Using a Scanner

For those who have not worked with a scanner before, here is a very basic introduction to get started, a brief overview of how it works, how you would actually "use" a scanner. And....a Glossary!

The flatbed scanner is very much like a copy machine, to the extent that it has a glass plate under a lid, and a moving light that scans across under it. Except that scanners can do great color too, and have more controls possible. And like a copy machine, a flatbed scanner allows you to scan photos, paper documents, books, magazines, large maps, or even 3-dimensional objects (those that don't have a lot of depth, coins for example), etc. It scans very much like a copy machine. But instead of creating another piece of paper like a copy machine does, we instead create an image in memory, which we can do with as we please. We have acquired a digital image, and we can show it on the screen, or write a file and email it, or print it, anything we wish.

We must use software to operate the scanner. Some scanner software can operate by itself, and some cannot. Most image editor programs (like for example Adobe PhotoDeluxe or Photshop Elements) have a menu at *File - Acquire* or *File - Import* or *File - Scanner* that you use to scan an image. Sometimes there is a toolbar Scanner icon too. This menu starts the scanner's software, called a TWAIN driver. A fancy word, it is really just another program, but [TWAIN](#) is a software standard that all the scanner manufacturers agree to use, intended so that all image programs can operate all scanners. It wasn't always that way, not so long ago you could use only the one image program that came with the scanner. Today you have your choice of any. (TWAIN is said to be an acronym for Technology Without An Interesting Name, but the organization says it is not an acronym for anything.)

The TWAIN driver itself is simply the software provided by the scanner manufacturer to operate the scanner (the user interface), and it is also the interface between the graphics program and the scanner hardware. It will always have another name too, Epson calls theirs the Epson SmartPanel, Microtek calls theirs ScanWizard, Umax has two, VistaScan and MagicScan, and HP had a version called DeskScan, and the current is called PrecisionScan. The TWAIN driver comes with the scanner, and knows how to operate this one brand of scanner hardware. Each scanner manufacturer provides their own TWAIN driver for their hardware. You can use any image program, but you typically must use the provided TWAIN driver.

The TWAIN driver ordinarily has the controls that we use to specify the scan; we set the mode (Color or B&W or Line art), we set 100 dpi or 200 dpi resolution, we set the area on the flatbed glass that we wish to scan, and there are controls to help correct the tonal quality and color balance of the scanned image. After the scan completes, the TWAIN driver transfers the image into the image program memory. That is, the new image just appears back in the image program. Then you can tweak the image more, or print it, or save it to a disk file.

TYPES of scans . Scanner modes offer the following choices to get image types illustrated by these 50 dpi scans of a small photograph.

Color - "Millions of Colors" above. Scans three color samples per pixel, one each for Red, Green, Blue (RGB), the combination of which is the one resulting color from the 16.7 million color choices possible with 24 bit color. Older scanners made three passes to do that, but today's scanners are single pass, one trip does it all.

Gray Scale, 256 shades of Gray - Like a Black and White Photograph, for scanning photos, pencil drawings, etc.

Line art - only 2 colors, either White or Black. This is the same as fax, or clipart, i.e., no gray. The name comes from ink drawings. It is a very poor choice for photographs, it is much too contrast.

There are ways to improve such images with software, called dithering. Other than fax, you'd need a good reason not to use one of the better modes for photos.

Line art - Line art mode is ideal for pages of printed text.

