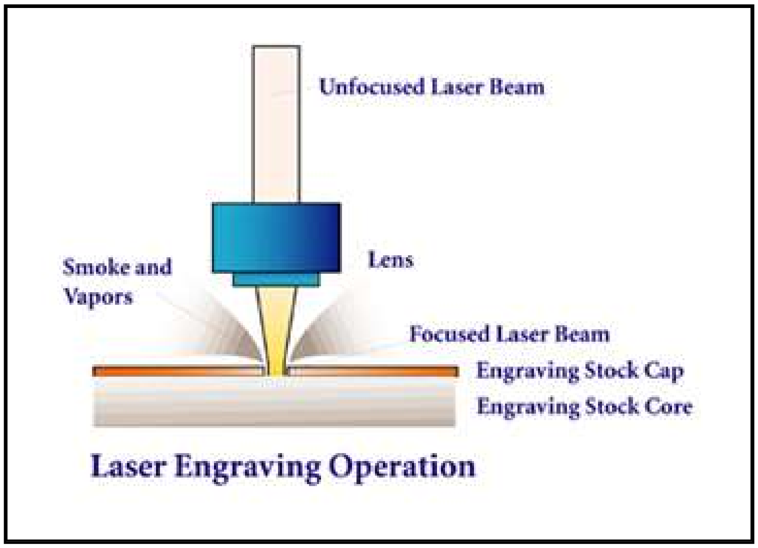
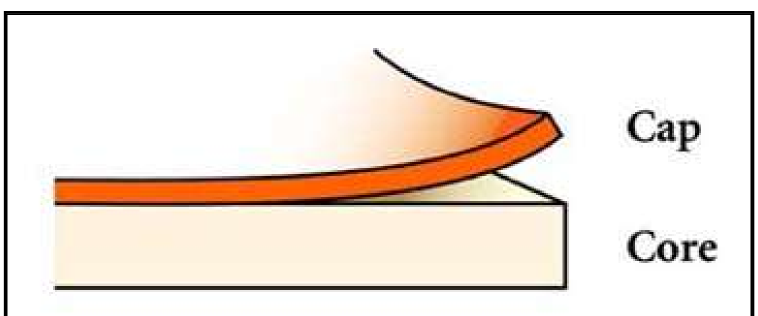
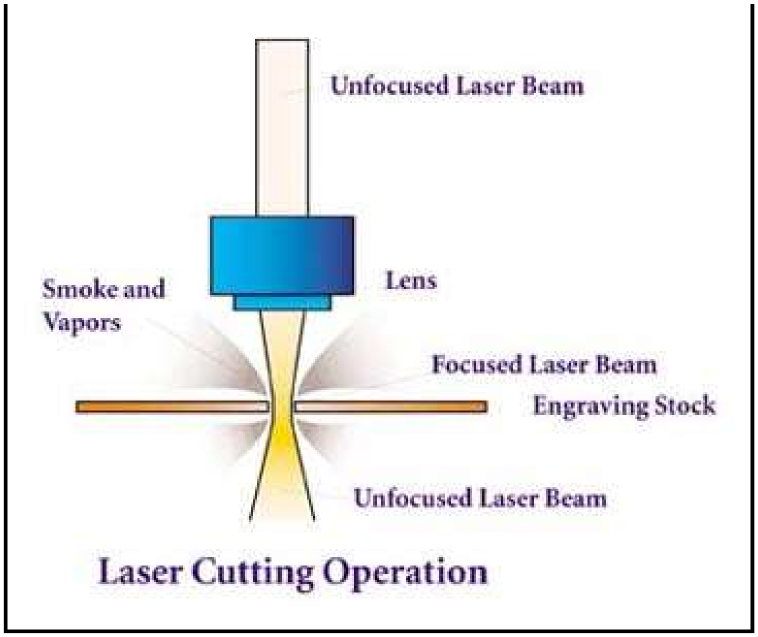


What is Laser Engraving?

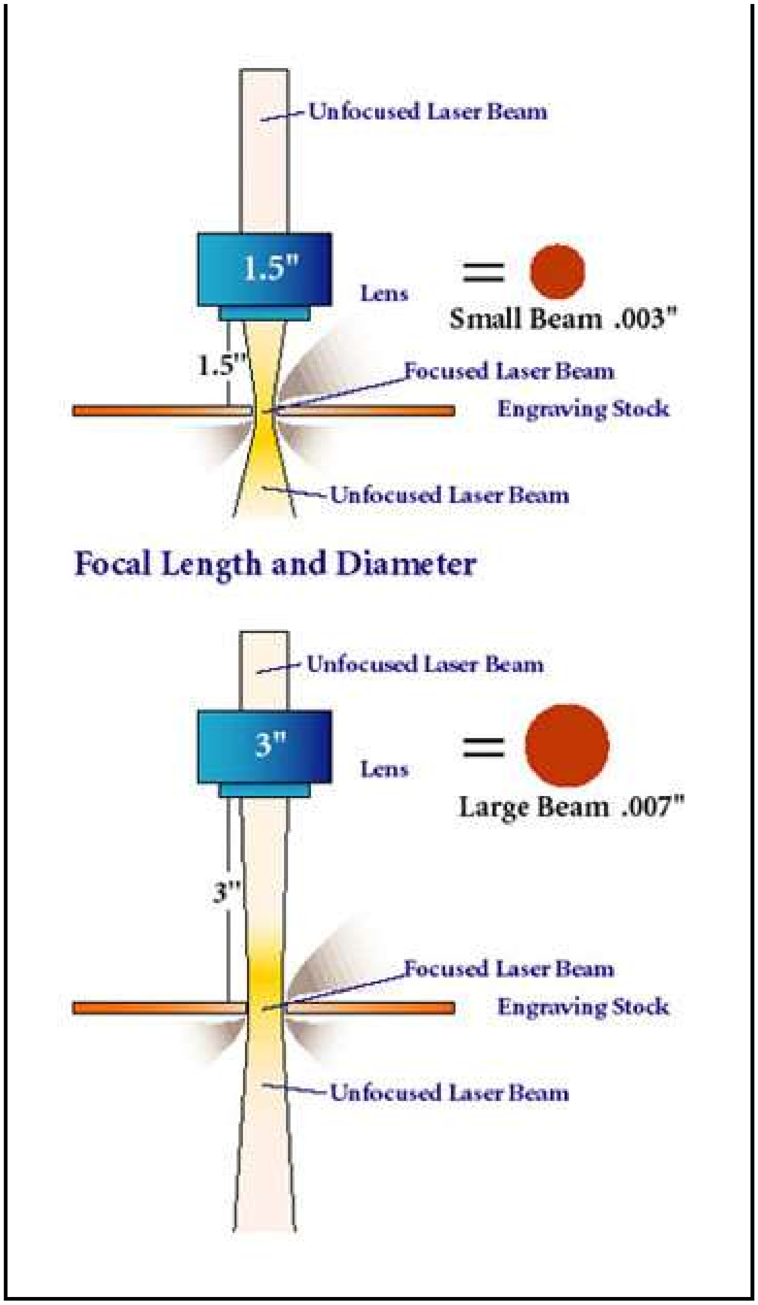
A laser engraver uses a highly concentrated beam of light to burn or cut into a variety of materials. Rowmark has developed a complete line of products specifically for the laser engraving process. Most laserable products are 2-ply laminates, the top layer (cap) of which can be burned away to reveal a contrasting substrate below, resulting in one-step signage. The laser is computer driven and functions by moving the lens over the surface or bed of a designated area, commonly 18" by 24". The lens can simultaneously move side to side and front to back with quickly, allowing it to cover the entire surface of the bed. The beam, focused through the lens, is capable of firing and shutting off within a fraction of a second.





