

Screen Captures 102

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1 Introduction

This document is about making screen captures for technical writers working primarily in a Microsoft Windows environment. The tools targeted include Adobe FrameMaker, Microsoft Word, Adobe Acrobat, along with Techsmith's SnagIt, Adobe Photoshop, and Ulead's PhotoImpact 4.2.

I do not intend to make this a tool-centric discussion.

Certainly, the thoughts and techniques mentioned herein can be applied to other professions, other operating systems, and other tools.

THANKS AND APPRECIATION

Thanks go to the following gurus for their assistance in gathering this information:

- ◆ Niels Grundtvig Nielsen (<http://www.asbuilt.be/team/ngn.html>)
- ◆ Thomas Neuburger (<http://www.twelfthnight.com>)
- ◆ William Swallow (http://www.geocities.com/bill_swallow)
- ◆ Techsmith (<http://www.techsmith.com>)

EQUIPMENT

The equipment I used includes:

- ◆ *Hardware*
- ◆ *Software*

Hardware

I reviewed the results of my test on two computers:

- ◆ PIII 450, using a PanaSync S110 21-inch monitor, 85Hz, 24-bit color, 1024x768 pixels, supported by a Matrox Millenium G400 Max with 32MB RAM.
- ◆ P5-166MMX, using a Gateway 2000 Vivitron 17-inch monitor, 72Hz, 16-bit color, 1024x768 pixels, supported by a Diamond Viper V550 PCI video card with 16MB RAM.

The three printers used to test PDF output are:

- ◆ a Xerox Document Center 332ST 600-dpi PS printer
- ◆ an HP 4Si 600-dpi PS printer
- ◆ an HP 5000 printer using PCL5e, PCL6, and HP PostScript drivers

Software

Note: The software I use was selected from that which I had at hand. Certainly, I expect products competing with the ones I used to be able to accomplish the same tasks.

I used the following software. This is by no means the latest version of the software used. Check the links for information about the products I used:

Adobe Acrobat 4.05c/5.0.5:

Adobe Acrobat 4.05c, including Adobe Distiller, were used to create PDFs and EPS files from PDFs used in this document and tests. The PDF process used the Distiller printer, which comprises the Adistil.ppd and Adobe PostScript printer driver, version 4.4.1.

In the second revision, this became Adobe Acrobat 5.0.5 using PS driver 4.5.1.

Adobe FrameMaker 6.0p405:	Adobe FrameMaker is desktop publishing software. I used FrameMaker to create this document. I am an Adobe Certified Expert (A.C.E.) for the FrameMaker 6 product.
Adobe Photoshop 6.0.1:	I used Photoshop for my EPS creation of a screen capture. Photoshop is a full-featured package that requires a lot of computer resources, has many capabilities, and can take some serious devotion from you to learn. Photoshop provides fine control of EPS output and is well suited to the high-end graphics market. In general, excepting the EPS process, I consider Photoshop to be overkill for the task of fussing with a screen capture. For more information, see http://www.adobe.com .
Microsoft Windows 98:	I used Microsoft Windows 98 and Windows 98 Second Edition as operating systems for the tests and documentation of the tests.
Microsoft Word 2000 SR-1:	I used Microsoft Word as a foil to FrameMaker to show how software interprets and displays imported graphics. For more information, see http://www.microsoft.com .
TechSmith SnagIt 5.1:	TechSmith's SnagIt is screen capture software. Screen capture software automates many screen capture tasks and, in my opinion, pays for itself pretty quickly. Several years ago, I evaluated a number of different screen capture applications and settled on SnagIt. Some screen capture software used to offer different capture features depending on which version of Windows I was using. SnagIt was fully-featured across the entire Microsoft Windows range of operating systems. For more information, see http://www.techsmith.com .

Equipment

Ulead PhotoImpact 4.2:

I used Ulead PhotoImpact 4.2 for the majority of my bitmap editing and resampling, because it is less grand and simpler than Photoshop. For more information about PhotoImpact, see <http://www.ulead.com>.

Certainly, Jasc's Paint Shop Pro (<http://www.jasc.com>) is a popular product for the kind of things I did with PhotoImpact.



About Screen Captures

If you read nothing else, here's how you take a successful screen capture:

- 1) Consider your deliverables; where is the screen capture going to be used and seen by the customer? This helps you determine how you need to create your screen capture.
 - ◆ 120 or 150 ppi for dual-purpose, screen and print
 - ◆ 144 ppi for online PDF at 200% zoom
 - ◆ No more than 100 ppi for HTML-based viewing
 - ◆ For high-resolution printing, such as from an offset press, test various resolutions to determine what is best. Theoretically, 1.41 times the line screen should be a good value, but testing will confirm the best resolution to use and save you time and money in the long run.
 - 2) Set up the desktop on which the capture will be taken.
 - ◆ No funky fonts
 - ◆ Simple and conservative color scheme
 - 3) Minimize the size of the screen element, dialog box, or window that you are going to capture. Minimizing this element before you take the capture will reduce the need to resize or resample the screen capture later. Resizing and resampling screen captures is the source of most screen-capture-related aggravation.
 - 4) Invest in and use screen-capture software, to automate your process and save you a tonne of time. This can be used to automatically set a ppi resolution for your screen capture. I use Techsmith SnagIt screen capture software (<http://www.techsmith.com>), but there is plenty of screen-capture software out there, including some bundled with Paint Shop Pro.
- Note:** Screen captures do not contain resolution information; they only contain pixel and color data.
- 5) Capture your screen.

If you take a lot of screen captures and are using Print-Screen-based methods, you are doing yourself a disservice, in my opinion.



If you are going to resize each screen capture repeatedly, consider using EPS as the format for your screen capture. Otherwise, for a one-time resize, bitmap formats are fine.

- 6) Set the resolution of the screen at the time of capture, using screen capture software, or in the image-editing software into which you paste the screen capture. Set this resolution as needed by your output.
- 7) If you later need to resize the screen capture, try to re-take the screen capture in the original application by resizing the dialog box or window appropriately and then retaking the screen capture.

Otherwise, try to resize your screen capture without removing or adding pixels.

PARTS OF A SCREEN CAPTURE

Screen captures actually only include information about the number of pixels and color. Screen captures do not include resolution information, which is a source of much confusion when it comes to taking screen captures.

Number of pixels:	When you capture an image, it consists of a number of pixels that can be calculated by multiplying the number of pixels in the X dimension by the number of pixels in the Y dimension.
Color information:	When you capture an image, the color of that image depends on your desktop settings. For example, you might have your desktop set to 8-bit (256) color or 24-bit color.
Resolution:	Resolution is not part of the information captured by a screen capture. The misunderstanding about resolution is part of the problem with taking screen captures. Resolution is assigned by the image-editing software into which you paste the screen capture. Image-editing software includes Photoshop, PhotoImpact, and SnagIt.

RESIZING SCREEN CAPTURES

Problems about screen captures usually involve resizing the screen captures. There are some important concepts to keep in mind:

Windows are dynamic: The window or dialog box that you capture is dynamic. If you resize it, the program that renders the window or dialog box automatically takes care of displaying the window or dialog box correctly.

Screen captures are static: Your screen capture is not dynamic. A screen capture represents the dialog box or window with a fixed number of pixels. If you resize the screen capture, there is no underlying program to dynamically re-create and re-display the screen capture. The number of original pixels is fixed.

For example, let's say you photographed the Mona Lisa. However, now you want her to smile with a big, cheesy grin. Well, while the original human model could smile and her face would be dynamically redrawn, your photograph cannot do that. With the photograph, or a fixed number of digital pixels, you have a static image with which to work.

While it might be optimal to go back and ask the model to smile, so you can take another picture, or to re-run the software to resize the screen and take another screen capture, it might not be possible to do so.

If you choose to modify the static image you have, you are going to run into issues. When working with screen captures, it is important to remember you are working with images that have a fixed number of original, static pixels.

Resized graphics display badly: If you resize the screen capture, by changing the resolution, adding pixels, or removing pixels, the display of that screen capture will be less sharp than the original. Printers, however, are more forgiving than screen displays. Anyway, try to avoid resizing screen captures.

How to Resize a Screen Capture

Resolution information is provided by your image-editing software to give your desktop-publishing or word-processing application a way to size a screen capture on the page.

Note: **Anti-aliasing is the blurred effect you may see where you would expect sharp edges in an image (see page 2-11 for an example). It often appears when your image-editing software has to add new pixels after you resample an image or change its resolution. It can also result when your display tries to display an image that does not exactly match the screen resolution.**

Your image editing software probably doesn't use the resolution information for anything. Your DTP and word-processing applications do, as does your printing device. When resizing a screen capture, keep the following in mind:

Do not add or remove pixels: When resizing a screen capture, do not add or remove pixels. If you do add or remove pixels, then your image-editing software has to re-do the transition between adjacent pixels to make up for the missing information. There are various algorithms that do this, but you can expect to lose clarity and sharpness with any of them, resulting in anti-aliasing and jaggies.

Changing resolution: An effective way to resize your screen captures is to change the resolution that your DTP or word-processing application use. I set my resolutions to 120 ppi, usually.

Upsampling the resolution will increase the size of your graphics file considerably.

Upsampling the Resolution: In Photoshop, and other image-editing software, you can increase the resolution of your screen capture without increasing the dimensions of the screen capture.

You might want to up-sample a screen capture that is too low in resolution for your output device, such as a high-resolution press.

In Photoshop, in the Image Size dialog box, experiment with resampling. For example, try choosing Nearest Neighbor resampling, and change the resolution by a multiple of four, such that a 72-ppi image becomes 288 ppi. Using a multiple of four should provide consistently successful upsampling.

Thoughts about the GUI

- ◆ Software programs are written for screen display, not paper, PDF, or Web-based presentation and documentation.
- ◆ Screen display has an aspect ration of about 4:3. A common screen layout is 800 pixels across by 600 pixels tall—though 1024x768 pixels is common, too. Certainly, within that area, programmers often create complex dialog boxes that can be 500x500 pixels in size.
- ◆ The aspect ratio of US letter is 17:22 and the A sizes are 1:root 2.
- ◆ A 500x500 pixel dialog box at 96 dpi is a 5.2x5.2-inch dialog box in a paper-base document. That's pretty large, given your column layout, headers and footers, margins, and the need to fit text on your A4 or US-letter paper. Remember, the use of side-heads will reduce the available column width of your document.
- ◆ In online help, where your PDF, HLP, CHM, JavaHelp, or HTML Help occupies a viewer window, where the viewer window uses its own space, and where the viewer window needs to reside side by side with other active applications, that 500x500 pixel screen capture leaves precious little room for other things.

Screen display degrades:

When you resize a screen capture—usually you will be making it smaller—the screen display will degrade. Consider what you are doing is creating a thumbnail, of sorts, and though what you are doing is not to the degree of the usual thumbnail, you are relying on your video setup and application's graphic rendering to make up for the fact that you are reducing the number of pixels that can be displayed on screen.

Printed output is flexible:

Printers provide more flexibility in outputting pixels than your monitor. In general, if you are resizing your screen capture by resampling a resolution value, try to make that value evenly divisible into your printer's output resolution (dpi). For example, 120 ppi and 150 ppi are resolutions that divide evenly into the 600-dpi output resolution that is common to today's desktop printers.

Bitmaps rescale poorly:

Screen captures are bitmaps (also called raster images); they are an image defined on a pixel-by-pixel basis. Pixels know nothing about adjacent pixels and bitmaps scale poorly.

If you are resizing a bitmap once, you can probably do so quite well. If you are resizing a bitmap more than once, consider making an EPS of it. EPS files are scalable. See *“EPS Capture for Print Output,”* on page 3-16, for more information.

Resize your window properly:

Application programmers seldom consider the needs of documentation about their application when designing their windows and dialog boxes. In a perfect world, programmers would consider the need to accommodate screen captures and 5-inch-wide text columns when creating their dialog boxes and windows.

However, you can reduce, if not eliminate, your need to resample a screen capture by resizing the window or dialog box you want to capture before you capture it. On the whole, you want to make as small as possible the window or dialog box before you capture it.

A Note about Scanning

If you are scanning an image, set the scan resolution based on you intended output.

- ◆ The typical 600-dpi desktop printer has a line screen of less than 150 lpi. Such a device will not benefit from scans with resolution higher than 150 ppi.
- ◆ The human eye often sees color depth as resolution. Thus, scan for 24-bit RGB if you are outputting color and your audience will probably perceive a sharper image than if you used 256 colors.
- ◆ Monitors typically do not display resolutions higher than 100 ppi. Therefore, if your scan is for online presentation, don't scan at a higher resolution than 100 ppi.
- ◆ Doubling the resolution of a scan quadruples the file size. Halving the resolution of a scan quarters the file size.
- ◆ Color increases file size noticeably. If your output will be to a monochrome laser printer, consider scanning in or converting to greyscale. Typically, greyscale is 8-bit, containing 256 shades of grey. This is a lot less information than a 24-bit color (16,777,216-color) scan would contain, and the file size is reduced accordingly.

