Getting Better Raster Results

A laser has two states: on and off. Every black pixel or "laser dot" is the result of the laser turning on and firing at a particular location. This location is controlled by the input image, which can be thought of as a "map" of on and off pixels. The question is how do we give RetinaEngrave the best "map" of these laser dots to accurately represent the original image?

Your source image is processed several times between sending it to the Windows XPS Image Writer (printer) and final laser processing of the work piece. The first alteration of the source image occurs when the image is sent from the print stream into RetinaEngrave. If the printer DPI is set differently from the software DPI, the source image must be up-sampled to the native DPI of the laser; up-sampling is necessary to keep the output image dimensions (in inches) the same as the source image dimensions. This process generates new pixels; unfortunately there are mathematical constraints on the sampling process so it is imperfect.

In order to avoid introduction of error through up-sampling, the source image must be a 1-bit image. 1-bit images are an exact "map"; all pixels are either on (black) or off (white). The best results are achieved by creating/converting a source image in a dedicated editing program with DPI settings that match the native DPI of the laser (1000dpi).

In the case of non 1-bit .bmp images (greyscale/color), dimensions are set on import using the page size in the print driver dialog box. Changing the DPI setting results in a different number of pixels in the same space, without changing the dimensions of the image. This procedure results in lower output quality that is not true to the source image. Multi-bit images that are not evenly divisible by the native laser DPI (250/500/1000) should always be direct printed instead of dragged and dropped, and should be rastered at the same resolution as they were printed. The case study in the following section examines the results of various import methods.

Summary of Best Practices for Image Formats

SOURCE TYPE	IMPORT METHOD	NOTES
1bit BMP	Drag and Drop, File-Open	Pixels are divided by laser dpi (1000 for hobby). 1000=1 inch. DPI box changes DIMENSIONS of output by skipping lines. Output is always true to source. It is not recommended to Direct Print 1-bit images
Color/Greyscale BMP	Direct Print	Always Direct Print non 1bit images as they are sampled at a rate proportional to laser output resolution, resulting in better quality output. For best output, Raster at the same DPI as the source image
XPS file containing images	Drag and Drop, File-Open, Direct Print	For best output, Raster at the import DPI

Case Study: The Effects of Up-scaling Following Direct Print

We have generated a small 50x50 pixel box. In the following illustration, the center box is the original size. This is direct printed using "Half Page" format from Windows Picture Viewer. Figure 8 is the actual size of what is generated from Direct Print. Figure 9 is the result of a Direct Print at 250dpi. Observe the rounded edges due to the drastic increase in size.

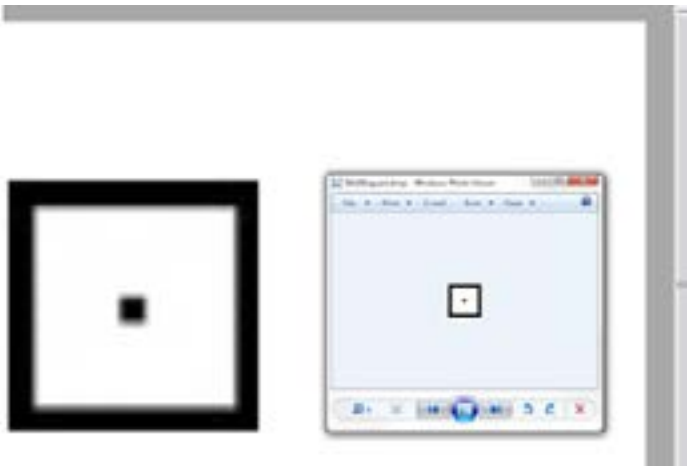

Figure 8 - Direct Print Source

Figure 9 - Direct Print at 250dpi

If we select 1000dpi within RetinaEngrave and then Raster, we get surprising results. The right image in Figure 10 is the actual output that is sent to the laser, including the anomalies along the edge. This is the result of direct printing from a small source to a large output and rastering at a much higher DPI than the project was direct printed at (1000 vs 250).

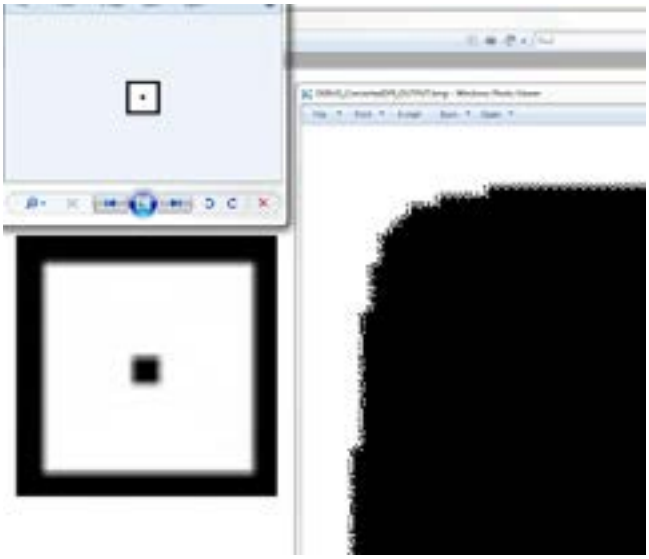

Figure 10 – 1000dpi Output from 250dpi Print

In Figure 11 we take the corner of the same project and output it at 500dpi instead of 1000. The effects are still visible although not as severe as using a 1000dpi output.

