

Technical Review of Trotec Speedy 300 CO₂ Laser Engraver



Scott Nolfi, Graduate Research Assistant, CAT
Jeremiah Gracia, Graduate Research Assistant, CAT
Sebastien Dion, Graduate Research Assistant, College of Art
Wendy J. Like, Laboratory Project Manager, CAT
Center for Applied Technology



Front cover photograph:
Trotec CO₂ Laser engraver

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BGSU
100 Sandstone Bldg.
Bowling Green, OH 43403



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Preface: Nicholas Hellmuth, FLAAR at BGSU

For several years the scores of architecture students at BGSU have used the venerable CO₂ laser engraver from Universal Laser Systems to make their architectural models. Since I was a student of architecture decades ago at Harvard, I was impressed by how hard all the BGSU students worked. We did not have laser engravers when I was a student.

The students here did not either, not in earlier years. But once the Universal Laser Systems machine arrived, they kept commenting how much it helped.

So I asked what other kind of equipment could assist their studies? They all replied pretty much the same, “a larger laser cutter” and “a more powerful laser cutter.”

So, since FLAAR specializes in obtaining sophisticated digital imaging hardware and software for evaluations, and since our backgrounds are in architecture (both of FLAAR as an institute and me as an individual), I spent a year checking out what better laser engravers could we locate for the students. I attended DRUPA trade show, Photokina, in Germany; ISA, SGIA, and many others in the US. Since I have lived for many years in Austria, and noted that Trotec was an Austrian company, I figured they probably made a solid product. Plus their US headquarters was just a short drive from BGSU.

So Trotec kindly organized a loan unit for evaluation. It took a while to obtain it, because the loan unit was being used at trade show demos. But when I saw the Trotec person at a trade show in Dubai, United Arab Emirates, I asked what was the status, and shortly after that the unit was delivered. Installation and training ensued.

My initial goal was to have architecture students and art students be creative, and generate exciting new work with this great equipment. I had wanted also to see all the things that museums and archaeologists could do with equipment of this nature. But the continually evaporating funding on campus doomed these goals rather quickly.

The next hurdle was that the equipment had been used at many trade shows prior to arriving on campus. This reminds me of a Sinar camera that was loaned to me once. It had been used by so many people before it was sent to me for evaluation that it literally fell apart. Needless to say the evaluation stated that it did not hold up and that we were surprised that an elite Swiss camera would be so weak.

A year later a Dutch company provided a comparable camera. It was brand new. It performed flawlessly because it was not already injured or damaged by previous use. We still have this Cambo Ultima 4x5 six years later; it still works (better than the Swiss Sinar ever did). And we still mention this in our continuing reviews.

The laser engraver was eventually repaired, and the evaluator has continued to work with it. But I had expected that this project would produce fabulous results, more innovative and interesting than I saw at trade show exhibits. But because the university budget collapsed, there were no funds to allow the art students easy access to do creative projects.



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Some direct and open pros and cons

Most products are “reviewed” with a “Success Story.” Other “reviews” are what I call a sham review or pseudo review: they don’t really admit the weak features of a project. Most of these pseudo reviews are just thinly veiled PR for the manufacturer.

We try to avoid this type of review by having specific pros and cons of a project. We feel that a more honest evaluation will help potential end-users make a more meaningful decision on what project to consider purchasing. Even if a product has a few weak points does not mean it should be avoided. Indeed you will tend to be happier with a product if you know the issues up front. What counts is what the product does well, and/or better than competing projects.

I asked one of the art students who had persevered and actually used this equipment for her projects, how she felt about it: “The larger size of the bed is really good.” This is what we heard from everyone. Larger is better in this case.

The software seems to have created a steady demand for aspirin: “The machine uses Corel Draw; even 10 years ago, that was not “the” software to use. And today most artists prefer to use Adobe Illustrator.”

So artists have to take their Adobe Illustrator files and export it into Corel Draw (which takes hours, because the two softwares don’t always accept each others file aspects). I long ago learned, if a particular field uses a particular software, if your product does not speak that language, that’s a roadblock to be overcome or that group of people will look elsewhere. This kind of comment is why end-users prefer the FLAAR Reports format: actual comments of the pros and cons of using a machine.

If all you see are “Success Stories” they are so unrealistic, and ultimately rather phony. In real life, equipment, and people, have their good aspects and a few issues that need to be overcome. If you do all your original work in Corel Draw, then the headaches with Adobe Illustrator will not be an issue (so this is a rosy way to look at this situation).

Val (Van Sice, the art student) was definitely very pleased with one key aspect of this machine: “With this Trotec you can register your sheet precisely. You can align things perfectly. This means you can either engrave on both sides, or you can repeat the same design on more than one sheet and always have it line up. So the precision layout system is excellent.”

I sincerely thank the nice people at Trotec (Austria and in Michigan) for being patient. Neither they, nor FLAAR, anticipated the two glitches: that the unit would arrive a bit out of synch from having traveled to so many trade shows, and the meltdown of the facilities once it was clear that the building was destined to be torn down and that all budgets would be either slashed or exterminated.

FLAAR is not affected since we do most of our evaluations of UV-cured wide-format flatbed printers off campus, and all our training programs that we receive from wide-format printer manufacturing companies have been off campus the last year. But I would have preferred that both the engraver and the political situation on campus had been more congenial.



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One thing I can say, however, is that this model of Trotec laser engraver is so vastly better equipped for health concerns that there is no comparison with earlier units that routinely sent students to the Infirmary (when students engraved or cut Plexiglas). This Trotec has its own air purification system. It is so good that we don't even have or need any exhaust outside whatsoever.

The older smaller laser engraver had a complex jerry-rigged exhaust sticking outside. It never worked (the wind just blows the fumes and incinerated particles back into the building's air intake). I do notice that the newest models of Universal Laser Systems now also have their own filter units available. Without a stand-alone filtration unit the incinerated particles are so bad that it's a potential lawsuit just waiting to happen. With the Trotec, I am very content with its filtration system.

Every architectural school definitely needs a laser engraver.

Art schools as well. And I would highly recommend that museum curators and archaeologists should become more familiar with laser engraver/cutters. I can especially see potential to engrave bas-relief Mayan hieroglyphic inscriptions on stone, wood, and other materials.

I will continue to look at new models and various brands. I will also be interested in feedback from other users of Trotec and competing brands.

Contact Info for Trotec

If you wish to learn more about Trotec laser engraver/cutters, you can find them at some trade shows, both in the US and in Europe. You can contact them via Geoff.Thompson@troteclaser.com. He can forward your request to the most appropriate place in your country or region.

Reality of trying to do evaluations in a university context

One of the reasons this report took so long to produce was that while we were waiting to receive the laser engraver from constant trade show usage, the university decided to tear down the building housing our facility on campus. The original lab manager cleverly got another job; the university's director of the facility cleverly retired. The associate director intelligently got another job elsewhere on campus.

Then the entire university campus budget got slashed. Then there was a rule put in place that a manager had to supervise and only trained operators could do the projects. The reasoning was that a large expensive item of equipment that was on loan should only be used by trained personnel (not by every student that wandered into the building). That meant that there were no funds to allow the students access to the equipment on their own. So everything that had been so much looked forward to, having a great laser engraver for the architecture students to practice on, hit obstacles. My original idea had been to allow all the more capable architectural students and art students direct access to the laser engraver so that they could produce innovative projects. We then would display these project results in the Trotec booth at trade shows around the world.



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Beverly Hills, CA 90209



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But by the time the engraver actually got set up, 100% of the administration who were on duty when we originally requested the engraver were long gone. Even the Dean of the College of Technology changed! So the only person who seemed really excited that the engraver finally arrived was me, but with every aspect of the budget slashed and with all the support staff gone, it was a changed environment.

Wendy Like, the new person running the day to day operations, did the best she could under these circumstances. Dr John Sinn, the new head of the Center for Applied Technology, allowed two graduate students to be assigned to do the evaluation by testing. Scott Nolfi, Jeremiah Gracia, and Sebastien Dion all did a good job considering all the changes that were taking place around them (building being prepared to be bulldozed, the programs being phased out, etc). I thank them all for their perseverance and for their efforts to get this report finished.

This was a painful learning experience: first, if you are going to do an evaluation, get a unit that is not damaged. Second, if you intend to do evaluations, have a full-time crew in place that love doing testing and evaluations as much as you do. Third, have doing testing and evaluations as a core value of your department, Center or Institute. If testing, evaluations, and publishing the results are not a core value of the larger unit, the small group who are dedicated to testing, evaluations, and publishing reviews have a tough time surviving.



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Abstract

As laser engraving equipment continues to develop, it becomes more cost effective and user friendly. These factors allow for profitable mainstream applications. In addition, improved software, decreased size, and self containing filtration systems make integration within printing facilities and office environments manageable for both individuals and companies.

The Trotec Speedy 300 engraver was loaned to FLAAR and The Center for Applied Technology (CAT) through Bowling Green State University in the Fall 2006. Since 2003, we have had in our possession a ULS M-300 engraving system. This system allowed for comparison between models and manufacturers. While the specifications of the models varied, a qualitative reference can be made based upon numerous factors including ease of operation, speed, consistency, and overall performance.