About Color

Note: Before you create screen captures, make sure to set up your desktop appropriately. I recommend using a conservative Windows color scheme—I use Windows Standard—and against using flamboyant colors and fonts; for example, I do not use Comic Sans. I also set my desktop to use 24-bit color, to avoid any initial issues with palette-based color.

- ◆ It is best to consider the color you need in your screen captures. 16-bit and 8-bit color captures might be unsuitable because they are palette-based. However, 24-bit and higher color settings might produce unacceptably large images.

Palettes contain a fixed number of colors. It is possible that a Windows system using a palette might not include, in its palette, the color you are using in your screen captures. If that is the case, the system that does not have the color will have to match the color in the screen capture as best it can. This change in color sometimes looks bad. Of course, you probably cannot control what color setup your readership has, but you can control the colors you use.

Palette-based colors should be fine for you to use. I just recommend you read your software's documentation before choosing from the available 8-bit (256-color) palettes.

I use an 8-bit optimized palette that includes the standard Windows colors and enough spaces left for the colors in my screen capture. After all, typical screens, windows, and dialog boxes use very few colors.

Before you decide on a particular palette to use for your screen capture, review the documentation in your image-editing software to understand the inclusions and limitations of the various palette choices.

- ◆ Another consideration is whether you need to edit your images. Some editing features in some image editors, such as anti-aliasing, are unavailable if the image uses less than 24-bit color. Thus, if you need to edit your image, to strike text or add text copied from somewhere else, you might need to use and keep 24-bit original screen captures.
- ◆ If you are creating 4-color (CMYK) output of your screen captures in print, you are spending a lot of money to print the color of those captures. Is the color worth it? If so, consider an EPS process to pass 4-color information to a PostScript printer. In Windows, EPS is the only way to get 4-color information out of FrameMaker or Microsoft Word and into PostScript without third-party utilities. The Windows GDI processes only RGB, not CMYK, color information, and both FrameMaker and Word use the Windows GDI to print PostScript. And, remember that your source is RGB display color—monitors do not display CMYK color.

- ◆ If you are creating greyscale output, either via a Xerox Docutech, office laser printer, or some other non-color printing process, then color accuracy is not really important to you. If color accuracy is not that important, choose 8-bit or 256 color as your output to save your file size. That 8-bit color will print nicely as 8-bit greyscale.
- ◆ Allegedly, there are 216 Web-safe colors that display the same on all platforms and using all browsers. Don't bet on it. Reports indicate that not all browsers support the alleged Web-safe palette.
- ◆ 1-bit color, black and white line art, is also an option. 1-bit color displays necessary information without shades of grey, and 1-bit color makes the smallest files. Is 1-bit color what you want to see online, in print, either, or both?

Importing Screen Captures

I import screen captures into my DTP and word-processing applications by reference or linking. That means the screen captures are maintained outside the document or chapter as separate graphics files.

Maintaining the screen captures as separate graphics files gives me two advantages. Firstly, I can update a screen capture by just replacing the external graphics file. Secondly, the size of my DTP or word-processing application file is kept small, which often results in greater speed and reliability.

Something to consider when linking external files is managing the file locations. I have found that relative links—linking to the graphics in subfolders that are contained in the main document folder—work better than linking along absolute paths, across networks, or via the root directory. I archive my projects as ZIP files, and all the files a project needs are contained in that ZIP. I have never lost a file this way.

CONSIDER YOUR OUTPUT

What your output can be PDF, printed material, online help, HTML, and the like.

- ◆ If your output is in print, what are the requirements?
Are you printing to an office laser printer, office color printer, off-site Xerox Docutech-type printer, or an offset press?
Are you printing at high resolution, and are you using a multi-color printing process? What resolution and color do you need to output?
- ◆ If you are outputting to PDF, how is it going to be used? Are high-resolution color separations going to be made from it, is it going to be printed off small workgroup printers by those who receive it, is color printing a factor, or is the PDF only going to be used on-screen?
- ◆ Online help and HTML are on-screen formats. How important is it to dress up your files by using color? Certainly, you can render your screen captures in greyscale, but do you want to when color displayed from a monitor is free (whereas printing in color is quite expensive)?
- ◆ How important is file size? High color and high resolution each bring larger files, which mean longer downloads and longer printing times.
- ◆ What are your file output requirements? Do you need Web-compatible formats, such as JPEG, GIF, or PNG, or do you need four-color support of EPS or TIFF, or can you use the RGB color support offered by Windows-specific BMP files? Also, if you need to resize each screen capture repeatedly, EPS lends itself to frequent resizing better than the other formats mentioned here.
- ◆ Similarly, what are your file-size requirements? TIFFs and BMPs tend to be large formats, whereas GIF and PNG are compressed formats that are not lossy. Lossy formats use compression that loses data. Because lossy formats discard data, they can be less than ideal for screen captures, which feature sharply defined pixel transitions, such as edges of dialog box regions, or text. JPEG (JPG or JPE) is a lossy format. (Lossy formats do well for photographs and images that feature easy transitions of pixels and data.)

HOW DTP AND WORD-PROCESSING SOFTWARE DISPLAY IMAGES

Note: The point of this section is to remind you that it is not often important how your screen capture displays in your publishing software, such as Adobe FrameMaker or Microsoft Word. What is actually important is how the screen capture displays in your deliverable: PDF, printed material, HTML, etc.

You might use Microsoft Word, Adobe FrameMaker, Corel Wordperfect, Corel Ventura, or something else from which to publish your content to your output media, be they online or printed.

Sometimes, the publishing software is the output medium. What I mean is, perhaps you are not sharing PDFs, perhaps you are sharing FrameMaker or Word application files. If you are sharing application files of your publishing software, then you should optimize your process for that software, be it printing from or viewing in that software.

If your publishing software is just the means to create your deliverable, be it PDF, HTML, or printed output, then it really does not matter what your work looks like in the publishing software.

I mention this because publishing software displays your screen captures in different ways—ways that differ from each other and that might differ from Adobe Acrobat Reader, a Web browser, or your printing device. To display images, the publishing software—be it Microsoft Word, FrameMaker, or whatever—renders your imported screen captures to your screen in a proprietary way.

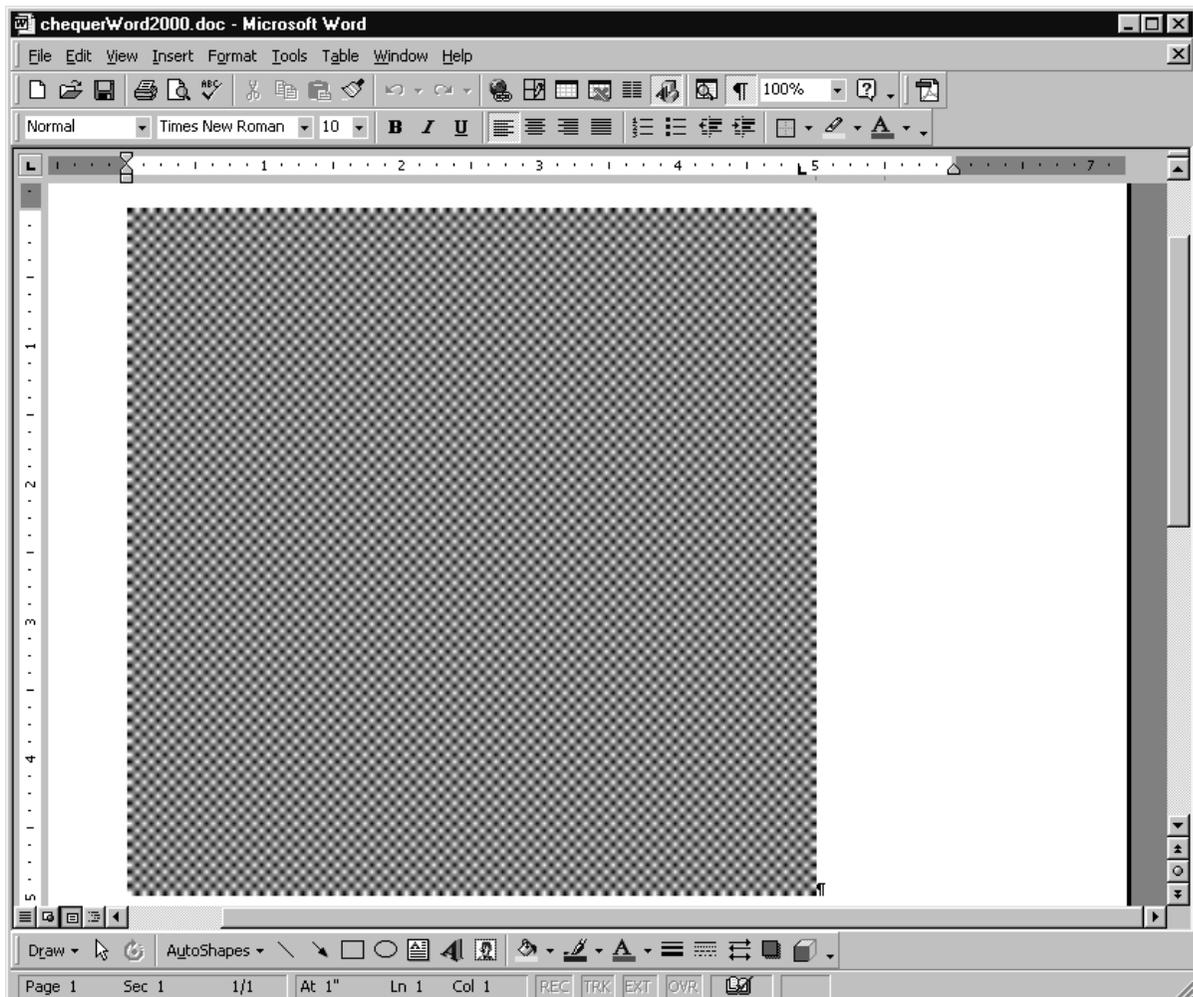
Note: It is important to remember that how your publishing software displays your image should not affect printed output.

For example, create, in image-editing software, a bitmap checkerboard pattern of alternating black and white squares. Import that bitmap into FrameMaker and also into Microsoft Word. Review how each product displays the result.

Word makes extensive use of anti-aliasing to smooth the screen display. This does not affect your printed output, your PDF, or what you see in your HTML output. This only affects what you see in Word and is only important if your deliverable is a view-only Word file.

While a checkerboard uses discrete black and white squares with abrupt transitions, Word creates shades of grey to smooth the transition from black to white, as you can see in the example. This is not WYSIWYG (what you see is what you get), but neither is this a wrong approach. This is merely Word's approach, and this approach makes screen captures look quite smooth in Word. However, this has no effect on printed, PDF, or HTML output from Word.

The original checkerboard displayed in Microsoft Word, notice the anti-aliasing



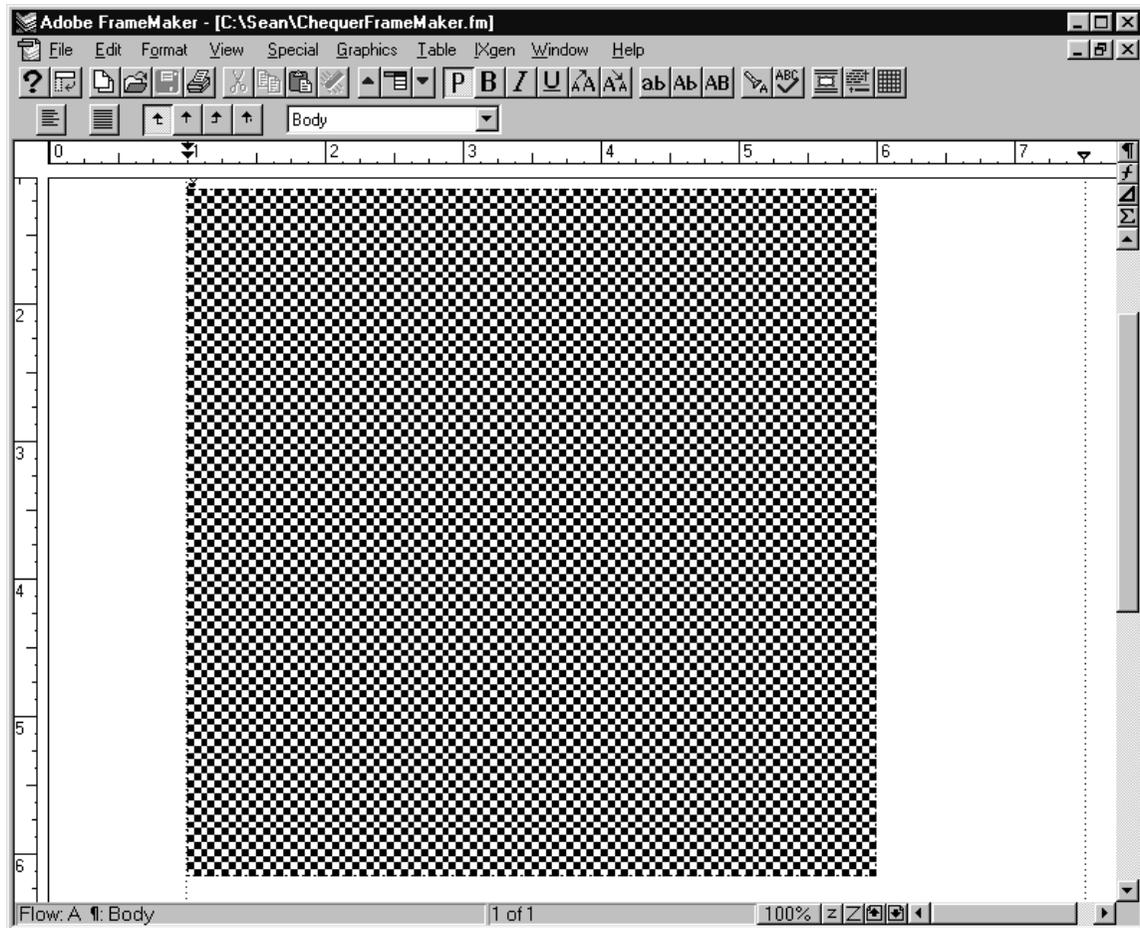
What is important is the deliverable: your printed output, your PDF, or your HTML.