Adjustments can be made to the speed at which the lens moves and the amount of power it discharges. Speed and power settings control the depth of the cut into the material with great precision. This beam is generated from a laser tube and is directed by a series of mirrors, through the lens, and finally onto the laser bed.

Laser systems come equipped with a focus lens, but most manufacturers will supply alternate focal-length lenses for various uses. These lenses are usually designated in inches, or the distance required from lens to material for optimum focus. For example, a 2" lens would need to be 2" from the material being cut in order to be properly focused. Focusing is generally achieved not by adjusting the lens (which is at a fixed height), but by raising or lowering the bed. The lens size also determines the diameter and length of the cutting beam. A smaller lens size produces a shorter and narrower beam.



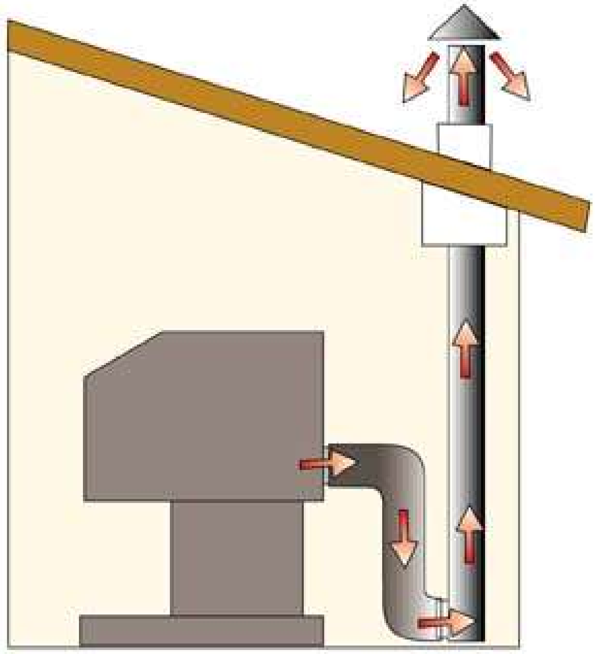
TIP: Since plastic is fairly easy to engrave or cut and is very heat sensitive, a lens with the shortest focal length is the most versatile. Its narrow diameter beam means less heat is concentrated in its path. It also leaves a narrower gap between cutouts when vector cutting and is capable of greater detail engraving.

The laser renders artwork in one of two ways. It will send the lens in a back and forth motion, intermittently firing in accordance with the pattern of the artwork and dropping down a predetermined, fixed distance on each pass. Picture a farmer plowing a field, moving along one row to the end of the field, reversing direction, dropping down one row and heading back, etc. This is known as raster engraving. In the second method, the laser follows outlines that have been computer generated. In this case, visualize a figure skater moving around a field of ice. This is called vector cutting.

A design is created using graphics software consisting of images and/or type. This is sent to the laser in much the same way a file is sent to any printer, through a parallel port or USB connection. Settings can be adjusted along the way to control the kind of engraving, power, and speed desired. Material is placed on the bed, the lens focused on the material's surface, and the machine is started. The laser then renders the artwork. Adjustments to the settings, based on various factors such as the type of material used, are often necessary to obtain optimum results.

What You Need to Get Started

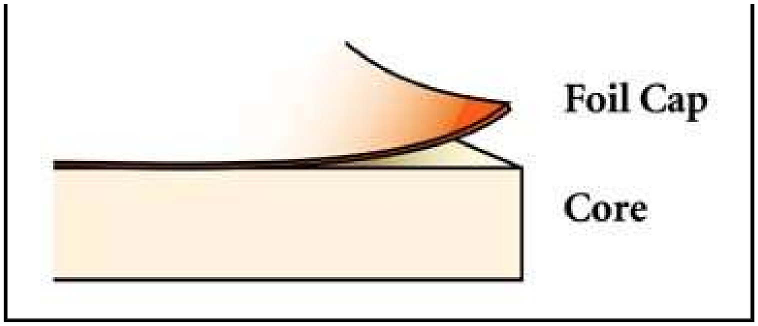
In order to set up a lasering operation, it is necessary to have a computer system, appropriate graphics software (CorelDraw or similar graphics programs), and a laser attached to the computer through the parallel port or USB connection. (Consult the documentation included with the laser and software for minimum computer requirements). Remember to properly vent the laser to remove vapors that result from cutting and engraving plastics and other materials. (See manufacturer's specifications for further details).



Cutting Rowmark material to size (to fit inside your specific laser system) can be accomplished with a shear (large mechanical cutter), a plastics hand shear (similar to a paper cutter), a plastics safety table saw (provides the cleanest edge), or other power saw units equipped with a blade designed for cutting plastics. A special utility knife blade is the simplest option and scores the material, allowing it to be snapped along the scored edge (surprisingly clean and effective). As long as the sheet can be cut to fit the laser bed, the material can then be cut into a particular size. Other fabrication accessories can be acquired as needed, depending on the nature of the operation being performed.

