

Basic Computer 2

The Basics

Adobe Photoshop

Topics Covered

Understanding resolution issues

Monitor resolution

The number of pixels or dots displayed per unit of length on the monitor, usually measured in dots per inch (dpi). Monitor resolution depends on the size of the monitor plus its pixel setting. Most new monitors have a resolution of about 96 dpi, while older Mac OS monitors have a resolution of 72 dpi.

Understanding monitor resolution helps explain why the display size of an image on-screen often differs from its printed size. Image pixels are translated directly into monitor pixels. This means that when the image resolution is higher than the monitor resolution, the image appears larger on-screen than its specified print dimensions. For example, when you display a 1-by-1 inch, 144-ppi image on a 72-dpi monitor, it appears in a 2-by-2 inch area on-screen. Because the monitor can display only 72 pixels per inch, it needs 2 inches to display the 144 pixels that make up one edge of the image.

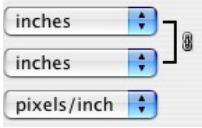
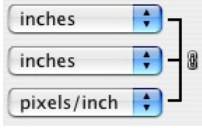
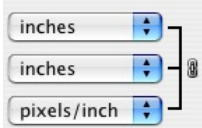
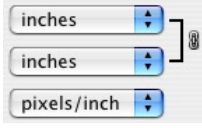
To check the actual size of the image in inches or picas, go to the Main menu>Image>Image size.

Re-sizing images

Resampling refers to changing the pixel dimensions (and therefore display size) of an image. When you *downsample* (or decrease the number of pixels), information is deleted from the image. When you *resample* up (or increase the number of pixels), new pixels are added based on color values of existing pixels.

Resizing downward in resolution eliminates excess file size which can save space in memory and prevent increased RIP times at the printer. **If a larger, high quality image is needed, it should be re-scanned at a higher resolution.**

For flexibility in working with images, high resolution scans at 300 to 600 ppi allow for archiving high quality images as well as resizing. Scan once at the high end and create a low resolution versions of the image to be used for preliminary page layout (called FPO – “For Placement Only”). This reduces file size and re-drawing time of the previews. Replace the low res image with the high res image at the appropriate size when the design is complete. Images in a final file should **always** be resampled to the actual size needed (in Photoshop) and replaced (updated) in the page layout document. Images should never scaled in a page layout program for final production.

Decrease Image Size (Downsample)					
Resample setting	Link symbol	What happens	Result	Tells Photoshop to:	How Used:
Resample ON <input checked="" type="checkbox"/> Resample Image:		Resolution stays the same, extra pixels discarded	Smaller image, same resolution	Calculate what is not needed and make image smaller	Start with appropriate resolution, image too large (ie. resized 300 ppi image in layout)
Resample OFF <input type="checkbox"/> Resample Image		Condenses pixels, increases resolution	Smaller image with higher resolution (ppi higher)	Keep all pixel info and redistribute	Start with low res, large size image to get appropriate size and resolution (ie. digital camera image)
Increase Image Size					
Resample OFF <input type="checkbox"/> Resample Image		Resolution drops	Larger image, lower resolution (ppi lower)	Spread pixels over larger area	Start with high res, don't go under minimum needed (ie. 600 ppi scan enlarged 200%)
Resample ON <input checked="" type="checkbox"/> Resample Image:		Keeps resolution the same, adds pixels.	IMAGE BLURS	Resample: INTERPOLATES & ADDS PIXELS based on existing pixels	DON'T DO IT!! Rescan at higher resolution

Improper re-sizing of images

Original low resolution image [72 dpi] and version enlarged in a page layout program. Larger image has poor image quality due to enlargement of pixels which were scaled in a page layout program.



Improper re-sizing of images

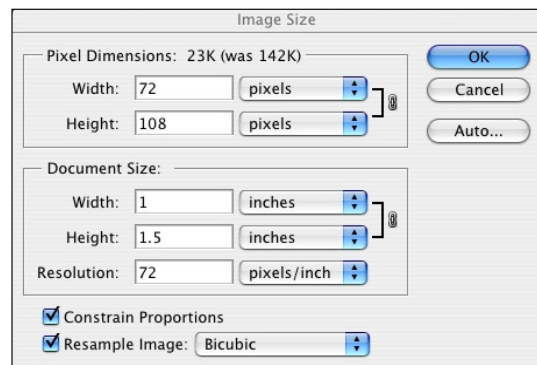
Original low resolution image [72 dpi] and enlarged version at the same resolution made in Photoshop. Larger image has poor image quality (blurry) due to "fill-in" of pixels.

