

What You should Know About Scanning



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If you're thinking about purchasing a scanner, you may already know some of the ways they can add visual interest and variety to all of your projects. You don't have to be a graphic artist to inject extra punch in a special presentation, newsletter, or brochure. You've probably also heard that by using OCR (optical character recognition) software, the scanner can create an editable text file from any hard copy, such as a journal article, fax, or legal document. But do you really know how simple it is to use a scanner?

This booklet shows you how easy it is. Inside, you'll find the basics of how a scanner works and see samples of scanned images. Useful tips address common questions, such as how to determine the right scanning resolution or make fine adjustments.

DON'T MISS THIS SPECIAL OFFER!

When you purchase your Epson® scanner, send a copy of your bill of sale in the envelope provided in this booklet, and we'll extend the warranty on your scanner for an additional year, free of charge. You receive two years of warranty coverage with benefits like top-notch technical support.



SCANNER TECHNOLOGIES

Several types of scanners are available; the list below summarizes some popular choices.

FLATBED SCANNER

Best suited for most business applications, this scanner looks similar to a desktop photocopier. You place a document on glass and close the cover, and the scan head moves underneath it along the “bed” of the scanner. Originally a gray scale technology, color models are now just as affordable, offering the widest range of uses in a desktop system. A flatbed color scanner is ideal for virtually all uses, from simple line drawings to complex full-color illustrations and photographs.

HAND HELD SCANNER

You hold this type of scanner in your hand and run it over the image. The scan head is limited in size, usually just four inches wide, so you have to piece together wider images using your software. While this is the least expensive of scanner technologies, you’ll need a steady hand to avoid distortions caused by shaky movement.

SHEETFED SCANNER

Developed specifically for use with OCR applications, this scanner feeds sheets of paper into the unit and scans them automatically. You can get similar results by adding an optional automatic document feeder (ADF) to your flatbed scanner.

How SCANNERS WORK

All scanners convert areas of light and dark into digital data for your computer. One of the most versatile scanners for general office use is the flatbed scanner. Scanning an image on a flatbed scanner is a lot like using a photocopier. Here's how it works:

- ▶ **1** You place your document (a photo, book, or any image that you want to scan) face-down on the glass and close the cover.
- ▶ **2** Using the scanner software, you select a few simple settings to adjust the way the image will be captured; then you scan the document.
- ▶ **3** Inside the scanner, a light bar moves over the image and the reflected light falls on a bed of photosensitive cells. The cells “read” the image, interpreting it as a series of tiny dots. Each dot is called a pixel, or picture element. The carriage scans one line of pixels at a time.
- ▶ **4** The software converts the values of each pixel into data that the computer can understand. When the entire document is scanned, the resulting image appears on your monitor.
- ▶ **5** You can print the image as it appears on-screen or you can manipulate it with image editing or graphics software to get the results you want.

A WORD ABOUT SOFTWARE

Your scanner hardware works hand in hand with your software to produce data files. In fact, the most important aspect of getting great results with your scanner is understanding a little bit about the software that creates these files. The rest of this booklet presents software topics that will help you to understand the scanning process. You'll find that scanning software is used to produce two types of files: text files, which contain characters and letters, or image files, which depict some type of illustration. Text files can be edited with an ordinary word processing program. Image files can be manipulated using special software programs called image editors.

FROM PAGE TO FILE-OCRs CAPTURE TEXT

OCR (optical character recognition) programs decipher hard copy words and covert them into editable text files, just as if you had typed them yourself. More powerful programs even recognize a variety of typesyles and page formats.

Why waste time reentering information to get it on disk? For businesses with a steady stream of critical information or any hard copy data that must be converted to disk, a scanner and an OCR program can be real time-savers. You can combine information from many different sources into comprehensive reports, convert old documents to data files for easy storage, capture information from trade journals or papers-the list goes on and on.

Even if you usually use your computer for simple word processing or spreadsheets, you'll appreciate the convenience of OCR. To prove it, Epson includes a leading manufacturer's OCR Try-Pak with each of its scanners, so that you can try out



OCR for yourself. Scan up to 25 pages with the Try-Pak. Try it on a fax, have fun with the daily newspaper, or even that dusty resume you prepared on the typewriter. If you find you're hooked, we offer the full package and documentation at a considerable discount.

IMAGING PROGRAMS: PICTURE THE RESULTS

You can use imaging programs to capture a wide variety of artwork, illustrations, and photographs into image files. Scanned images fall into three categories: line art, gray scale, and color.

Line art includes all drawings made up of black and white only, with no gray tones. Both of the illustrations on the left are examples of line art, even though the artist has used lines that look like shading in the second one.