FrameMaker uses a different approach to rendering images to the screen. FrameMaker uses little, if any, anti-aliasing. Thus, FrameMaker renders the checkerboard with the abrupt transitions. What you see in the FrameMaker example is how both FrameMaker and Word print the image of the checkerboard.

Consider Your Output

This is not the right or wrong way, this is just the way FrameMaker happens to do it. FrameMaker does not smooth screen captures, and displays any jaggies in screen captures as-is.

The original checkerboard displayed in Adobe FrameMaker, notice the lack of anti-aliasing



It is interesting to note that Adobe Acrobat Reader has trouble displaying line thicknesses consistently. That is, 1-pt. lines do not display with uniform thicknesses from a PDF; some appear thicker and others thinner.

However, in the case of these examples, the squares appear to be different sizes because they are. I designed the checkerboard pattern to show how different software can render the same image differently to the screen, not to illustrate the shortcomings of Acrobat's display of line thickness.

DISPLAYING SCREEN CAPTURES CLEARLY IN PDFs

Note: See “Graphics Capture for PDF Display On-Screen,” on page 3-8, for examples of this.

You can run into a fair amount of trouble trying to get screen captures to look perfect when viewed online in PDF format. Here’s the trick:

144 ppi is probably the most useful screen-capture resolution for use in online PDFs.

Adobe Acrobat is hard-wired to display certain resolutions at specific levels of zoom. Set up your images as follows and they will be perfect at the listed magnifications.

Note: In my experience, it has been difficult to control the zoom level at which your readers view a PDF. Thus, setting these resolutions up for the purpose of making perfectly viewable PDFs might be an exercise in futility. In my opinion, you are better off setting up your PDF for print, instead, and not bothering with the online display.

Image Resolution (ppi)	Zoom Needed for Absolute Clarity (%)
72	100
144	200
216	300
288	400
... +72	... +100

You can test this by using 167% to view the 120-ppi screen captures in the following section.

You can easily determine the best zoom for a given resolution. For example, I use 120 ppi a lot. So, if 72/100 is clear display in PDF, then what zoom should I use for 120 ppi? $72/100 = 120/x$. $x = 166.67\%$ zoom should display a 120-ppi-resolution screen capture clearly. Similarly, for 150 ppi, the necessary zoom would be 208.33% and 133.33% for 96 ppi.

Also, your original screen capture file type has no effect on the size of the resulting PDF. That is, if you have two identical images, one a BMP and the other a PNG (with the BMP being a much larger file size), as long as the number of pixels, resolution, color depth, and Acrobat Distiller job options do not differ, then the PDF of each will be the same size. Because Acrobat Distiller can use JPEG compression, by trial-and-error you might be able to save some file size by using JPEG screen captures. However, make sure you check the output image quality. (See “JPEG Capture for Multi-Output,” on page 3-20, for more information.)

96 DPI IN WINDOWS AND OTHER MYTHS

Many, many places I read that “Windows PCs use a resolution of 96 dpi and Macintosh computers use a resolution of 72 dpi.” I have also read that you should measure the display area of your monitor and divide by the number of pixels you set to determine your resolution. Some documentation, such as the Photoshop and Adobe Illustrator user guides, claim both.

While I have found no formal authoritative discussion on the issue of screen captures and resolution, the following reflects a discussion I had online with the folks at Techsmith, makers of SnagIt screen capture software. (For more information, see <http://www.techsmith.com>.) While you don’t need to agree with me on this, these thoughts certainly seem true when used. Besides, you can validate them yourself easily enough: roll up your sleeves and try it.

- ◆ Does it seem reasonable that Windows PCs have a screen resolution of 96 dpi and Macintosh computers have a screen resolution of 72 dpi? Why would this be? Why would a 21-inch Macintosh monitor have a 72-ppi resolution, while its Windows counterpart has 96-ppi one? That makes no sense to me. I’ll leave this debate here, because the last Macintosh I owned was a fat Mac, 512KE. Certainly, its tiny monitor probably did boast 72-ppi, but I cannot believe this myth holds true for any modern Mac since then.
- ◆ Can it be true that if you measure the viewable horizontal and vertical dimensions of your Windows monitor, and divide by the number of pixels, that you always get the mythical 96-dpi number, as many sources claim? I’ve done it. The answer is a resounding, “No!”

When you set your desktop “resolution” in Windows, you are really setting your screen dimensions, in pixels.

Really, think about it. If I’m using Windows, have a 21-inch monitor, and (foolishly) set my desktop to a size of 640x480 pixels, is that somehow 96 ppi? Ok, how about if I set my 15-inch monitor to 1600 x 1400 pixels? Is that, too, 96 ppi? How can both cases be true? Clearly something is amiss here.

- ◆ Do the mathematics yourself or follow along with the example at the end of this section. 96- and 72-ppi resolutions are not accurate reflections of Windows screen displays.
- ◆ It certainly is true that the Paint Shop Pro, SnagIt, and other screen-capture utilities regularly assign a default screen capture resolution of 96 ppi, whereas traditional image-editing software, such as Photoshop, PhotoImpact, or Paint Shop Pro (not in screen capture mode) default to a value you set or 72 ppi resolution for graphics. Why is this?

- ◆ According to an informative online chat I had with a representative from Techsmith, the 96-ppi resolution information is not a part of the screen capture but is a value reported by Windows when an application queries for resolution information. An application, such as SnagIt or Paint Shop Pro screen capture software, queries Windows for resolution information so your capture can be sized appropriately in a DTP or word-processing application. Other image-editing applications don't query Windows and just use a default value.

You do not have to take my word or Techsmith's word about this. Check it out! Change your font size—in desktop properties, which needs a reboot—and then test using Paint Shop Pro or SnagIt screen capture utilities.

Windows reports a value for screen resolution based on how large you want your Windows fonts displayed. Windows does not report the actual screen resolution, nor does it determine screen resolution by using your monitor size, display area, and screen size settings. Merely, Windows reports 96 ppi or 120 ppi screen resolution depending on whether you chose large or small fonts.

If your screen display properties use small fonts, then Windows reports a resolution of 96 ppi. If you use large fonts, Windows reports a resolution of 120 ppi. Note that these values are not inherent in the bitmap you capture but are added only if Windows is queried for a value. The 96- and 120-ppi values have nothing to do with the actual, precise resolution of your display.

MY PERSONAL PREFERENCES

Currently, I save all my screen captures as 8-bit, 120-dpi BMPs. (See “*BMP Capture for Multi-Output*,” on page 3-10, for more information.) My reasons for this are these:

- ◆ 8-bit color looks nice on-screen in PDFs and HTML, two of my deliverables.
- ◆ 8-bit color prints nicely to greyscale on black and white laser printers, another of my deliverables.
- ◆ I do not worry so much about the on-screen display of PDFs because I cannot control the user’s personal settings for Acrobat Reader. (See “*Displaying Screen Captures Clearly in PDFs*,” on page 2-13, for more information.) Instead, I focus on controlling the printed output.
- ◆ 120-ppi resolution generally scales my screen captures to a small-enough size to fit in my documents, both printed and online. Occasionally, I use 150-ppi resolution.
- ◆ 120-ppi resolution displays well-enough to the screen in PDF. 120 ppi is a compromise I make between print, online, PDF, and the huge sizes of the dialog boxes created by my programmers.
- ◆ I use BMPs because, occasionally, I have to creatively edit what I capture to remove items that will not be in the final release of the software I document, or to add items that should be there. Some image editing options do not work in 8-bit color, particularly the anti-aliasing of text. So, I have to resample my image to 24-bit to do some editing. BMP supports 24-bit color.
- ◆ I write exclusively in Microsoft Windows. BMP is a Windows format.
- ◆ My software tools, including those I use to publish to the Web, all support BMPs.
- ◆ The size of a PDF file seems independent of the size of the screen captures you use; using BMPs versus PNGs seems not to affect the size of PDF.

“Measuring” DPI

Clearly, the 96- and 72-dpi resolutions that are commonly reported are not the result of any measurement and mathematics. Try this for yourself:

Let's say I have a monitor with an 18-inch viewable diagonal and I select a 1024x768 desktop size. Then:

1) $h^2 = x^2 + y^2$ (where h is the diagonal, x is the horizontal, and y is the vertical length in inches)

2) $x/y = 1024/768$

3) Thus, $18^2 = x^2 + y^2$

4) and, $x = 1024y/768 = 1.333y$ (a common value for desktop sizes)

5) So, $324 = (1.333y)^2 + y^2$

6) $324 = 2.777(y^2)$

7) $(\text{square root})(324/2.777) = y$

8) $10.8 = y = \text{vertical dimension of 18-in. monitor in inches}$

9) $10.8 * 1.333 = 14.4 = x = \text{horizontal dimension of 18-in. monitor in inches.}$

10) $14.4 = x = \text{horizontal dimension of 18-in. monitor in inches}$

11) **In the horizontal dimension, we have 1024 pixels over 14.4 inches, or 71.1 ppi.**

12) **In the vertical dimension, we have 768 pixels over 10.8 inches, or 71.1 ppi.**

Most desktops seem to have the 1.333:1 ratio. However, 1280x1024 is an exception, so follow these same calculations for this desktop:

1) $x/y = 1280/1024$ on a 1280x1024 desktop

2) $x = 1280/1024y = 1.25y$

3) $324 = 1.25y^2 + y^2$

4) $\text{sqrt}(324/2.56) = y$

5) $11.25 = y = \text{vertical dimension of 18-in. monitor in inches using 1280x1024 desktop}$

6) $14.06 = x = \text{vertical dimension of 18-in. monitor in inches using 1280x1024 desktop}$

7) **In the horizontal dimension, we have 1280 pixels over 14.06 inches, or 91 ppi**

8) **In the vertical dimension, we have 1024 pixels over 11.25 inches, or 91 ppi**

Using these calculations and a 1024 x 768-pixel screen size, other monitor resolutions are, **64 ppi for a 20-inch diagonal, 80 ppi for a 16-inch diagonal, and 91.4 ppi for a 14-inch diagonal.** Clearly, the value of 96 ppi for Windows monitors is not a real-world measurement of actual resolution.

