

Preparing drawings for the laser cutter

November 10, 2013

You can use any software you're comfortable with to prepare drawings for the laser cutter. The control PC for the laser cutter has Inkscape and LibreCAD installed, so you can save your drawing in any format that can be opened by either of those. The recommended formats are .svg (for Inkscape) and .dxf (for LibreCAD). If you're stuck using a Windows machine to prepare your original drawing, you can export your original drawing in .xps format on your own machine. Otherwise, you will use either Inkscape or LibreCAD on the control PC to convert your drawing to .xps format.

Although many kinds of drawing software and file formats can be used, the manner of drawing matters a good deal. The laser cutter uses line drawings to control cutting, and black and white images to control engraving. The best results depend on understanding how to generate a drawing that RetinaEngrave, the laser control software, will interpret predictably and consistently.

The laser cutter has two modes: vector (for cutting or engraving line drawings) and raster (for engraving images). It is recommended that drawings for the laser have at least three layers, vector, raster, and alignment.

Drawings for vector mode

In vector mode, the laser cutter follows lines in the drawing. The fill color or texture for the shapes in the drawing doesn't matter, only the outlines of shapes is important. The order and depth of the cuts can be controlled according to the color of the lines. The following colors can be used: blue, red, magenta, green, cyan, and yellow. When the file is imported into RetinaEngrave, you can assign separate settings for power, speed, and number of passes for lines in each of these colors. Depending on settings, this mode can be used for engraving (if the settings are such that the material is marked rather than cut through) as well as for cutting.

Black can also be used, but is not recommended for vector mode. Non-standard colors in the drawing will be treated as black by RetinaEngrave, and black is also significant in the raster then vector mode, so it can be confusing to use it for cutting.

Figure 1 shows an example of a drawing prepared in Inkscape for the laser. The green, blue, and yellow lines are engraved (i.e. not cut into, but not through, the material) and the cyan lines are cut lines, set so they are cut through. The order of operations will be set so that the engraved lines are done first, and the cyan lines are cut last. This helps prevent the small parts from shifting before they are engraved.