Halftones - this scanner mode is for images to appear in magazines and newspages. However, this mode is normally NOT used at home, and halftones are never used for video screen images.
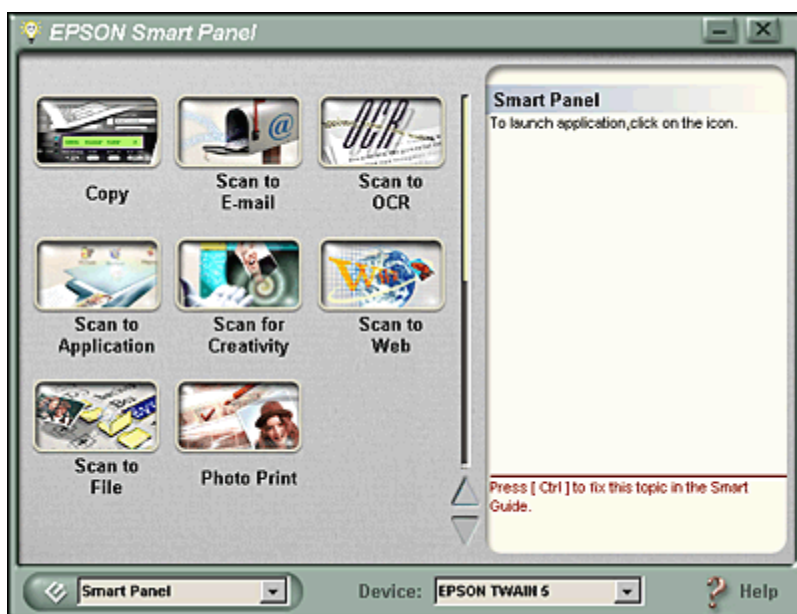
Using the Epson Scanner:

Starting EPSON Smart Panel

Follow the steps below to start EPSON Smart Panel.

| I | Click the **EPSON Smart Panel** shortcut icon on the desktop to start EPSON Smart Panel.

EPSON Smart
Panel

2 The EPSON Smart Panel window appears.

Scan to File

Use this application to scan, convert and then save the scanned image to a specific folder. When you launch this application, an image is scanned from EPSON TWAIN and displayed in the Verify Assistant dialog box. Click **Finish** and the following dialog box appears. For details, refer to the EPSON Smart Panel documentation.
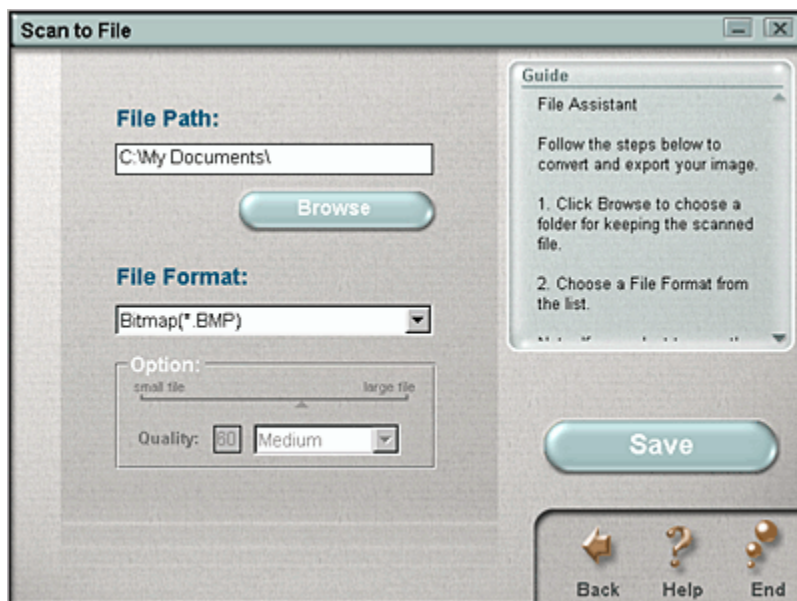
After you've scanned and saved the file you can modify the images you've saved in the image programs (Photo Editor, Photshop Elements, etc... if desired, lighten it, darken it, crop it, resize it, change its color balance, touch up small areas, edit it drastically, apply various filters like sharpening filters or descreen filters, etc, etc.

Scan to OCR

Use this application to scan and convert images to text. The converted text can be saved or sent to a word processing application. When you launch this application, the following screen appears. For details, refer to the EPSON Smart Panel documentation.

You then scan to a word processing application...i.e....WordPad, Microsoft Word, Etc...and make any necessary adjustments, change fonts, run spell check, etc.

Things you can do with a scanner

There's just really no limit...

- Scanning photographs for printing, for web pages, for Windows wallpaper, for emailing images to friends and relatives, images for newsletters or genealogical notebooks, for PowerPoint slides shown in class, etc, etc.   And since these photos are now digitized, you can use editing software to combine images, create special effects, etc.

