Analog

Photomechanical (Analog) Proof

An analog proof requires that film negatives or positives be made in order to produce the color proof. Analog proofs can be categorized as either an "analog position proof" or an "analog contract proof".

An analog position proof provides an overall concept of the color scheme for the project, as well as the design format. Because the colors that are used to make the proof do not coincide with the colors utilized with the printing device, it is never used as a guide to match the color with the final printed piece.

The analog contract proof is used as the final version approved by the customer, in which the colors of the final proof are expected to match. The analog process utilizes film negative color separations of the primary subtractive color components of the image (cyan, magenta, yellow) and black. The separations in turn are used to create separate layers containing colored toners (color key) that match closely with the primary ink colors used when printing the project. The individual layers are sandwiched together to produce the full color effect. The separation negatives are also used to create the printing plates.

Analog proofs come in several types:

- **Blue Line** - Sometimes called a Dylux, it is a one-color proof made from all four separation films. It is used to check the **imposition**, text, layout, and traps, but it is not used for checking color. Most systems use a vacuum frame to hold the film or flat in contact with the light-sensitive coated sheet. An ultraviolet light source then exposes the emulsion to create the image. There is no processing involved. It can be folded, trimmed and stitched to approximate the finished job. The proof is bluish in color, and the image fades with time.

- **Composite Overlay Proof** - One of the trade names for a composite overlay proof is Color Key™ (Kodak). Each layer is a separate color overlaying each other. The colored layers usually represent the color separations (cyan, magenta, yellow, and black) and/or any spot colors. Most systems use a vacuum frame to hold the film layers or flats in contact with the light-sensitive coated sheet. The light source exposes the emulsion and the product is then processed. This process occurs for each color layer. The layers are taped down to any stock to be registered with the other layers and are usually put into the order in which they will be printed at the press. The composite overlay proof can be useful for checking color breaks, trapping, text, and layout, but it is not as good as other types of proofs for matching color at the press. The illustration below shows how four layers, representing the process colors, are taped down so that the individual layers can be registered.

- **Composite Integral Proofs**
    - **Precoated Subtractive** - An example of a precoated subtractive proof is MatchPrint™ (Kodak). A negative for each color is placed on a laminated color sheet receiver stock, exposed to ultraviolet light, and then processed. A precoated subtractive proof can take about 30 minutes to produce. Consistent densities, dot gain, and color are the main advantages of this type of proof.
    - **Additive** - An example of an additive proof is Cromalin (DuPont). An additive proof is made by hand-mixing powdered toners into "recipes" for each color. The toners are available in color kits that can be used to create many pantone colors. If you do not want to mix toners to create the pantone color you need, you can order individual pantone colors from Dupont. The toners are also available in metallic and fluorescent colors. The proofs are prepared by adhering a clear photosensitive sheet onto a substrate, exposing the material with the film. After exposure the clear laminate is peeled from the base substrate leaving exposed adhesive. The adhesive then accepts the powdered

toner which is applied and brushed off by hand. This process is repeated for each color and can be made on any stock. An additive proof takes about 30 minutes to produce.

The advantages of an additive proof are: there is not a limit on the number of colors that can be used, you have the ability to mix your own colors, and you may apply any density that you desire. The main disadvantage is the inability of the colors to be consistent. The inconsistency is due to the hand mixing of the colors, which may cause a slight variance in the colors each time they are mixed.

Some types of analog proofs can show spot colors (PMS) and can be produced with different types of paper so that the result is a closer match to the final piece. Analog proofs will also show the line screen and screen angles in the film. Problems such as **moiré patterns** may also be present.

Consistency with any type of analog proof depends on the calibration of the proofing system and by using color bars on every proof. Even with current digital technology, traditional analog proofing is still the dominate method of color proofing, although digital proofing is quickly growing in acceptance.

Tips for checking an analog proof for accuracy

Tips for checking an analog (film-based) proof for accuracy:

1. Make sure the proof is the correct size and that it is at 100%.

2. Make sure the proof is in register by checking the registration marks.
3. Check for scratches, dust or any other marks that would be on the film.
4. Check the text. Line up the proof with a laser copy to check for line endings, correct color, and correct typeface. It should have been proofread and checked for accuracy before this step, but it is a good idea to check it again to be sure.
5. Check all of the images. Are they clear and sharp with good color? If you are using

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Color Matching

The color gamut of different proofing technologies and printing processes usually do not match. Part of the color gamut that can be achieved by the proofing system is not possible with the printing process. Trying to match the proof colors with print colors is where a **color management** system can help.