My Personal Preferences



Screen Captures Exposed

The purpose of this document is to illustrate the output of screen captures. This section provides the following screen capture information:

- ◆ *“Print-Screen Capture,” on page 3-2*
- ◆ *“Screen Capture Software,” on page 3-4*
- ◆ *“BMP Capture for Screen Output,” on page 3-6*
- ◆ *“Graphics Capture for PDF Display On-Screen,” on page 3-8*
- ◆ *“BMP Capture for Multi-Output,” on page 3-10*
- ◆ *“BMP Capture for Multi-Output 24-bit Color,” on page 3-11*
- ◆ *“BMP Capture for Multi-Output,” on page 3-10*
- ◆ *“BMP Capture for Greyscale Output,” on page 3-12*
- ◆ *“BMP Capture at 1-bit No Color,” on page 3-13*
- ◆ *“EPS Capture for Print Output,” on page 3-16*
- ◆ *“GIF Capture for Multi-Output,” on page 3-19*
- ◆ *“JPEG Capture for Multi-Output,” on page 3-20*
- ◆ *“PNG Capture for Multi-Output,” on page 3-22*
- ◆ *“PNG Capture at 1-bit No Color,” on page 3-24*
- ◆ *“Comparison of Results,” on page 3-25*
- ◆ *“Conclusions,” on page 3-26*

SCREEN CAPTURE METHODS

This document considers two methods of screen capture:

- ◆ *Print-Screen Capture*
- ◆ *Screen Capture Software*

Print-Screen Capture

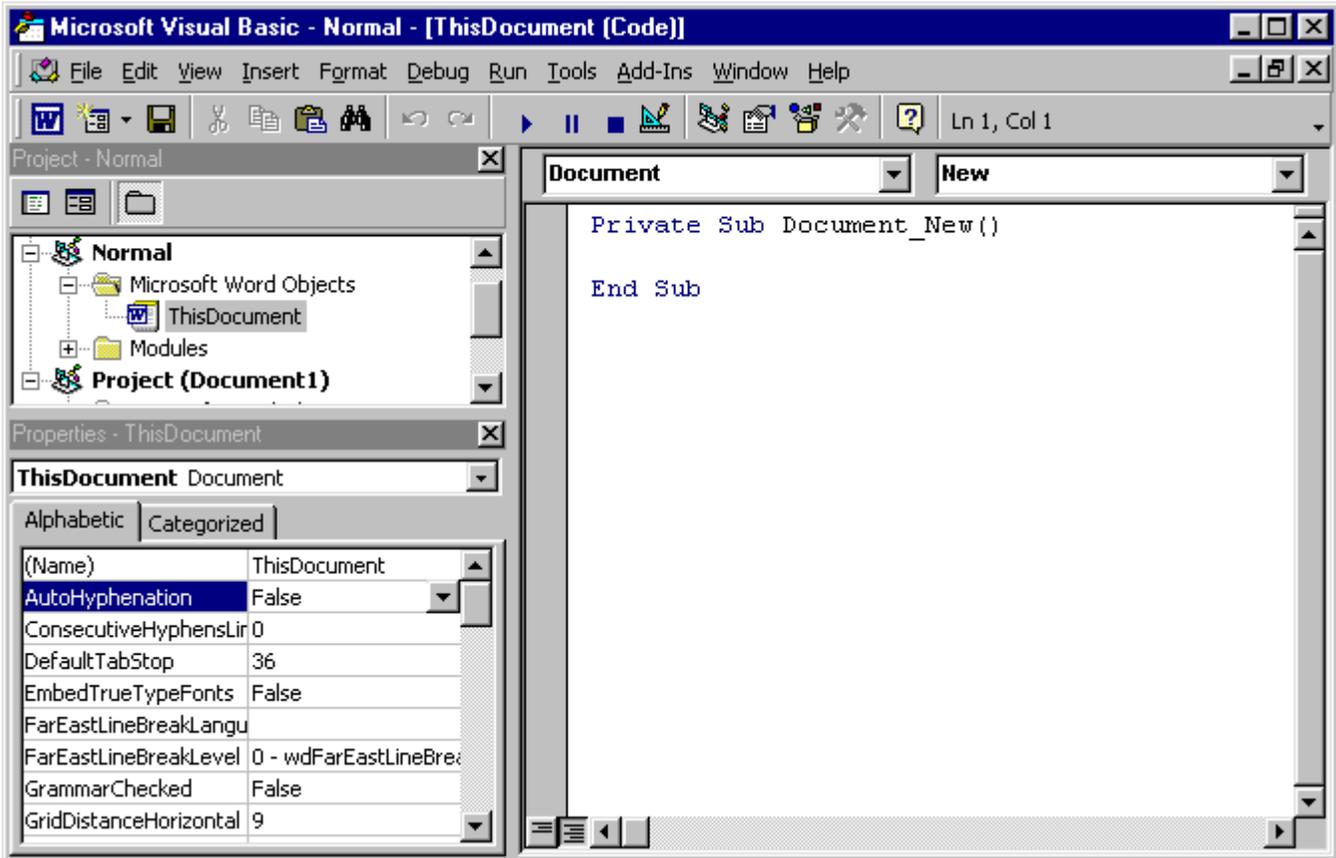
In Windows, there are two built-in key combinations to capture dialog boxes and the desktop to the Windows clipboard. From there, the image can be pasted into an image-editor and saved or into your publishing software. Because the image has not been resampled or resized, this image displays very well on-screen.

- ◆ Pressing the **Print Screen** button on your keyboard captures the entire desktop.
- ◆ Pressing **Alt+Print Screen** captures the active window or dialog box.

These key combinations do not let you capture parts of windows and dialog boxes, such as data areas, buttons, toolbars, menus, and the like. If you want to show just part of the window, you have to edit the result in an image editor.

More likely, though, you will need to use an image editor and edit the capture to include just the information you want to show. The edited image can then be imported into your publishing or word-processing software.

Print Screen: This takes on the default resolution of your image-editing software, in this case the resulting size is 7x4.5 inches



In my opinion, you are doing yourself a disfavor if you capture screens like this, without using screen-capture software. If you need to edit many of your Alt+Print Screen images, to reduce their dimensions, color depth, or to remove unwanted detail, consider using screen-capture software. Screen capture software can automate most of the edits you would want to make.

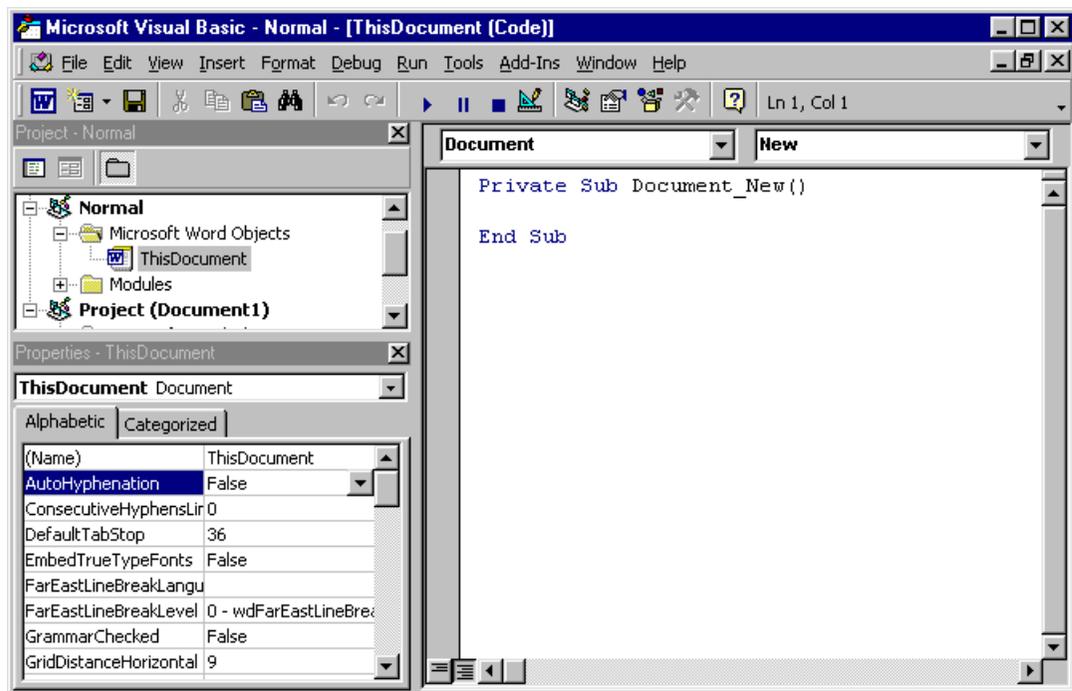
Screen Capture Software

Screen capture software saves you time by automating the capturing and editing of screen captures.

My software of choice is SnagIt, used for all the screen captures in this document. In addition to making it easy to select parts of windows and dialogue boxes, SnagIt can be set up to capture, process, and save images with one key-combination. SnagIt also queries Windows for the resolution to use as default. See "96 DPI in Windows and other Myths," on page 2-14, for more information.

Throughout this document, unless otherwise stated, I have used the following process to capture the screens you see:

Sample screen captured and resampled with SnagIt



BMP: 120 ppi, 8-bit color, 285 kb (view at 167% zoom in Acrobat)

- 1) Setup SnagIt to automate the process. This is done only once, beforehand. Thereafter, your screen-capture settings are used repeatedly and automatically—you do not need to set up the software each time. Setup SnagIt to:

- ◆ Capture a window.

Note: Image dimensions of the screen captures used in this document are 672 pixels by 433 pixels. For 96-ppi images, that is 7-in. wide by 4.5 in. tall. For 120-ppi images, that is 5.6-in. wide by 3.6-in. tall. Increasing the resolution to 150 ppi would further decrease image dimensions, to 4.5 x 2.9 inches.

- ◆ Resample the captured image—this is usually to 120 ppi.

Note: See “About Color,” on page 2-7, for more information.

- ◆ Convert the color depth from whatever the desktop is to whatever you want for your output—in this document, I identify the color depth in all cases.
- ◆ Automatically name and save the file—set the name and file format based on your editing and output needs.

- 2) Press the hotkey combination—for me this is Ctrl+Shift+P. The image is captured, the preset processing (resampling and color-depth change) is performed, and the file is automatically saved.
- 3) Import the resulting graphics file into your publishing software.

SCREEN CAPTURE EXAMPLES

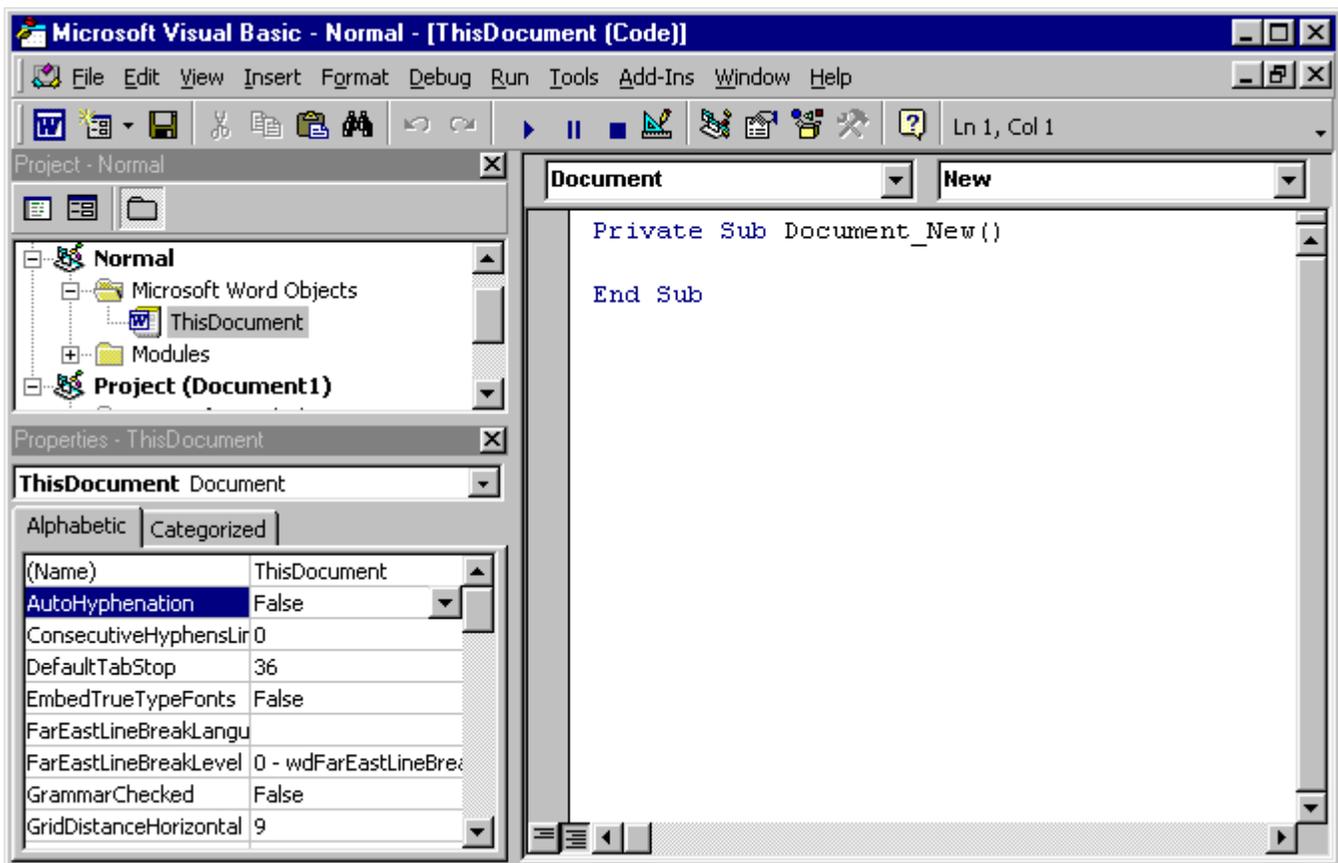
This section provides a variety of examples of screen captures using different parameters and file types. Though you are restricted to seeing this in one format, a PDF, my intent is to compare and contrast the various settings so you can judge the merits of those settings.