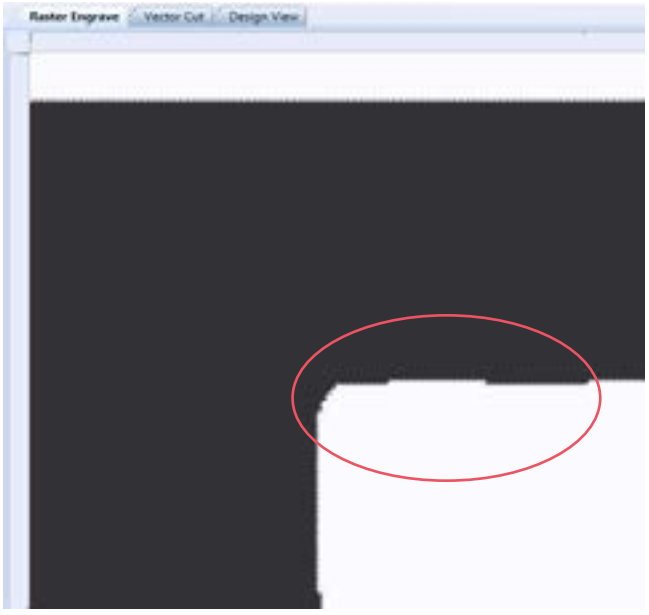

Figure 11 – 500dpi Output from 250dpi Source

Figure 12 shows a Direct Print at 500dpi with output at 250dpi.

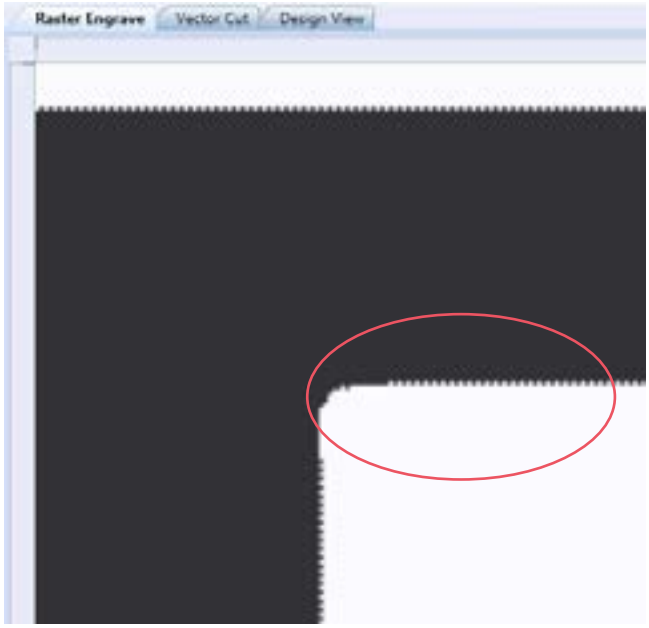

Figure 12 – 250dpi Output from 500dpi Source

When we print at 250dpi and output at 250dpi, we find the best results because import and output DPI are identical (Figure 13). The software must up-sample to 1000dpi in order to lase, resulting in an image ¼ the size of the original. In order to output at the same dimensions as the source, the software skips 4 lines for every line of output on the Y-Axis. In this way, no scaling is required and no anomalies are introduced as pixels need not be generated before output.

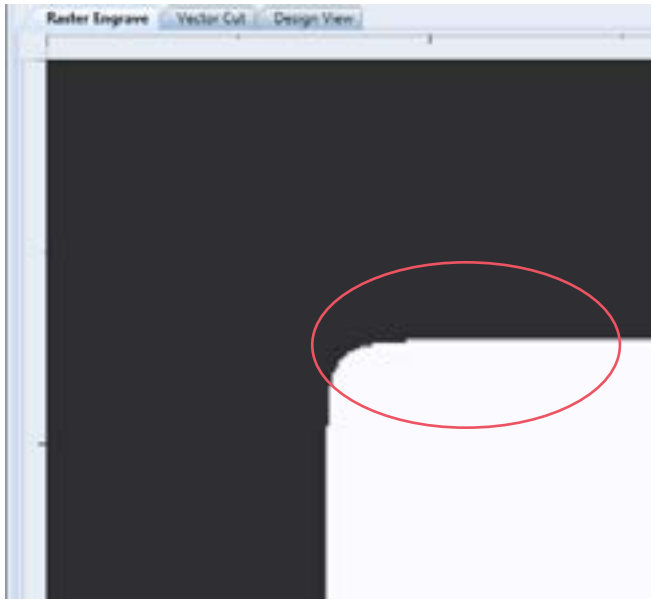

Figure 13 – 250dpi Output from 250dpi Source