Speedy 300 System

The Speedy 300 is a mid-range engraving model from Trotec. Various versions of this model exist with the primary difference being the choice of power level, ranging from 12W to 120W. A 95W model is reviewed in this report.

Laser: The Trotec Speedy 300 features a CO₂ laser.

Overall Dimensions: 42.9 x 35 x 23.2 inches

Max. Dimension of Workpiece: The manufacturer lists 29 x 17 x 7.8 inches. During review, it was found to be approximately 28.7 x 16.9 x 7.8 inches.

Power Requirements: 1- 220V source (engraver) and 1-120V source (filtration)

Accompanying the Speedy 300 engraving unit, FLAAR received a Mistral Eco 110 filtration system. This component is directly connected to the laser engraver through an exhaust hose and data cable. Two charcoal filters collect all fume and particle emissions while the engraver is in use. Not only does this protect the environment, but it prevents odors and gasses from being released. This can be extremely beneficial as some facilities may not have access to ventilation systems. Also, because the Eco maintains a data connection with the engraver, it is automatically powered on whenever an engraving process begins. This prevents an operator from accidentally leaving the exhaust off, which is detrimental to the machine.

Unlike some laser engravers, the Speedy 300 includes a built in air compressor unit. The compressor allows for an air assist operation to be on while the equipment is in use. Air assist helps to prevent particulate material from settling on the engraving lens. In addition, it is useful to decrease burn marks on engraving media.

Another advantage of this machine is that the air assist system is automatic. With some other engravers, an external air compressor has to be turned on before engraving begins. Failure to turn on the compressor, in conjunction with an air assist nozzle attached, leads to a buildup of smoke and debris resulting in damage to the lens. With that said, it should be noted that acquiring accurate settings for air assist operation is vital for maintaining the life of the engraving lens.

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Installation

Trotec provided a packet of instructions for unpacking and basic setup. The process was fairly straightforward and took approximately two hours. The laser unit was securely packaged in a wooden crate. Accompanying filtration equipment was also well protected.



Figure 1: Trotec Speedy 300 during the unpacking process.



Figure 2: Trotec Speedy 300 system fully installed.

Along with the hardware installation, software has to be configured as well. Trotec supplies a proprietary program called JobControl, which acts as a modest software application in conjunction with their printer device driver. JobControl communicates directly with the laser engraver and allows for the adjustment and saving of material settings, layout of the table and positioning of the laser, and history of job operations. Functions within the program also reflect many of the control commands found directly on the machine, such as fan operation, starting and stopping jobs, etc.

While JobControl interacts with the engraver, another application is required to print, in reality it is more like to send, the job to be processed. Most engraving manufacturers appear to use CorelDraw. The drivers provided with the machine are designed to work with this program. FLAAR uses CorelDraw v12 with both of their engravers. Though CorelDraw is not the most robust program, it is able to handle most jobs without any problems. It will take a short bit of time to become acclimated to the interface and tools; however, it should not take more than a few hours to learn the commands necessary for engraving.

Those familiar with basic PC operation and installation should not have too much trouble getting the software and drivers working properly. During testing, there was an issue where the link between the engraver and JobControl was lost. More information and how to troubleshoot this problem is listed in the appendix. While not a major flaw, it is something to be aware of in the event that it occurs.



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Training

Training for the engraver was provided by company trained staff. Once the unit arrived, Trotec technical support contacted us in order to set up a training session. Two Trotec technicians provided basic operation training to CAT graduate student employees and project manager. The instructional training included basic operating and maintenance procedures. The entire training session took about 3 hours.

The training session was very beneficial for understanding proper use of the machine as well as when and how to perform maintenance. There is a lot of information to cover, so expect to spend some time familiarizing oneself with the equipment and its operation. As mentioned before, reading the manual will help one to become very knowledgeable on the engraver.

For facilities that may need to have a large number of individuals using the engraving equipment, it should be noted that Trotec has provided a sample training program within the manual. These templates assist in the training program by recording which training processes employees have completed. It also divides the training program into more convenient training sessions, so that it does not all have to be completed in one sitting.

Materials and Settings Testing

The printer driver and JobControl software contain default settings for a large number of materials. This can be a great starting point when working with new materials as there is already a tested setting. In contrast, the ULS engraver lists basic settings within their manual but does not have nearly the same amount of tested materials, and their software does not allow the option of assigning particular properties to a specific material. In a production environment, saving tested settings would be crucial for efficiency, making it a very streamlined process of loading material, selecting its approved setting, and starting a job.

With all of that being said, it should be noted that repeated testing is required to obtain individual engraving settings on materials not offered by the company or other known vendors. The Trotec software groups material settings into different categories, which can be quite handy. Some of the categories include wood, metal, plastic, ceramic, rubber, and stone. Within each category are a variety of settings for more specific materials. An example being in wood there are settings for pine, maple, oak, and others. User defined settings can be saved in any of these categories or in newly created categories.

As part of our evaluation process, materials were chosen based on student and faculty needs. These vary widely from project to project and even within the same material, different results often need to be achieved. Our selection of materials included, acrylic, basswood, EVA craft foam, pine wood, mat board, card stock, linoleum, ceramic tile, and balsa foam.

In order to make an accurate comparison from our previous engraver, we ran our tests using the same files. For our everyday testing and use, we created a file that requires all three engraving operations that may be necessary for a particular material: vector engraving, vector cutting, and raster engraving. In our sample file shown below, red lines indicate vector engraving. The black text would be raster engraved. The gradient is raster engraved as well, and the grayscale allows us to see the results of the very lightest engraving and the very darkest engraving for our setting. This file worked very well when we were testing new materials.



Figure 3: CAT sample engraving file.

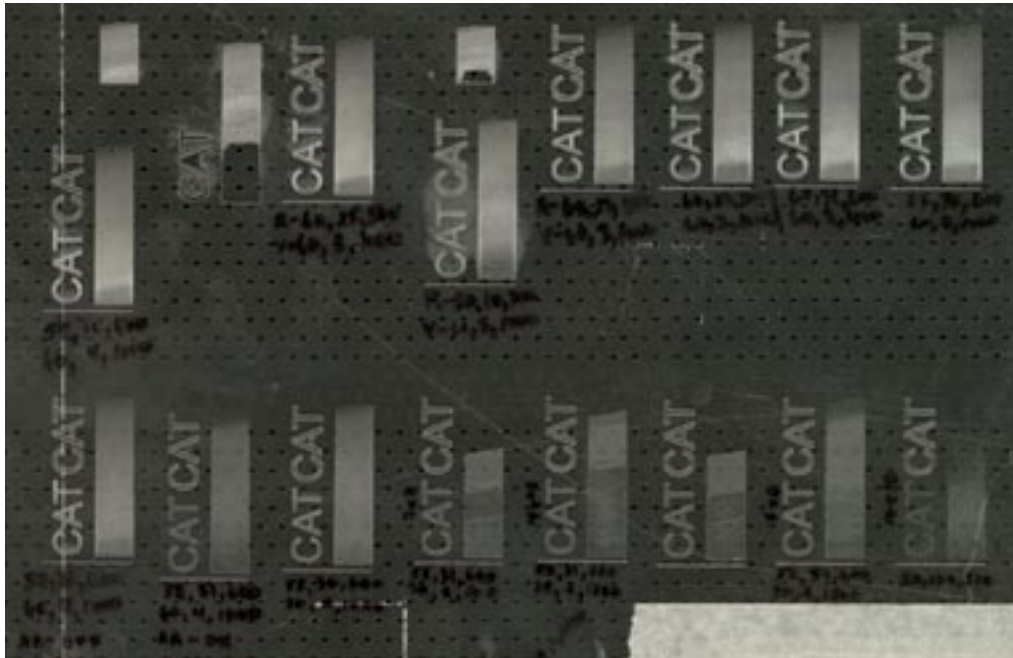
We began testing by reviewing the default Trotec settings and making adjustments to the speed and power until the desired results were achieved. As can be found in the manual, the speed and power settings follow a linear relationship. If we halve our speed on a job, we can halve the power and will achieve the same output. Limitations of this being that for a vector cutting operation, speed is not to exceed 10%.

Numerous factors affect the output on materials. Properties such as chemistry, material density, and applied coatings all influence optimum settings. Consequently, new profiles had to be created for each material evaluated. Settings were determined using simple trial and error methodology, starting with reference settings provided through Trotec software. Criteria for material settings were based on quality and accuracy of the cutting and engraving of a generic sample file.