  Flatbed scanners are very versatile for about all purposes except one. If wanting a huge image for printing 8x10 inches or A4 size prints on a photo quality printer, then a film scanner is much better. This is a limitation when enlarging the color print itself rather than the scanner, but scanning the original negative or slide is the answer.

- Copying documents. Use the flatbed scanner with a laser or inkjet printer as a way to have a good copy machine at home. And unlike a real copy machine, you can use the scanner controls to edit and improve these documents too. A flatbed scanner is particularly versatile, and will allow scanning books and magazines without removing the pages. Some people mention that they scan their important papers and receipts as a way to store them (but frankly, that seems more awkward to me than putting the paper in a file cabinet). Faxing documents with a fax modem. You can fax text files from a word processor of course, but if that text is printed on a piece of paper instead, or maybe in a book or magazine, you can simply scan the paper and fax it too. You fax those scanned images the same way, by "printing" to the fax driver.
- OCR - scan documents and use OCR (Optical Character Recognition) software to convert the image back to editable text, suitable for loading into a word processor. Most scanners include free sample OCR software, but for extensive use, you'd probably want to spend $80 for better.

What is OCR?

If you scan a page of text, like a magazine page, you will get

a *graphics image* of the page, just like any other image. It is not text, it is a picture of a page of text, and can only be viewed or printed as an image. Its form is a graphics image, like a scanned photograph. Its form is not at all the same as if you had retyped the characters from the page into your word processor, which are individual text characters instead.

But the purpose of OCR software is to decode that scanned image of the page, decoding the individual pixel patterns, and it will generate *real text characters* in your word processor, the same as if you did retype the page yourself on your keyboard. This analysis of the pixel patterns is an easy job for the human brain, but it's a very difficult job for a computer.

- Scan real items - coins, cloth, autumn leaves, the cat, whatever. Scanning fabric or wood boards can make some great textures, used maybe for your web page background, etc. 3D objects to be scanned should be more or less flat, without much visible height, perhaps ¬ inch or less for best sharpness. This is not to say you won't get good results with the doll or teddy bear, but the more distant parts will not be sharp or in focus. Shiny metal objects often cause reflection problems, and rotating the object, or perhaps tilting it slightly to change the angle, is about the only lighting control possible. The scanner certainly cannot replace a camera in every case, but it can do a lot. Lighting and depth are the main problems, where cameras offer much more control.

Hardware Requirements

Computer speed is not a big issue, 400 MHz seemed very usable, but 1.1 GHz is faster. Images are often several megabytes now, so system memory is extremely important. 32 MB used to be a lot, but it is quite inadequate today. People talking about 32 MB today probably mean in their video board. 128 MB is the norm today for Win98/ME, and that may be skimpy if you will print full-page images. You will want at least 256MB with Windows XP and maybe more with a film scanner too. Memory is the best single improvement you can make.

Disk space - Lots of large images will consume lots of disk space, more than you can imagine. If you will be active, figure on several hundred megabytes space. Huge fast 7200 RPM 40 gigabyte disks are only about $120 now, and they make a very dramatic difference in speed.

In previous years when memory chips were expensive, video board memory was often too limited to allow large screen sizes. But today's boards have generous memory because it is cheap, and because 3D games need much more memory than photos. Video boards with 4 MB memory will allow 2D 24 bit color mode at higher resolutions (like up to 1168x768 pixels) on a 17 inch monitor, and 8 MB is fine for 2D on a 19 inch monitor, at say 1280x1024 pixels, or more. Scanner images are 24 bit color mode (needs True Color setting in Windows video).

Check at the Windows Control Panel - Display - Settings, to be certain 24 bit True Color mode is selected. If 32 bits is offered, select it instead, for more hardware efficiency than 24 bits (32 bit mode is faster, but it is still 24 bit color). If a larger pixel size or higher color depth setting is not available, it means there is insufficient video board memory present to support it.

If your video is set to 256 color mode for games, it will be very unsatisfactory for a scanner. If you are currently seeing poor quality photo images (but maybe graphics are OK), then your video system being set to only 256 colors is a common cause. Photo images will look bad at 256 colors. In 256 color mode, the 24 bit images from the scanner will be dotted and grainy, speckled and mottled. That is not the scanner image at all, it's probably fantastic. It's just that you can't see it due to the very limited way a 256 color video mode can show a 16.7 million color image.

