

CAD considerations when engraving with AvCAM.

Background:

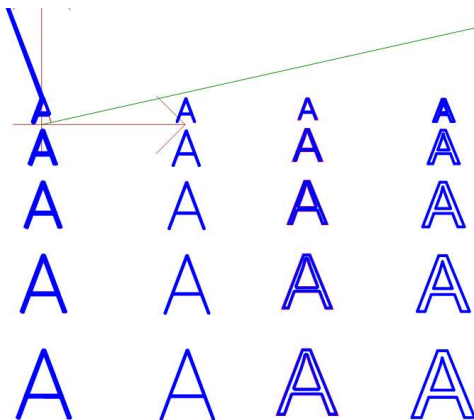
With early AvCAM versions, all engraving was accomplished by tracking down the outline of text and other entities such as lines, arcs, polylines etc. Current versions of AvCAM attempt to create a toolpath inside the character outline unless placed on the online or hatch layer. The effect of this is to “fatten” the character when using a small tool such as the .007” laser spot or a small engraving cutter.

In most general switch, circuit breaker and placard cases, the easiest and most trouble free method is to use the legend font placed on the online layer. There are times however when a larger character is desired. The following describes font, font size, cutter size and layer selection.

AvCAM recognizes the true type fonts that are commonly used with Windows programs. When Windows renders a font, it draws the font outline, and fills the interior with pixels. This is a process called rasterization. We have developed a font called Legend. The lines are so close together that the effect is a single line. This works well for normal switch legends, however the stroke width with the laser may make the letters too thin.

When larger fonts are used, a larger cutter tip width on the EG2 can be used to make larger stroke widths. See layer use at the end of this to fill large fonts.

When cutting on the outline of a text, there is a possibility of the letters running into the next letter, particularly using a font other than Legend. AvCAM now attempts to offset the letters to the inside by $\frac{1}{2}$ of the cutter tip width set in AvCAM settings unless the font is on the layer named online.



The picture shows the left 5 rows of text. The top row is .1” high, the bottom row is .3” each row is .050 higher than the last.

Col 1. legend font, engrave layer .010 cutter
Col 2. Legend font, online layer, .010 cutter

The first A with a line going wacko is a result of trying to offset a very thin section with a too small font or a too big cutter tip. This can be remedied by putting this text on the online layer or cutting with a smaller tip width. Adjusting the cutter width in settings and simulating again will show when it is right.

Col 3. Arial font, engrave layer, .010 cutter
Col 4. Arial font, online layer, .010 cutter

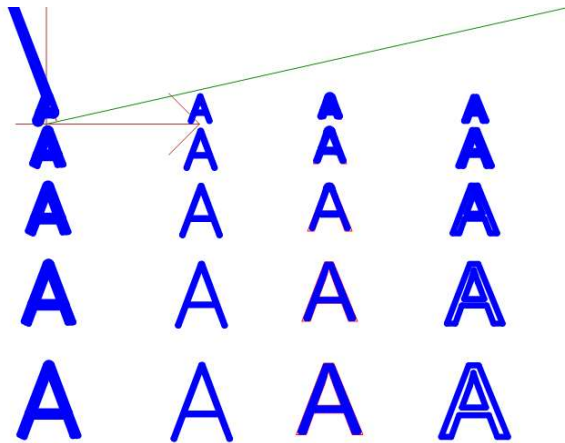
Note that the 2nd col using legend, online increases the letter size but the stroke width remains the same. Looking at the 3rd col, arial, inside, the letters look good at .1 and .15, but .2 starts showing some of the inside not completely cut out with the .010 tip width and .25 and .3 are definitely not cutting the interior. The fix for the larger sizes is simply to use a larger tip width.

The 4th column is online and selecting a cutter size that will fill the inside may actually widen the outside to the point that it interferes with the letter next to it.

So now lets change the tip size to .020 and repeat using the same file.
This is done with the same file as before.
Row 1 = .1 row 5 = .3”.

Col 1 Legend font, engrave layer, .020 cutter
Col 2 Legend font, online layer, .020 cutter
Col 3 Arial font, engrave layer, .020 cutter
Col 4 Arial font, online layer, .020 cutter

Legend inside at .1 high is still a problem,
.15 completely fills in the center of the A. .2,.25, and .3 are usable. Bear in mind that other letters may not work as well.



Legend online looks pretty good except at .1” letter height.

Arial inside, is unusable, at .1” high, .15 is overcut a little at the top, the rest look pretty good. Arial online basically doesn’t work.

So, what to use. As you can see, Legend online works in many situations, but the user still needs to select the correct cutter size.
Using a font such as arial on a layer that is not

named inside and the proper cutter tip size results in well filled and properly spaced letters.