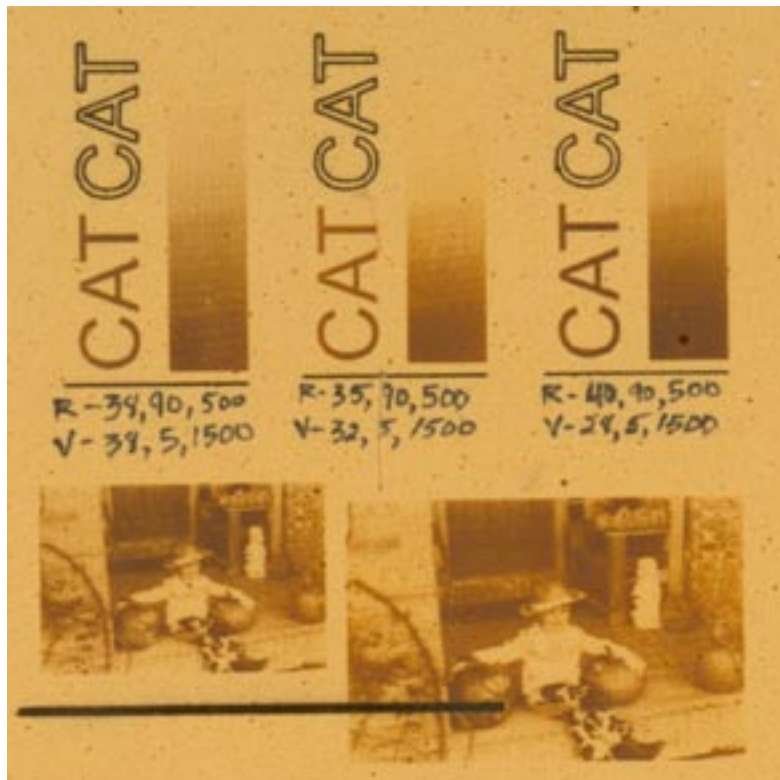
During testing, we observed how crucial it is that all materials be perfectly flat. There are some exceptions to this, such as small variations in texture with stone and similar materials. What we are referring to, however, is media that is warped or has been rolled for extended periods of time. Because the laser is designed to achieve optimum results when its focal distance is calibrated, material that differs from the proper position receives laser contact in an out of focus condition. This can result in the beam being larger than specified, thus weakening its power. We usually taped the media to the engraving table if we anticipated issues.

Shown below are samples of our engraved materials.

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Sample 1: Plexiglas



Sample 2: Balsa Foam

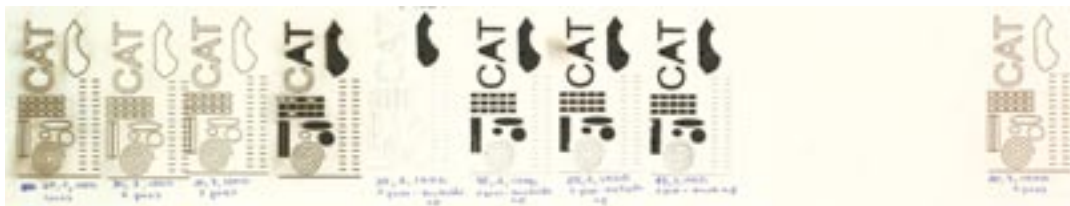
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Sample 3: Linoleum Tile



Sample 4: Veneer

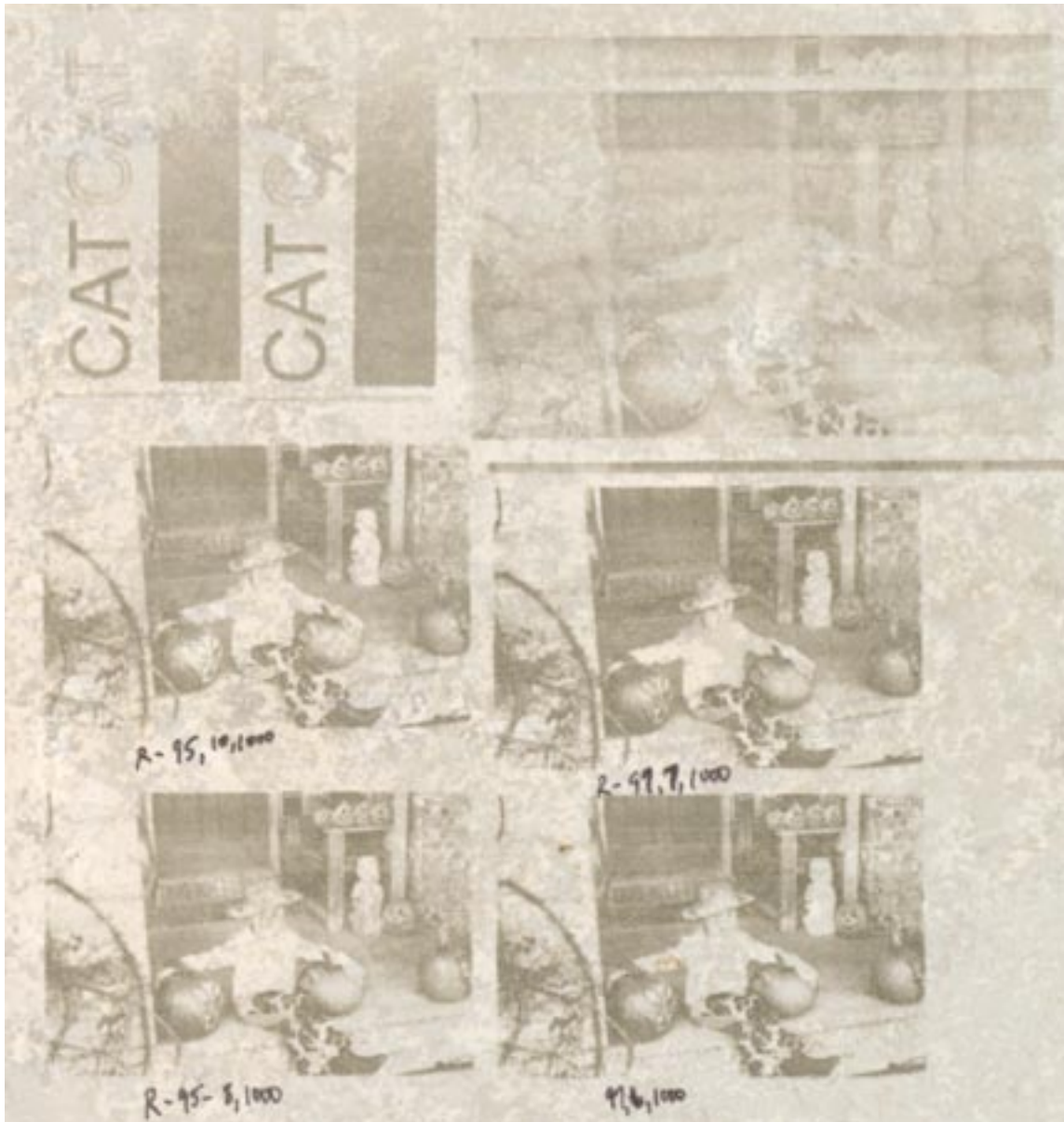


Sample 5: Mat Board



Sample 6: Wood Pine

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Sample 7: Ceramic Tile

Not only did this testing procedure help to determine optimum settings for various materials, but also provided our facility with comparative examples to show to customers in the event that they wanted nonstandard results. Having samples readily available became crucial when working with customers who brought in untested material. The tested materials served as excellent reference points when beginning to work on new media.



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While testing, it is very important to check the lens before and after every operation. Until steady operation is ensured, the precautionary measure will help to prevent the lens from accumulating debris, which will result in a cracked lens. A new lens costs \$325 and during approximately five months of testing, our facility cracked two lenses. In one situation, the lens was damaged because of excessive flames on the engraving material. This could have been prevented by placing an absorbent underneath our engraving material. The second lens was damaged due to excessive air from the air assist system.

When air assist is adjusted too high, a vortex is created. This causes cool air to be blown directly on the lens. The lens heats up during laser usage, thus resulting in a cracked lens. To ensure that the lens and equipment were being properly maintained, a user log was implemented. We highly recommend some type of operational recording, so that in the event of a problem, the most recent user can be determined.

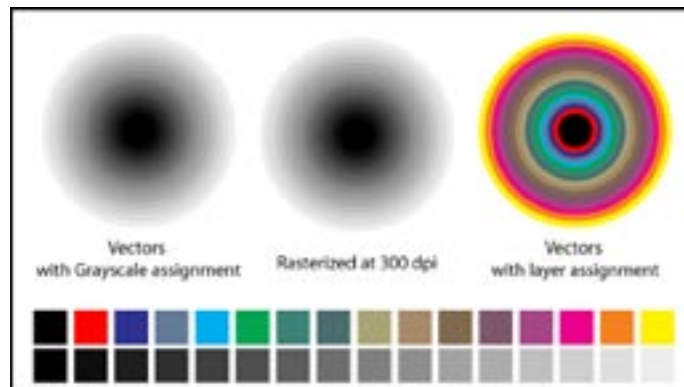
Applications

After describing the various materials tested, we briefly wanted to mention some of the applications commercial laser engraving is useful for. Although many more ideas and products can be found online, a sampling is provided to show its versatility.