A similar result occurs when increasing resolution to enlarge the image. Increasing resolution in Photoshop does not necessarily create a high quality image due to interpolation.



*Resolution Essentials***Image resolution**

The number of pixels displayed per unit of length in an image is called the image resolution, usually measured in pixels per inch (ppi). An image with a high resolution contains more, and therefore smaller, pixels than an image of the same dimensions with a low resolution. For example, a 1-inch-by-1-inch image with a resolution of 72 ppi contains a total of 5184 pixels (72 pixels wide x 72 pixels high = 5184). The same image with a resolution of 300 ppi would contain a total of 90,000 much smaller pixels.



Because they use more pixels to represent each unit of area, higher-resolution images can usually reproduce more detail and subtle color transitions when printed than lower-resolution images. However, once an image has been scanned or created at a given resolution, increasing the resolution in Photoshop will not usually improve the image quality because in this case, Photoshop must in effect spread the same pixel information across a greater number of pixels.

The proper image resolution to use for an image depends on how you intend to display or distribute the image. Using too low a resolution for a printed image results in pixilation – large pixels that produce very coarse-looking output. Using too high a resolution (i.e., pixels smaller than what an output device can reproduce) increases the file size unnecessarily and may increase the time required to print or distribute the image.

Screen frequency and image resolution

Many commercial and desktop printers use halftone screens, which consist of printer dots called halftone cells, to print grayscale images and color separations. Screen frequency, also known as screen ruling, refers to the number of halftone cells per inch in a halftone screen, and is measured in **lines per inch (lpi)**.

The relationship between image resolution and screen frequency determines the quality of detail in the printed image. As a general rule, to produce a halftone image of the highest quality, use an image resolution that is **1.5 to 2 times the screen frequency**. In some cases, however, depending on the image and the output device, using a lower resolution produces good results.

Note: Some imagesetters and 600-dpi laser printers use screening technologies other than halftoning. If you are printing the image on a non-halftone printer, consult your service provider or your printer documentation for the recommended image resolutions.

Determining image resolution of scans

DPI	Dots Per Inch	Resolution of output device such as laser printer
PPI	Pixels Per Inch	Resolution of computer screen. Image resolution indicated in Photoshop under Image Size
LPI	Lines Per Inch	Description of the dot size (halftone dot screen) of the output device – <i>not the resolution of the device.</i> Newspapers are typically printed at 60–100 lpi, magazines and commercial printing at 120–150 lpi, and 200–600 lpi for high quality color process printing

Image Resolution FORMULA

$$\text{PPI} = 1.5 \text{ to } 2 \times \text{LPI} \times \% \text{scale}$$

1.5 = medium quality

2 = high quality

% scale = Percentage you increase or decrease the image in dimensions

Sample Line Screens

Apple LaserWriter IIg 54 - 70 LPI

Minolta Color Copier 90 LPI

Image Setters 80 - 200 LPI

Examples

Scanning for Laser Printers at 60 LPI

High Quality - $2 \times 60 \times 1$ (no scaling) = 120 PPI

High Quality - $2 \times 60 \times 2$ (for increasing the physical size to 200%) = 240 PPI

Scanning for Image Setters at 133 LPI (normal output)

High Quality - $2 \times 133 \times 1$ (no scaling) = 266 PPI

High Quality - $2 \times 133 \times 2$ (for increasing the physical size to 200%) = 532 PPI

DPI and PPI are terms that are used somewhat interchangeably when determining image size, although technically they are not the same. Knowing the KB or MB size of an image is not enough information for producing a printed image. A 600KB image can be 5" x 7" at 72ppi, but it would not be the right resolution for a printed image. An image that will be printed at 150 lpi at a print shop would need to have a resolution of 300ppi.

Generally, 300ppi is a good resolution for printing, without the file size being too large to work with or to print.