Gray scale (also called monochrome or continuous tone) refers to images such as black and white photographs that contain various shades of gray in addition to black and white. You can also scan a color photograph as gray scale if you want to print it in black and white.

For color reading, the scanner divides the various colors in the image into three primary colors: red, green, and blue. Epson's powerful 24-bit color scanners devote 8 bits/pixel to each of the three colors, so the scanner can represent over 16 million colors.

Use color scanning for color photographs or other originals which will be printed or presented in color.



Line art



Line art with shading

RESOLUTION

Resolution determines how many pixels, or dots, are used for scanning and reproducing an image. As the resolution value increases, the scanner reads and reproduces the image in finer detail. You might hear resolution described in terms of dots per inch (dpi), or pixels per inch (ppi).

The best resolution setting really depends on the type of image you are scanning and the printing method. The table below shows optimum scanning resolutions for most needs.

Output Device	Line Art	Gray Scale Color	
Black and white printer	300-400	75	75
Electronic color printer	300-400	150-200	150-200
Printing press/ imagesetter	400-800	150-200	150-200

Remember that the higher the resolution, the larger the resulting image file. An 8 1/2 x 11-inch color photo scanned at 300 dpi requires 25MB! Larger files use up your computer and hard disk memory; they take longer to process, to print, or to transmit by modem; and they are more difficult to save to a disk for sending to a service bureau or printing company. Selecting the lowest possible resolution that gives acceptable quality keeps file sizes manageable.



200 dpi/133 line screen



600 dpi/133 line screen

You'll also notice that if you scan a color image at 600 dpi, the printed result is not much different from what it is if you scan the same image at 200 dpi, because all printers and printing presses reproduce the image as a series of dots and have their own maximum resolution.

Here are two images, one scanned at 200 dpi, one at 600 dpi, output on the same device. Can you tell the difference?

An easy way to determine the best resolution for your intended output is to find out the lines per inch (lpi) capability of your printer and multiply it by 1.5. For example, a typical magazine printing press prints at 133 lines per inch. To tailor your scanned image for the best possible results on this press, you multiply the lines per inch (133) by 1.5:

$$133 \times 1.5 = 199.5$$

In this example, the resulting number (200) is the optimum resolution for the scan. (If you regularly use a service bureau to print your scanned materials, you can also ask the printer for the lpi of his particular printing press and to suggest resolutions.)

SELECTING A PRINTING METHOD

You can print scanned images on a variety of devices. Here are three of the most common:



Black and white laser printer



Electronic color printer



Printing press

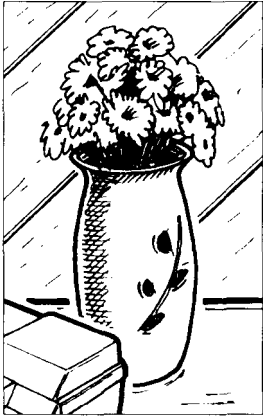
Black and white printers (laser, ink jet, or dot matrix) like those used in most offices produce good to excellent text and line art but are not as good for gray-scale images. You might use these printers to reproduce photographs in newsletters or informal reports that don't require the highest quality. The example to the left shows a typical photograph printed by a laser printer.

Electronic color printers use laser, ink jet, or other technologies to produce color or gray scale images that range in quality from coarsely patterned to nearly photographic (often called continuous tone). Electronic color printers work well for small quantities of color images or for proofs of images you'll later print on a printing press. The image to the left was printed on an electronic color printer.

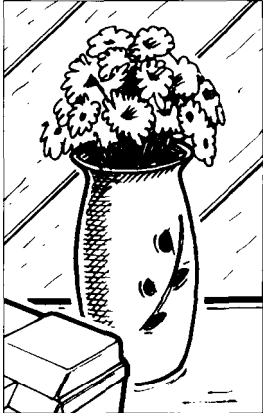
Printing presses can produce high quality and high volume work. You scan and edit your images and then send the files to a service bureau or printing company, which uses a high resolution imagesetter such as the Linotronic™ 300 for high quality text and gray-scale images. For full-color images, you scan in color and then use your image editing software to produce the color separation files that are necessary for printing color on a printing press.

Note: All three images on this page were scanned with an Epson scanner.

WHAT IS INTERPOLATION?



300 dpi



600 dpi, using interpolation

Each flatbed scanner has a maximum optical resolution based on the physical number of light sensors in the bed. For example, a 400 dpi scanner has 400 sensors per horizontal inch. Despite this maximum value, many scanners can use a process called *interpolation* to achieve higher resolutions. Interpolation allows the software to make an educated guess based on mathematical probability to determine the value of pixels it can't see and then insert these values in the final image. Interpolation can be especially useful to improve the jagged appearance in some line drawings, as shown in the samples on the left.