About Laminated Acrylics

As stated above, Rowmark manufactures laminated acrylic sheets for the awards, recognition, and signage industries. These sheets consist of a thinner cap material permanently bonded to a thicker core material. Most of the products Rowmark recommends for lasering have a cap thickness of only .001", although a thicker cap surface may be engraved. This thin cap allows engraving with minimal power settings at maximum speeds.



Plastics are very heat sensitive. In order to laser these products successfully, it is necessary to minimize the amount of heat contacting the material by either reducing the power or by increasing the speed. These adjustments can be made when the job is sent to the laser by changing the printer settings. (See **Raster Engraving**, **Vector Cutting,** and **Settings**.) Minimizing the laser beam diameter by using a smaller focal length lens will also help prevent overheating.

With the correct settings, the cap material is removed to reveal the core material below. Usually the cap material forms the background of the sign, while the engraved images and type (the exposed core material) form the subject of the display. This process can be reversed, but involves the removal of a large quantity of cap material. In either case, the lasered sign is complete, barring any other fabrication needs.

Rowmark materials are available in a variety of thicknesses from 1/32" to 1/8", depending on the product line. A few unique product lines offer even thinner gauges. The majority of Rowmark products are 2-ply. 1-ply materials can be used for cutting rather than engraving, such as ADA compliant tactile signage, and 3-ply materials can be used for signs that require engraving on both front and back.

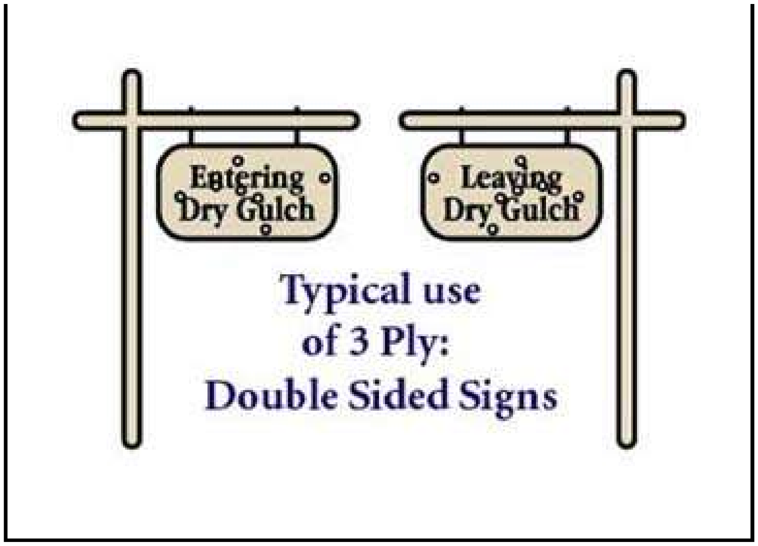
Standard Sheet Thicknesses

Available in most lines

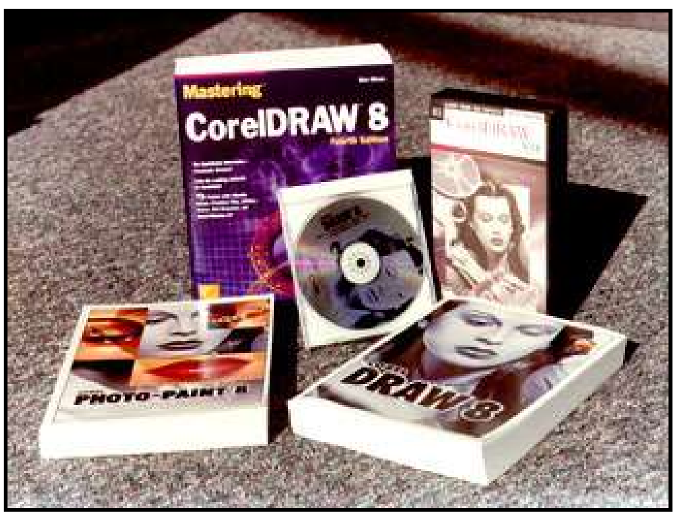
Other Thicknesses

Specific to certain product lines

Standard Lamination

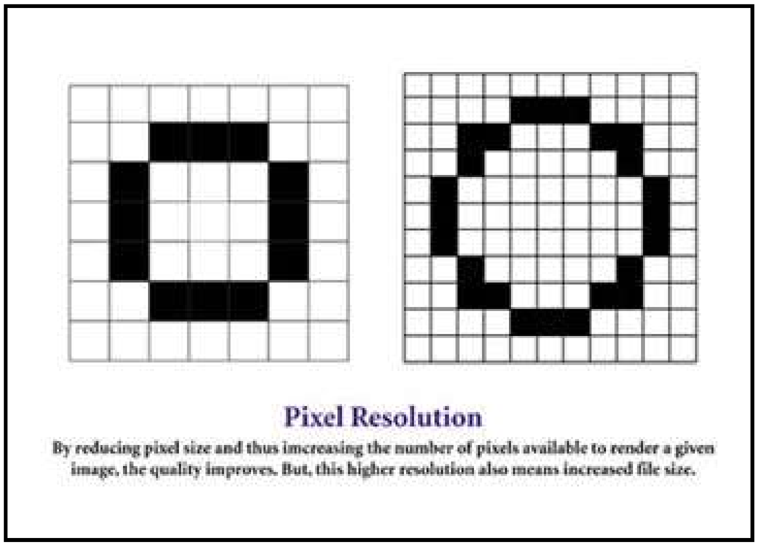


Rowmark offers multiple product lines with a variety of colors and finishes. Not all Rowmark materials are laserable due to the make-up of the core material and the thickness of the cap. Many Rowmark product lines were originally developed for rotary engraving and are ideal for that application. Some of these products are not suited for laser engraving. We do not list them as laserable in our product literature because they require special attention and often more than one laser pass to achieve desired results. (Please refer to **Product Line Tips** and **About Our Product Lines** for further information.)

