



Overview

The key to laser engraving 2-ply or 3-ply laser plastic is to use a material that allows the engraver to pass as quickly and with as little power as possible across the surface color and still produce a clean, bright marking. **IPI** laserable materials are manufactured with impact modified acrylic resins to fabricate exceptionally well with CO2 laser systems. While laserable plastics have become more fabrication-friendly over the years, it is still **important to experiment** with various materials and laser settings. Different color plastics, even those in the same product family, can require unique speed and power settings. As you work through this process and you recognize you have achieved your optimal results, be sure to **document** them for future projects. Collecting this information will help you **customize your own** personal reference from your projects and experience!

There are numerous variables that can affect the lasering process for both rastering and cutting acrylics. These differences include but are not limited to color, gauge, density, texture and composition of the sheets. **Below** are some practical observations to help prepare you as to what to expect from your laser engraving experience with IPI materials.

General Print Driver Setting Observations

Power Setting

- Higher burns deeper. Too much power sacrifices detail. Has no effect on running time.
- Lower burns shallower. Too little power sacrifices detail. Has no effect on running time.

Speed Setting

- Higher saves time. Burns shallower and reduces detail.
- Lower increases time. Burns deeper but too deep may reduce detail.

PPI Setting

- Higher increases the burning or melting effect. Produces finer detail if speed is not too fast.
- Lower decreases the burning or melting effect. Reduces image detail if set too low.
- Has no effect on running time and very little effect on depth.

General Observations

- Doubling the power doubles the depth and halving the power halves the depth.
- Halving the speed doubles the depth and doubling the speed halves the depth.

Standard Lens Options

Lens | Beam Diameter | Usage

1.5"	.003"	Fine detailed lasering
2.0"	.005"	Standard for engraving and cutting with emphasis on engraving better than cutting
2.5"	.007"	Standard for engraving and cutting with emphasis on cutting better than engraving
4.0"	.012"	Deep material distance engraving and cutting

- **Focus is Key.** Focus is critical in laser engraving whether auto or manual. Running a job out of focus can result in wide kerfs, flaming and melting. Be sure to focus **every** project, even when using similar substrates.
- **Cleaning Optics** - Wipe the lens lightly with a soft cloth or lens tissue moistened with optic cleanser. Wiping in a circular motion, working outward from the center is the most effective method. Never wipe the lens with a dry cloth, this may scratch it or remove the protective coating.

Heat Stress – Lasers are incredibly powerful pieces of equipment and generate a significant amount of heat. This is why it is imperative both to safety and achieving optimal results, to control these parameters effectively in your fabrication process. Lasering acrylics with excessive power, high PPI, too slow of speed or even an out of focus beam can result in ‘concentrated heat’ in the material which can cause degradation, cracking or warp. This is also true when lasering large areas as ablation of larger amounts of the cap surface can also result in heat build-up in the core layer. IPI recommends using lower power and DPI with multiple passes in these applications to allow the material time to relax and cool.

The recommendations in this document are intended for reference purposes only and are provided by IPI to our customers as a courtesy. This guide offers safe starting point settings however adjustments may be necessary to achieve your optimal results as variations in equipment, environment and materials will inevitably yield different results.

Base Laser Settings *(safe starting points – adjustments may be needed to achieve optimal results)*

Laser Wattage	Raster Power	Raster Speed	DPI	Passes	Vector Power	Vector Speed	Hz or PPI	Passes
75 watt	20	90	400	1	50	20	1000/400	1
60 watt	30	90	400	1	60	10	1000/400	1
40 watt	30	80	400	1	60	5	1000/400	1
30 watt	40	80	400	1	70	5	1000/400	1

The settings above are intended for use with micro-surfaced, 1/16" gauge plastic sheet. Heavier capped sheets (ie: **Laser Tuff & TUFFTEX**) may require increased power or multiple passes to ablate surface.

Best Practices - for lasering plastics

- **ALWAYS** remove the IPI printed protective masking before **raster** engraving.
- **Bottom Up Engraving** – Change the orientation of your laser to begin engraving from the bottom of the material upwards. This simple step will minimize the amount of residue being exhausted over previously engraved material which can re-deposit on the warm core and make post-fabrication clean up a challenge. You can change the orientation of your laser to bottom up engraving from the advanced tab in your print driver.
- **Reds & Blues** – Due to the color density of some of the more vibrant color selections, IPI recommends running two passes to achieve optimal results. The first pass should ablate the majority of the micro-surface while the second pass removes any residual colorant to offer you a clean, sharp result. Once again, using the 'bottom up' engraving method helps to facilitate optimal results in these applications.
- **Soft Focus** – When lasering reverse engraveable materials, a second pass with a soft focus can create a smoother 'glass like' finish which in turn will offer more vibrant results in your color filling efforts. A soft focus is achieved by focusing your laser to your material then dropping your laser bed out of focus approximately .020" then run your second pass.
- **DPI vs. PPI - DPI** applies to **raster** engraving, *whereas PPI* applies to **vector** cutting. When '**raster engraving**' your image will determine how many times the laser tube must fire to produce the image you desire, PPI will be ignored. As such, when '**vector cutting**' you determine your PPI setting while the DPI will be relatively ignored. Lowering the number of laser firings per inch, particularly when engraving larger text or objects, will help keep the material cooler, minimizing warp tendencies. Setting your DPI at 400 for photo engraving will also help minimize the 'banding effect' often experienced with these projects.
- **Vector Cutting** – When your application will permit, IPI recommends leaving the protective masking in place when laser vector cutting. This will minimize residue and ease post-fabrication clean up. An additional tip for clean vector cuts would be to apply a small amount of dish soap and 'coat' the surface of your material. Let the soap dry then cut. Rinse your material under warm water to easily wash away soap and residue. Ensure your laser has an accurate focus to achieve the cleanest cuts. **Note:** PPI's over 400 are likely to result in tacky edges.
- **Air Assist** – The purpose of using air assist when vector cutting is to force air directly onto the surface of the material to reduce heat and disperse combustible gases from the cutting surface by directing a constant stream of air across the cutting surface, minimizing possible flaming and scorching. IPI strongly encourages the use of air assist in the **vector cutting** process however not in the raster engraving portion of your job as it can result in the re-deposit residue in the engraved portion of your project.
- **Cleaning** – While experienced engravers may have some success using alternative cleaners for post-fabrication clean up, IPI strongly recommends cleaning with only warm water and mild dish soap. Damage and degradation of materials through the use of alternative cleaning solvents is solely the responsibility of the user.
- **Ventilation** – A **necessity** ... NOT an accessory! Your laser manufacturer will recommend a minimum of cubic feet per minute of air to be exhausted contingent on the size of your laser cabinet. This not only removes the smoke and dust from your cabinet keeping your optics cleaner but also exhausts & dilutes any dangerous fumes to acceptable level. **NEVER** operate your laser without an **efficiently operating exhaust** ventilating outdoors at the CFM recommended.
- **Safety** – While offering these guidelines as safe starting points for laser engravers, we need to recognize all machines and fabrication circumstances will vary from shop to shop. Common practice will reinforce the engraving basics: Most laserable plastics can be engraved at high speed with the power adjusted according to the wattage of your laser. Some will require multiple passes. Cutting plastic is best achieved using relatively slower speed and higher power. **Respect** your equipment and the materials you fabricate ... keep in mind plastics are flammable so **NEVER** leave your laser running unattended!
- **WARNING** – Never laser engrave or cut materials containing PVC (Polyvinylchloride). These fumes are extremely toxic and so caustic that they can chemically corrode the metal parts of your laser system and will nullify most laser warranties.