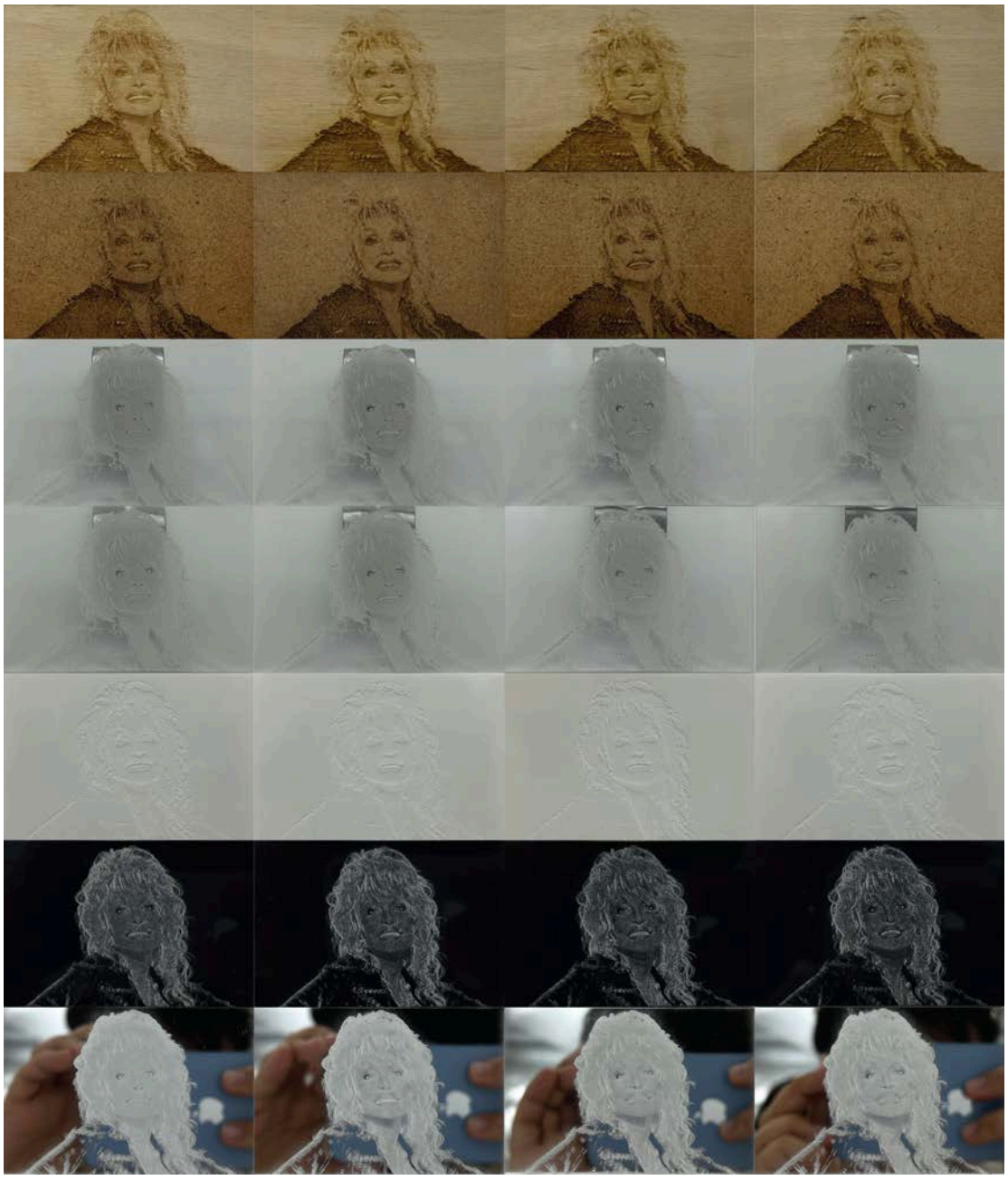
Laser Photo Rastering Best Practices



The Creative School

Design + Technology LAB

Laser photo rastering is not an exact science and can take a few tries to perfect. However, we've compiled some guidelines and best practices to help you prepare your file to achieve your desired result.