- Picture Frames
- Signage
- Awards and Trophies
- Wood and Stone Engraving
- Textiles
- Jewelry Boxes
- Architectural Models
- Goblets and Glasses
- Rubber Stamps

Appendix A

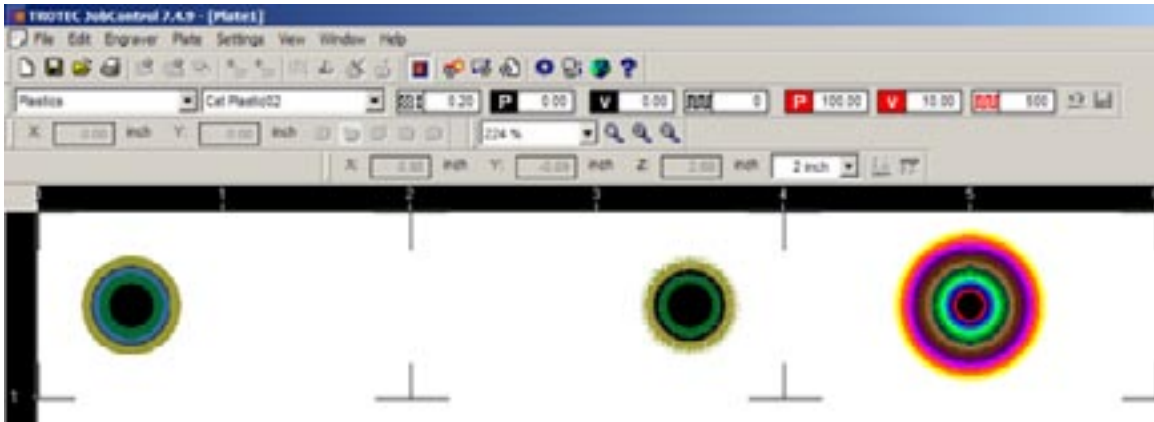
The following is a report and application administered by a BGSU School of Art graduate student. During my experiments with the Trotec speed 300 laser engraver I felt upon a technical difficulty. I tried to reproduce an engraving effect that I had obtained with our older engraver a Universal laser system machine acquired several years ago. The nature of the work is to reproduce from a digital vector document the information of the topographic levels of a landscape. In order to engrave an acrylic sheet of 0.22 of an inch thick I sent the topographic information to the Universal machine in the form of vector with the fill option defined so that the deepest level would be 100% black and that all subsequent levels would be of a graduate grayscale until ground zero would be defined as white. By sending this job to print in a vector / raster mode, and a power of 100% and a speed of 4.5% at 500 ppi the engraver rendered a nice deep representation of the topographic landscape. When I tried to reproduce the effect on the new Trotec machine I was unable to send the print job using the same settings since the software used in the Trotec process is different. The following images represent a simplified approach of the testing method that was used to experiment with the different settings available on the Trotec equipment.



Illustrator file

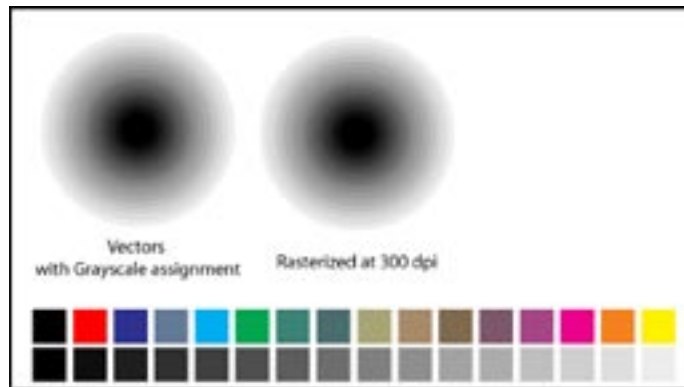
The first approach was to try to replicate the experience in the closest mode available. Therefore the first test to the left is based of a vector-based file where each rings have been assigned a shade of gray by an increment of 5%. As seen in the illustration depicting the preview from the Trotec software, it looks as if only the software is representing few of the first colors from the center out. This example seems to demonstrate that the problem encountered here might be of a software nature and is therefore not surprising that the actual rendered job is reflecting the preview rather than the file sent.

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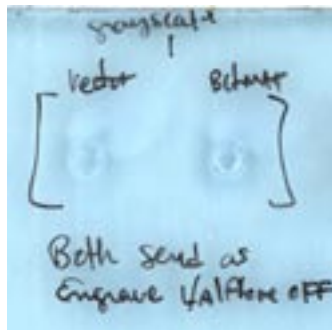


Preview in Trotec software of the tests

The second approach was to rasterize the vector based work at a setting of 300 dpi and to send it to print with the raster mode with the halftoning option set to “off”. Here again the as seen in the illustration depicting the preview from the Trotec software, it looks as if only few of the first colors from the center out are being represented by the software. This time the preview looks even worse. Once again it is not surprising that the actual rendered job is reflecting the preview rather than the file sent.



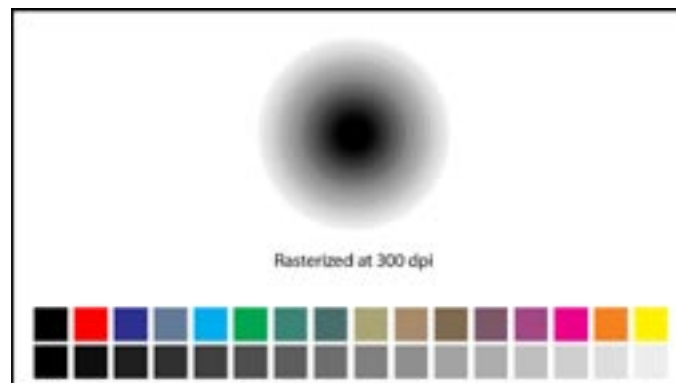
Test 01 and 02 files



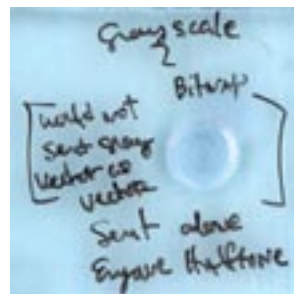
Test 01 and 02 results

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The third test was to send the same job as with the test 02 but with the halftoning option set to “on”. This option converts the shades of gray into a screen representing visually the different values of the gray scale but fails to “emboss” the material and results in a superficial engraving which can not be used to obtain the desired results.



Test03



Test03 results

The fourth and final test of this experience is a more complicated approach where each shades of gray are assigned to one of the 16 possible “layers” or colors settings available within the Trotec software. By doing this it is possible to adjust the power and speed of each colors and therefore “force” the machine to engrave at the desired deepness for this process. Note that the 16 different settings option limits the amount of detail and level that could be represented by this process. This last option could have been a solution but somehow because each “layers” are rendered one after the other the engraving leaves a ridge between each level. This effect lowers the quality of the rendering and makes it inadequate for the use of serious representation of topographic model.

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Test04



Test04 result.

I have since experimented with other type of vector engraving and have had mediocre results where the vector lines are being rendered unevenly and in a non-continuous manner. Again I have resulted in using our previous engraver, which, as always has rendered the fine vector work to the level of my expectations.

These several tests leaves me to conclude that something in the software interpretation of the data is not converting properly the information and makes it impossible to engrave jobs that have been rendered with previous, older equipment in the blink of an eye. Is this a glitch, something related to our specific settings? Is this something that could be fixed with a software update, or is it a limitation of the Trotec product? To date Trotec has recommended running this job on the relief feature setting. This seems to work on test samples but I still need to run a full job file.

Evaluation

In order to provide a base reference for operation, we decided to compare the Trotec Speedy 300 to another laser engraver. Unfortunately, our facility only possesses one other laser engraver, a 50W ULS M-300. The main differences between the two pieces are that the Trotec has a larger engraving table (29"x17" vs. 24"x12"), a more powerful laser (95W vs. 50W), and a self contained filtration system. By far, the most valuable asset to us was the filtration unit. With the previous ULS model, we had to build our own ventilation system and modify our physical building in order to have exhaust exit the machine and facility.

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Because of the difference in power and operation between the two systems, there are not very many conclusions that can be reached from the comparison. Essentially, the only standout data point within our testing was time for job completion. The Trotec times were significantly less than that of the ULS model. On average, ULS operations took three to four times that of the Trotec. This information should not be used to declare one manufacturer over another, as the ULS machine is three years older than the Trotec. Simply, we wanted to make a point as to potential benefits of newer equipment if one were to pursue laser engraving commercially.

Below we have included scans from our engraving comparison. Settings between machines differed, and as such, results on the media varied. These images are provided only as a reference of the types of outputs achieved across a range of media.