Scanner glossary

Achromatic Color - The primary colors of light: red, green, and blue, used by scanners, monitors, and other computer devices. When combined, they produce white light.

Anti-aliasing - A process used to remove stair stepping effect found in diagonal lines of an image by inserting dots of an in between tone along the edges.

Array - A grouping of elements such as sensors.

Aspect Ratio - The relative proportion of the length and width of an image. For example, if you scan an original that measures 4 by 6 inches, it will have an aspect ratio of 4:6, or 2:3.

Attribute - Characteristics of a page or character, such as underlining, boldface, or font that can be captured by an optical character recognition (OCR) program.

Automatic Document Feeder (ADF) - A device attached to a scanner that automatically feeds in one page at a time, allowing the scanning of multiple pages.

Auto Trace - A feature found in many object-oriented image editing programs, such as Adobe Illustrator, that allows you to trace a scanned image and convert it to an outline or vector format.

Batch - Actions carried out consecutively on a set of files.

Bilevel - In scanning, a binary scan that stores only the information that tells whether a given pixel should be represented in black or white.

Binary - Base-two arithmetic, which uses only 1's and 0's to represent numbers. 0001 represents 1 decimal, 0010 represents 2 decimal and so forth. Binary numbers are used indirectly to refer to color depth, as in 24-bit or 8-bit color.

Bit - The abbreviation for binary digit, either 0 or a 1. Scanners typically use multiple bits to represent information about each pixel of an image.

Bit Depth - The number of bits used to represent colors or tones.

Bitmap - An image represented as pixels in a row and column format. (Note that Adobe refers to a bitmap as a two-color image.

Bleed - An image that continues to the edge of the page, often accomplished by having the image extend past the edge and then trimming the page to the finished size.

Blend - To improve the transition between image areas by smoothing the boundaries between them.

Burn - To make a portion of an image darker.

Calibration - A way of correcting for the variation in output of a device such as a printer or monitor when compared to the original image data from the scanner.

Camera Ready - Artwork printed in hardcopy form, which can be photographed to produce negatives or plates for printing.

Carriage - The scanner component that moves down a page to capture an image.

Cast - A tinge of color in an image.

Charge-Coupled Device (CCD) - A type of solid-state sensor used in scanners that captures light reflected or transmitted by original.

Chrome - Color, combining hue and saturation.

Chromatic Color - A color with at least one hue available, with a visible level of color saturation.

Contact Image Sensor (CIS) - A new type of image sensor used in smaller, low-cost scanners that has limitations on resolution.

Clone - To copy pixels from one part of an image to another.

Complementary Metal Oxide Semiconductor Sensor (CMOS) - A new type of sensor used in scanners and digital cameras that is based upon a semiconductor process designed for digital electronics instead of analog electronics as in the CCD.

CMYK - The abbreviation for cyan, magenta, yellow, and black.

Color Correction - Modifying the color balance of an image, usually to produce a more accurate representation of the colors in an image. Color correction compensates for the deficiencies of process color inks, inaccuracies in a scan or color separation, or an undesired color balance in the original image.

Complementary Color - The opposite hue of a color, or the direct complement.

Compression - Squeezing a file (especially an image) into a more efficient form to reduce the amount of storage space required.

Contrast - The range between the lightest and darkest tones in an image. In a high-contrast image, the shades fall at the extremes of the range between white and black. In a low contrast image, the tones are closer together.

Crop - To trim an image or page.

Data Compression - A method of reducing the size of files, such as image files, by representing the sets of binary numbers in the file with shorter string that conveys the same information. Many image editing programs offer some sort of image compression as an optical mode when saving a file to disk.

Density - The lightness or darkness of an image or a portion of an image.

Desaturate - To remove color from an image or hue.

Device Driver - A software module that tells your operating system how to control a given piece of hardware, such as a scanner.

Diffusion - The random distribution of gray tones in an area of an image.