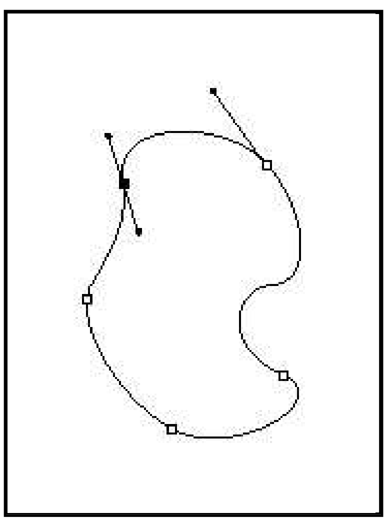


Preparing Artwork

Graphics programs such as CorelDraw and Adobe Illustrator allow you to use both text and images in a design. Laser engravers are able to render such artwork as long as it is presented in black, white or shades of gray. Lasers can only engrave and cut material. They do not print, therefore they are incapable of applying color. The final output can be rendered in color through the choice of color materials and fabrication methods, but the artwork itself must be black and white or grayscale. A specific and limited set of colors can be applied to the outline or fill of any artwork, but only for the purpose of establishing an engraving order utilized by the laser printer driver. These assigned colors will still print as though they were black.



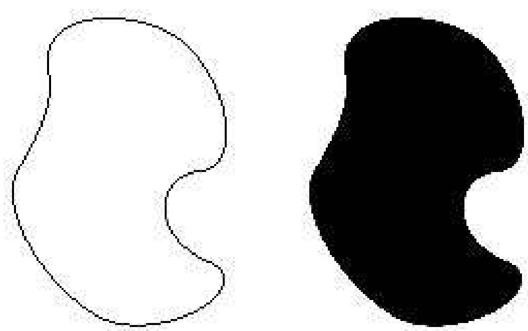
There are two primary methods the computer can use to render images: raster and vector. To understand raster images, imagine coloring in the squares on a sheet of graph paper in order to form a picture. The quality of such a rendering would improve as the size of the graph squares became smaller and increased in number. All raster images are made up of tiny solid colored squares, whose appearance improves with increased resolution (diminished pixel size). The computer must keep track of every pixel location (every square on the graph paper) and of which solid color is applied to each specific pixel at each location. Because of this, file sizes for raster images can be quite large.



Vector images, on the other hand, are created by computer design tools that create outlines. The computer remembers these outlines as mathematical formulas, which proves to be a more efficient method and generally results in smaller file sizes. The computer reads the outline as a series of points with lines flowing from one location to the next at varying angles and curves. The software allows these points and their corresponding outlines to be moved and adjusted in order to create artwork. The mathematical nature of these files allows the computer to talk to machinery such as plotters and engravers. Therefore, vector oriented software is generally used to create the artwork that is sent to a laser.

The terms raster and vector are also applied to the laser operations themselves, even though only vector images are being sent to it. The raster method is used to fill areas, and the vector method is used to follow outlines. This use of the terms raster and vector does make some sense when applied to the operation of the laser, but should not be confused with its meaning in regard to the creation of computer images.

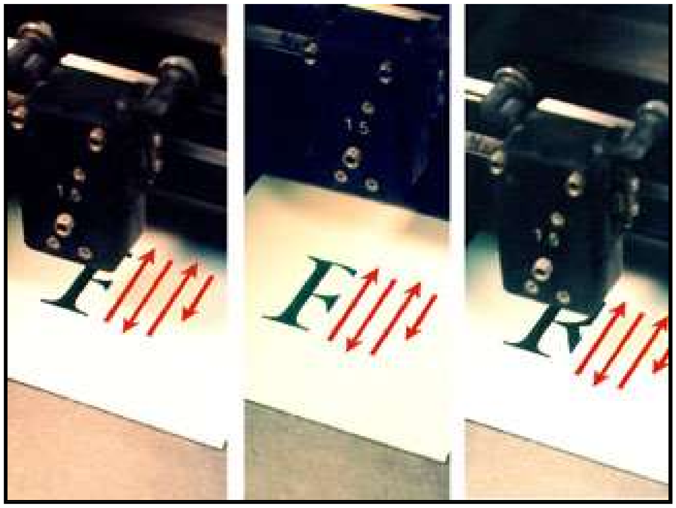
For the most part, images and text in the above-mentioned programs will be in outline (vector) format. This artwork can be left as outlines or filled with black, white or grayscale tones or gradients. In the vector mode, the laser beam actually follows the outline as a path and can engrave through the cap or cut through the material. In the raster mode, the laser moves in the back and forth motion described above until it renders the fill inside the shape.



Vector Shape: Outlined and Filled

For example, text usually appears on the monitor as filled with black, but its fill can be changed to white and the outline changed from none to black to allow the letters to be vector cut from the material chosen. (It is often necessary for the outline to be assigned a thickness, such as .003" or less, so the laser can vector cut rather than raster engrave the outline. Consult your specific machine documentation for details.)

Any vector artwork that has been filled, or whose outlines are heavier than mentioned above, will automatically be raster engraved. In raster engraving, the laser beam moves back and forth progressing down the page in a field-plowing fashion. As the lens moves across the page, it fires and cuts through the cap of the laminate wherever it finds corresponding black images in the artwork file. The image is rendered line by line, generally working from the top of the page to the bottom until the image is complete.



Images created using the raster method on the computer are known as bitmap images. Bitmap images, which include scanned images, photographs, some clipart, and images created in programs such as Adobe PhotoShop and Corel Photo-Paint, can also be lasered. They are composed of a grid of tiny squares of color. There are no outlines to follow, so the laser can only raster engrave these types of images unless they have first been converted to vector outlines. These images must be in black, white or grayscale, and are generally imported into a software program such as CorelDraw to send artwork to the laser. Grayscale and photo lasering will be discussed at length under **Photo Lasering**.

Raster Engraving

As mentioned earlier, both vector and raster (bitmap) images can be raster engraved. A file is prepared in a size no larger than the engraving bed, and the artwork is created and placed within that page. Material is chosen, cut to size, and placed in the laser bed. An appropriate lens is selected for the job and focused so the distance from the surface of the material to the lens equals the designated lens size. (A 3.5" lens needs to be 3.5" from the top of the material. Follow machine instructions for appropriate focusing.) Since photographic and grayscale images are more complex to prepare, we'll discuss only black and white images here.

