

## Scanning 101

Office of Transportation Economic Development and Enhancement  
Michigan Department of Transportation

### Scanning Guidelines

Only .jpg or .gif files under 400 kilobytes in size can be used by the online application.

This tutorial takes for granted that the user is familiar with navigating in a window-based environment and that the scanner hardware and software is already installed and working properly. For assistance in the latter, please consult with the documentation that came with the scanner.

### Scanners. What are they?

Scanners are devices that allow the user to copy a document, photo, map or even a 3-dimensional object (providing it doesn't have much depth, such as coins). One of the most common types of scanners is a flatbed scanner, which possesses a glass "bed" through which items are scanned and a lid which covers the glass.

Scanning may be accomplished in one of two ways, though both methods require some sort of software interface. You may complete a scan by:

- Using your graphics program to acquire an image through your scanner.
- Using your scanning utility software that is shipped with the scanner.

Let's look at these methods in more detail.

#### ➤ Using your graphics program to acquire an image through your scanner.

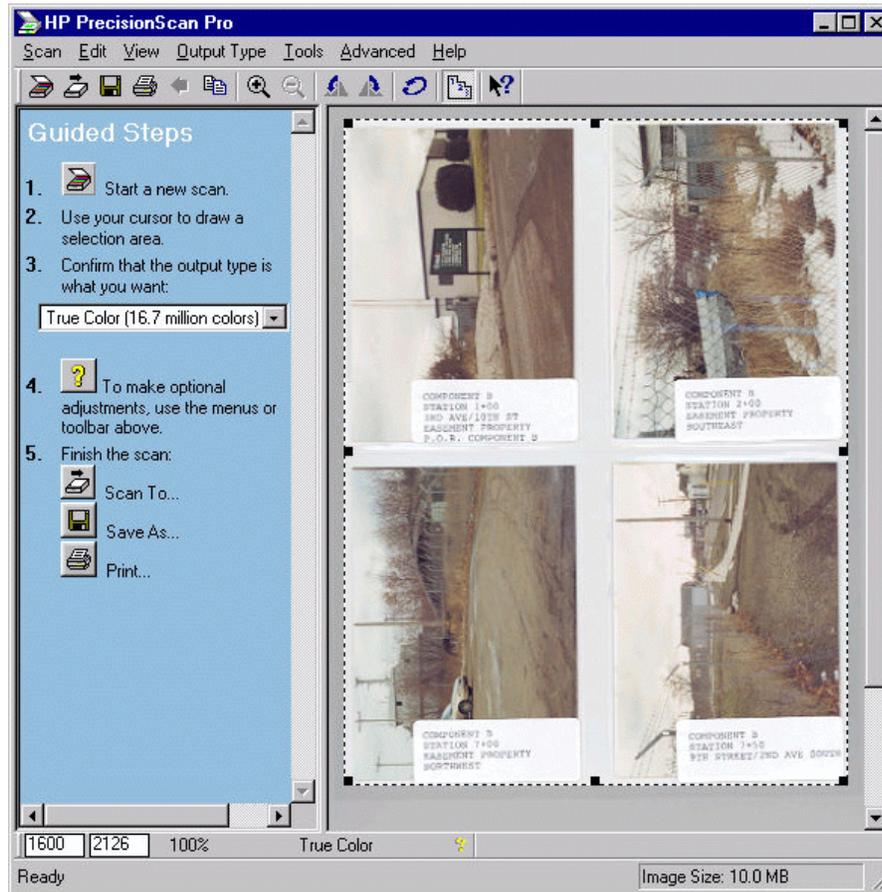
Most graphics programs (programs whose specific purpose in life is to manipulate images) have a menu option under "File", such as "Acquire", "Import" or "Scan", that you use to access your scanner directly. You may find that these options list something referred to as 'TWAIN'. This is a small program that allows the scanning software and your scanner to talk to each other (an example of a hardware "driver"). Scantips.com defines a TWAIN driver as "a software standard that all the scanner manufacturers agree to use, intended so that all image programs can operate all scanners." The TWAIN driver comes with the scanner as part of the scanning software and it is typically proprietary to that specific scanner (though you can use any graphics program you wish). Scanning in this manner can be broken down into a few simple steps:

1. Launch your graphics program (whatever application you plan to use to edit your graphics. Some examples of such software would be Adobe Photoshop, JASC Paint Shop Pro, Macromedia Fireworks or Ulead PhotoImpact).
2. Under the "File" menu option, select "Acquire" (or it could be "Import" or "Scanner" or "Scan" or something of the like). The scanning software that shipped with your scanner should initialize. Once you've completed the scan (see "Using your scanning utility software" below), the image should load into your graphics program for further manipulation.