Using a color management system and the application of ICC compliant color profiles will help to produce quality proofs that will ensure the same color on press. In order for color management to work, rigorous quality control measures must be utilized, kept current, and employed often.

Color Viewing Booth

Color is affected by the type of light in which it is viewed. Different lighting conditions will change the appearance of the color on a proof. For example, the colors on a proof will look different under fluorescent lighting than when viewed under sunlight. The colors surrounding the proof will also affect the colors of the proof. Because of the affect that different lighting will have, a standard viewing conditions have been established within the graphic arts industry. In order to accurately view color, a color viewing booth is a necessary item. A proper booth should use 5000 degree Kelvin lighting (standard daylight) with equal color temperatures in each part of the spectrum, and no reflections from surrounding surfaces.

Contract

Contract or Final Proof

The term "contract proof" is defined as a proof that becomes a legal contract between the producer and the customer, once the customer has signed the proof. It must be understood by the customer that the proof does not represent the exact appearance of the press sheet. Proofing material is often brighter than what is used in the actual printing and it almost always has greater image density than a press can deliver. The contract proof only simulates and predicts the appearance of the final printed piece. It is used in the pressroom as a guide to compare colors while the piece is running on the press. A contract proof can be produced as:

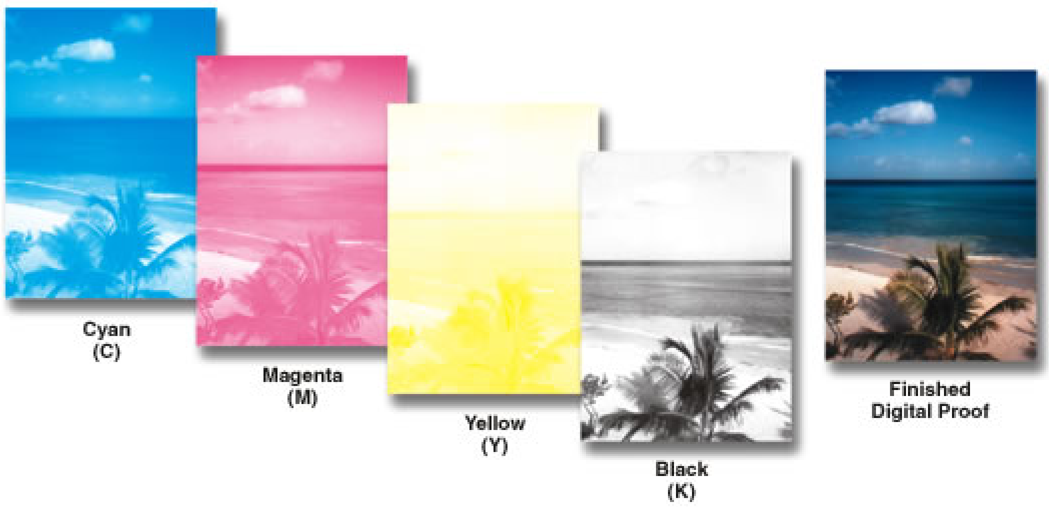
- a photomechanical (analog) proof from the film
- a digital proof from a digital file
- a press sheet as a press proof

Digital

Digital proofs are made directly from the computer authored digital file without creating a set of films. The digital file is the same file that will be used to create the printing plates. The quality of digital proofs has improved to a level that is acceptable for use as a contract proof, which is necessary as the industry moves to a filmless workflow. Further improvements involve proofing systems that create proofs containing halftone dots, which gives a more accurate representation of the image to be reproduced.

When using digital systems for proofing, be aware that the device(s) need to be color calibrated often to maintain color accuracy, and color bars should be used on every proof.

A digital proofing process involves printing each of the subtractive primary color components of the image (cyan, magenta, yellow), and black on one pass through the output device to create the full color digital proof as shown below.