Sample 8: Mayan Copan Bench Relief on Balsa Foam, Trotec and ULS



Sample 9: Mayan Copan Bench Relief on Linoleum Tile, Trotec and ULS

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Sample 10: Mayan Copan Bench Relief on Mat Board, Trotec and ULS



Sample 11: Mayan Copan Bench Relief on Pine, Trotec and ULS

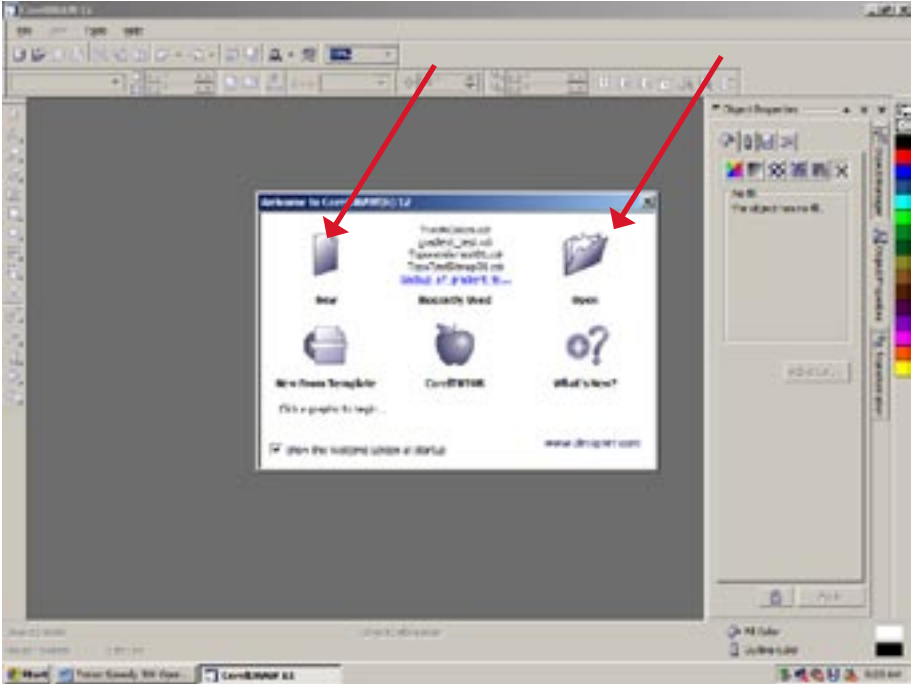
Overall, the Trotec Speedy 300 performed comparable to, and in some areas, better than our previous engraver. The self contained filtration system is a feature we cannot praise enough. Not only does it vastly simplify installation, but it prevents fumes and contaminants from being exhausted into the environment. Its size was adequate for the vast majority of engraving operations we receive. For more commercial oriented endeavors, its speed should also come as a top selling point as jobs can be returned to customers sooner and require less operator time. Although a decent amount of time is required in order to have the equipment running properly across different media without issues, that appears to be innate to the process of laser engraving.

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Appendix B - Quick Operation Procedures

The following provides a brief overview on operating the laser equipment. The instructions are intended to serve as a quick reference for basic operating procedures. A more detailed explanation can be found in the user guide provided with the equipment.

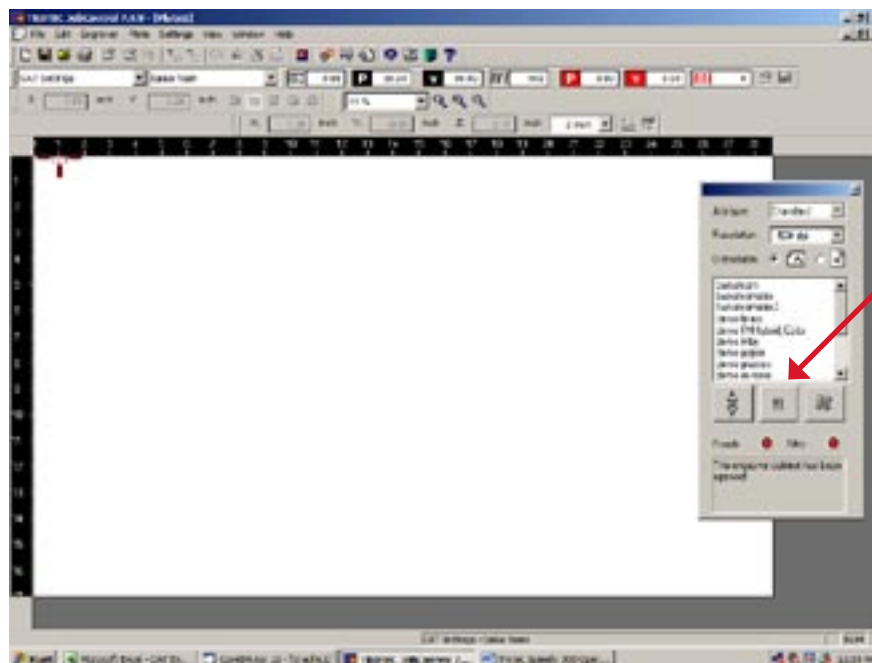
1. Check the condition of the mirror and lens on the laser engraver head. To do so, you must make sure the engraver is powered off.
2. Loosen the two brass screws located on the top of the laser head.
3. Carefully remove the mirror and inspect it for any damage or debris. If necessary, clean the mirror using lens cleaning paper.
4. Check the condition of the focusing lens. To remove the lens, turn the red fitting below the lens clockwise and carefully slide the lens out. Place the lens back into place and tighten it back into place.
5. Replace the mirror and tightly refasten the brass screws.
6. Record the condition of mirror and lens in the user log.
7. Open the CoreIDRAW Software.
8. Select "New" to create a new document or "Open" to access a saved file located on the computer.



9. If you select “New” a blank work area will be created.
10. You may adjust the size of the work area by entering in your preferred measurements into the paper width and height boxes in the top left corner of the screen.
11. To import a saved file, click on “File” from the top drop down menu and select “Import”.
12. Locate your saved file and double-click on it.
13. You will return to the work area and will find the symbol with the name of your file.
14. Click and drag your mouse to size the image on the work area.
15. Make any and all changes to your images.

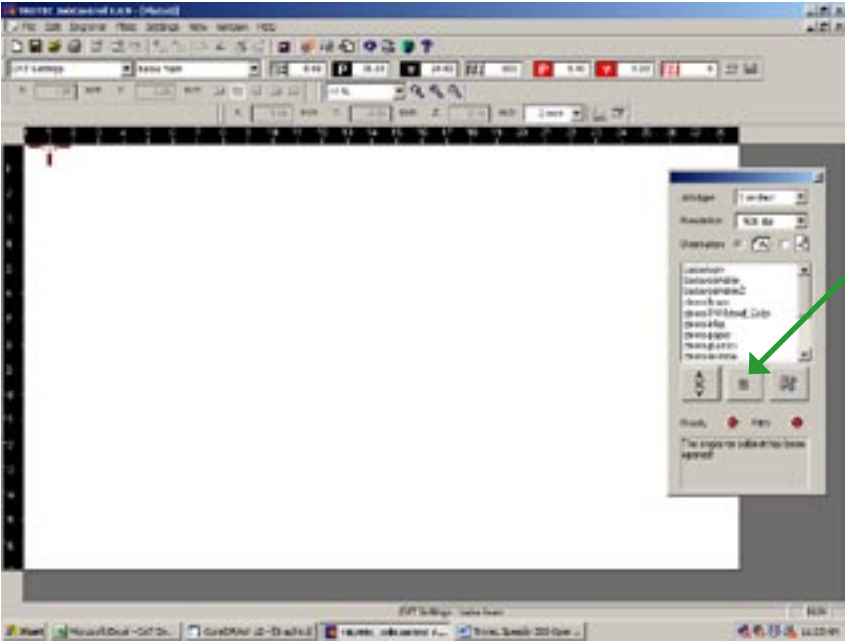
Focusing and Connecting to the Laser Engraver

1. Open up JobControl software.
2. Make sure the engraver lid is closed and turn on the engraver.
 - Power switch is located on the back upper left side of engraver.
3. Click on the “Connect” button that the red arrow is pointing to below.



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- 4. Once properly connected, the “Connect” button will change to a Green “Play” button that the green arrow is pointing to below.

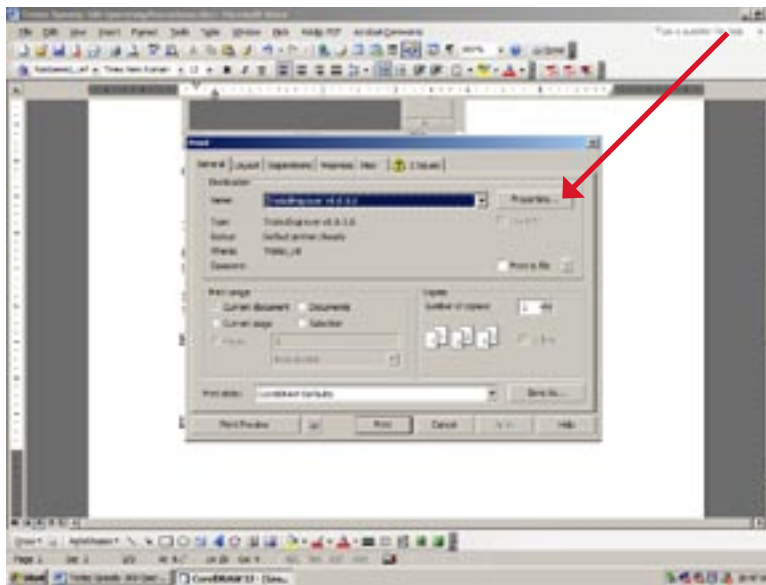


- 5. Once connected, the laser table will automatically drop down to the lowest height level.
- 6. Open the engraver lid and carefully place your material onto the work table.
- 7. You must focus the laser according to the thickness of your material. To do so, you must first hang the red focusing tool (located on the inside ledge of the engraver) on the lip located on the right of the laser head.
- 8. Position the laser above your material.
- 9. Close the engraver lid.
- 10. Carefully raise the work table until the tip of red focusing tool touches the media causing it to fall off the lip of the laser head.
- 11. Open the engraver lid, remove the red focusing tool from atop the media, and place it back onto the inside ledge of the engraver.
- 12. Close the engraver lid. The laser is now properly focused and ready to use.