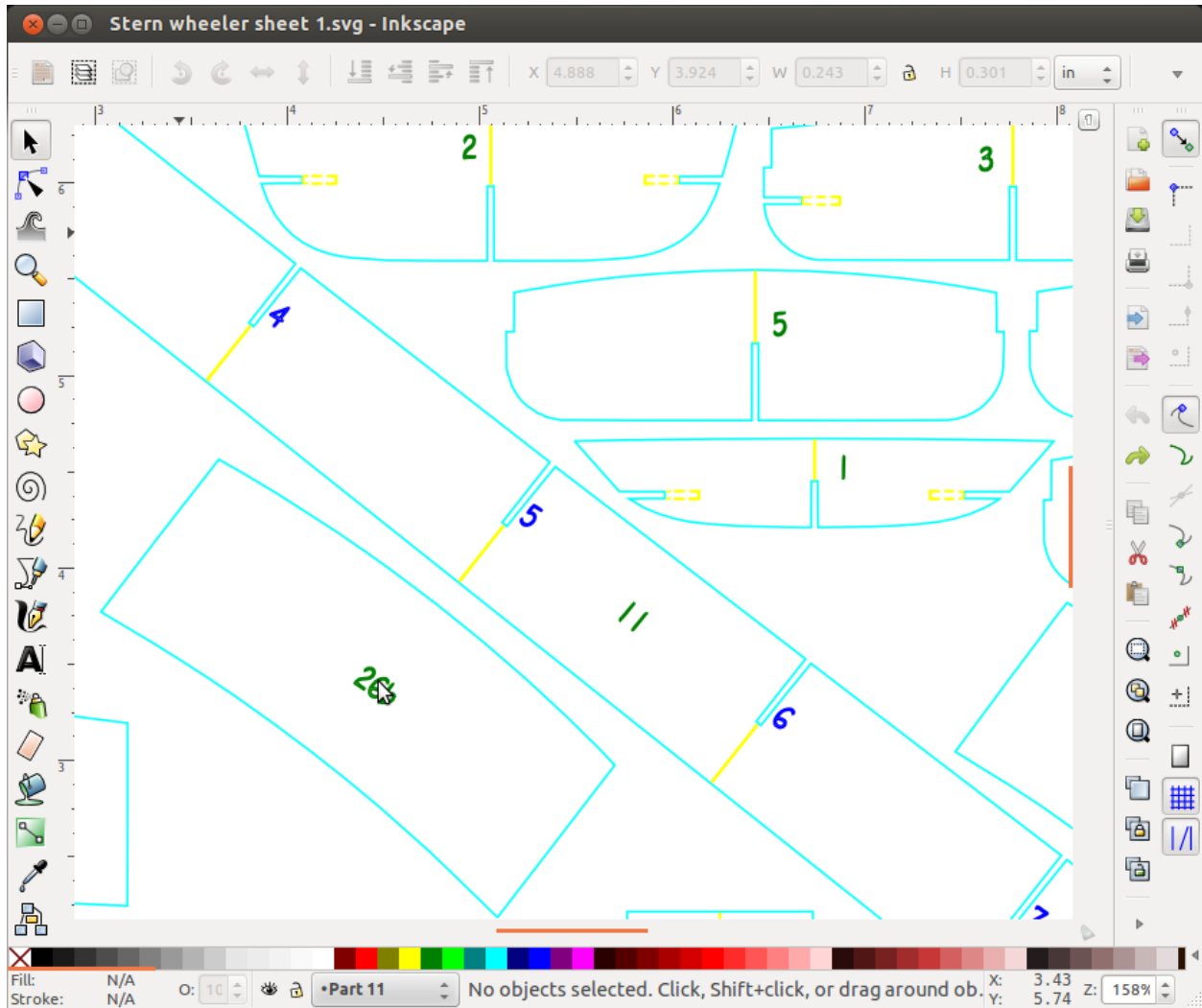


Figure 1: Example drawing for vector mode

Order can also be important for cutting. Parts that have interior cuts (e.g. holes) should have the interior cuts done first. This will help maintain alignment. Since the larger part is not separated from the parent material before the interior openings are cut, it cannot shift during the operation. If the exterior is cut out first, the part can shift (up to the kerf of the laser) before the interior cuts are made. This is illustrated in Figure 2, which shows three parts, each of which has three holes in it. The interior holes are drawn in a different color than the exterior outlines of the parts. When the drawing is brought into RetinaEngrave, the order will be set so that the cyan lines will be cut before the blue lines.

Note that in vector mode, engraving happens on the outline of the shapes. Figure 3 shows a close-up view of one of the engraved labels for the example of Figure 1. The laser will mark the outline of the characters 26b. For small details like this, engraving this way works very well. For large fields, engraving is better done in raster mode.