BMP Capture for Screen Output

BMP capture for screen output captures a screen at a 24-bit RGB color depth and 96 ppi, which are the color settings of the screen on which the capture was made and the resolution reported by Windows. The result is a low-res file with a high color depth.

- 1) Capture the window.
- 2) Process it as follows:
 - ◆ Resolution unchanged (96 ppi)
 - ◆ Color depth unchanged (24-bit)
- 3) Save the image as BMP.

At 96 ppi, this screen capture is 7x4.5 inches—it is hard to fit in online help and in print



BMP: 96 ppi, 24-bit color, 852 kb (view at 133% zoom in Acrobat)

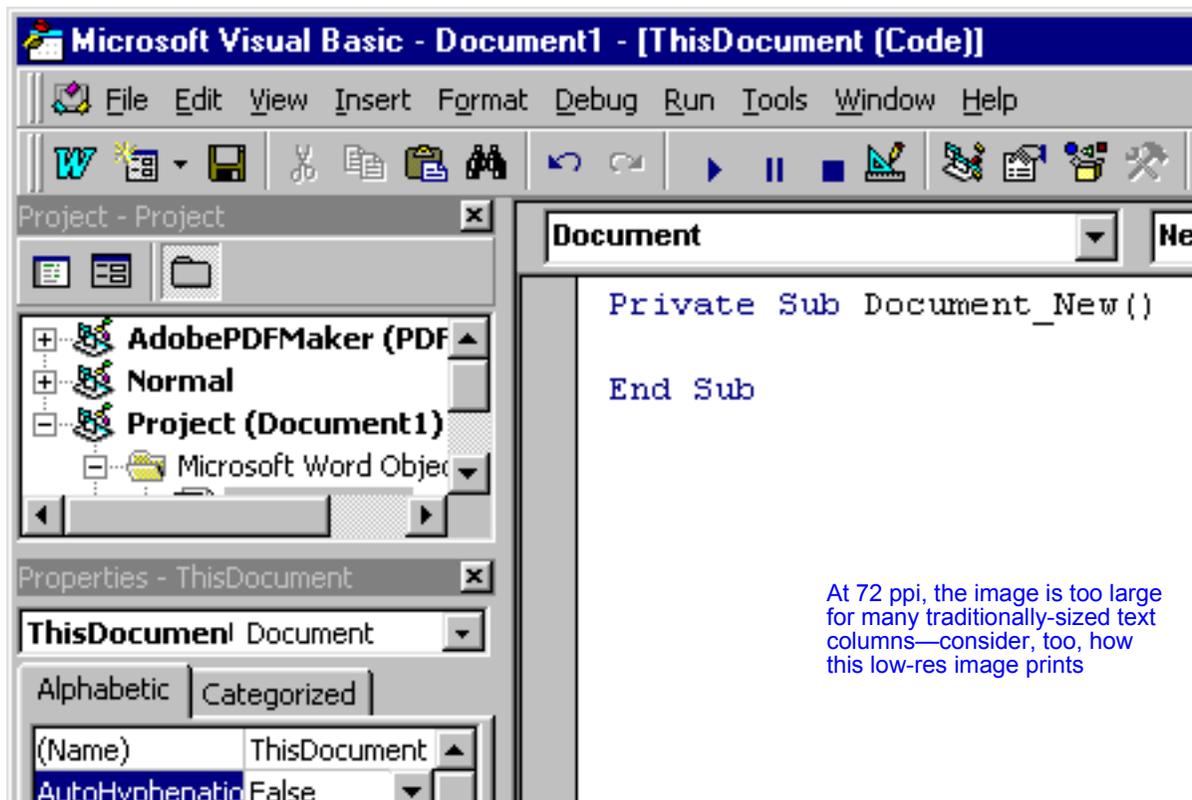
Graphics Capture for PDF Display On-Screen

Note: See “*Displaying Screen Captures Clearly in PDFs,*” on page 2-13, for more information.

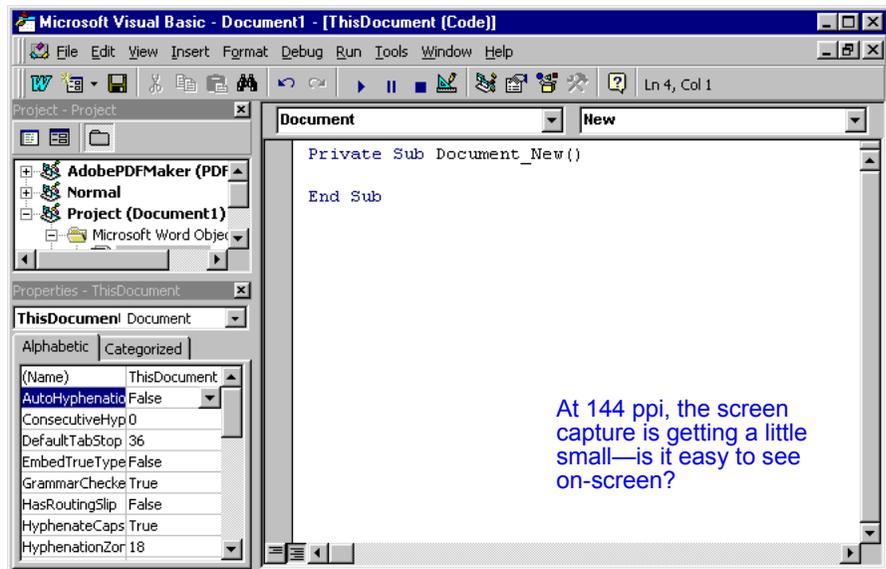
This section discusses resolution and on-screen PDFs. For a discussion of color, file type, and file size, see other examples.

Using the fixed 72-ppi multiple, you have to consider whether your screen captures fit within your text columns in a useful way. Perhaps, you need to redesign your text columns to compensate for the 72-ppi multiple. Or, perhaps you need to compromise and not capture your screens faithfully to that multiple.

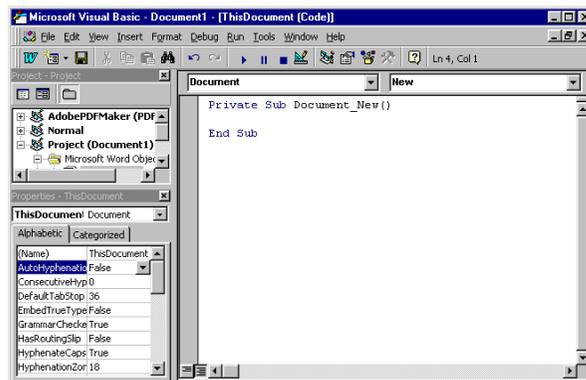
- 1) Capture the window.
- 2) Process it as follows:
 - ◆ Set the resolution
 - ◆ Set the color depth
- 3) Save the image as TIFF.



TIFF: 72 ppi, 8-bit color, 280 kb (view at 100% zoom in Acrobat)



TIFF: 144 ppi, 8-bit color, 280 kb (view at 200% zoom in Acrobat)



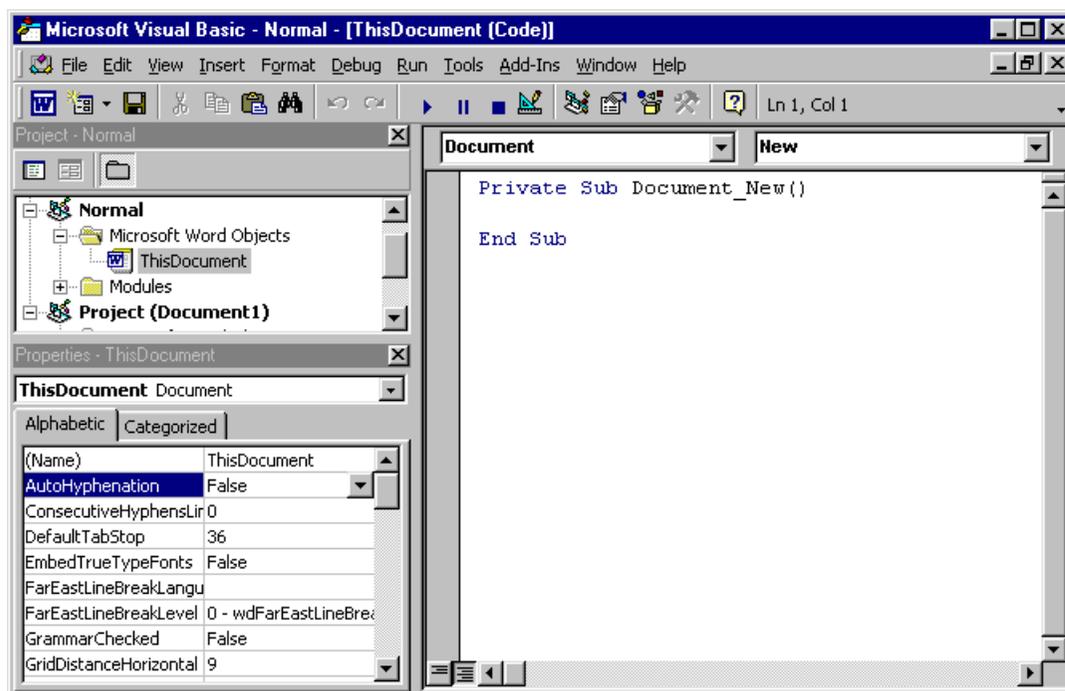
TIFF: 216 ppi, 8-bit color, 280 kb (view at 300% zoom in Acrobat)

BMP Capture for Multi-Output

Note: A 120-ppi image is less sharp than a 96-ppi image on a monitor. That is because 120 ppi is less of a match for the actual screen display. However, since 120 is evenly divisible into the output of a 600-dpi printer, then the 120-ppi image will print quite cleanly and sharply.

BMP capture for multi-output captures a screen at an 8-bit optimized indexed color depth and 120 ppi, which is well suited for printing to a greyscale 600-dpi laser printer and for color display to the screen.

- 1) Capture the window.
- 2) Process it as follows:
 - ◆ Resolution 120 ppi
 - ◆ Color depth 8-bit
- 3) Save the image as BMP.



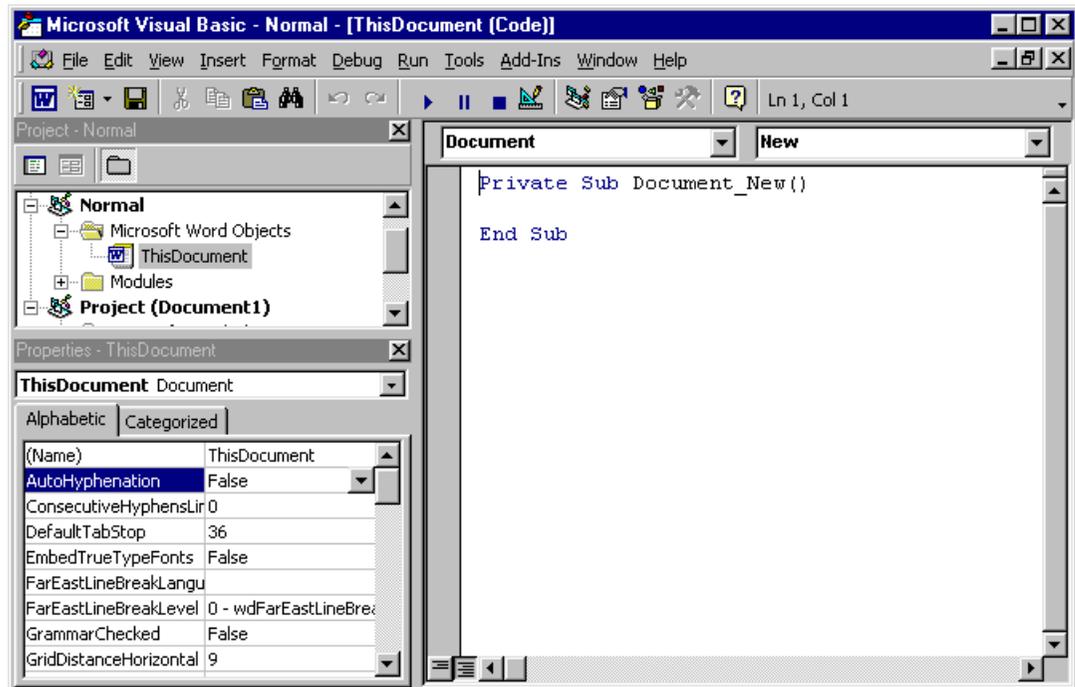
BMP: 120ppi, 8-bit color, 285 kb (view at 167% zoom in Acrobat)

BMP Capture for Multi-Output 24-bit Color

GIF can only support 256 (8-bit) colors. JPEG, PNG, and BMP can support 24-bit color. EPS can support CMYK color—but remember your source is RGB.