Different types of digital color printers are:

Digital Sublimation

A digital sublimation proof is the closest of all digital proofers to the analog proofing method. Like the analog method, the transparent colorant is transferred from a sheet or roll (called ribbons) of clear polyester base, which has been coated with the colorant. The ribbons are brought into contact with a receiver sheet and varying temperatures of heat are used to transfer the colored material in the image area to the receiver. The colorant begins as a solid and then it is heated to become a gas. Once the colorant is on the receiver, it cools and becomes a solid again. This procedure is completed for each color. Most systems can transfer the colorant to the actual printing stock either directly or as an additional step. The digital sublimation proof system requires little maintenance and is reasonably consistent.

There are two different types of sublimation proofers, dye sub and laser sub. The dye sub uses dyes to create the color on the proof and the heat required in the proofing process is supplied by a thin pointed metal stylus. The laser sub uses pigments to create the color on the proof and a laser is used to provide the heat that is required.

Dye Sublimation Proofers were the first of the sublimation systems on the market. The proofs are called Dye Subs. They utilize a series of thousands of styluses and dye based colorants, which are relatively inexpensive and reasonably fast. The disadvantages are: the dye colors on the proof will fade with time and may not match the color at the press; the proofs must be viewed under proper lighting conditions; the process has limited resolution and produces a continuous tone effect.

Laser Sublimation Proofers are the first of the dot oriented digital proofers. This system is much more expensive and is slower than the dye sub system, but the quality has been considered equal to the analog proofing system. The laser sublimation proof system has been optimized for dot resolution and dye match to the point where it is currently the standard. The disadvantages of this system are that the proofs can also change color over time and they must be viewed under proper lighting conditions.

Thermal Wax

Thermal wax printers work the same way as the dye-sub printers except the printer ribbon is coated with colored wax instead of using dyes. As the thermal head heats up, the wax fuses to the paper. The thermal wax printer also prints only one process color at a time so the paper must be fed into the printer four separate times to produce the full color image. Thermal was printers produce a stronger color than the ink jets, and they are much faster, but they are also move expensive.

Inkjet

Inkjet printers range from inexpensive desktop units suitable for letter size paper to floor units capable of printing banners that are 36" wide and several feet long. The ink comes in bottles containing the process colors and is sprayed from nozzles onto the paper. Instead of printing a single row of pixels, the ink jet printer prints a series of rows, vertically, each time it travels across the sheet.

Some systems use six-colors to get 'photographic-quality' output. The six-color inkjet printer add light cyan and light magenta inks which produce more subtle flesh tones and finer color gradations than the standard four colors.

There are several types of inkjet technology, but the most common are drop on demand (DOD) and continuous flow. DOD works by squirting small droplets of ink onto the paper. A continuous flow system works with a continuous flow of very small droplets of ink directed toward a receptor base mounted on a spinning drum. In locations where color is not needed, the droplets are deflected and captured by a waste collection system.

Since the proofing substrate is much whiter and glossier than most papers, the proofs usually appear better than the printed piece. To compensate for the paper difference, some inkjet systems allow a simulation of the paper to be printed on the proof, by printing the paper color with the rest of the document. Also, some printers allow you to use the same paper that will be used for printing the job on the press. This method of color management is called absolute colorimetric rendering.

The inkjet printers require high-quality coated or glossy paper for the production of photorealistic output. The special paper that is required is composed of two layers. The base layer is paper, and the second layer is a coating which accepts inkjet ink. The surface must allow the ink to dry instantly during printing to avoid smearing and ink spreading. The weight of the paper must be heavy enough to avoid bleed through and curling, but of a weight that can be folded and handled like regular printing stock.

The problems associated with inkjet printers are:

- The ink has a tendency to smudge immediately after printing.
- The proofs are not waterproof.
- They are expensive to maintain. The special coated paper required to produce high-quality output is very expensive, and the ink cartridges which can also be expensive need be changed often. Most systems have one cartridge for the black ink and one cartridge for the other three colors (cyan, magenta, and yellow). If one of the three colors runs out before the other two, the entire cartridge must be replaced.

Color Laser Printer

Laser printers and copiers use a pre-charged drum or belt that conducts a charge when exposed to light. Toner is magnetically attracted to the appropriate areas of the image and repelled from others. The printer transfers the image to the paper where it is fused by heat and pressure.

Color laser copiers, interfaced with fast and powerful RIPs, are now being used by service bureaus, quick printers, and design shops as a way of producing quick proofs or short-run, variable-data digital color printing.