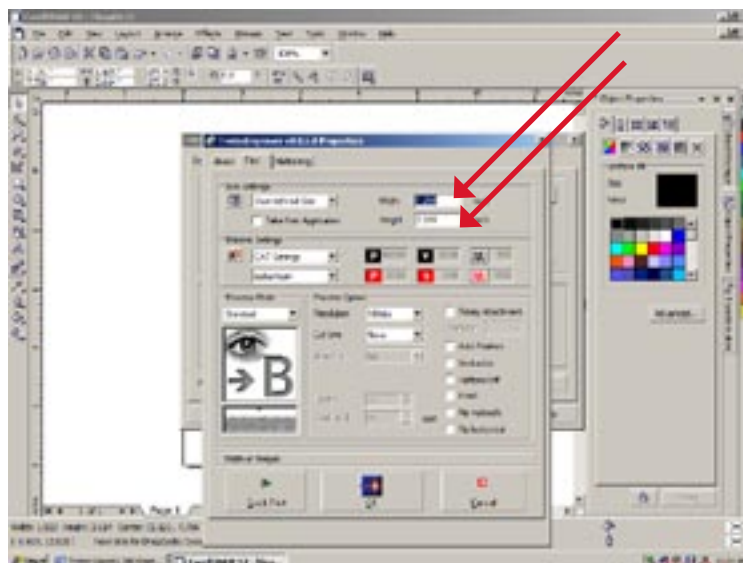
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Submitting CorelDraw files to Laser Engraver Job Control

1. Click on “File” from the top drop down menu.
2. Select “Print”.
3. Click on the Properties button located in the Print general options tab, which is identified by the red arrow below.

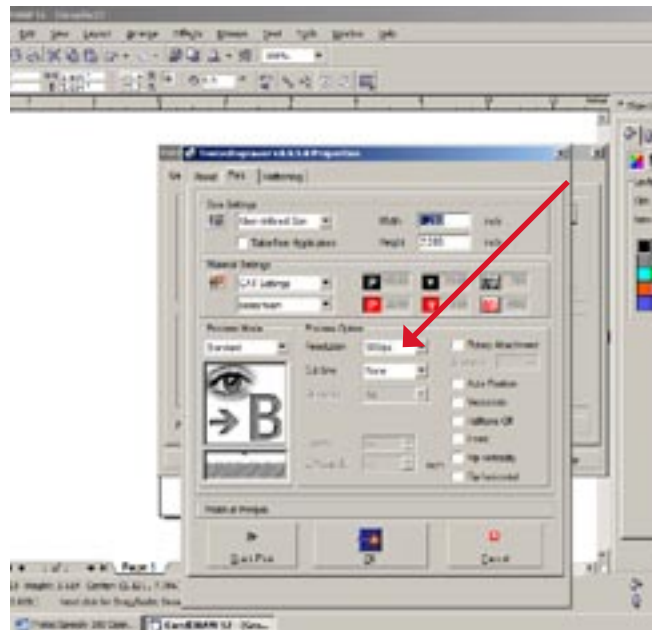


4. In the Properties box, click on the “Print” tab
5. Enter the width and height of your project in the boxes provided so that it matches the work area of your project in CorelDraw.

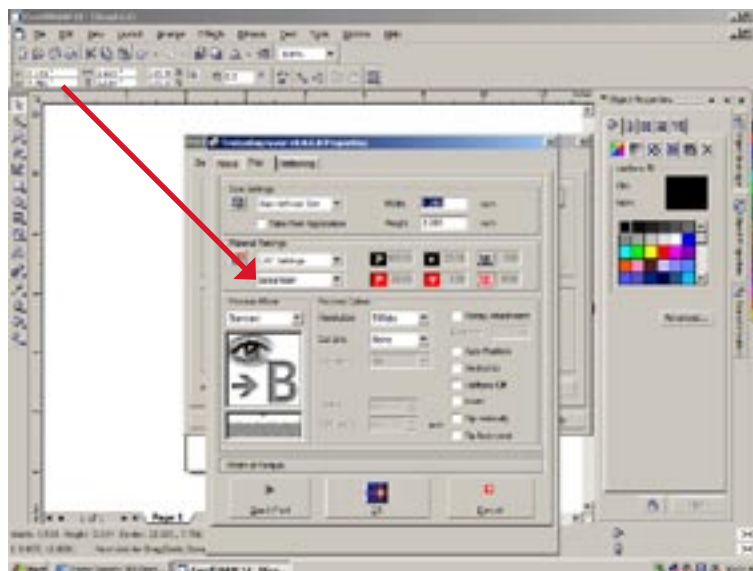


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6. Select the material setting that corresponds to the type of media you are using in the laser engraver.

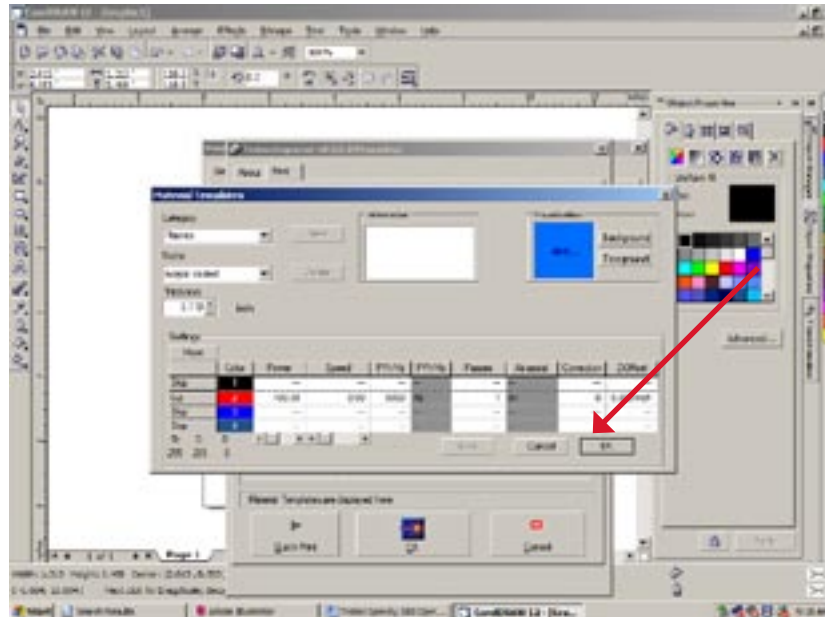


7. To view predetermined material settings, or manually adjust any settings, click on the button to the left of the material setting menu.

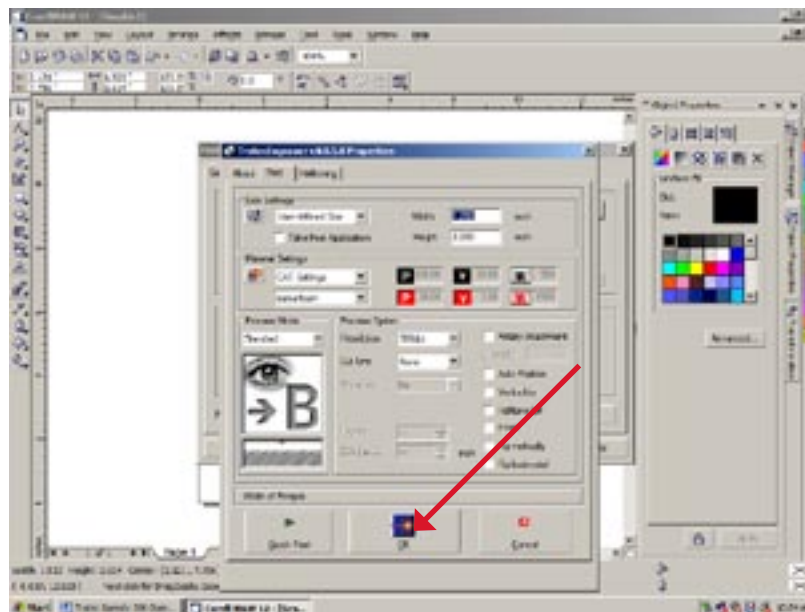


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8. Make any appropriate changes to the settings and click OK. **Do not override presets for any material.** If changes are made, save them under a new name.