BMP capture for multi-output 24-bit color captures a screen at a 24-bit RGB color depth and 120 ppi, which is well suited for printing to a 600-dpi laser printer and for color display to the screen. The 24-bit color creates an increase in file size. You judge whether this extra colors are worth anything, versus 8-bit color.

- 1) Capture the window.
- 2) Process it as follows:
 - ◆ Resolution 120 ppi
 - ◆ Color depth 24-bit
- 3) Save the image as BMP.



BMP: 120 ppi, 24-bit color, 852 kb (view at 167% zoom in Acrobat)

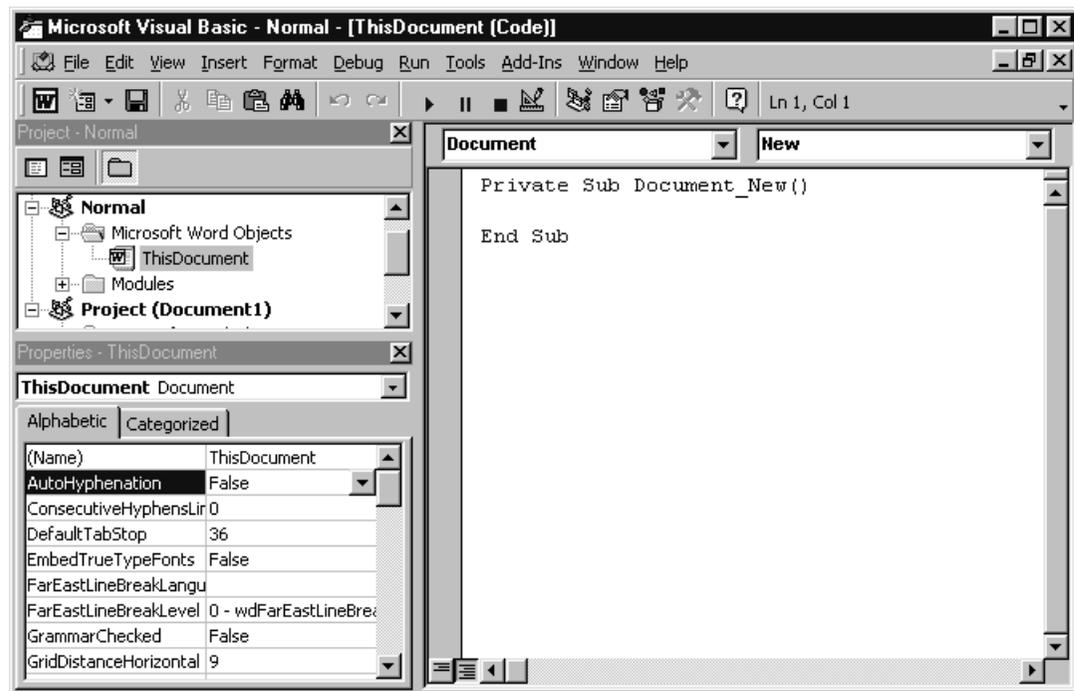
BMP Capture for Greyscale Output

BMP capture for greyscale output captures a screen at an 8-bit greyscale color depth and 120 ppi, which is well suited for printing to a 600-dpi laser printer but does not display color on-screen.

In this workflow, changing the image color to greyscale and resolution is done automatically by SnagIt. No image editor is used.

- 1) Capture the window.
- 2) Process it as follows:
 - ◆ Resolution 120 ppi
 - ◆ Color depth 8-bit greyscale
- 3) Save the image as BMP.

File size is 285 kb—notice the greyscale file is not smaller than the 8-bit color file; does it print any better than the color file?



BPM: 120 ppi, 8-bit greyscale, 285 kb (view at 167% zoom in Acrobat)

BMP Capture at 1-bit No Color

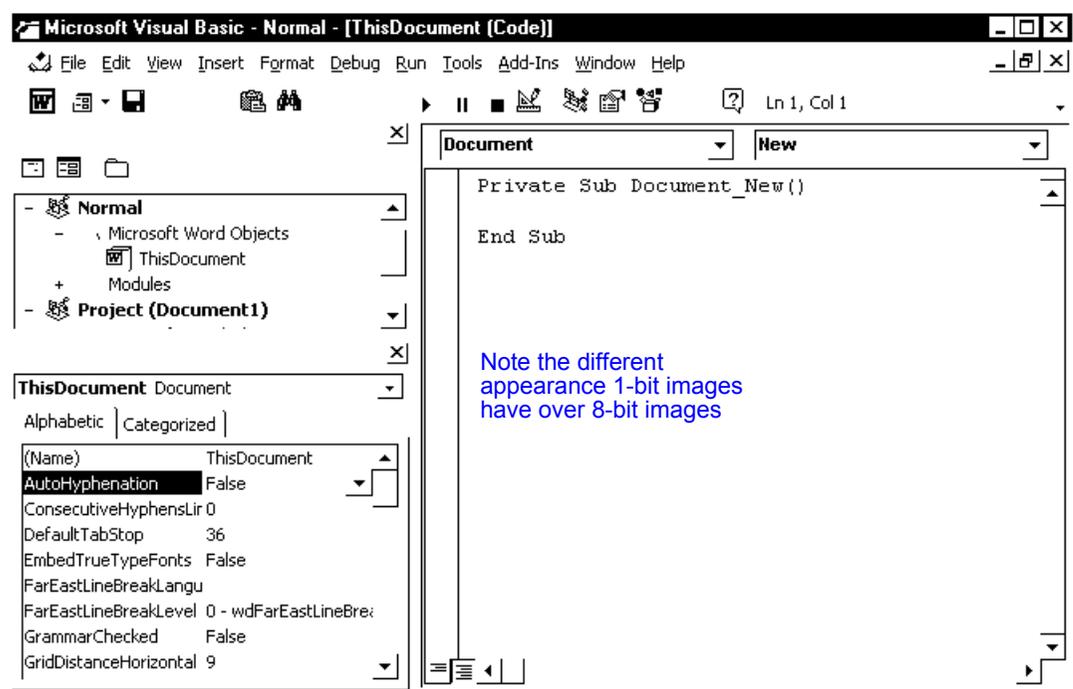
See “PNG Capture at 1-bit No Color,” on page 3-24, for more information.

BMP capture for 1-bit color captures a screen at an 1-bit color depth and 120 ppi, which is well suited for printing to a 600-dpi laser printer and for black and white display to the screen. The file has the advantage of small size over 8-bit images.

- 1) Capture the window.
- 2) Process it as follows:
 - ◆ Resolution 120 ppi
 - ◆ Color depth 1-bit

Note: This format might be better suited to message boxes rather than complex dialog boxes.

- 3) Save the image as BMP.



File size is 35.5 kb—notice how much smaller this BMP file size is than either the 8-bit color or 8-bit greyscale. This is 12% of the size of an 8-bit image.

BMP: 120 ppi, 1-bit color, 35.5 kb (view at 167% zoom in Acrobat)

Some TIFFs have different file flavors, or customizations to the TIFF format, based on the application that created the TIFF.

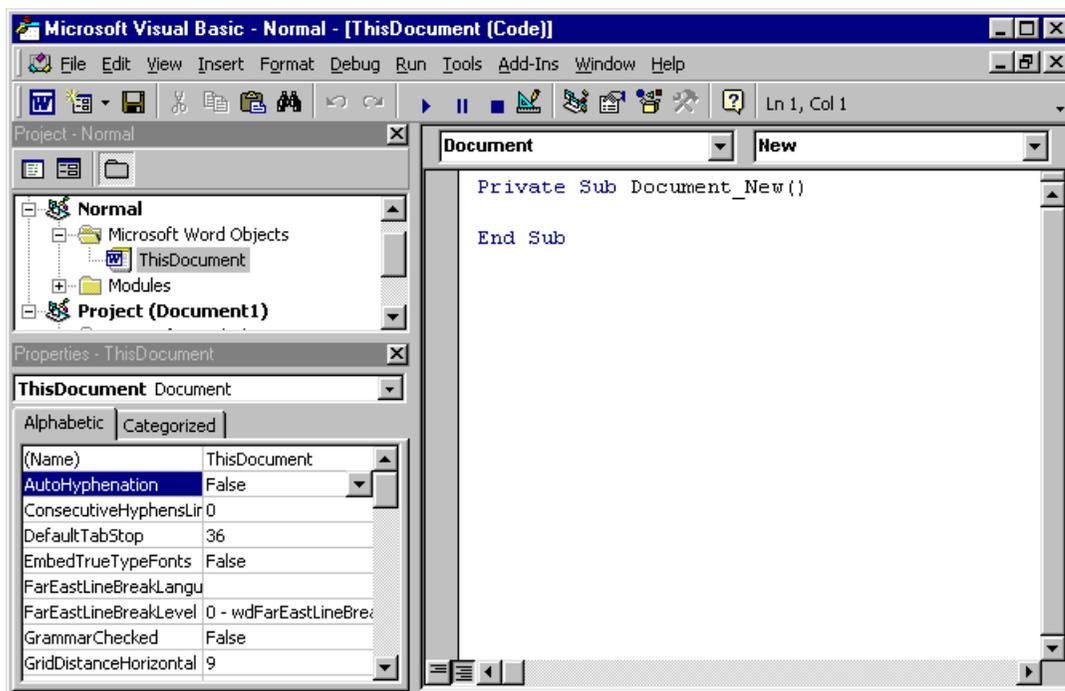
TIFF Capture for Multi-Output

TIFF capture for multi-output captures a screen at an 8-bit optimized indexed color depth and 120 ppi, which is well suited for printing to a 600-dpi laser printer and for color display to the screen.

Note: When deciding on a graphics format, consider all the parameters of your screen-capture environment, including the operating systems you use and where your deliverables are used. However, keep an eye to the future as requirements often change.

TIFFs have some advantage over BMPs. TIFFs are used on Macintosh as well as Windows computers. TIFFs support CMYK color information, whereas BMPs support only RGB information. But, like BMPs, TIFFs are large. Overall, if you are not exchanging files outside Microsoft Windows and you don't need CMYK color from your screen captures, TIFF has no advantage over BMP.

- 1) Capture the window.
- 2) Process it as follows:
 - ◆ Resolution 120 ppi
 - ◆ Color depth 8-bit
- 3) Save the image as TIFF.



TIFF: 120 ppi, 8-bit color, 286 kb (view at 167% zoom in Acrobat)

EPS Capture for Print Output

In this workflow, changing the image color and resolution is done in Photoshop, not in SnagIt.

UNIX and some software can create and display a preview of EPS images on-the-fly.

This EPS (encapsulated PostScript) screen-capture method is recommended by several FrameMaker and Adobe gurus, including Tom Neuburger, author of “The Masters Series-FrameMaker 6.” (For more information about this book, see <http://www.twelfthnight.com>.)

Advantages of this EPS method include scalability for high resolution printing, as you might use from a 2,400-dpi offset press.

Disadvantages of EPS are that you must print it to a PostScript printer and the format is not Web-ready, although Distiller is a PostScript printer and PDFs made from Adobe Distiller are Web-ready. Moreover, this method requires using an interpolation flag that is available in Photoshop, but might not be available in other software. Also, since EPS does not display on-screen, but uses a low-resolution bitmap preview (usually but not always a TIFF), the display in your publishing software will be low-quality. Of course, this only matters if your deliverable is the viewable output of your publishing software, as the EPS will display well in print and in your PDF.

Note: I am unable to test this and other output to high-resolution printers, such as offset presses.

