Printing Differences: Lines Per Inch and Dots Per Inch (5/93)

Article Created: 11 May 1993

TOPIC ----------

The Apple Color Printer spec sheet says the printer has 360 dots per inch, but it also says the printer has 65 screen lines per inch. Can you explain the difference between lines per inch and dots per inch?

DISCUSSION ----------

Dots per inch (dpi) represent the quantity of dots per inch a printer is capable of putting onto paper. Dots per inch is also known as the resolution of the printer.

Lines per inch (lpi) represent the number of halftone dots (per inch) that a screen contains Lines per inch is also referred to as the screen frequency or screen ruling.

The halftone dot is quite different from the dpi dot. The halftone dot can actually be a variety of shapes: lines, ellipsoids, squares, dots, random flecks, and a variety of other solid black shapes. Typically dots and ellipsoids are used. However, for the more artistic representations other shapes are often used. The number of shapes per inch is measured by lines per inch, that is, shapes per inch equals lines per inch.

With the exception of daisy wheel type printers, output from computers has always been based on a quantity of dots placed together to represent alphanumeric characters and graphics. The first printers of this nature were the dot matrix printers. Laser printers and ink jet printers use this same principal. The laser and ink jet dots are smaller than the dot matrix printers, but they work the same way. The number of dots these printers produce is the measured in the dots per inch (dpi) notation.

Prior to the use of the dot based printers the pre-press/printing industry used various methods of placing solid forms of ink onto paper (gravure, letterpress, offset, and so on.). These methods do not use dots to form the alphanumeric characters. Similar to the daisy wheel printers, the characters are fully formed ink impressions. The problem with using solid ink comes when attempting to print graphic images which consist of more

than solid lines or solid blocks (line art). Some method to vary the amount of ink placed on the paper is needed in order to represent various levels of gray. Otherwise, printing photographs and other continuous tone artwork would not be possible.

To address this need, a technique was developed to print various sized black halftone dots on the paper. An area of various sized, solid black halftone dots will trick the eye into thinking it is seeing various levels of gray.

In the traditional technique used to create these various sized dots a screen is placed over the photographic enlargement paper to break the continuous-tone photograph into halftone dots. A screen can best be described as a sheet of plastic which contains the inverse (negative) gray scale pattern of halftone dots. This sheet of semi-transparent plastic allows varying amounts of light to pass through and contact the photographic paper placed beneath it. In the computer technique, there is no physical screen used. The halftone dots are created via computer image processing.

The number of halftone dots in the screen is represented by the lines per inch (lpi) measurement. That is, 65 halftone dots per inch equals 65 lines per inch. The number of halftone dots per inch for a screen can vary. Typical values are 65 lpi for newspaper photograph halftones to 200 lpi (or higher) for art reproduction books.

There is a relationship between dpi and lpi. The relationship exists as a limit. The lpi of a printer will always be less than the dpi of the printer, because the halftone dot is composed of a matrix of the dpi dots. Higher dpi does not directly indicate higher lpi, only the possibility of higher lpi. Both a 300 dpi printer and 600 dpi printer can produce halftone dots of (possibly) 53 lpi, 75 lpi, 83 lpi, 106 lpi, and 150 lpi, but the 600 dpi printer would be able to produce additional, higher lpi.

Keywords: <None>

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