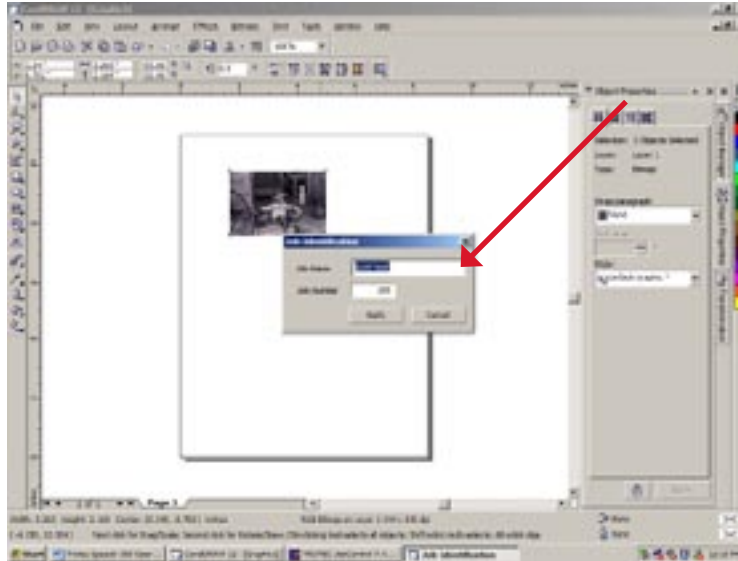
9. Click the “OK” button once your appropriate settings are selected.



10. You will return to Printing Properties menu. Click on “Print” to submit the project to JobControl.

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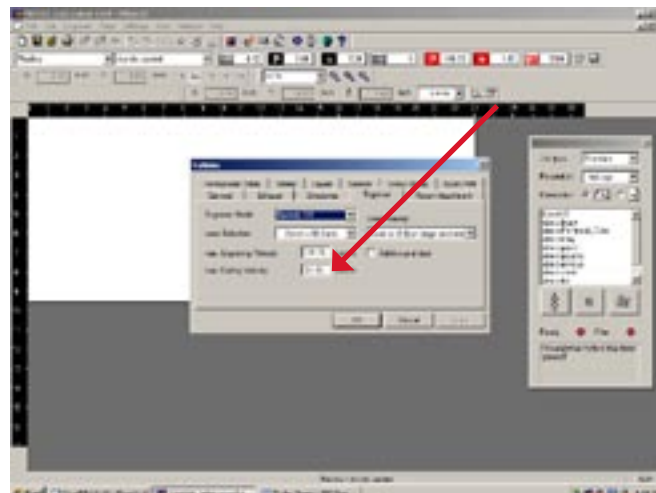
11. You will be prompted to enter a job name before the project is submitted to JobControl. Enter a job name for your project and click on “Apply”.



12. Your job will be submitted to the JobControl software.

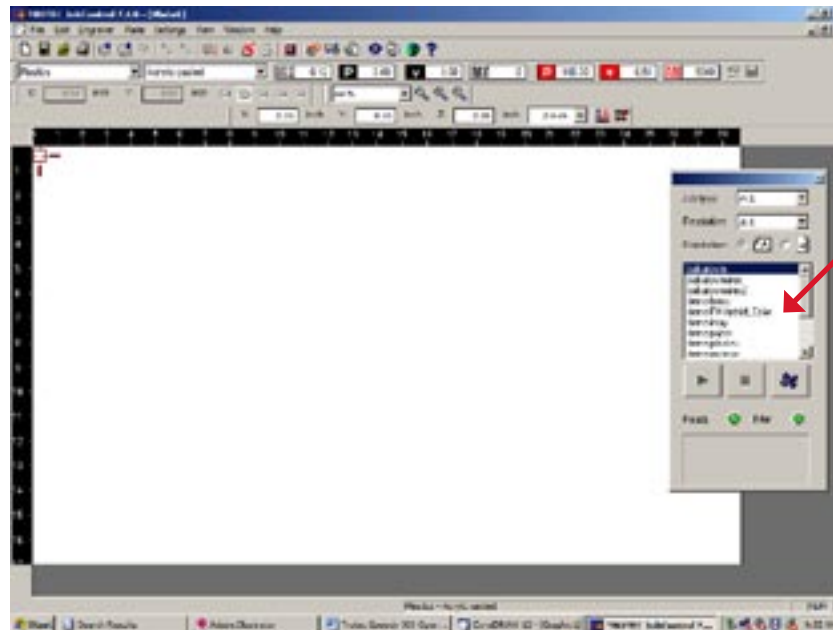
Printing Projects from JobControl

1. Make sure the laser engraver is turned on. If it is not, you must follow directions provided under “Focusing and Connecting to Laser Engraver”.
2. Check and make sure the “Auto Focus at Start” option is turned off. You can do this by clicking on “Settings” from the top menu in JobControl.
3. Once selected, click on “Options”.
4. Click on the “Engraver” tab. Make sure “Autofocus at Start” option is not checked. If it is, uncheck the box and click “OK”.

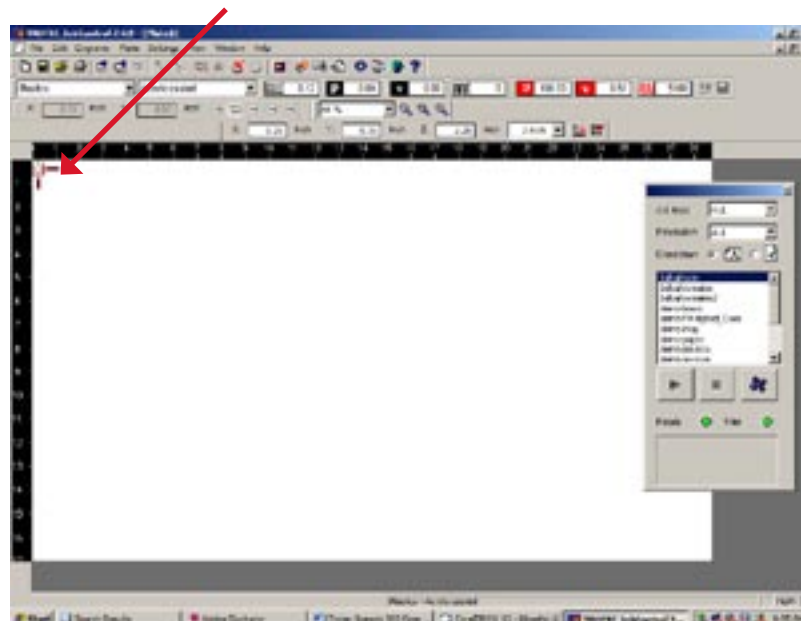


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5. Find your project in the job queue box located on the right hand side of the screen.

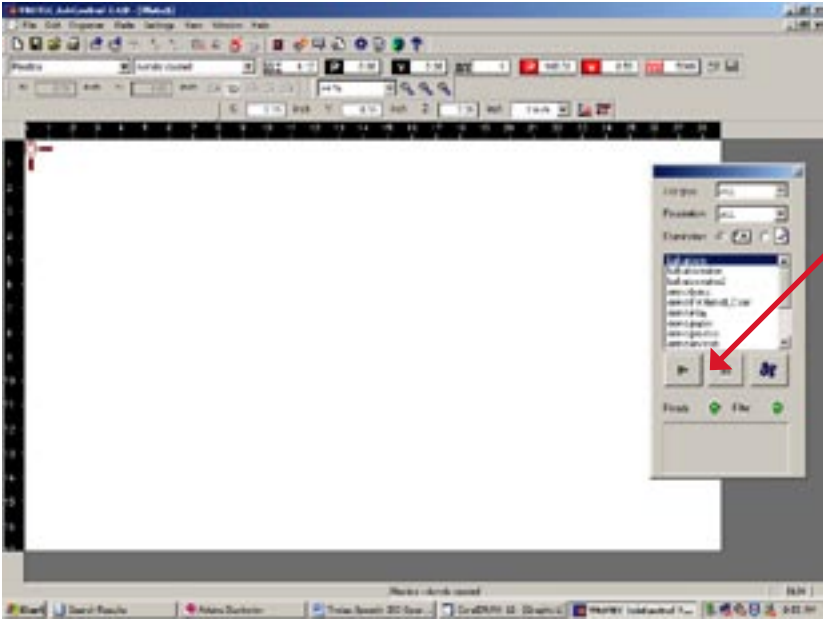


6. Locate the red cross hair on the work area located to the left of the job queue box. This should correspond with the location of the laser on the engraver equipment.
7. Adjust the positioning of the laser on media in relation to where you would like it to begin the engraving process.
8. Push the F8 key to mark the starting position of your project. The marker will show-up as a blue cross inside the red cross hair pictured below.



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- 9. Drag your project(s) onto the work area from the job queue box.
- 10. Once positioned on the work area, drag the image towards your blue marker to properly fix it to the laser starting position. The image should “snap” to the blue marker position.
- 11. Once positioned, click on the green “Play” button to begin the engraving process.

