

Placing Graphics in Word Processing and Poster Documents

We often have to embed pictures of various kinds into documents. These guidelines outline the best file formats to use and the best techniques for getting your graphics from the application in which you created them to your word processing or poster document. This should help you obtain the best quality printed results.

There are two general kinds of graphics files, **bitmaps** and **vector or object-based**. A bitmap picture is a rectangular matrix of dots (pixels) where each dot is a single color. When a bitmapped picture is printed a certain size the printed picture can be described as having a certain resolution, or number of dots per inch (dpi). If a picture is 1000 pixels wide and is printed 5 inches wide the horizontal resolution in dpi is 1000/5 or 200 dpi. Examples of bitmaps are digital photographs and scanned pictures of graphs or drawings. Vector or object-based graphics files are composed of mathematical descriptions of the object and letter shapes that make up the figure. The concept of resolution in dots per inch does not apply to them, and when printed they will print at the maximum resolution of the printer being used. It is possible to insert bitmapped objects into vector based graphics files, and these inserted bitmapped objects follow the rules as other bitmapped pictures. Examples of vector/object based graphics are graphs from most graphing packages and drawings created using programs like Adobe Illustrator.

This following table shows the optimal resolution to use for the various graphics file types when printing in the CLIPR lab.

Picture Type	Preferred File Format	Optimum Resolution in dots/inch for CLIPR Printers		
		B&W Laser	Color Laser	Poster Printer
photograph	jpg	150	300	300
bitmapped line drawing (e.g. scanned graph)	png	600	600	600
vector or object-based (e.g. graph saved from Excel)	eps or pdf*	not applicable	not applicable	not applicable

* Older versions of Microsoft Office (2003 and earlier for PC and 2004 and earlier for Mac) do not handle pdf graphics properly, so you should use eps files for inserting graphics into these programs.

Using Bitmaps – In order to get the best quality print from a bitmap file while keeping the size of the file to a minimum, the size of the pixels or dots should be matched to the size of the dots that the printer uses. Most black and white laser printers are capable of printing at 300 or 600 dots per inch (dpi). B&W lasers cannot print shades of grey (e.g. photographs) so they must print black dots with the density of the non-overlapping dots determining the darkness of a region. This makes it so the optimum resolution for photographs is lower. The color laser can print dots of any color at 300 dpi. The poster printer is an inkjet printer that can print 1200 dpi using eight different colors of ink. Thus to print colors that are combinations of the eight “primary” colors it must use an area of non-overlapping dots of the primary colors plus the white of the paper. We have determined that the quality of printed photographs does not improve significantly beyond about 300 dpi in the original image. Using higher resolutions will make your file much larger without significant improvement in the printed picture quality. However if you have a picture for a poster in which fine detail is very important, you might try scaling it to 600 dpi.

The preferred file format for photographs is **jpg** because this format utilizes compression algorithms that reduce the file size substantially without noticeably reducing the quality of the picture. Information is lost during this compression and during scaling so you should keep your original photo file intact. The jpg compression does not work very well for line drawings like scanned in graphs or other pictures with high contrast sharp edges, so the preferred file format for these is **png**. The **png** file format uses a loss-less compression scheme that works very well with line drawings. Scaling these files down does result in loss of information so you should keep originals of these also. If the application you are using does not support **png** files, a very similar alternative format is **gif**.

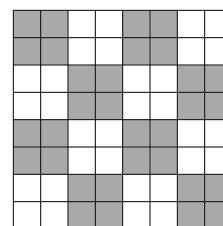
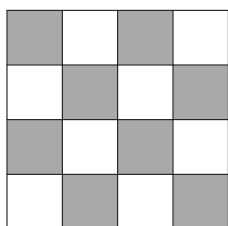
Printing images at higher resolutions than suggested in the table above will not improve significantly the quality of printed version but will increase the size of your document file and may increase printing time substantially.

Scaling photographs and other bitmapped images – You can use an application like GraphicConverter or Photoshop to scale photographs to match the optimal size for the printer you are going to use. The following table shows a few examples of scaling pictures to best fit the printers.