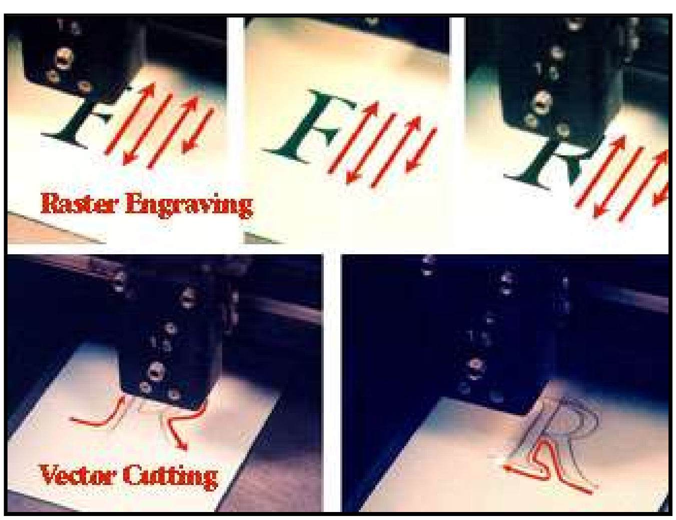
The intricacy of the image is not a factor as long as it fits on the page and is only black or white. Make sure the laser has been turned on, is properly vented, and is connected to the computer through the parallel or USB port. Then, simply go to "file" and select "print".

Make sure the laser's printer driver software has been properly installed and the laser model has been selected from the printer options. A settings dialog box should appear on your screen. For raster engraving, enter the desired settings for power, speed, and DPI (dots per inch - refers to the distance down the page the lens will drop as it moves from pass to pass). The higher the DPI setting, the more passes required to complete the job, thus lengthening the rendering time. A normal DPI setting would be 500. Higher DPI settings allow for greater detail but also take longer to engrave since more passes are required. Lower DPI settings result in coarser rendering and take less time since fewer passes are required.

When raster engraving, it is advisable to optimize the speed, which translates to a 100% setting. For most lasers, a power setting of around 30-50% is appropriate for laminates designed for lasering such as Rowmark's LaserMark, LaserMax or FlexiBrass materials. Once these figures have been entered, the file can be sent to the laser. Depending on the machine, the lasering will begin immediately or the file will be displayed on an *LCD* display on the laser, at which point the start button can be pressed and the lasering begins.

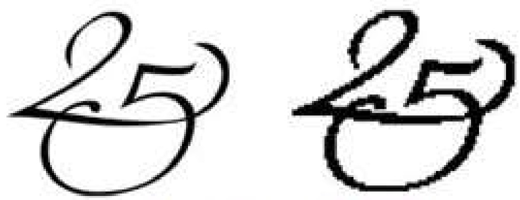
As the lens begins its sweep from left to right and right to left, it will only concentrate on the black areas of the artwork. Thus, if a tiny black dot appears on the top of the page and there is nothing else in that portion of the page, the lens will make several passes back and forth but only over the perimeter of the dot in order to engrave it. It will not make full sweeps across the page unless it finds something else to laser. This allows for efficient operation, and, as the lens moves down the page, it automatically jumps over any blank areas. If there is a tiny dot at the top of both the left and right hand sides of the page, the laser will sweep from one dot to the next, back again, until both dots are rendered. It will not quickly render one and then jump over to the other since it must complete one sweep before moving down to the next. If it finds no black in its path, the lens will skip that pass as well as others until it finds black to render. If it finds two or more instances of black in its path, it will jump to the first instance, sweep across to the next, etc. until the last mark is rendered, at which point it will jump down to the next line. Understanding this pattern can be quite helpful and allow the engraver to save much time by taking advantage of the color coding of elements.

Once the final line is engraved, the lens returns to its home location. The job is complete so the laser's lid can be lifted and the lasered substrate can be removed.



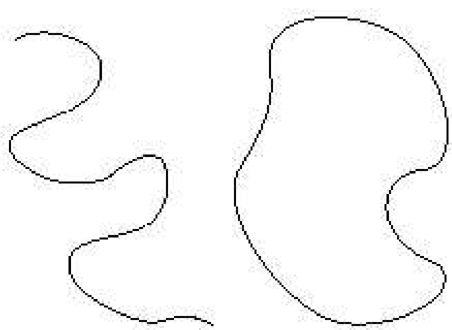
Vector Cutting

While it is possible to raster engrave most vector images, it is not possible to vector cut raster (bitmap) images unless they have first been converted to vectors by hand or through some automated conversion program. For instance, if a logo is scanned with the intention of cutting that logo out of some material, it will not initially be possible since scanning automatically creates raster (bitmap) images. The bitmap needs to be manually traced (most accurate) using the bezier tool in a program such as CorelDraw or by using the auto-trace feature of Corel R.A.V.E. or some other program. Once it is traced, the logo is in an outline or vector format and can be vector cut. When the laser is in its vector mode, it drives the lens over the engraving bed directly tracing the outline or path of the vector image on the screen.



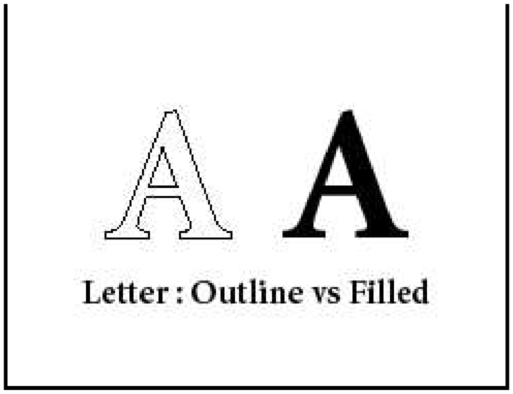
A vector based logo (left) becomes rasterized (pixelated) when scanned

Vector paths can be individual lines or the closed outline surrounding a shape. Vector artwork can be made up of any number of lines or shapes, including text. The laser will move from one line or shape to the next until the artwork is completed. In most cases, the engraving order can be controlled.



Vector Path vs Closed Shape

Most fonts are created as vector outlines but usually appear on the screen filled with black and with no outline visible. By giving them an outline and changing the fill to white or no-fill, it is possible vector cut them.



Letter : Outline vs Filled

As with raster engraving, it is first necessary to create a page using a graphics program such as CorelDraw. The page size of the document should not exceed the bed size of the laser. The outlines then need to be drawn or imported and arranged. Once the artwork is complete, the file is printed as discussed in the **Raster Engraving** section. When the settings dialogue box appears, the important categories shown include the speed and power. DPI is not an issue at this time. What *is* important is the number of firings per inch referred to as Rate or PPI (pulses per inch), with the higher number of pulses creating smoother but hotter lines. For acrylics, this setting should be on the low side to avoid excessive heat buildup (between 150 and 500 PPI). With vector cutting, the power should generally be 100% with the speed varying to accommodate material type and thickness. This allows it to achieve the desired cutting depth without overheating or burning the material. Generally, the speed should not exceed 12% since higher speeds tend to cause an over-cut in tight areas. For intricate work, very slow speeds such as 2% to 3 % might provide the best results. In such instances, the power setting will also need to be lowered until the desired cutting depth is achieved without burning.