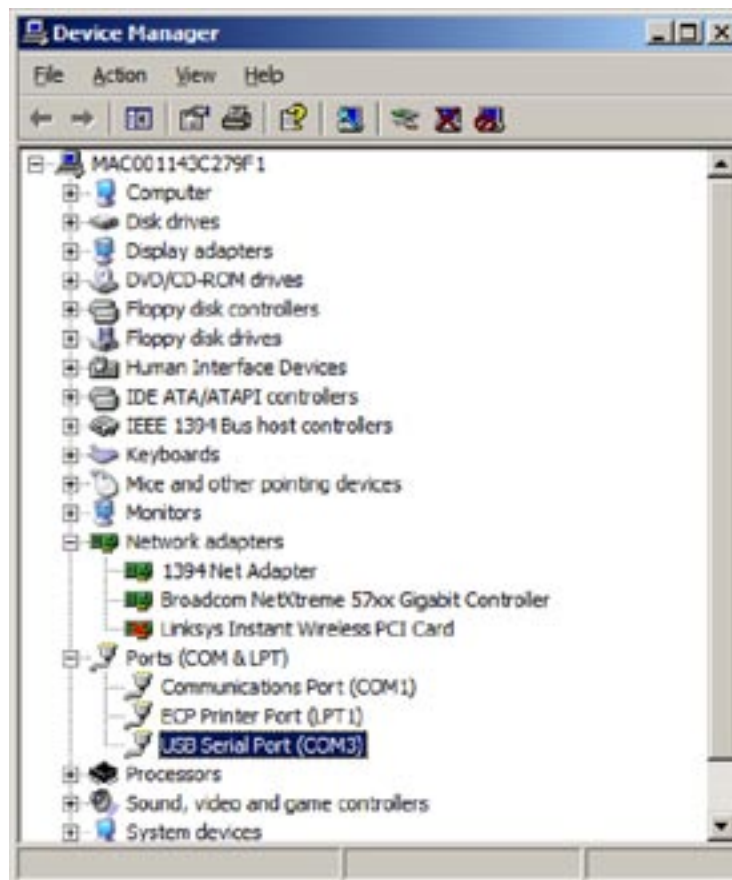


- 12. Remain with the engraver at all times during operation.

Appendix C - Troubleshooting Solutions Not Included in the Trotec Manual

The engraver will not connect in the JobControl software:

1. Ensure that the engraver is powered on and that the USB cable is connected
2. Verify that the USB Serial Port Device is installed on the computer
 - Right-Click on **My Computer > Properties**
 - Under the **Hardware** tab click on **Device Manager**
 - Locate the **Ports (COM & LPT)** menu item and click the **plus (+)** to expand it
 - Locate the **USB Serial Port (COMx)** x may vary depending on what COM ports are available. Record the number in the place x (in the following image it is 3) for use later.



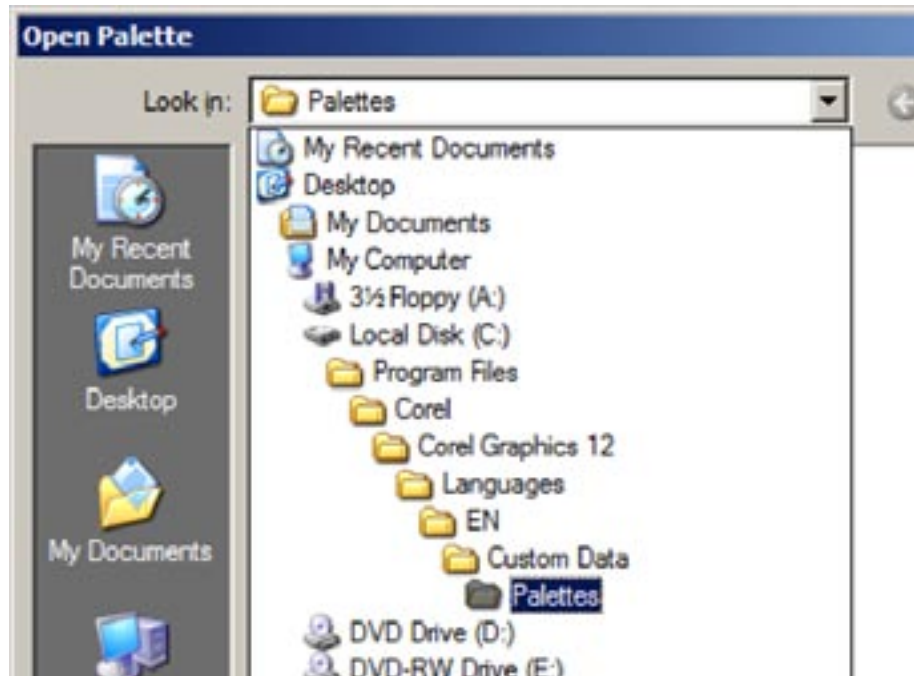
Note: If unavailable, the USB Serial Port device can be installed from the Trotec provided USB driver disk

3. In the Trotec JobControl software, click on **Settings > Options**
4. Under the **General** tab, set the **Com-Port** setting to match the previously recorded number listed in the Device Manager

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The proper palette colors in CorelDraw are either not displaying or not displaying properly:

1. To reinstall the color palette:
 - The color palette file should be installed on the machine during setup/training, if not, consult your local Trotec representative.
 - The default color palette location for CorelDRAW 12 on Windows XP is shown below



- In CorelDRAW, click on **Window > Color Palettes > Open Palette** and navigate to the Trotec palette (usually named something like Trotec.cpl)
 - Once selected, the palette should be loaded into CorelDRAW
2. In CorelDRAW, turn off color management by clicking on **Tools > Color Management**. The **Style** option should be set to **Color Management Off**. Click **OK**.

The (0,0) position of the laser engraver does not match properly with the JobControl position:

1. Make sure laser engraver is turned off.
Note: When engraver is off you may move all of the parts freely.
2. Slide laser arm to middle of table.
3. Slide laser head to the middle of laser arm.
4. Under both sides of laser arm there are small metal tabs that act as reference positions for the boundaries of the engraving table.
 - To expand the boundaries closer to the table limits, push the metal tab back
 - To contract the boundaries inward from the table limits, pull the metal tab forward
5. Close the laser engrave lid and turn it back on.
6. You must reconnect to the laser in JobControl in order to check your adjustments.
7. Once connected, position the red laser marker on (0,0) on the work table.
8. Verify that the red crosshair in JobControl corresponds to the location of the laser marker.
9. If further adjustment is necessary, repeat steps 1-8.



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The material is burning on the surface while cutting/engraving:

(Not always totally preventable depending on settings)

1. Apply masking or similar tape over the area that is being affected.
2. Spray water absorbent materials, such as wood, lightly before engraving.
3. Apply moistened paper to the area that is being affected.

The laser position in the machine and JobControl software are not synchronized:

1. Make sure laser engraver is turned off.
 - When engraver is off you may move all of the parts freely.
2. Slide laser arm to middle of table.
3. Slide laser head to the middle of laser arm.
4. Under the left side of laser arm there is a small metal tab.
 - To adjust laser alignment “in” push the metal tab back
 - To adjust laser alignment “out” pull the metal tab forward
5. Close the laser engrave lid and turn it back on.
6. You must reconnect to the laser in the Job Control in order to check if your adjustments were successful.
7. Once connected, place laser on (0,0) on the waffle work table.
8. Check to see if red-cross-hair in Job Control corresponds with the location of the laser on the Speedy 300.
9. If further adjustment is necessary repeat steps 1-9.



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Appendix D - General Operator Tips and Information

Although it is not always extremely helpful, read the manual before ever using the equipment as it provides some useful information, in particular, safety guidelines

Check the laser lens prior to and after operation by turning the large red fitting on the lens housing unit. Once the fitting is loosened you can remove the lens and clean it with cleaning solution and lens cleaning tissue. Only clean the lens if it is dirty. If the lens is dirty and the engraver is operated this can cause the lens to crack.

Internal components (laser arm, laser casing, etc.) can be freely moved only when the machine is off

Pressing the table up and down buttons at the same time will cause the laser to auto focus on the material currently set on the engraving bed. Manual focusing is preferred over auto focusing though.

The exhaust fan speed can be adjusted as low as possible until a noticeable smell is emitted, at which point the speed should be increased

The exhaust system for the Speedy300 should activate automatically when the engraving process is started

The #3 mirror, located on the sliding laser casing, has brass screws that allow it to be removed

The #2 mirror, located on the side of the machine, has brass screws used for alignment and allen screws that allow it to be removed

Within the JobControl software, F8 creates a marker at the current laser position that engraving jobs can then snap to. Pressing ctrl+del allows these markers to be deleted.

In CorelDraw, under expert options while printing, change the width and height settings to match those of the file being printed.

In Material Templates, PPI maximum is 1000ppi and Hz maximum is 10,000Hz

Vector cutting speed should never exceed 10%

Never turn off air assist when engraving in acrylic this produces a cloudy effect

Usually, material is placed in the upper left corner of the engraving table, however, jobs can be run on material located anywhere on the engraving bed

Air assist should be on whenever engraving on flammable materials

Lower Hz settings help to decrease flaming



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A lower PPI setting should be used for plastic materials as they typically have a lower melting point

Power can be reduced to eliminate burn marks when engraving.

Applying a Sharpen Filter to a raster image will normally help to define the contours of the image better for engraving

Filter Life - Carbon filter 1000 hrs or 100% - time to change the filter.