This process is:

- ◆ Use Techsmith’s SnagIt to capture the image as a TIFF with one key-combination and without using any autoprocessing
 - ◆ Import the TIFF graphic into Photoshop
 - ◆ Manipulate the image in Photoshop and output the image as an EPS
 - ◆ Import the EPS into FrameMaker
- 1) Setup SnagIt to:
 - ◆ Capture a window
 - ◆ Automatically name and save the file as a TIFF
 - ◆ Perform no other sampling or editing
 - 2) Use Photoshop to:
 - ◆ Change the image to greyscale (select Image|Mode|Greyscale)

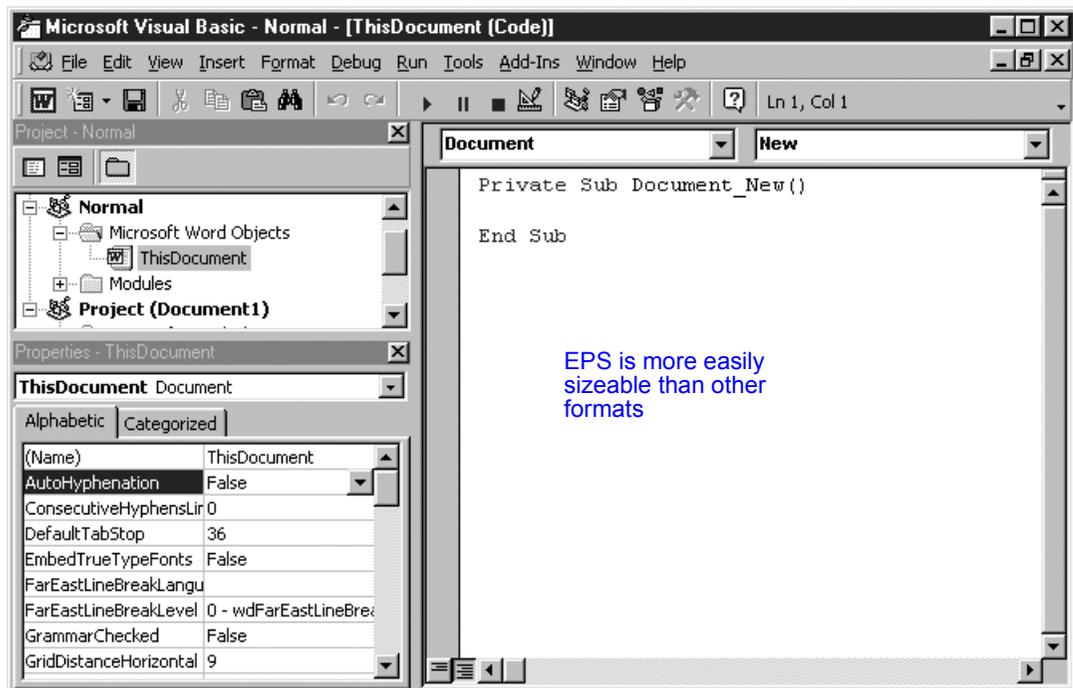
Note: Turning off **Resize Image** is important. Turning off **Resize Image** is different from setting **Interpolation** on when saving. When resizing, if you turn on **Resize Image**, interpolation happens immediately. When saving, **Interpolation** sets a flag that tells the downstream **PostScript** printer to interpolate at print time to the highest resolution of that device, which can vary.

- ◆ Change resolution to 120 ppi with **resize image** turned off (select **Image|Image Size**)—the image’s size dimensions are reduced
- ◆ Save as **Photoshop EPS** with:
 - ◆ **Preview:** TIFF (8 bits/pixel)
 - ◆ **Encoding:** Binary
 - ◆ **Image Interpolation** turned on (checked)

The image was not manipulated or resized in **FrameMaker**.

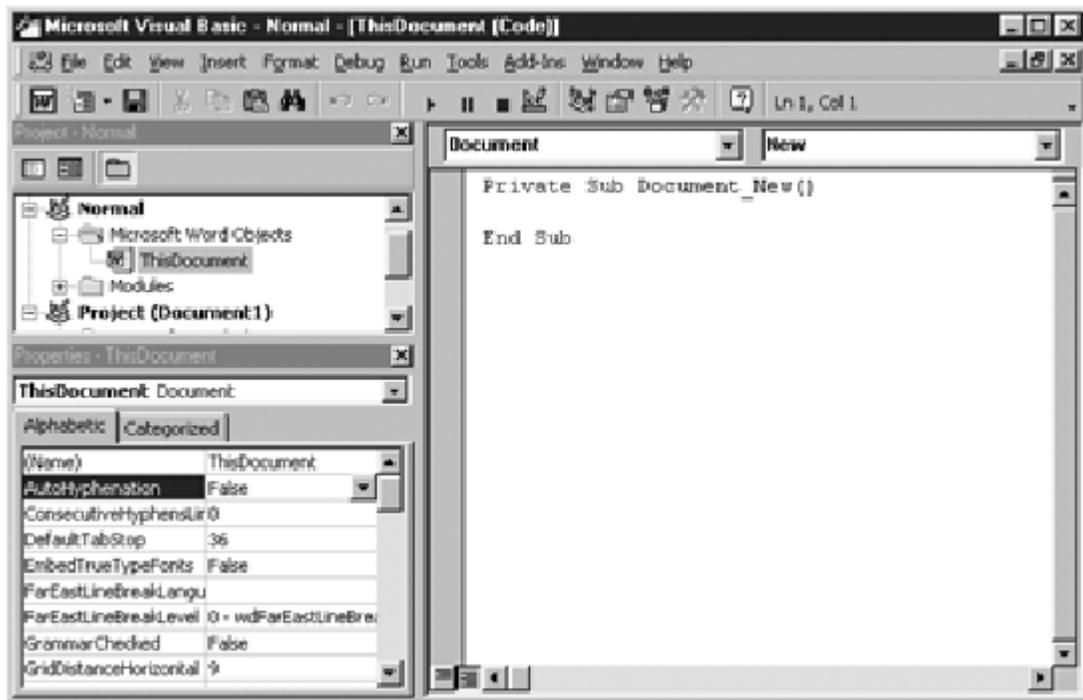
3) The resulting **EPS** can be imported into your publishing software.

Printed output is displayed here



EPS: 120 ppi, 8-bit greyscale, 399 kb (view at 167% zoom in Acrobat)

Bitmap preview of an EPS is displayed here



Bitmap Preview: Is not displayed in Acrobat

You can run a batch process in FrameMaker to significantly reduce the time needed per file, for large numbers of files.

- ◆ The bitmap preview, which is usually but not always a TIFF, looks pretty terrible. However, when viewing this in your publishing software, remember this is not the deliverable. EPS is intended for print output, including output to PDF—so print it and test it.
- ◆ Some software lets you use WMF files as a preview for EPS graphics. EPS files with WMF previews are Windows-only files and are not supported by all software applications.
- ◆ Remember, this EPS image is designed for high-resolution, PostScript-printed output.

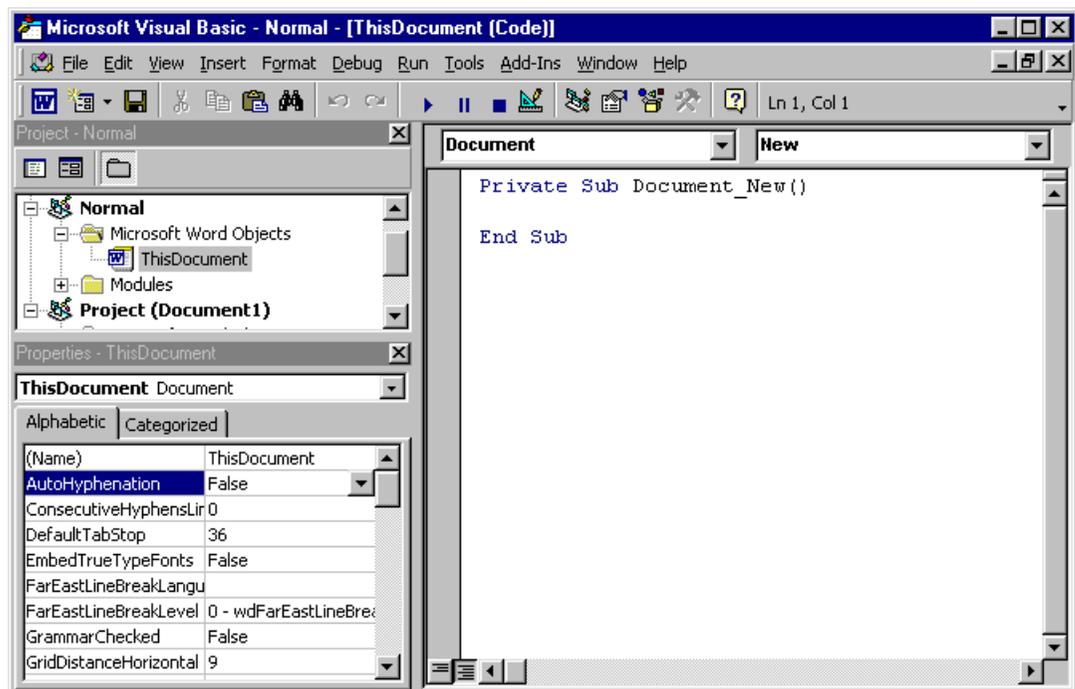
GIF Capture for Multi-Output

GIFs support only 256 colors.

GIF capture for multi-output captures a screen at an 8-bit optimized indexed color depth and 120 ppi, which is well suited for printing to a 600-dpi laser printer and for color display to the screen. GIF uses compression, so the file size is smaller than a BMP. GIFs are also Web-ready, and are viewable in a Web browser.

Note: Compare this image, its output and file size, to the 8-bit, 120-ppi BMP. See “BMP Capture for Multi-Output,” on page 3-10, for more information.

- 1) Capture the window.
- 2) Process it as follows:
 - ◆ Resolution 120 ppi
 - ◆ Color depth 8-bit
- 3) Save the image as GIF.



GIF: 120 ppi, 8-bit color, 15.3 kb (view at 167% zoom in Acrobat)

- ◆ File size is 15.3 kb, 5% of the size of a BMP with the same color and resolution. See “BMP Capture for Multi-Output,” on page 3-10, for more information.
- ◆ Compare the file size of the GIF to the 1-bit BMP. What do you think of the viewable and printed output from each? See “BMP Capture at 1-bit No Color,” on page 3-13, for more information.

JPEG Capture for Multi-Output

JPEGs support only
RGB (24-bit) colors.

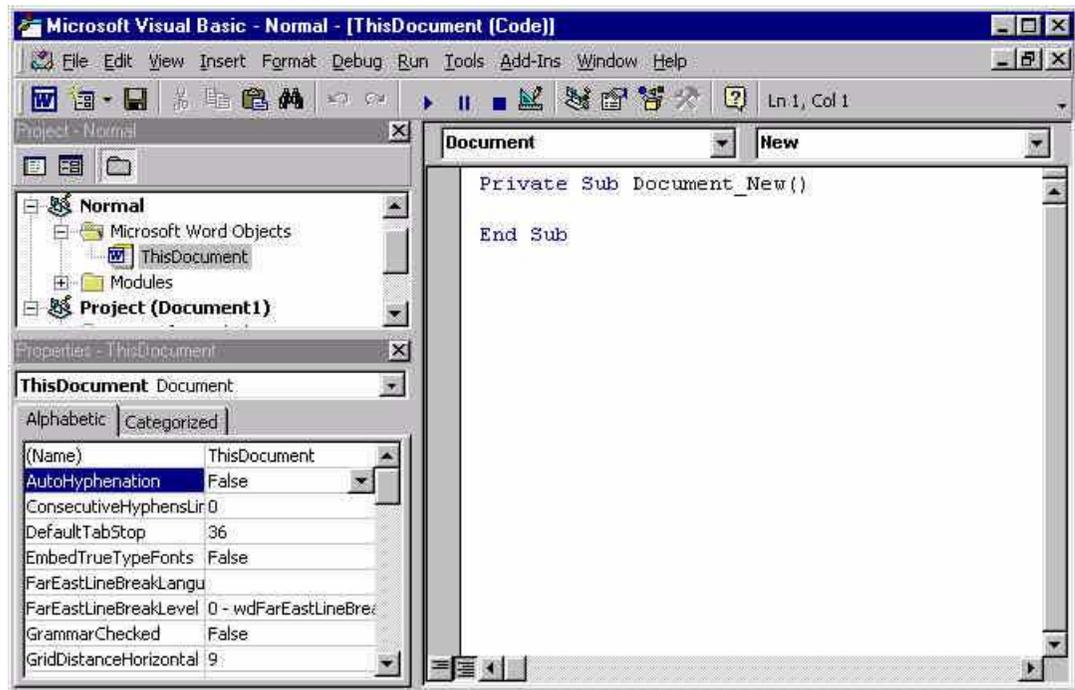
JPEG capture for multi-output captures a screen at a 24-bit color depth and 120 ppi, which is well suited for printing to a 600-dpi laser printer and for color display to the screen. JPEG uses lossy compression, so the file size is smaller than a BMP but you risk seeing jaggies and anti-aliasing at sharp edges. JPEGs are also Web-ready, and are viewable in a Web browser.

Note: You can save a screen capture as a JPEG, using the highest-possible quality, and achieve acceptable results. However, JPEG uses lossy compression, in which data is discarded to reduce the file size. And, JPEG’s lossy compression is cumulative, the results are additive and you lose more data each time you save. Thus, while you can make JPEG work for you, I prefer other formats, such as PNG.

- 1) Capture the window.
- 2) Process it as follows:
 - ◆ Resolution 120 ppi
 - ◆ Color depth 24-bit
- 3) Save the image as JPG with quality set to 70%.