Digitize - To convert analog information, such as a continuous tone image, to a binary form that can be processed by a computer.

Direct Memory Access (DMA) - This term refers to the movement of data directly from memory to some other device, such as the disk drive, without first being loaded in the microprocessor.

Dithering - A way of simulating gray tones or colors by grouping dots so they can be merged into a intermediate colors or tones.

Dot - A unit used to represent the smallest element a printer can image, but sometimes used to represent the resolution of other devices, such as monitors or scanners.

Dots Per Inch (DPI) - The resolution of a printed page, expressed in the number of printer dots in an inch, abbreviated dpi. Scanner resolution is also expressed, somewhat in accurately in dpi.

Downsampling - To reduce the amount of information in an image, usually to make it smaller or to discard some colors when changing bit depth. Also used when reducing the number of pixels in an image.

Dropout Color - A color invisible to a scanner during grayscale scan.

Dynamic Range - The range of densities between the highlights and shadows of an image.

Export - To transfer an image to another format.

Filter - An image transform tool used to process an image; for example, to sharpen, blur, or diffuse it. Often this is a plug-in in an image editor, but filters are also built into scanning software or hardware.

FlashPix - A new image format that stores images in a series of different resolutions.

Flat - A low contrast image.

Frequency - The number of lines per inch in a halftone screen.

Gamma - A way of representing the contrast of an image, shown as the slope of a curve showing tones from white to black.

Gamma Correction or Gamma Compensation - The process of preconditioning or adjusting an image to correct for the gamma of the device used to reproduce the image, such as a printer or display screen. Without gamma compensation, the image will look too dark when printed or displayed.

Gang Scan - The process of scanning more than one picture at a time, used when images are of the same density and color balance range.

Graphics Interchange Format (GIF) - A compressed image format popular on the Web. GIF was the first commonly used image format, but was largely replaced by JPEG.

Gray Component Removal - A process in which potions of an image that have all three process colors have an equivalent amount of gray replaced by black to produce purer, more vivid colors.

Grayscale - Gray values in an image.

Halftoning - A method of representing the gray tones of an image by varying the size of the dots used to show the image.

Highlight - The brightest values in an image.

Histogram - A bar like graph that shows the distribution of gray tones in an image.

Hue, Saturation, Brightness (HSB) Color Model - A model that defines all possible colors by specifying a particular hue and then adding or subtracting percentages of black and white.

Hue - A pure color.

Interpolation - A method of changing the size, resolution, or colors in an image by calculating the pixels used to represent the new image from the old ones. It is also being used to increase bit-depth claims on scanners (as in "Enhanced Bit Depth" or "Enhanced Color").

Interrupt - A signal to the microprocessor to stop what it is doing and do something else.

Invert - To reverse an image's tones to its opposite value: to make a negative.

Joint Photographic Experts Group (JPEG) - The JPEG format offers a compression scheme that makes the image file smaller than files in other formats by discarding some of the image information.

Landscape - The orientation of a page in which the longest dimension is horizontal.

Line Art - Images typically consisting only of black and white lines.

Line Screen - The resolution or frequency of a halftone screen, expressed in lines per inch.

Lines Per Inch (LPI) - The yardstick used to measure halftone resolution.

Luminance - The brightness or intensity of an image. Determined by the amount of gray in a hue, luminance reflects the lightness or darkness of a color.

Mask - To cover part of an image so it will not be affected by other operations.

Midtones - Those portions of an image with a value between black and white, usually in the 25 percent to 75 percent range.

Moire- In scanning, an objectionable pattern caused by interference of halftone screens, often produced when rescanning a halftone and the sampling frequency of the scanner (spi) interferes with the halftone or dither pattern of the original.

Monochrome - Having a single color. Typically refers to a black and white image, but could be any single color image.

Noise - Random information that distorts an image, especially the background distortion of an analog image before it is converted to digital format.

Optical Character Recognition (OCR) - The process of converting printed characters into the ASCII characters and other attributes of a bitmapped image of text.

Optical Resolution - The resolution of a scanner that is calculated by dividing the width of the scanned area by the number of pixels in the CCD. Optical resolution is also often called true resolution and does not include any interpolation to increase pixels.