Once the settings have been established, click OK in the dialogue box. The file will be sent to the laser and the cutting will begin immediately or need to be started manually by pressing the start button.

Settings

Laser settings vary substantially from system to system. Even two systems of the same make, model, and wattage can require different settings for optimum results. Many companies manufacture lasers and each is making constant improvements. New models with new features continue to emerge. It would be nearly impossible to list settings for all Rowmark product lines covering every manufacturer, every model and wattage. The best advice is to become familiar with your machine and follow the suggestions below.

DETERMINING THE SETTINGS

Offering precise settings for laser engraving is a difficult task due to the wide variations in laser machinery and materials. It is quite possible that two machines of the same manufacturer, model, and wattage may require different settings to achieve optimal results.

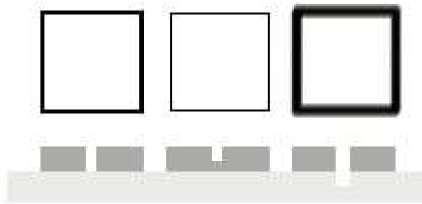
The best advice begins with becoming familiar with how a particular laser functions and how its settings can be adjusted. To understand the variances of your machine, we recommend these test steps.

Raster Engraving:

For raster engraving, create a 1" square using the graphics software. Fill it with black and with no outline. Enter settings that seem to make sense for the intended use, keeping in mind that the key variable should be the power setting, leaving the speed setting at 100%. Send the file to the laser and begin lasering. A close look after even a few strokes should make it clear whether the cut is too deep, too shallow, or just right. If necessary, reset the power and try again until the depth is just right. Most systems allow the power to be reset on the fly. This means that as the square is being lasered, the power can be increased or decreased until the right depth is achieved. (Check owner’s manual for specific instructions.) Be sure to make a note of the settings since these should work whenever that particular material is used on that specific system.

Vector Cutting:

For vector cutting, make three 1" squares using the graphics software. Assign them a .001" outline and a color that corresponds to the engraving order along with no fill color. Keep the settings on all three squares the same except for the speed. Assign a high, low and middle speed to the squares. If you are unfamiliar with the ‘engrave by color’ aspect of your software, make one square and send it three times with a different speed setting each time. Send the job to the laser and evaluate the depth of cut.



Vector cut three squares at different settings. Choose the one that cuts through all the way without burning.

The setting that produced the best result may need to be refined. If the cut didn't quite make it through the material, then the speed will need to be decreased to slow the lens down in order to burn deeper. If, on the other hand, the material cut all the way through but heat damage occurred, the speed will have to be increased to reduce the burn. Adjustments at this level can be very subtle, such as single percentage points or on some machines even tenths of a percentage point. Using the same file, send three different speed settings very close to the best speed setting from the first attempt to the laser. Usually this second attempt will yield the desired results. If not, try the test again with three different speed settings. Be sure to note the settings.

When the speeds are increased much beyond 4% and there are a mix of straight lines and curves in the file, a differential in cutting depth may occur between the curves and the straight lines. (There may be a built in maximum speed allowable for the rendering of curves.)

As in the example above, 4% may be the maximum speed. Use 4% maximum speed for cutting, leave that speed setting as the constant and, as in raster engraving, make the power setting the variable. Adjust your settings up or down to cut through the material with a minimal amount of burning.

Try vector cutting a rounded corner rectangle to make sure the same cutting depth is achieved on both the straight lines and the curves. If the depth varies, then lower the speed until the lens moves at about the same speed for both curves and straight lines. There is no need to cut material during this test — a visual check should suffice. Once the speed is established then lower the power setting until the right cutting depth is achieved.

SAMPLE SETTINGS

Rowmark products have been tested using specific laser models from three well known manufacturers. Based on that testing, settings have been compiled that might be used as a starting benchmark for both raster engraving and vector cutting. These settings are for the machines specified and may or may not be useful for other makes, models, and wattages. **Ultimately each product will need to be tested on a specific machine for the best results.**

The following describes the machine, the lens, and unique characteristics:

Universal Laser Systems® 25E - 25 Watt, 1.5" lens

Power 0-100% Speed 0-100%

PPI 0-1000 pulses per inch DPI 0-1000 passes per vertical inch

Epilog Profile - 25 Watt, 2" lens

Power 0-100% Speed 0-100%

Rate 0-100% (similar to PPI) DPI 0-1200 passes per vertical inch

GCC Laser Pro™ - 25 Watt, 2" lens

Power 0-100% Speed 0-100%

PPI (not available on this model) DPI 0-1000 passes per vertical inch

Raster Engraving Overview

Only the power and speed settings are noted, assuming the DPI and PPI settings will be mid range (500 — Universal/GCC and 600 - Epilog). In most cases the speed setting will be 100%. In the event the power setting is at its maximum, the speed setting will be lowered to gain added burn. The setting will be expressed as power/speed (100/85).

Vector Cutting Overview

Only the power and speed settings are listed, assuming the PPI setting for Universal will be 250, and the Rate setting for the Epilog will be 7. No similar setting option is available on the version of the GCC LaserPro tested. The settings will also be expressed as power/speed (100/85).

True Laserables (See **Product Line Tips/True Laserables**)

True laserables are Rowmark's recommended products for lasering.

	Universal	**Epilog**	**GCC**
Raster Engrave	Power/Speed	Power/Speed	Power/Speed
LaserLIGHTS	40/100	40/100	70/100
LASERmag	50/100	50/100	80/100
LaserMax	40/100	40/100	70/100

LaserMark	30/100	30/100	60/100
LaserMark Rev	30/100	30/100	60/100
FlexiBrass/FlexiColor	25/100	25/100	50/100
Textures Pass 1	40/100	40/100	100/85
Textures Pass 2	20/100	20/100	100/85
Vector Cut	Power/Speed	Power/Speed	Power/Speed
LaserLIGHTS	25/10	50/25	50/2
LASERmag	100/10	100/20	100/2
LaserMax	100/ 4	100/32	100/3
LaserMark	100/4	100/32	100/3
LaserMark Reverse	100/4	100/32	100/3
FlexiBrass/FlexiColor	50/10	100/50	100/5
Textures	100/3.5	100/20	100/2

Transitionals (See **Product Line Tips/Transitionals**)

Transitionals are Rowmark's products originally developed for rotary engraving. Rowmark does not include these products in its line of laserable materials, but they can be successfully lasered using extra care and, in most cases, two passes.