Image Selection and File Set-up

When laser photo rastering, you want to work with a high quality greyscale image of high resolution, good overall contrast, and that has the main elements stand out from the overall composition. Additionally, you want to work with a photo that has many tones of grey, as the laser processing software will be reading these greyscale values to determine where and how dark to raster. More detailed and technical information on laser photo rastering can be found here.

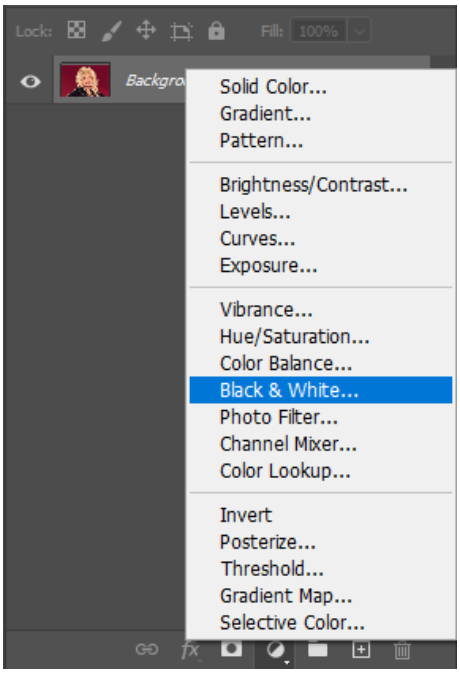
When selecting an image it is ideal that it be **300 dpi**. If you do not have a 300 dpi image available, most 72 dpi images can work if they are scaled down or can be brought into a graphics software to increase their resolution. Here is a resource on how to increase an image's resolution in Adobe Lightroom and Photoshop. As you prepare your image, it can also be helpful to remove the background of your photo if you want to highlight the main subjects in the original image. This will ensure that the raster treatment pops against the chosen material.

While you can stop here, we recommend doing a bit of photo editing to ensure that your image rasters as well as possible since all raster results can vary significantly on different materials.

There are three main steps to improve the quality of your laser photo rastering:

- **turning your photo black and white**
- **contrast enhancement**
- **unsharp mask**

Making your photo black and white

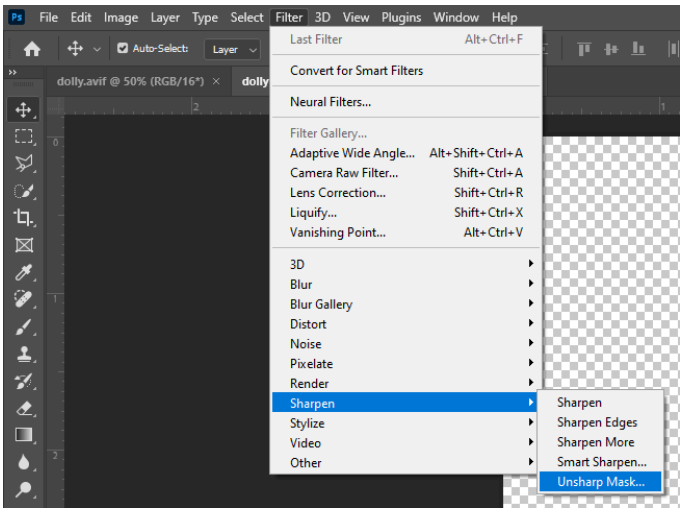


To convert your image to Black and white in Adobe Photoshop, in the bottom right corner add a new adjustment layer and select "Black and White..." and your photo will be in black and white.