Epson scanners use interpolation to double the scanner's native resolution, so our 300 dpi scanners achieve apparent resolutions of up to 600 dpi, and our 400 dpi scanners attain resolutions of up to 800 dpi. By using the enlargement feature, which goes up to 200% on most programs, you can even "stretch" the apparent resolution on a 400 dpi scanner to 1600 dpi.

ADJUSTING THE IMAGE

Most scanning software offers a common group of scanning settings to help you get the results you want. Many also provide a preview function that lets you see a sample of what the finished scan will look like and check the settings. You may have to experiment a few times to get the results you want, but you'll soon be adept at making minor adjustments to fine-tune your scanned image.

GAMMA AND COLOR CORRECTION

When you scan a color image, you usually want the tones and colors to be as close to the original as possible. Two software functions are particularly helpful for matching your original: *gamma correction* and *color correction*. Gamma correction lets you adjust the light intensity (or tone) in the scanned image so that when it is reproduced—either on your monitor screen or a printer, the resulting image has similar gradations to the original. (The term gamma refers to a curve on a graph that measures the degree of contrast between light and dark.)

Color correction adjusts the color information so that the colors in the reproduced image are close to the original colors. For example, a typical CRT display uses a combination of red, green, and blue to produce the entire range of colors. On the other hand, a color printer usually uses magenta, cyan, and yellow (and sometimes black) to produce the same range of colors. The color correction function processes the image data for the specific characteristics of the color output device you use, to produce it.



Gray scale image



Dropout background

EDITING IMAGES TO MAKE YOUR MARK

Image editing software lets you manipulate a scanned image to fit your intended output device, or to change or repair an image. They work along the same principle as word processing programs, letting you delete things, move things around, or “clean up” a scanned image. For example, you might want to erase tiny specks or imperfections that show up in the printout, to repair areas damaged in the original, or to fill in areas or broken lines. You can also use image editors imaginatively to change the final look of your images, either by eliminating the background, as shown in the example on the left, or by combining several scanned images. You can even change the colors, draw in new details, or stretch an image to fit your space.

CONFIGURING YOUR SYSTEM FOR GREAT RESULTS

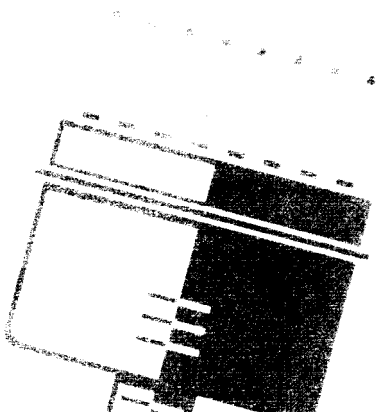
Adding a scanner to your system requires a bit of muscle in your other components. When you plan your system configuration, keep these questions in mind:

- Do you have enough RAM (Random Access Memory) in your computer? How much storage is available on your hard disk? Remember, scanned images use much more memory than text files, so you may need to upgrade your mass storage options or add RAM. You’ll probably need at least 4MB of RAM and a 40MB hard disk drive.

- Is computer performance slower than you'd like? Larger files take longer to process. See if there is an accelerator board or CPU or RAM upgrade available for your system.
- Do your video card and monitor support the resolutions you need to display high quality scanned images? Check the resolutions supported by your current video card to make sure it supports at least 256 colors. Consider changing the existing video card or adding a high resolution video or graphics card to boost performance. For the highest quality you need a 24-bit card (also called true color).
- If you'll do most of your printing in the office on a laser printer, can your printer support the scanned image? The more complex the image, the more RAM the printer needs to store instructions from the computer and compose complex pages. General purpose lasers are usually equipped with 512KB of memory. See if memory upgrades are available.

INTERFACES MAKE THE CONNECTION

Epson offers a variety of scanner interface kits to meet your system requirements. Choose Bidirectional DOS or SCSI DOS for your PC-compatible, or Mac SCSI for your Macintosh®. If you regularly work in both the PC and Mac environments, consider the Epson ES-800C, a scanner that supports both the Mac SCSI and Bidirectional DOS interfaces, so you can share the scanner between both systems.



ADDING OPTIONS TO YOUR SCANNER

You can add versatility to your scanner by installing a few simple options. An automatic document feeder (ADF), designed primarily for OCR scanning, lets you place a stack of up to 30 pages in your scanner for consecutive scanning. You might also add a transparency unit so you can scan transparent materials such as 35mm slides or negatives.

CHOOSE AN EPSON

Epson offers a family of top-rated color scanners; one of them is right for you. Our scanners come with a comprehensive set of software, including both an image editor and an OCR Try-Pak to get you up to speed quickly. Once you experience the ease of scanning and see how much images can enhance your documents, you'll be left with only one question. How did I do without it?

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