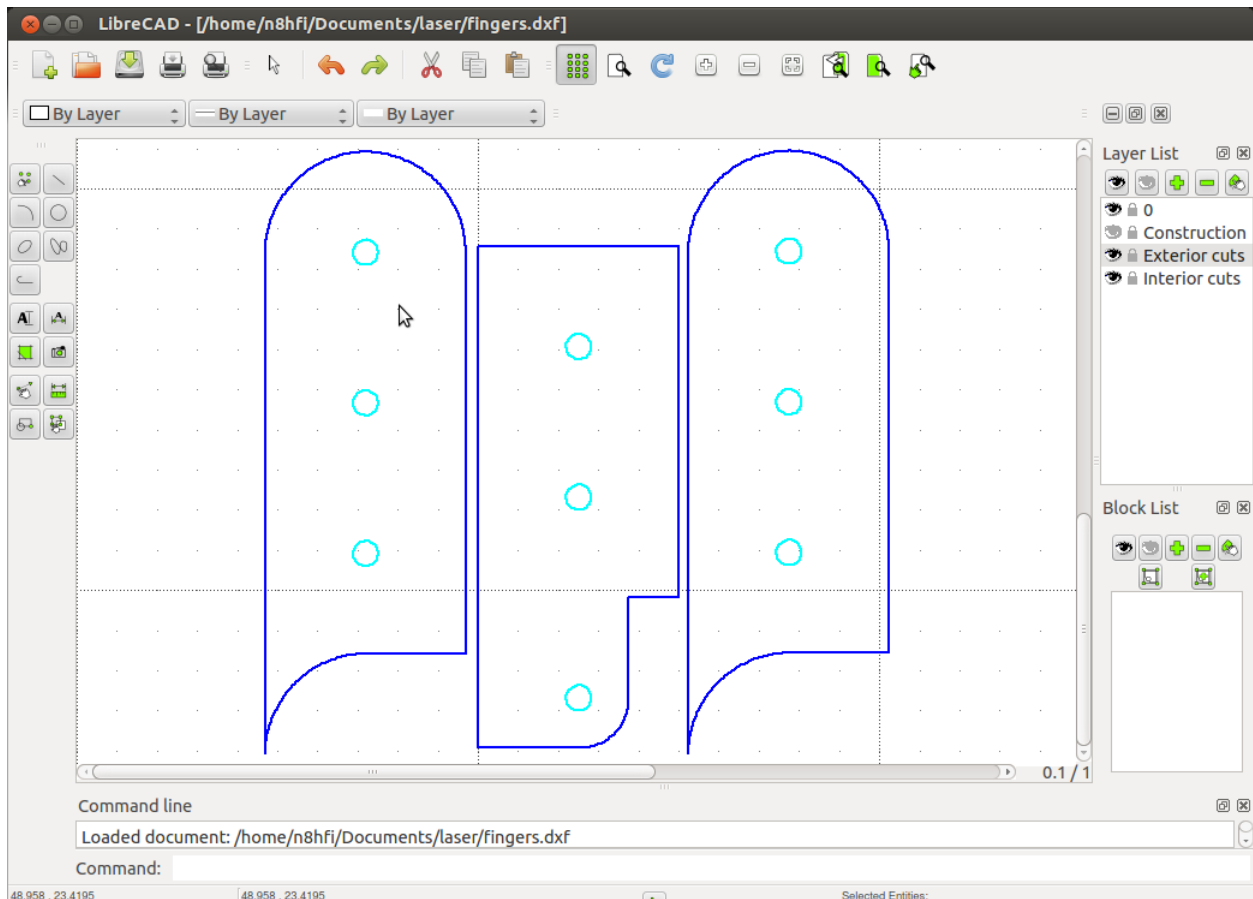


Figure 2: Example of proper cutting order

Drawings for raster mode

In raster mode, the laser traverses in progressive horizontal lines across the material. The laser beam is turned on when the image is dark and off when it is light. Detailed images can be engraved this way, but it is important to remember that the engraving operation is essentially binary. The laser is either on or off. You can start with any image, but images which have a lot of color shading or low contrast are unlikely to engrave well. It is strongly recommended that you convert the source image to black and white yourself to see how the engraving will look before you try it on the laser.

Alignment feature

Some materials cut (e.g. plywood) seem to cut better in multiple passes at high speed, with enough time between passes for the material to cool (so there is less scorching.) Some other parts may call for both vector and raster operations on the same part. The RetinaEngrave software automatically crops whitespace around images, so for any part(s) which may require multiple operations, there must be some feature which appears in the same place in the upper left corner of all the operations. Otherwise, the whitespace cropping will destroy the

