-obsolete technique of placing an etched sheet of glass over continuous tone artwork. Photographing the artwork through the glass broke the image down into printable patterns or dots.

A quiet revolution has been going on in screening technology since the photomechanical days. It began with the era of precision imagesetters, which changed the way that images were converted into screens, or dots. Imagesetters replaced the photomechanical screens with software. The algorithms by which the software screens you image are, of necessity, quite complex. The point is to create a pattern that doesn't look like a pattern; one that, in fact, appears to be completely random.

There are many different screening techniques available and many different dot shapes. Each technique has its own advantages. There is no single best method for all types of imagery. With help from you printer, you can even consider mixing and combining techniques for optimized results on press.

Rules of thumb:

- ***Newspapers: line screens between 85 and 120 lpi***
- ***Cold Web: line screens between 120 and 133 lpi***
- ***Heatset Web: line screens between 133 and 150 lpi***
- ***Sheetfed: line screens between 150 and 200 lpi***

Are you certain that you want to be responsible for problems that appear on press that are related to your films? In many ways, the division of responsibility the old workflow offered was superior. There's a lot of technical detail to be mastered in proper screening. Ask yourself if you want to be a separator or a designer.

New Techniques

The advent of computers in printing is bringing back techniques that were ruled out as too experimental for photomechanical screening. Some of the emerging "high fidelity color" screening techniques are becoming more prevalent. Be sure you printer has experience with them. New "hi-fi" screening centers around the ultra-high frequency (240 lpi and above) and frequency-modulated (FM) or "stochastic" screens.

Unlike conventional fixed frequency screening, (variable size dots spaced evenly), stochastic screens use very small dots of the same size and vary their relative positioning to create changes in density. Because there is no regular grid upon which to base dot position, there are no screen angles to contend with, and therefore no moiré. In addition, frequency modulated screening techniques allow an image to be printed with color quality comparable ton conventional screening using far less image data.

Because of the fact of a fixed frequency screen and the small diameter of the individual dots (approx.14 microns) this technique can actually rival an original photograph and while dots are actually used, can have no apparent dots at all.

COLOR

The first thing to remember about color is that color monitors do not accurately represent ink on paper because they create color differently than do printing presses. Monitors add red, green, and blue phosphors to create colors; presses combine cyan: magenta: yellow, and black inks to

COLOR

Spot Color

The best way to specify spot colors accurately is to use a spot color reference guide like the Pantone Matching System™, TruMatch Color Reference™, FocalTone™, or Toyo Ink™. It is critical that the colors' names and numbers be specified in the layout or illustration software.

The most common errors in defining desktop colors are easily avoided. Often, the Process Separation button in layout programs is overlooked. If it set to ON, every color—including colors intended to be printed as spot colors—will be printed as a CMYK separation. Spot colors must be specified as such, by setting the Process Separation button (in Quark Express) to OFF so the color will not be generated as a CMYK match.

Process Color

Some colors, called "process tint matches" are intended to be created by mixing tints of process colors. Here, the swatch books are most accurate at designating what percentages of CMYK will be used. Some software programs will take the same Pantone color and generate different CMYK percentages that do not work as effectively. Spectrophotometers can be sued to analyze artwork beforehand, in order to compare it to proofs later on.

Proofing

Because of the RGB/CMYK discrepancy, it is important to proof the job early and often. Knowing how the paper will perform is as essential to effective pre-press proofing as electing the right color. Since each grade of paper behaves differently, it's wise to select a proofing system that accurately depicts the sheets dot gain, holdout, and surface texture.

WHAT YOU WANT TO KNOW

COLOR

Proofing

Computer monitors create color by adding three phosphors together (red, green, and blue). This is known as the Additive Theory of Color.

Proofing systems and printing presses create color with four inks or dyes: cyan, yellow, magenta and black (K). This is known as the Subtractive Theory of Color. The resulting "color spaces" are different, which is why proofing is so important.

Thermal-transfer proofs or desktop ink-jet printers provide a rough idea of your job's color, early on. For greater color accuracy, Fiery™-calibrated color laser prints or dye sublimation printers are effective, but still too inaccurate for final sign-offs. Better yet are high-resolution color ink-jet proofs (Iris proofs)—and the new digital pre-press proofing systems. Cromalin™ proofs are based on colored toner powders and can vary according to the skill of the practitioner. New digital proofing systems such as Kodak Approval™ proofs can accurately represent line screen, dot structure, trapping and even dot gain on different papers.

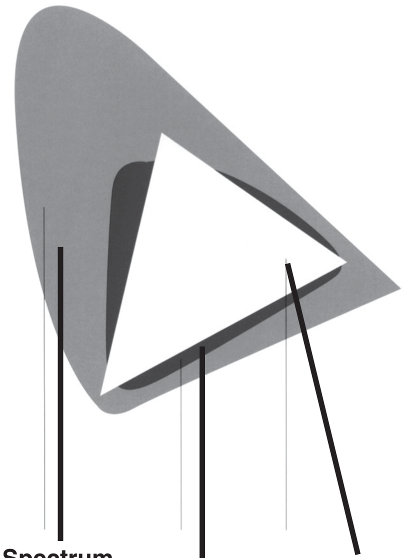
Rules of Thumb:

• Color test charts can be output in the different proofing formats for future reference. Keep copies of press runs and proofs to build a reference file.