	Universal	**Epilog**	**GCC**
Raster Engrave	Power/Speed	Power/Speed	Power/Speed
Metals/NoMark Plus	40/100	40/100	60/100
Mattes	45/100	45/100	65/100
OW Metals Pass 1	65/100	65/100	100/85
Pass 2	30/100	30/100	100/85
Lacquers Pass 1	65/100	65/100	100/60
Pass 2	30/100	30/100	100/60
Slickers Pass 1	90/100	90/100	100/60
Pass 2	40/100	40/100	100/60
UM Front Pass 1	80/100	80/100	100/60
Pass 2	30/100	30/100	30/100
UM Rev Pass 1	75/100	75/100	100/75
Pass 2	25/100	25/100	100/75
Vector Cut	Power/Speed	Power/Speed	Power/Speed

Metals/NM Plus Pass 1	100/ 2	100/18	100/3
Pass 2	100/8	100/30	100/4
Mattes Pass 1	100/2	100/18	100/3
Pass 2	100/8	100/30	100/4
OW Metals Pass 1	100/2	100/18	100/3
Pass 2	100/8	100/30	100/4
Lacquers Pass 1	100/2	100/18	100/3
Pass 2	100/8	100/30	100/4
Slickers Pass 1	100/2	100/18	100/3
Pass 2	100/8	100/30	100/4
UM Front Pass 1	100/2	100/18	100/3
Pass 2	100/8	100/30	100/4
UM Reverse Pass 2	100/2	100/18	100/3
Pass 2	100/8	100/30	100/4

Traditionals (See **Product Line Tips/Traditionals**)

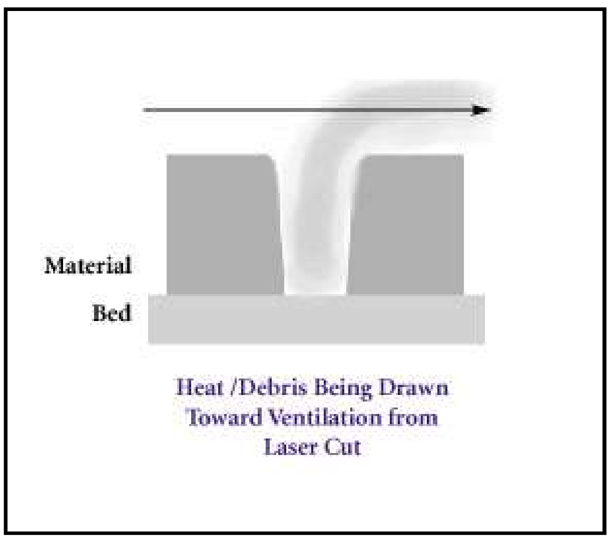
Traditionals are Rowmark's products developed for rotary engraving and are not recommended for lasering. Satins and Silks might vector cut using the settings listed below.

	Universal	**Epilog**	**GCC**
Raster Engrave	Power/Speed	Power/Speed	Power/Speed
Satins	Do Not Laser		
Silks	Do Not Laser		
HeavyWeights	Do Not Laser		
ColorLine	Do Not Laser		
Vector Cut	Power/Speed	Power/Speed	Power/Speed
Satins Pass 1	100/ 2	100/18	100/3
Pass 2	100/8	100/30	100/4
Silks Pass 1	100/2	100/18	100/3
Pass 2	100/8	100/30	100/4
HeavyWeights	Do Not Laser		
ColorLine	Do Not Laser		

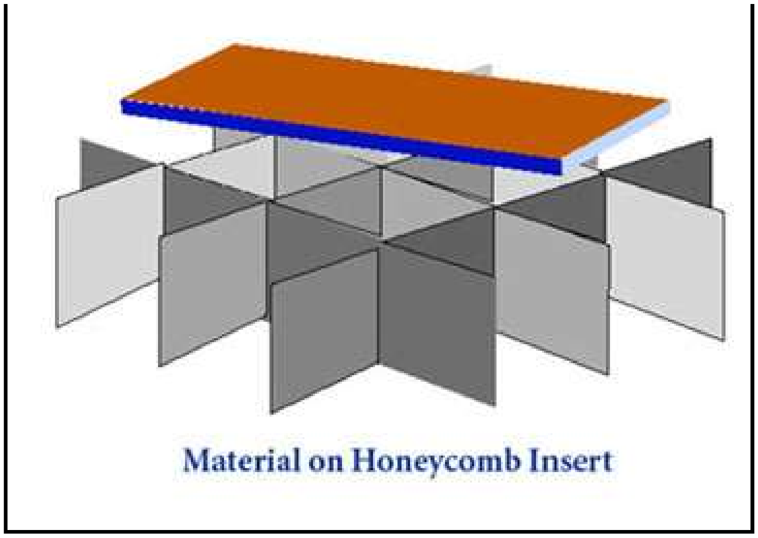
Fabrication Tips

Preventing Heat Damage

Vector cutting simply means the laser is following vector paths created in a vector software program such as CorelDraw (See **Preparing Artwork**). Adjustments to the speed setting (it is generally easier to keep the power setting constant when vector cutting) will determine the depth to which the beam will cut, including cutting all the way through the substrate. Slower speed settings generate much more heat for vector cutting than for raster engraving. During vector cutting, the beam follows a linear path which usually prevents heat buildup in a particular area even though it is cutting all the way through the substrate. A lot of material is being removed in the wake of the path, and this material vents up and out from the cut line in the direction of the exhaust. One common problem when cutting through a substrate is hot debris which glazes the exhaust-facing edges of the cut line. The entry point (surface level) is most susceptible to damage since it receives the more sustained blast of heat than the opposite side on the bottom. Even though the laser beam is perfectly straight sided, the walls of the cut do tend to angle up slightly in a v-shape, because of that heat damage. In addition to the glaze from the debris, the top edges of the cut can appear marred from burning.