Palette - A set of tones or colors available to produce an image.

Parallel - To move data several bits at a time, rather than one at a time. Many scanners use parallel connections to move image information, SCSI or printer parallel.

Peripheral - Hardware that extends the capabilities of the computer, such as a printer, modem, or scanner.

Pixel - A picture element of an image that refers to a single dot with in a digital photograph. A photograph is made up of thousands of pixels.

Pixels Per Inch (ppi) - The number of pixels captured per inch by a scanner. This is a more accurate rate term than dpi (dots per inch) when applied to scanners because scanners capture pixels.

Portable Network Graphics (PNG) - A lossless file format created to overcome deficiencies of the Graphics Interchange Format (GIF), such as the limited number of colors.

Port - A channel of the computer used for input or output with a peripheral. A scanner interface board includes a special port that the scanner can use to communicate with the computer.

Portrait - The orientation of a page in which the longest dimension is vertical.

Posterization - A banding effect produced by reducing the number of gray tones in an image.

Preview Scan - A preliminary scan that can be used to define the exact area for the final scan. A low- resolution image of the full page or scanning area as shown, and a frame of some type is used to specify the area to be included in the final scan.

Quantization - Another name for posterization.

Raster Image - An image defined by rows and columns of pixels. Scanners capture images as raster images, although some can convert them to vector images.

Raster to Vector Conversion - The process of examining a raster image for lines and strokes, and creating a new image that looks the same but is made up of lines rather than pixels. When a person draws, they are creating a vector image. Vector images can be enlarged much more accurately and often have a smaller file size.

Reflection Copy - Original artwork that is viewed and scanned by light reflected from its surface, rather than transmitted through it.

Rescale - To resize an image.

Resolution - The number of pixels or dots per inch in an image. Also the capability of a scanner to resolve detail, which requires quality optics as well as high ppi or spi.

Retouch - To remove flaws or to create a new effect in an image.

Sample Rate or Samples Per Inch - The number of pixels per inch captured by a scanner.

Saturation - An attribute of a color that describes the degree to which a pure color is diluted with white or gray. A color with low color saturation appears washed out. A highly saturated color is pure and vivid.

Scalable Black-And-White Image (spi) - These images are vector drawings instead of raster drawings and can be enlarged and reduced after the scan without introducing scaling defects. Some HP scanners can create scalable black-and-white images.

Scanner - A device that captures images or text and converts it to a bitmapped image.

Selection Area - The part of a HP Deskscan preview scan that you select to be saved to a file or sent directly to a printer.

Small Computer Systems Interface (SCSI) - A computer industry interface standard used for connecting peripherals to personal computers.

Serial - Transmitting information one bit at a time in sequential order. Used with modems as well as some scanners. USB and Firewire are very fast serial interfaces.

Shade - A color with black added

Sharpening - Increasing the apparent sharpness of an image by increasing the contrast between the adjacent tones or colors.

Smoothing - To blur the boundaries between tones of an image, usually to reduce a rough or jagged appearance.

Threshold - A predefined level used by scanners to determine whether a pixel will be represented as black or white.

Thumbnail - A miniature copy of a page or image, which gives you an idea of what the original looks like without having to open the original file or view the full size image.

Tagged Image File Format (TIFF) - A graphic file format originally developed specifically for scanners. It can be used to store grayscale and color images and now is graphic standard image file format supported by most applications, printers, and scanners.

TWAIN - A software driver interface between a scanner and other image capturing devices that lets you scan images from a scanning application directly into an application like Adobe Photoshop.

Unsharp Masking - A technique used by scanners and image editors to increase the sharpness of an image.

Universal Serial Bus (USB) - An advanced serial interface that supports large numbers of devices. USB is much faster than traditional serial interfaces.

Vector Image - An image defined by the beginning and ending points of each line.

Zoom - To enlarge a portion of an image.

Helpful Sites:

http://www.scantips.com/

http://www.desktoppublishing.com/scanning.html

http://www.jasc.com/tutorials/scantip.asp

http://support.epson.com/documentation.html

http://www.plu.edu/scanning/scantips.html