Laser Thermal Imaging Proofer

The thermal proofer is a high-end halftone digital proofer that uses pigment based colors to produce exceptionally high quality proofs. This is the fastest growing type of proofer because it gives the closest match to the actual printing process. It is driven by a single RIP that is also used to produce press plates.

The substrate is attached to a drum and a donor sheet (ink sheet) is attached on the top of the substrate. An infrared diode laser beam strikes the donor sheet and the material is transferred from the colored donor sheet to the substrate. Since the same RIP and laser exposure unit that creates the proof also creates the printing plate, the proof reflects the same dot structure and angles of the printed press sheet.

The following are factors to consider when using digital proofs:

- Dots or no dots - many of the technologies cannot produce proofs with halftone dots. The systems that are able to produce proofs with halftone dots, may not produce dots that are the exact size and shape, or at the same screen angle as those imaged on the printing plate. With the differences in dot size and shape and screen angles, it would be difficult to predict problems such as moiré patterns.

- Another factor is the ability to see the effects of overprinting.
- The key advantages of digital proofs over analog proofs are that the costs can be less than half that of an analog color proof and they are produced in much less time.

Galley

Before desktop publishing, copy was set on a typesetter and galleys of type would be output on an imagesetter to be proofread. The galleys were long strips of type set in the column width that would eventually be keylined. Today in production, text could be set in a word processor program and output on a laser printer to be **proofread**. The laser output could also be called a galley proof.

Laser

The laser printer was the first digital proofing system used for desktop publishing. A document is created on the computer and then sent to the printer in the form of a page description language (PDL), most commonly PostScript. A PostScript laser printer includes a raster image processor (RIP) that converts the information from the PostScript language into information that the print engine can understand. Through the use of positive and negative electrical charges, an image is written onto an internal drum by a laser beam. A developer roller picks up toner and applies it where the image is. The toner is transferred from the drum to the paper, forming the image. The toner is then fused to the paper by passing through a pair of heated rollers. This technology is called Electrostatic Printing, or Xerography, which is the same technology used for photocopiers.

Laser printers have image resolutions from 300 dots per inch (dpi) to 1200 dpi. The printers are used during the design stages for customer approval on initial concepts and also for proofreading purposes. The low cost and efficiency of the printer makes it a good choice for the initial proofing process.

Press

Press proofs are the only way to view an accurate proof, but they can be costly. A press proof involves using a press to generate a printed image before the actual pressrun. It is used mainly to simulate printing processes using the actual plates, inks, and paper. Note that the price of the job may include an additional press set-up charge because of the time involved in producing the press proof and then to set-up the press again when it is time to produce the actual job. If changes are to be made after a press proof, there would be additional costs involved if another press proof is required. However, a press proof is the best type of proof, particularly for projects using stochastic screening.

> **Note:** When different RIPs are used for proofing and imaging the plates, there is some risk that some differences will occur.

Remote Digital

Remote digital proofing is the ability to send a digital file to a remote location to output a proof. Technological advances in digital proofing systems, improved color calibration software, and a wide variety of file transfer options, now make it possible to send files to any location in order to have a digital proof made. Using the file transfer options saves time and money by eliminating the need for overnight courier services and streamlining the proof-approval process.

For the file transfer to be an effective process, you need the following:

- A reliable, fast, and cost-effective method to transfer the file such as a high-speed connection (ISDN or faster), either through Internet access or a private network. The speed of transferring files may vary depending on the size of your files and how often you send them.
- Software that allows onscreen viewing and proofing over a network so that people in different locations can collaborate on a project interactively. People can make notations on different layers labeled with their name and see the comments of other proofreaders as well.
- A color-management system that is accurate across several different computers. Using a color management system such as Apple's ColorSync allows you to apply profiles to an onscreen image, which then displays the impact of press or proof profiles. The onscreen **densitometer** shows the effect of a specific combination of press, paper, and ink on the final output.
- A reliable and consistent proofing device with controlled calibration. Are the proofs used for evaluating color or just for content? Knowing how the proof will be used makes a difference on how exact the color needs to be.
- A color target for the proof and a way to guarantee color at the receiving site:
    - Does the digital color proofing system have a means to adjust the color target to standard industry specifications?
    - Can the system match color to any press or color conditions?
    - Does the system produce consistent and repeatable color?
    - Is consistency measured and the results guaranteed