Contrast Enhancement

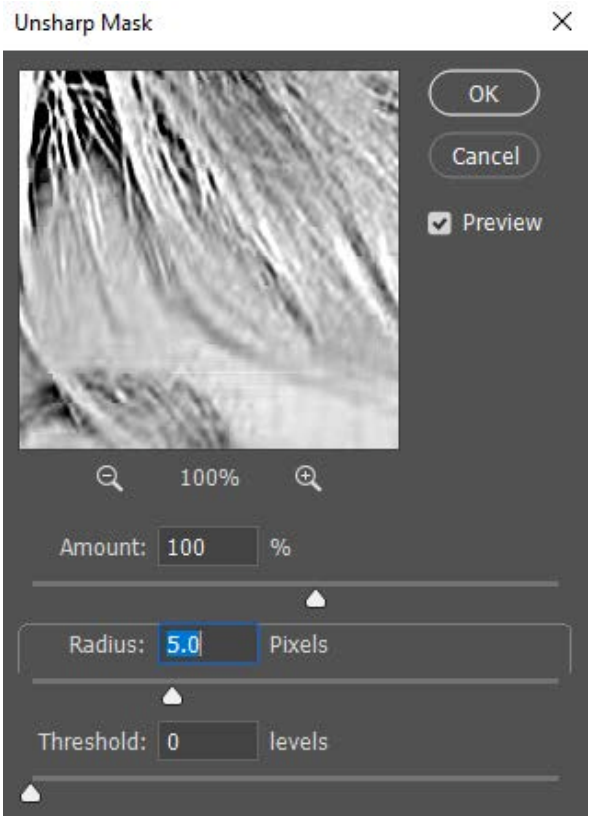
Once black and white, you want to adjust and enhance the contrast of your image so that there is a nice range of gray tones that can be read by the laser cutter. We recommend adjusting the image's Levels and specifically the Output Levels. You want to bring in both ends of the slider to remove the blackest blacks and whitest whites in the image so that there is an even raster and no parts that are too dark or not rastered at all which can flatten the image.

Unsharp Mask



Once you are satisfied with the contrast of your image, you want to select all of the layers and merge them into one layer to then apply an Unsharp Mask. To do this, select your single layer. Go to your top toolbar and select Filter > Sharpen > Unsharp Mask... and a pop-up window will appear. There will be a preview window where you can see the changes as you make them. You want to focus on the Amount and Radius sliders mostly. The Amount defines how much darker and brighter those respective pixels become while

Radius determines how many pixels are affected. The amount and radius size will depend both on the material you wish to laser photo raster on and your desired effect.



For materials like wood and MDF, it is recommended to select a higher percentage and radius size; the manufacturer of our laser cutter Trotec recommends 200% and Radius 15. For Acrylic, you do not need to increase the Amount and Radius as much compared to woods; Trotec recommends 100% and Radius. Note that these numbers are meant for CorelDRAW and not Adobe Photoshop so take these numbers as estimates and determine what looks good for your project.

When finished, export your image as a PNG with a transparent background at 300 dpi. Once your image has been prepared add it to your laser cutting file - this can stay as png within your file, **just be sure to embed it as part of the saving process**. You can submit this file as you do other laser cutting jobs through the Service Bureau.

Materials Selection for Laser Photo Rastering

When deciding which material to laser photo raster onto, it is important to know the difference in how your image will appear as it can vary by material type.

Woods and MDFs tend to produce a muddier image due to the fact that they are less dense materials and because rastering involves burning their surface which is a less precise process. To compensate for a slight flaring of the raster dots that are produced, we process these materials at a lower DPI (333-500 dpi). Doing this prevents the raster dots from overlapping as much and hopefully leads to a clearer image.

Because acrylic doesn't have the same challenges as wood and MDF, it is generally a more successful medium to produce crisp and detailed photo rasters. Without the risk of dot flaring and thus, dot overlapping, we process acrylic photo rasters at a higher DPI (600 dpi). It is good to keep in mind that files that are processed at higher resolutions will take longer to complete than those with a lower dpi.

When rastering on acrylic, be mindful that the rastered areas will turn white in the process and will therefore appear inverted from what you are seeing on screen. In order to achieve a result that matches what you are seeing on screen, you will need to invert your image. Information on how to do that in Photoshop can be found here.

It is also worth considering the colour of your background. The laser cutting software will read a transparent background as white. If you do invert your image, your now black background will be rastered. If you want to isolate your subject, you should add a white background so that the background is not rastered.

No Black Background

With Black Background

If you have your own material that you wish to laser photo raster on, come to the LAB with your material and chat with one of our staff about your project. Be prepared to have extra material for testing as our laser photo rastering settings are calibrated for the materials that we offer at the LAB and cannot guarantee that they will translate to other materials.

