

Resolution and LPI

Pixels: Raster graphics are made up of a grid of pixels. When viewing 100% or less on a monitor (72 dpi resolution) the individual pixels are not visible to the eye. If the dpi is lower such as in Example 1 you can see the individual pixels and can't really tell what the image is. Similar to when you zoom in on an image. Images that are only going to be viewed on the screen can be created or scanned at 72 dpi

DPI or PPI: Dots per Inch or Pixels per Inch.

Monitor and Scanning DPI/PPI: You will hear these terms used interchangeably and in this case they refer to monitor view perimeters or the scanning resolution you select. When scanning or creating an image to be viewed on a monitor or projection device the dpi/ppi should be the same as the monitor - thus 72 dpi or a 1:1 ratio.

Printer DPI/PPI: Your output device has a dpi resolution also. This is the number of dots it can create within a square inch. Example 2 shows that on a laser printer a number of dots can make up a halftone dot depending on the line screen selected (more about that later). When scanning or creating images that will be printed you need to capture more information about the image due to the printing process. The ratio you utilize must then be higher. But how high is enough. If your dpi is very high the file is huge. You only need to scan high enough for your output device's ability to print fine detail. Every output device has a different dpi and you can print on different types of surfaces. All these effect how you scan. Below are common resolutions of various devices.

Laser Printer: 600 - 1200 dpi

Inkjet Printer: 400 - 600 dpi

Imagesetter: 1240 and above dpi

Selecting the correct DPI/PPI for images: So how do you know what resolution to scan at or create your image in? This is determined by the lpi or Lines per Inch that you will be printing at. Almost all output devices print in what is called halftone dots. These are dots that are created of these small printer dots. Halftone dots are on a grid that is the LPI/lines per inch. The higher the number the smaller the grid. Thus the higher the lpi the less noticeable they are as there are more of them in a linear inch though there is an optimum lpi ratio to output dpi (see your Graphics Workbook pg 13 for examples). Below are typical lpi amounts for different printers and surfaces:

Laser printers: 55 - 75 lpi

Inkjet printers: 60 - 100 lpi

Offset Lithography

Newsprint: 65 - 85 lpi

Uncoated paper: 100 - 133 lpi

Coated paper: 133 - 150 lpi

Gravure: 200 lpi

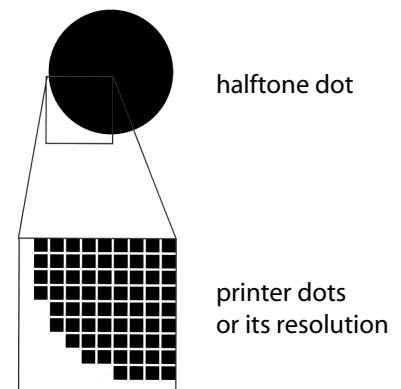
The rule of thumb is to scan at twice the lpi of your output line screen requirements (also called screen frequency) unless you are scaling an image. If so, scan with the following formula:

$$\text{LPI} \times 2 \times \text{Scaling \%} = \text{DPI}$$

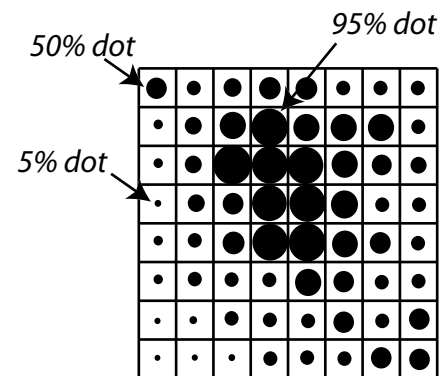
Halftone dots: Halftone dots are always laid out in a grid pattern (lpi) but the size of the individual dots vary. These create your image in a normal view mode. The halftone just tricks your eye into thinking it is a real photograph because the dots are so small. Example 3 is a zoomed in view of a segment of a printed image. Example 4 is a scanned photograph. The larger halftone dots would create the darker (shadow) areas and the smaller ones the lighter (highlight) areas. You can see how that correlates with Example 1. A good print of a photograph or gradient would never have a 100% dot (solid) or a 0% (nothing) or you would loose detail in your image. Also some printing presses cannot print dots smaller than approximately 5%.



Example 1: Pixels Enlarged



Example 2: halftone and printer dots



Example 3: halftone dots



Example 4: scanned photograph