(Note: There may also be a submenu called "Select Source" or "Select Twain" where you select your TWAIN driver. You must do this the first time you scan. Pick the most appropriate option, then, you when select "Acquire" again (or "Import" or "Scan", et cetera), the scanner's software should initialize. If for some reason it does not, you may choose to do your scanning directly from your scanning utility software that shipped with the scanner.)

## ➤ Using your scanning utility software.

The scanning software that ships with scanners allows a user to set the mode (color, grayscale, line art, et cetera), scanning area, resolution (think 'image size'), and there often controls to aid in adjusting tonal quality and color balance. Upon completion of the scan, the scanning software will display the results and allow you the chance to save, print or further manipulate the image. There are many different brands of scanning software on the market, with each scanner manufacturer supplying their own. For this tutorial, we will try to remain very general. The screen captures we will show are of Hewlett-Packard's "PrecisionScan" software, but don't be concerned if your scanning software is a different brand. Once you are familiar with one scanning software, you will be familiar with how they all work in general.



### Preview

The first step is the "preview" button. When you press the preview button (or "Start a new scan." in this case), you get a quick overview scan of entire scanner bed. A quick low-resolution scan will appear in the "preview window", allowing you to make additional adjustments before completing the final scan, such as repositioning your material, selecting the scanning area and more.

### Select Scanning Area

Once the initial preview is displayed, you have the opportunity to select how much of the preview will be used in the final scan. Typically, this is accomplished by dragging a dotted marquee into position (that's the dashed line surrounding the pictures). You may select the entire preview area or crop the selection area by marking only a portion of it. Once the process has been completed, the selected area will be the area that has been scanned.

## Select Resolution

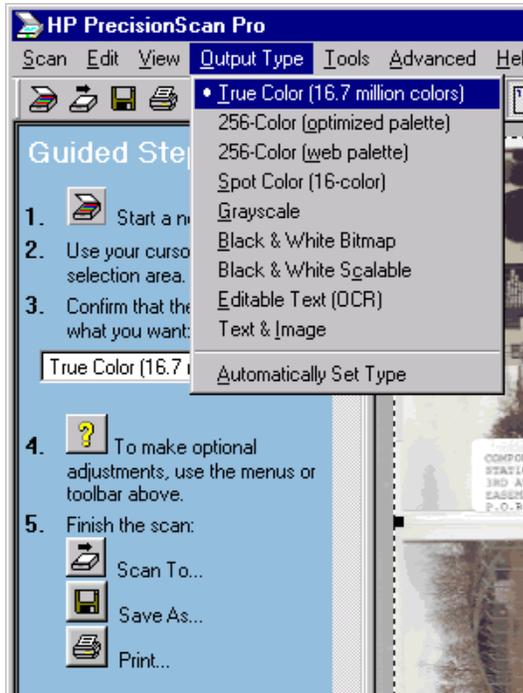
Most scanning software, by default, will try to give you a very large file to work with because it is better to work with too much visual data than not enough. When there isn't enough visual data for the computer to work with (when manipulating the image), the computer has to give its best guess. Sometimes this works, sometimes it doesn't. When it doesn't work, you will need to know how to resize the image in the scanning software. In the image of our scanning software on the previous page, notice the lower lefthand corner. This is giving you the dimensions of the selected scanning area if you were to scan the current selection at 100%. In this particular software, under the "Tools" menu item, you would find an option for "Resize". In this instance, this would be one of the places where you could set the image size.

You can also accomplish the same thing by changing the "resolution" of the image. For instance, 72 dpi (dots per inch) will produce a much smaller file than an image scanned in at 300 dpi. "Dots per inch" is a printer's term, reflecting the quality of the image once it is put to paper. 300 dots of ink to a single inch will produce a much higher quality image than something printed at 72 dpi. When we cross this over to the computer screen, now we're talking in pixels rather than dots of ink. Your average screen resolution is anywhere from 800 x 600 pixels or 1024 x 768 pixels displayed on your screen. Therefore, where you could before place 300 dots (pixels) to a single inch of paper, now you're fixed at a certain displayable area on a screen. This explains why an average sheet of paper (letter, small map, et cetera) appears so large on a computer screen if it has been scanned at the default size. If you scanned a regular 8.5 x 11 sheet of paper at 200 dpi, you're looking at an image that is 1700 x 2200 in size (8.5 x 200 by 11 x 200)! That is considerably larger than your typical computer screen resolution! So another way to bring files down in viewing size (as well as file size) would be to lower the resolution.

