SCANNING LINE AND TONE

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Scanning Line Originals
When an original image consists of lines and solid areas of black or white, it can be scanned as line art. Objects drawn with a single flat colour, such as logos are also referred to as line art.

The resolution at which line art is scanned depends upon its intended application. The scanning resolution should match the output device resolution, unless this is higher than 1200dpi. There is minimal visible differences between scans made at 1200dpi and 2400dpi. There is however a considerable difference in file size, which makes handling more difficult and more storage more costly.

No benefit will be gained by scanning an image at 1200dpi instead of 600dpi, when output will be made with a 600dpi laser printer.

What is a Halftone?
A printing press can only cope with the application of solid colour. If an image needs to be produced with varying tones or tints of solid colour (a coloured photograph), a halftone screen is used. The halftone screen is made up of small black dots interspersed with white space. If magnified or looked at closely it will appear as dots.

Halftone screens are measured in lines per inch (lpi). The different screen sizes are used for different printed products:

85 lpi	Newspaper and reproduction on coarse paper
100 lpi	Magazines, books etc.
133-150 lpi	Most commercial printed matter, good quality magazines and books
175-200 lpi	Specialist colour reproduction, high quality printing on hard and non absorbent surfaces

Scanning Tone Originals
Postscript programs handle up to 256 shades of each process colour. This can be achieved by using the following formula:

Imagesetter output at: $\left(\frac{2400 \text{ dpi}}{150 \text{ lpi}}\right)^2 = 256$ shades
Use a screen ruling of:

To scan tonal originals for halftone reproduction a range of 256 different levels of tone are required. This is normally sufficient to reproduce a smooth graduation without seeing tonal jumps or bands. This is referred to as 8 bit colour:

$2^8 = 256$ colours or tonal blends

The measuring of halftone screen ruling as *lines per inch* is sometimes referred to as *screen frequency.*

RGB (red, green and blue) normally use 24 bit colour (3 x 8 bit)
There are 256 brightness level per colour channel

2^{24} = 16.7 million colours

In order to maintain this tonal range of 256, we need to work from screen ruling to obtain the scanning resolution using the following formula:

Screen Ruling x 2 = Scanning Resolution

Therefore if a screen ruling of 150 lines per inch is being used for printing a coloured photograph, the following formula would be used:

150 x 2 = 300 dpi for scanning

The above data is based on scanning same size or 100%.

If a black and white (monotone) image is required from a colour original, scan in colour and print in monochrome. Scanning an image in colour (RGB) will give more detail and improve the quality of the image.

To keep file sizes small, save files in RGB mode. Change mode to CMYK when saving files which are being exported to a page make-up program. This is because files can only be printed using cyan, magenta, yellow and black inks, on a printing press. CMYK files will be larger as there is an extra channel of colour compared to RGB.

The screen ruling is normally controlled and applied when the picture is exported into a page make-up program like QuarkXPress or PageMaker. When the files are being output from an imagesetter, the details for the screen ruling and output resolution for the positive or negative film is entered into the page setup.

QUESTIONS ON SCANNING
LINE AND TONE

(1) When scanning line originals, what needs to be considered?

(2) What is the maximum scanning resolution for line originals?

(3) Why do photographs use an halftone screen?

(4) What screen ruling (lpi) is used for commercial printed matter?

(5) How many shades can postscript programs handle?

(6) If an image is scanned at 300dpi, what is an ideal screen ruling for ouput of coloured photographs?

(7) After scanning images, what mode do the files need to be saved in, and why?

(8) What mode do images need to be saved in, when exporting to a page make-up program?

(9) Where is the screen ruling for an image controlled and applied?