		Optimal Size (in pixels) multiply size (inches) times printer's optimal resolution in dots/inch (dpi)	
Original Size in pixels	desired size in inches same width to height ratio as original	B&W Laser optimal resolution: 150 dpi	Color Laser or Poster Printer optimal resolution: 300 dpi
(a) 1800 x 1200	6 x 4	900 x 600 scale down	1800 x 1200 no scaling necessary
(b) 1800 x 1200	10 x 6.67	1500 x 1000 scale down	3000 x 2000 the original has fewer pixels than desired - scaling up will not im- prove picture quality
(c) 2400 x 2400	5 x 5	750 x 750 scale down	1500 x 1500 scale down

The rule of thumb to follow is that you never need to scale a picture up to a higher resolution but should scale down if necessary to bring it to the optimal resolution of the printer you will be using.

If the checkerboard on the left below is your original 4 x 4 pixel graphic and you scale it up to 8 x 8 pixels, you will get the picture on the right. The pixels are smaller and the resulting file will be larger, but the picture content remains the same.



Using Vector Based Graphics – Because they contain mathematically defined shapes, vector based graphics will print at the maximum quality of the printer independent of how they are scaled in the document. While there are many file formats that are vector and object-based, the preferred format for inclusion into documents like Microsoft Word and Powerpoint files is encapsulated postscript or **eps**. With newer versions of Microsoft Office programs (2007 or later for PC and 2008 or later for Mac) you may use **pdf** files instead. They are generally simpler to make and can be inserted into the newer versions of Word and Powerpoint with good results. Older versions of Office programs would turn inserted **pdf** graphics into low resolution bitmapped graphics not suitable for publication.

EPS and **pdf** files contain postscript printer instructions. Postscript is a computer programming language that is used to describe text and graphics on a printed page. It is built-in on almost all laser printers. With **eps** files the postscript instructions are “encapsulated” with additional information that makes them easier to insert into other documents. Many applications cannot display the graphics represented by the postscript instructions within an **eps** file unless the file includes a “preview” representation.

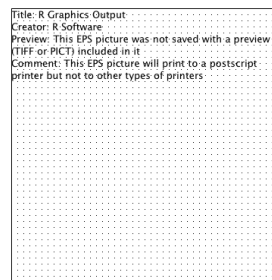
The preview included in an **eps** file may not be a very high quality representation of the graphics but the postscript will be used when the document is printed. The resulting printed picture will be at the highest quality the printer is capable of producing.

Many graphics applications allow you to create **eps** or **pdf** files directly by selecting options under “Save As...” or “Export...” menus. If the application you are using to produce your vector/object-based graphics does not support saving files as **eps**, then you can use Adobe Acrobat (the standard or pro version, not the free Acrobat Reader) to create the **eps** file but first you must save the graphics as a **pdf** file. On the Macintosh (OSX) there is a “Save As PDF...” button in the standard “Print...” dialog. On a PC you can use the free PDFCreator software (<http://sourceforge.net/projects/pdfcreator/>) or the “PDFmaker” printer selection that comes with Adobe Acrobat. Once you have the **pdf** file, open it with Adobe Acrobat and use the options in the “Save As...” dialog to create the encapsulated postscript file. In later versions of Adobe Acrobat the “Settings...” button in the “Save As...” dialog also allows you to designate that the **eps** file include a preview image.

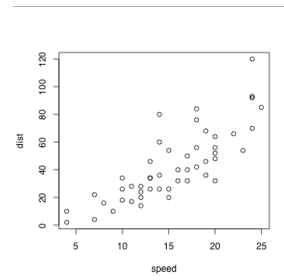
While these procedures somewhat complicate the process of placing graphics into documents, they will guarantee that you get the best quality output on the printers in CLIPR.

Inserting Pictures into Documents – While it is tempting to simply use “copy and paste” to move graphics from the application you used to create them into the application you use for word processing or posters, this does not guarantee a good quality printed document. It is best to save the graphics out into the appropriate file format as described above, and then use menu commands to insert the picture file into the document. Most applications will allow you to “drag and drop” the picture file into the document, but in some cases this is the same as the “copy and paste” method and does not guarantee good quality results. In Microsoft Office applications select Insert → Picture → From File... from the menus which will bring up a dialog in which you locate and select the picture file.

If you want the convenience of using “copy and paste” or “drag and drop” insertion of pictures into documents, then you should first test this technique using a small document on the printer you will be using for your final copy.



without preview



with preview