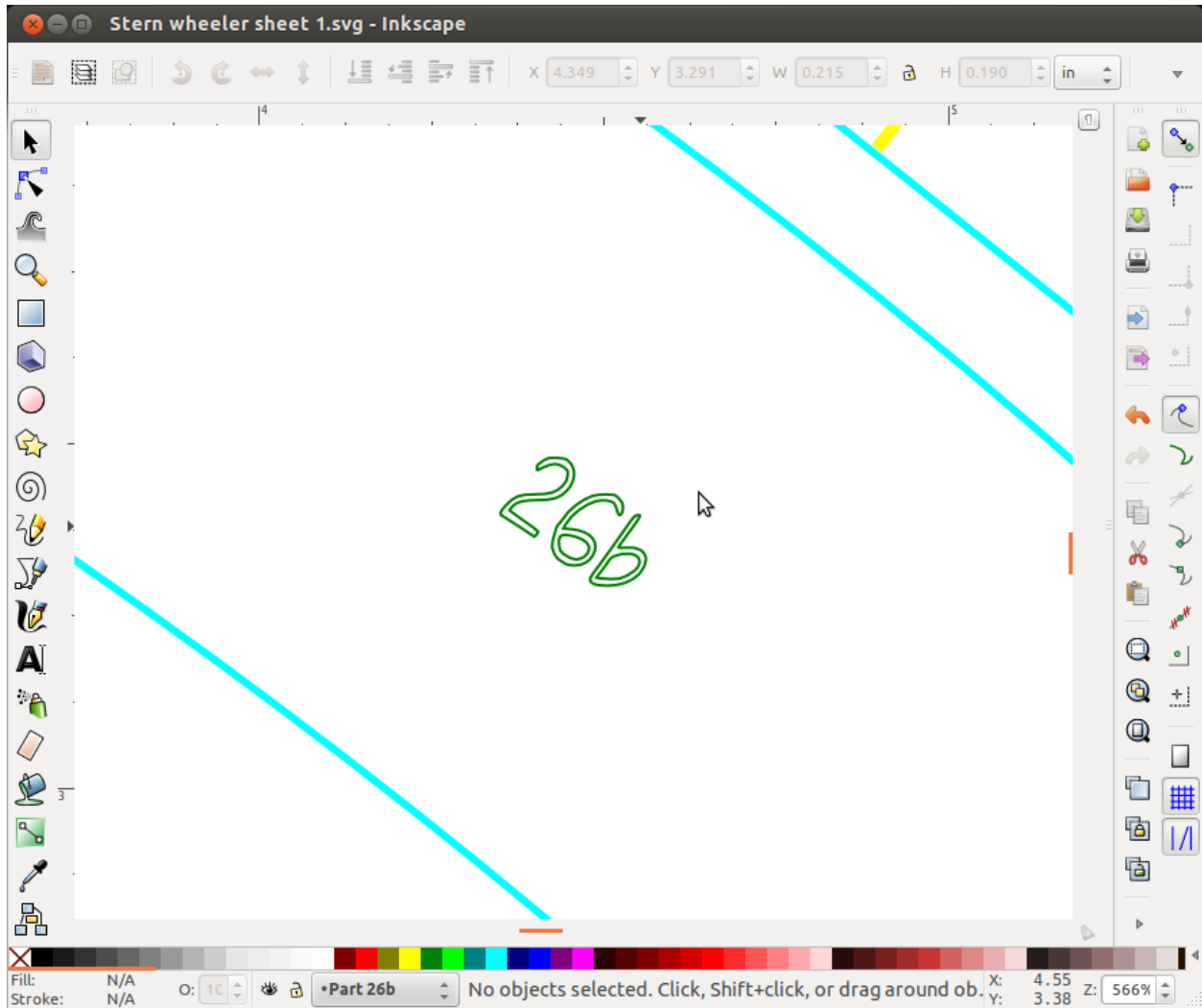


Figure 3: Vector engraving works on outlines

alignment of the operations (the laser cutter origin is the upper left).

The recommended alignment feature is a small square, black with black outline, which is located so that no other parts are above or to the left of it (so that it defines the upper right corner of the figure.) This should be on its own layer in the drawing. When preparing drawings for parts which will require multiple operations, the cuts or engraving for each operation should be on a separate layer. Then turn on the operation layers one-by-one and export each one to an .xps file (with the alignment layer on in all of them) defining the successive operations.