## Select the Output Type

Illustrated below, courtesy of Scantips.com ( <http://www.scantips.com> ), we have four examples of the more widely used output types. Notice how, as the quality of the image goes down, the file size decreases.

	<p><b>Color</b> - This will produce the largest file size but will also preserve more of the integrity of the original image. Experiment with color settings. Some software may offer different levels of color (true color, which is millions of colors, 256 colors, et cetera). The more colors, the larger the file size.</p> <p><b>File type:</b> JPG <b>File size:</b> 11K</p>
	<p><b>Grayscale</b> - the equivalent of a black and white photograph. 256 shades of gray produce a nice quality image at a reduced file size. This is great for scanning letters of support and other documents, including photographs and black and white maps.</p> <p><b>File type:</b> GIF <b>File size:</b> 32K</p>
 <b>performance</b>	<p><b>Line art</b> - only two colors, black and white. Imagine what your document would look like if you were to fax it. Scanning in Line art mode will produce the smallest file size, but there will be a greater degradation in quality than you'll see in the Color or Grayscale modes. Notice the jagged edges on the text.</p> <p><b>File type:</b> GIF <b>File size:</b> 2K <b>File type:</b> GIF <b>File size:</b> 1K</p>



(The image to the left portrays the list of available output types if you are working with this particular brand of scanning software. Certain software offers certain options and this is a good example of the possibilities you may have open to you.)

### Finishing up

Once you've made your final selections, continue by saving the image or by exporting it to another application. In the example to the left, we have three options instead of one. "Scan To..." offers the user to scan directly into another application, such as a graphics program or word-processing application. "Save As..." allows the user to save the file as a particular file type (for our purposes, JPG or GIF) and a filename that you, the user, designate. Finally, "Print..." will send the image directly to a printer, essentially accomplishing the same task as a copy machine. Upon selecting one of these options, the scanner will make another pass, moving more slowly than before. Once it completes, the finished product will continue to be displayed on the screen. From here, the graphic can be further modified or you have the option of scanning again in you need to make a change.

### Graphic optimization

To optimize an image file is to run it through a program with the intent of bringing the file size down as low as possible while still maintaining acceptable image quality. A few of the higher end graphics programs allow you to optimize images now (Adobe Photoshop and Macromedia Fireworks are two of these). These programs let you view the results of the different compression algorithms (for the purposes of this tutorial, we'll be looking at GIF versus JPG) before you even save the image file, allowing you to gauge how much degradation of image quality you will sacrifice for a smaller file size. And there *is* a trade-off. A simple example is provided below:



without optimization  
file type: jpg  
file size: **3.80K**



optimized  
file type: jpg  
file size: **1.72K**



optimized  
file type: gif/16 colors  
file size: **1.68K**

In the above example, the file sizes have been cut by more than half, but at what expense? Notice how blurred the optimized JPG image is, but then also notice that the GIF is almost grayscale now, with most of the blue having been removed (though there wasn't much color in the original image to the left). By no means does this mean that the GIF file format is always going to afford you the better image after compression. There is a "quality to compression" threshold that exists where a larger, more complicated image (such as a sizable photograph, for instance) will benefit more from JPG compression than the GIF algorithm. See the "Select the Output Type" chart to further compare file sizes versus file types.

### **What is OCR? A word on scanning text from Scantips.com.**

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 of your dog. 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 (Optical Character Recognition) software is to decode that scanned image of the page, down to the individual pixel patterns, and then generate real text characters in your word processor, the same as if you retyped 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. Most scanners include free sample OCR software, but for extensive use, you'd probably want to spend \$80 for better.

### **Additional problems?**

For any additional questions or comments, the Office of Transportation Economic Development and Enhancement is open Monday through Friday, between the hours of 8AM to 5PM. Questions on the web site or its contents, including the online application, should be directed to 517.241.1652 or email [MDOT-TEAsupport@michigan.gov](mailto:MDOT-TEAsupport@michigan.gov).