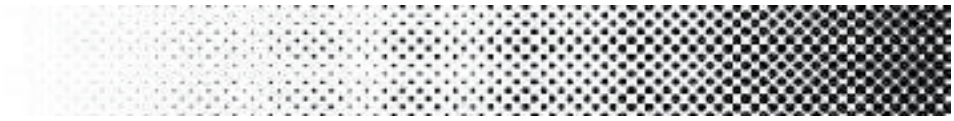
Raster Algorithms and How They Work

On your standard vector laser cut file, rastering will happen across a gradient of light to dark depending on the laser cut file preparation and will be flat.

Raster algorithms, on the other hand, will produce a dot pattern to create the gradient allowing for depth and detail in the image. There are two main raster algorithms offered in our laser cutting software: **Ordered Dithering** and **Error Diffusion**.

Ordered Dithering

Ordered Dithering is an organized raster structure where the raster dots differ in size depending on the grayscale value; **the darker the tone, the larger the raster dot**. This method is recommended for materials that are easy to engrave (acrylic) and the dotted pattern is visible in the finished product. While ordered dithering produces a very distinct style and is recommended for use on acrylic and especially for photos of people, this algorithm tends to create the flattest image.



Error Diffusion

There are three Error Diffusion algorithms which differ slightly but their underlying principle is the same: **the darker the grayscale value, the denser the points are packed together**. As opposed to Ordered Dithering, the raster dots for Error Diffusion are all the same size. What this allows for is better detail accuracy and image clarity. The three options are Stucki, Jarvis, and Floyd-Steinberg. Each of these offer slightly different approaches in

coarseness and depth sharpness. These methods are recommended for materials that are difficult to engrave (woods and MDF), high detail images, or images with little contrast.

While creating our material tests for all of the raster algorithms, we found that there was no real difference between the processing times for the different algorithms.

Laser Photo Rastering Examples

Let's use this photograph of Dolly Parton as an example for laser photo rastering material testing. It is 2624 x 1749 px and 72 dpi.

Since we offer two main types of materials we prepared two versions of the photograph: one for acrylic (left) and one for wood and MDF (right). These photos were edited the same until the Unsharp Mask, the acrylic was 100% and Radius 5 while the wood was 150% and Radius 5.

ACRYLIC

Amount: 100% Radius: 5

WOOD / MDF

Amount: 150% Radius: 5

For our material testing, we did all of these tests on 2" x 3" pieces of material to ensure consistency across all of the examples. This was also done to gauge the time differences between materials and processing dpi settings (333 dpi for woods and MDF and 600 dpi for acrylic).

	Ordered Dithering	Stucki	Jarvis	Floyd-Steinberg
Baltic Birch Ply [333 dpi]				
MDF [333 dpi]				
Clear Acrylic (front) [600 dpi]				

Clear Acrylic (back + flipped) [600 dpi]				
Frosted Acrylic (front) [600 dpi]				
Frosted Acrylic (back + flipped) [600 dpi]				
White Acrylic [600 dpi]				

Black Acrylic [600 dpi]				
Mirrored Acrylic (front) [600 dpi]				
Mirrored Acrylic (back + flipped) [600 dpi]				

Ink Washing Laser Photo Rastering on Acrylic

A fun and optional additional step when laser photo rastering is to do an ink wash on the rastered areas to colour in the photograph that was rastered out. After your rastering has been processed you need to clean and wipe away any leftover acrylic powder on the surface.

This method can be done with a variety of materials such as paint markers, watered down acrylic paint, etc. For our tests at the LAB we used acrylic paint markers to fill in the laser rastered image. We did so by painting the area that was rastered away and allowing it to sit for a moment before wiping away the excess paint and cleaning up the surrounding areas. This can be done by wiping up the paint with a dry cloth and wiping down the surroundings with a damp cloth. Be sure to allow the paint to fully dry before using the piece at it can smudge very easily

If there was too much paint deposited into the rastered area you can wipe away some of it with a damp cloth. If the inverse happens where not enough paint was deposited onto the area you can always go in to build up the layers.

Below are some tests on white and mirrored acrylic with regular and inverted versions of the same photo of Dolly Parton to highlight the difference between the two. Note that the example of white acrylic was done on the front of the material while the mirrored example was done on the backside of the material.

Normal	Inverted