Raster then Vector

The RetinaEngrave software defines a special *raster then vector* mode, which allows mixing engraving and cutting steps in a single operation. To set up a drawing for this mode, the features to be engraved should be black, and cut lines in other colors. The drawing is

exported to .xps with both the raster and vector features on. Then RetinaEngrave, in the *raster then vector* mode, will automatically engrave the black in raster mode, and then the other colors in vector mode. Figure 4 shows an example of a drawing prepared for raster

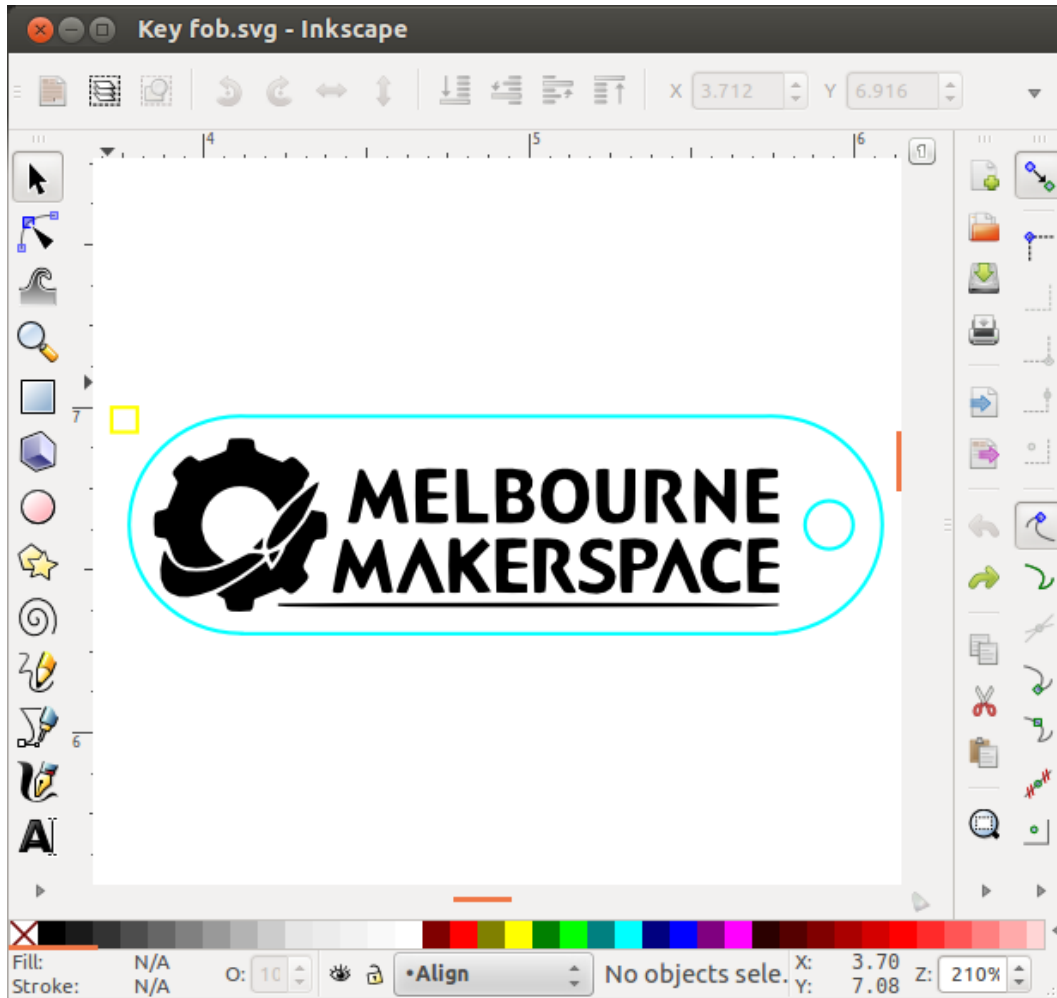


Figure 4: Raster then vector example

then vector mode. The black will be engraved in raster mode, then the cyan lines are cut in vector mode. Note the presence of an alignment feature (the yellow box in the upper right corner). When cutting the part, the yellow line is set to zero passes of the laser, so it will not be cut even though it appears in the drawing.

Note that RetinaEngrave is quite fussy about modes and settings, and when set to *raster then vector* mode, will revert to either vector only or raster only mode when changing other settings. Always check that *raster then vector* mode is still set before pressing the go button.