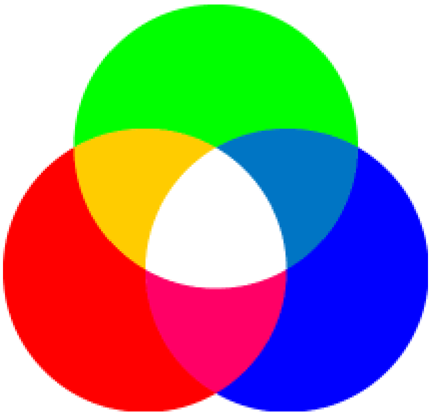
Scatter

Scatter proof is the term used to describe a proof of an individual photo or group of photos that have not been included as part of the complete page layout. Scatter proofs are used to check color before the final proof. Several photos can be grouped and proofed at the same time to save on time and materials. Software is available that automates the grouping process, placing photos in the most space-saving layout. You can also use step-and-repeat for multiple proofs. It is best to view scatter proofs in a color viewing booth with controlled lighting for the most accurate color proofing.

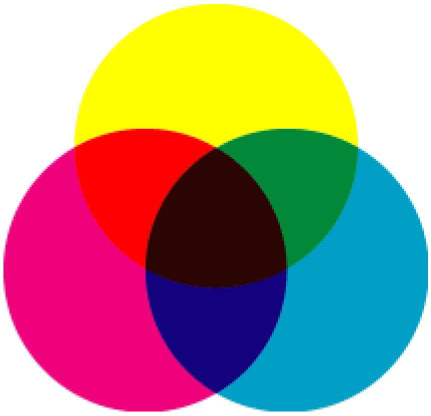
Soft

A color proof on a computer monitor, also known as a soft proof, is based on the "additive color process", where all colors are formed with the additive primary colors, red, green, and blue. The soft proof can be useful during the design process, but it is of very little use as a tool to match with the colors attained through the printing process, whether it be on a printing press or on computer printers. Printing output utilizes the "subtractive color process", with cyan (C), magenta (M), yellow (Y), and black (K) as the colors used to form the range of color. Because of the differences in the color gamut between the additive process and the subtractive process, accurate color proofing, using only the computer monitor, is not effective.

The additive primary colors red, green, and blue, with the secondary colors that are formed, cyan, magenta, and yellow.



The subtractive primary colors, cyan, magenta, and yellow, with the secondary colors that are formed, red, green, and blue.



To be able to view the most accurate color on your monitor, it should be located in a windowless area which is surrounded by a low level of neutral light. It is also helpful if the color of nearby walls is of a neutral gray which will aid in preventing any visible colors surrounding the monitor to influence color vision. A hood that fits over the front of the monitor could be added to keep the ambient light from changing your perception of color.

The monitor's color should be calibrated often because the color gamut can change over time due to age and environmental factors. A calibrated monitor helps ensure a closer resemblance to the final printed piece, although it still won't be exact.

Specifications

All proofs should include the following:

- **Color bars**
- Name, address, and contact person responsible for the job.
- Date
- File identification
- Type of proof (inkjet, MatchPrint, etc.)
- Purpose of proof (text only, color only, contract proof, etc.)
- An area where approval or changes can be noted.
- An area for the customer's signature to indicate approval or acceptance.

Spot Color

The colors used on spot color proofs are also known as "matched" colors, special colors, or by one of the brand names "Pantone" or "PMS" colors. Spot colors are printed from a single ink on a separate printing unit of the press. Spot colors can be standard, pastel, fluorescent or metallic colors. Several colors can be printed in select areas to create two, three or more color jobs. Spot colors can be used on may types of jobs, such as business cards, letterheads, forms, brochures and direct mail pieces.

There are several variables involved with spot colors. A few manufacturers create color guides such as binders, chips, and fan books to show the spot colors and the equivalent process colors. It is important to realize that the color guides fade over time and the paper may change colors so check the date of your guide and replace it periodically.

When you choose the spot color on the monitor, remember that it is simulated in RGB, and not as the spot color or CMYK. Be sure to tear off a chip from the guide and include it with the job.

Remember that if you are trying to match a spot color with process colors, very few colors will match. Many spot colors are outside of the color gamut of process inks. The paper stock that is used for the job will also provide different results than expected. The use of varnishes or coatings can also change the appearance of the color.