• Significant color shifts occur when spot colors are converted into their CMYK equivalents, and some convert more readily than others. Using a process conversion reference guide will help predict the actual tone and value you will see on the press.

• GCR and UCR (gray component replacement and undercolor removal) can wreak havoc with images if they are not used properly. Some color experts recommend adjusting GCR to "light" and negotiating any use of GCR and UCR with the printer.

Color Spaces



Extra Trinary

The RGB "colorspace" is capable of defining many more colors than can be made using CMYK ink sets. Most of the bright, vivid color—so attractive on you monitor—cannot be recreated using conventional color separation techniques. There are a variety of emerging "extra-trinary" (more than three primaries) printing techniques capable of greatly expanding the range of printable colors on conventional pressed. One example is the Pantone Hexa-Chrome™ system.

Calibration

The bars you see at the side or top of a printed sheet are referred to as calibration bars. They are there to help the printer ensure that the press is running properly. The point is to be sure that the proper amount of ink is being put on the paper. These are primarily for the press operator, and cannot be properly evaluated without special tools such as reflective densitometers. Most so-called calibration systems merely modify the luminance channel of your monitor. This is not enough. Products like Pantone's POCE™ (Pantone Open Color Environment) and Color Drive™ software, LightSource's ColorTron™ (a 32-band spectrophotometer with great software), and Apple's ColorSync™ 2.0 (system level device characterization profiles and management) go much farther to give you a more accurate calibration.

PREPARING
FILES

When sending the disks to the printer or service bureau, there are guidelines that will make everything much easier for everyone involved. The most important thing is to provide and identify all files pertinent to the job. Industry checklists can make this task much easier.

WHAT YOU NEED TO KNOW
PREPARING FILES

Preparations

Printers like to be able to trace images back to the source. Consequently, most printer checklists specify that all image files should be sent to the printer. The point is to send not just the output EPS file (which cannot be modified), but the working files as well. That way, if the printer needs to make a client-authorized correction he'll have the original file from the application program.

It's also advisable to send all screen and printer fonts to the printer (in compliance with your font licensing agreement). If there are problems with font ID conflicts, this will help straighten things out.

Trapping and Registration

Overprinted type, line work and vector illustrations must be trapped before printing to prevent misregistration on press. Trapping refers to the techniques needed to be sure that adjacent objects print without unsightly gaps or hard lines where certain colors abut. Special preparation is required to make these elements print correctly, and most designers let the printer handle traps.

Most printers these days prefer to insert their own registration marks, and almost all prefer to set the width of the trap themselves.

WHAT YOU WANT TO KNOW
PREPARING FILES

Checklist

The CREF standards mentioned earlier can be invaluable in helping designers an printers establish how best to work together.

Rules of Thumb:

• To avoid confusion, write what's in the disk on the disk and number all disks. It's important to include a directory of files and diskettes, as well as a hard copy, marked up for color and image placement.

• File names should be understood intuitively, including the date of the latest revision in the name.

• What printers and separators ask for most often:

• a hard copy proof, including FPO's transparencies, reflective art, logos, line art, type and registration marks.

• page layout file

• live TIFF files (real artwork files, not FPO's) placed in the document

• live EPS files (real artwork files, not FPO's) placed in the document

• parent files of any EPS files in the document

• screen fonts (if there may be conflicts)

• a checklist of everything sent

WHAT YOU DON'T NEED TO KNOW

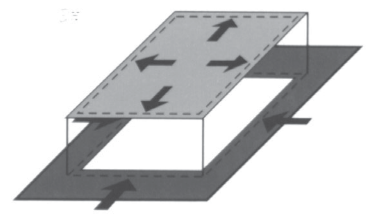
PREPARING FILES

Trapping

Traps are necessary because of what happens to paper on the press. Some types of stock tend to stretch a bit (some more, some less), and even the most accurate presses vary in their ability to hold plates, blankets and paper in absolutely strict registration. Many factors determine the amount of trapping you will need for different elements in you layouts: the accuracy of the imagesetter, what part of the roll your film came from, the kind of press being used, the mechanical condition of the press, the kind of paper specified, the printing process being utilized, etc., to name just a few. Also, different screening algorithms exhibit different behaviors; halftone screening acts differently than frequency-modulated/stochastic screening.

Traditional trapping

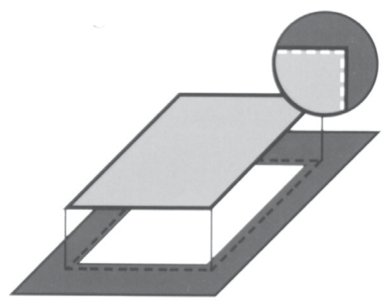
Cyan spreads, Magenta chokes



Traditional trapping is handled at the printer or color separation house. The borders of the two abutting color areas are physical changed. A stripper alters the film in the photographic process to allow one color area (in this case, cyan) to "spread" slightly, and the other color (magenta) to "choke" inward, thus closing any gap between the two on press.

Desktop Trapping

Line overprints. Fill, knock out



At the desktop, the process is slightly different, while the effect (to compensate for press inaccuracies) is the same. A third color—a line of a carefully calculated composite color—is printed over the area where the first tow colors join.