However, while this example uses 70% quality to demonstrate the weaknesses of JPEG’s lossy compression, JPEGs use user-settable compression. You can lessen the compression to improve image quality, or increase compression to reduce file size at the expense of quality. You might want to set the quality to as close to 100% as you can, or use no compression for the best image quality.

If you use the highest-quality setting, you might be able to achieve acceptable output using the JPEG file format



JPEG: 120 ppi, 24-bit color, 40.3 kb (view at 167% zoom in Acrobat)

- ◆ File size is 40.3 kb, 5% of the size of a BMP with the same color and resolution. See *"BMP Capture for Multi-Output 24-bit Color,"* on page 3-11, for more information.
- ◆ Compare the file size to the GIF. What do you think of the viewable and printed output from each? See *"GIF Capture for Multi-Output,"* on page 3-19, for more information. The GIF uses fewer colors and is a smaller file size.
- ◆ Because JPEG is a lossy format, in my opinion it is not ideally suited for screen captures.

PNGs support 24-bit color.

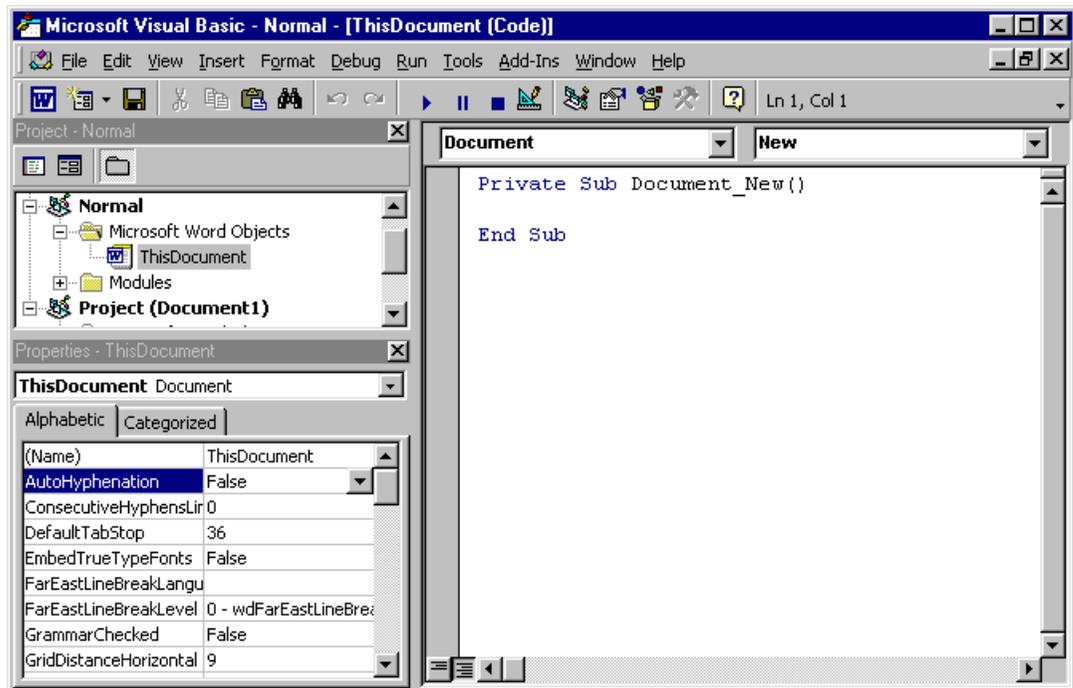
PNG Capture for Multi-Output

PNG capture for multi-output captures a screen at an 8-bit optimized indexed color depth and 120 ppi, which is well suited for printing to a 600-dpi laser printer and for color display to the screen. PNG uses non-lossy compression, so the file size is smaller than a BMP. PNGs are also Web-ready, and are viewable in newer Web browsers.

PNG is a proposed replacement for CompuServe's proprietary GIF format. PNG does pretty much everything GIF does, plus more, including allegedly better file compression and support for 24-bit color. However, PNG is a relatively new format, so it is not supported by older browsers.

Note: Compare this image, its output and file size, to the 8-bit, 120-ppi GIF. See *"GIF Capture for Multi-Output,"* on page 3-19, for more information.

- 1) Capture the window.
- 2) Process it as follows:
 - ◆ Resolution 120 ppi
 - ◆ Color depth 8-bit
- 3) Save the image as PNG.



PNG: 120 ppi, 8-bit color, 9.1 kb (view at 167% zoom in Acrobat)

- ◆ File size is 9.1 kb, 3% of the size of a BMP with the same color and resolution. See *"BMP Capture for Multi-Output,"* on page 3-10, for more information.
- ◆ Compare the file size of the PNG to the GIF. The PNG is 64% the size of the comparable GIF. What do you think of the viewable and printed output from each? See *"PNG Capture for Multi-Output,"* on page 3-22, for more information.

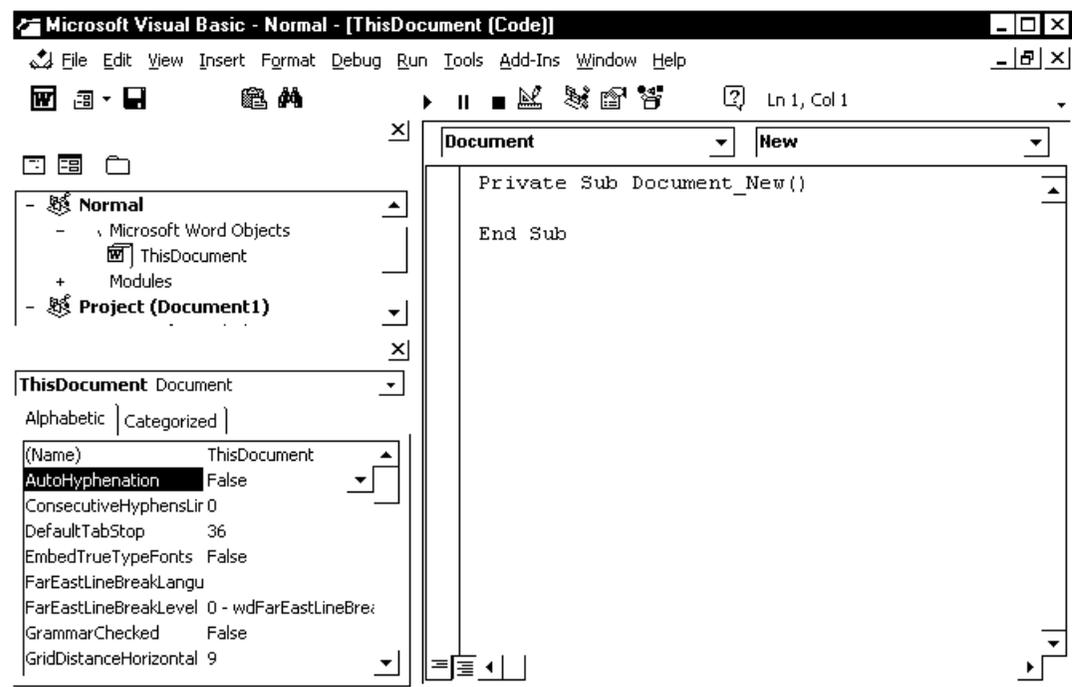
PNG Capture at 1-bit No Color

Note: See “PNG Capture for Multi-Output,” on page 3-22, for more information.

PNG has smaller file sizes than other formats. With this in mind, 1-bit PNG should provide the smallest file size of all.

- 1) Capture the window.
- 2) Process it as follows:
 - ◆ Resolution 120 ppi
 - ◆ Color depth 1-bit
- 3) Save the image as PNG.

Note the different appearance 1-bit images have over 8-bit images



PNG: 120 ppi, 1-bit color, 4.2 kb (view at 167% zoom in Acrobat)

- ◆ File size is 4.2 kb, 12% of the size of a BMP with the same color and resolution. This file is a whopping 1.5% of the size of an 8-bit BMP. See “BMP Capture at 1-bit No Color,” on page 3-13, for more information.
- ◆ Compare the file size of the 1-bit PNG to the 8-bit PNG. What do you think of the viewable and printed output from each? See “PNG Capture for Multi-Output,” on page 3-22, for more information.

Comparison of Results

Remember, the screen-capture format you use might not be your final output. For example, I capture all my screens as 8-bit BMPs but I never output BMPs. I use BMPs because, unlike GIFs, I can change the color in the BMP to 24-bit to perform some critical editing functions, as needed. Such editing functions include anti-aliasing text, something you cannot do with 8-bit color.

My BMPs are part of my source, but these get printed to PDF or converted to GIF or PNG for output and delivery. Thus, I am never actually delivering BMPs.

Capture Format	File Size (kb)	Colors	Dimensions (In.)
<i>Print-Screen Capture</i>	852.0	24-bit	7 x 4.5
<i>BMP Capture for Screen Output</i>	852.0	24-bit	7 x 4.5
<i>Graphics Capture for PDF Display On-Screen</i>	280.0	8-bit	Various
<i>BMP Capture for Multi-Output</i>	285.0	8-bit	5.6 x 3.6
<i>BMP Capture for Multi-Output 24-bit Color</i>	852.0	24-bit	5.6 x 3.6
<i>BMP Capture for Greyscale Output</i>	285.0	8-bit grey	5.6 x 3.6
<i>BMP Capture at 1-bit No Color</i>	35.5	1-bit	5.6 x 3.6
<i>TIFF Capture for Multi-Output</i>	286	8-bit	5.6 x 3.6
<i>EPS Capture for Print Output</i>	399.0	8-bit grey	5.6 x 3.6
<i>GIF Capture for Multi-Output</i>	15.3	8-bit	5.6 x 3.6
<i>JPEG Capture for Multi-Output</i>	40.3	24-bit	5.6 x 3.6
<i>PNG Capture for Multi-Output</i>	9.1	8-bit	5.6 x 3.6
<i>PNG Capture at 1-bit No Color</i>	4.2	1-bit	5.6 x 3.6

CONCLUSIONS

- ◆ Remember, screen captures contain no inherent resolution information. This is set by the image-editing software into which you paste your screen capture, or by the screen-capture software you use.
- ◆ You are wasting your time and money if you use the Print Screen key and edit the results every time—spend \$40 and get yourself some screen-capture software.
- ◆ If you must have absolutely crisp output to PDFs for on-screen viewing, consider using an image resolution that is a multiple of 72 ppi. See *“Graphics Capture for PDF Display On-Screen,”* on page 3-8, for more information.
- ◆ For output to the screen only, don’t resize anything and leave the image at 96 ppi, or the default resolution.
- ◆ 96-ppi images might display some mild jaggies when printed at 600 dpi because of their lower resolution. If your output includes print, you might want to use resolutions higher than 96 ppi.
- ◆ 120-ppi images display some anti-aliasing on-screen and in PDFs. However, 120-ppi images print crisply from a 600-dpi printer, because 120 is evenly divisible into 600.
- ◆ 24-bit color adds little for on-screen display and nothing for greyscale printing.
- ◆ 8-bit color produces shades of grey that have the same quality as greyscale images, plus 8-bit color appears as color on-screen. There is no real need to use greyscale unless you are using a color printing process and want to avoid printing color. (If you are using only black ink, be aware that colored text will print shades lighter than black text.)

However, before saving your screen captures as 8-bit-color images, make sure you read your image-editing software’s documentation so you can make an informed decision about the palette scheme to use.
- ◆ 1-bit color provides the smallest file sizes, if you don’t mind the way they look.
- ◆ BMP and TIFF have the advantage that you can convert the color to 24-bit to take advantage of some specific image editing options. TIFF adds cross-platform compatibility. Other than that, these are large files.

- ◆ Because it uses a low-resolution bitmap preview, the on-screen EPS image should look poor in your word-processing or DTP software. Output from a 600-dpi PostScript laser printer is crisp but, in my opinion, the output is not better than an 8-bit BMP, TIFF, GIF, or PNG, for my application. However, if you are going to resize a screen capture many times, EPS handles resizing with much less fuss than the other formats presented here.

Furthermore, EPS alone can get CMYK data past the Windows GDI unmolested. Perhaps at higher resolutions, the EPS looks sharper in print? I could not test the output of the EPS versus the other formats from an offset press or high-resolution printer.

- ◆ The only reason to consider GIF is for support of version 4 and earlier browsers. Otherwise, consider PNG as a Web-ready format for screen captures.
- ◆ JPEG's lossy compression provides poor-quality output, on-screen and in-print, as expected. For screen captures, use PNG or GIF instead of JPEGs for Web-ready output. Or, use BMP or TIFFs if the screen-capture file does not need to be Web-ready.
- ◆ By far, PNG provides smaller file sizes, smaller at 8-bit color than other formats in 1-bit. 8-bit PNGs in this test were 3% the size of comparable BMPs.

Conclusions