Note that decorative fonts frequently have very thin sections that will result in errors such as the upper left A above. In these cases move it to the online layer and or use a smaller cutter tip width.

Laser:

The spot size of the LZ1 laser is fixed at about .007” The same considerations for engraving with the EG2 rotary engraver hold true for the laser except that you cannot change the cutter size for the laser. For some of the larger sizes, consider using a narrow font like Yu Gothic Light or some other light font so that the inside is cut out. Simply simulate in AvCAM to see how it will cut. If it does not cut out, select a narrower font or a shorter font size.

For large text such as an N Number, consider using a decorative font such as Times New Roman placed on either the online layer for an outline or hatch for completely filled characters.

Justification:

The Autodesk dxf specification lists 4 vertical justifications

Baseline, bottom, middle and top

The problem arises when CAD manufacturers mix them up.

EASY CAD

TOP CENTER

MID CENTER

BOTTOM CENTER

BELOW CENTER

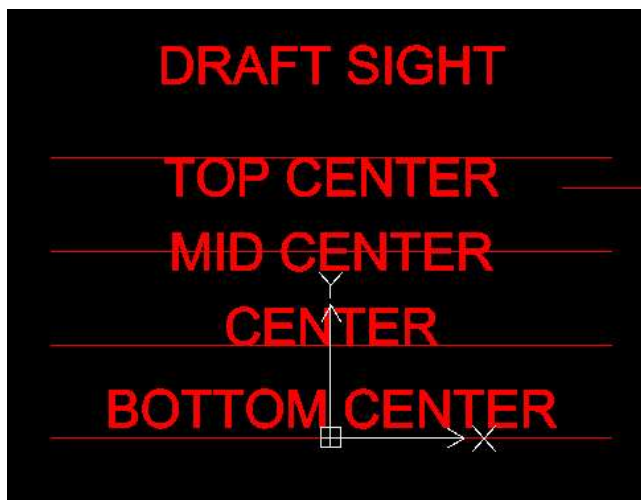
QCAD

TOP CENTER

MID CENTER

BASE CENTER

BOTTOM CENTER



These three screen shots depict EasyCAD, QCAD and Draftsight terminology for the different alignments. I drew 4 lines and selected the alignments and snapped the text on the center of those lines. You can see that EasyCAD, QCAD, and Draftsight each call the alignment that snaps to the bottom of the text. AvCAM will only observe the EasyCAD version of Bottom center. The result is if you use DraftSight or QCAD bottom center alignment, when rendered in AvCAM, the text will shift down because AvCAM only recognizes top, mid and baseline vertical justification.

EasyCAD is not recommended for engraving due to text sizing issues.

The vertical placement and height is very accurate, however some cads render the text width differently. For instance place a couple word sentence in EasyCAD, draw a vertical line on each end of the sentence. Zoom in and out. You will notice that at some zoom levels the width of the sentence is quite different. There is no way to detect this in AvCAM, If there is a critical width text, be sure to check it in AvCAM and adjust in EasyCAD as required. QCAD and DraftSight are quite accurate in text width.

We have previously discussed engraving using the online layer which causes the tool path to track along the outline of the character. Any other layer name causes the tool path to be inset inside the character.

Layer Names that affect engraving

The default tool path generation in the engraving mode is to place the tool path inside of the character outline. Some tools (cutter diameter) may create errors listed above or not completely fill the interior of the letter. Any layer name other than ONLINE or HATCH will create the default tool path. The same holds true for closed figures such as circles, polylines and groups of lines and arcs who's endpoints meet to create a polyline.

Regardless of layer name, open figures such as lines and arcs that do not describe a closed figure will cut down the center of the line.

ONLINE creates a tool path where the center of the tool or laser spot track down the outline of the character or figure.

HATCH creates a series of horizontal lines that completely cut out the center, followed by the normal inside tool path. The hatch tool path generation and cutting take considerably more time and should be used only for large text or figures. Highly complex figures such as a snowflake may not compute properly and may need to be cut online instead.

ITALIC forces AvCAM to render the font in italic when the text entities are on the ITALIC layer. Some CADs do not export the italic flag in the dxf file

Laser hints: The best use of the LZ1 laser is to burn the surface. Since the laser spot is fixed at about .007", use a narrow font like Yu Gothic light. The laser works well with flat, or textured light colored surfaces.

Always make a sample piece to experiment with power and speed settings. Start with about 10% and 15 ipm feed. Change only one setting at a time to gauge the effect of the change.

The burning process creates an ash. Depending on the chemistry of the surface, you can either clean the ash out which may be less black than the ash or seal the ash in with a clear coat. To clean the ash, first blow it out with compressed air, then clean with mild soap and water.

If you seal the ash in, it will be a dense black color. Be careful not to touch the surface before clear coating to avoid smearing the ash.