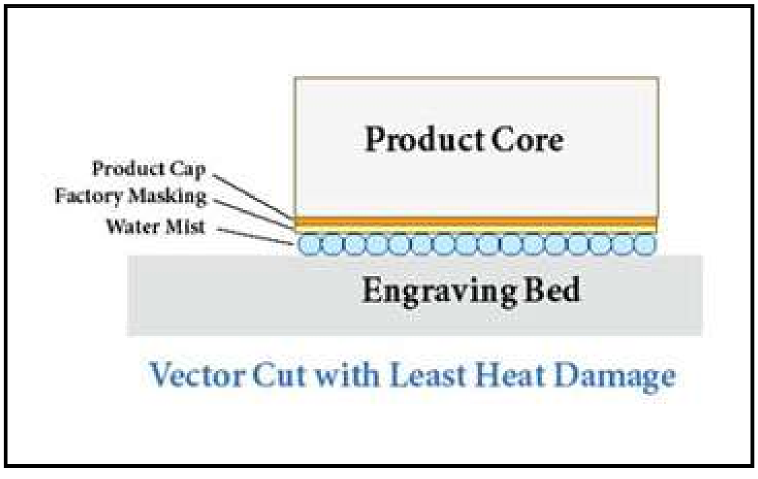


To counter these effects, the smallest focal length lens (smallest diameter beam means less heating area) is recommended together with the minimum combined power and speed settings possible in order to cut through the material. Also lowering the number of pulse firings per inch will keep things cooler. If the PPI is lowered too much, though, the cut edge will start to take on a serrated appearance. In extreme cases, two passes will allow lower combined settings per pass and also minimize damage.



Many engravers use a honeycomb insert, which helps to dissipate heat and debris by raising the material off of the laser bed. This helps but does not eliminate the heat build-up and debris entirely, coming out the top. Others mask the material and wet it down before cutting, which produces good results, but is time consuming.

Our experiences show that the most effective method for vector cutting is to cut from the back to the front. This requires the on-screen image to be flipped in order for the cut piece to be right reading and to place the material in the laser bed face down. It also requires cutting directly on the laser bed, not on a honeycomb insert. (When the laser hits the edges of the honeycomb cells, it bounces back causing a pitting that will ruin the surface of the material it is in contact with.) Whenever it is convenient, leave the factory masking on the front surface and if good results are still not being achieved, try spraying the bed with water to absorb heat before laying the material face down with the masking on. If two passes still prove necessary, adjust the first setting so the cut travels nearly all the way through the substrate. The second cut, the one affecting the face of the material, should be adjusted to a much cooler setting, just enough to cut through the remaining substrate and cap. This method is successful with nearly all Rowmark products, including the thickest (1/8") stock, and can result in no surface damage.



Often it is necessary to cut and engrave in one operation. When cutting face down, it is necessary to cut first, flip the cut pieces and remove the masking, all before engraving. There should be no registration problems, since the background serves as a template. Irregular shapes pose a greater problem and require more planning in order to ensure good registration. If removing the masking from the individual pieces before engraving becomes an issue, take the masking off before cutting, but be sure to mist the engraving bed with water to help absorb heat and prevent burning before laying down the material.

Engraving Large Open Areas

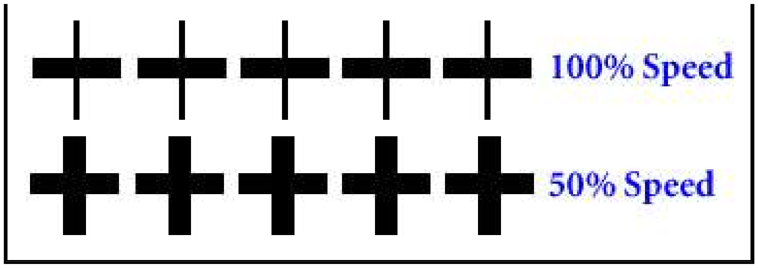
Heat and plastic do not mix well. When the laser engraves large open images or text, it passes back and forth over the same area very rapidly until the image has been engraved. Because a large quantity of cap material is removed in a concentrated area, the heat does not have a chance to dissipate, overheating can occur, and substrate warping may result. Every effort should be made to minimize the heat. Power settings should be as low as possible as long as the beam still cuts through the cap. Lowering the DPI and PPI settings will also help. In extreme cases, using two passes, each with a lower power setting, can make the difference. However, this will increase the engraving time dramatically.

If the bed is sprayed with a light misting of water and the material is placed face up, the water will act as a cooling agent and absorb some of the heat, thus preventing warpage. This works particularly well with thin gauge material such as FlexiBrass and 1/32" stock. Wiping up excess water from around the sheet and taping at least the outer edges can also help, especially with the thinner gauges.

Small Text and Detailed Graphics

For small text, especially serif or italic fonts, and intricate images with minute details, it is best to use the smallest available lens (1.5" recommended). High DPI and PPI settings can also improve clarity, but only use 1000 DPI as a last resort since it will increase engraving time. It is a worthwhile sacrifice, however, if quality is paramount. Power settings may also need to be increased to render these tiny areas, since the pulsing is so intermittent.

If all of the above methods have been tried and the output still does not look right, perform this little test. Open a new document, type five plus signs in 10 to 12 point type, and laser it at the settings mentioned above. If the horizontal bars are heavier than the vertical bars, slow the speed setting from 100% to 50% and cut the power setting in half as well. Try this lower speed on the job file and see if there are better results. Both bars should appear as the same weight.



When the laser beam moves across the page, it pulses rapidly whenever it encounters image or text. If the text is small enough, the laser has to turn on and off extremely rapidly which does not give it a chance to burn through fully. By reducing the laser speed, the beam will be able to fully render what is intended. Your laser manufacturer may be able to help remedy this problem; but, in the meantime, decreasing the time setting should resolve it.

Removing Engraving Dust

Some jobs where a lot of cap material is being removed become coated with dust and residue. This can happen on pieces that contain large open areas of text or graphics, or on jobs where a lot of detail is being removed all across the surface, particularly as seen in photo laser engraving. These dust particles can smear into the substrate and ruin the job if they are wiped with a dry or, even worse, a wet cloth. This dust contains colorants and is so fine that when mixed with any fluid almost immediately turns into a kind of paint. The best way to eliminate the dust without ruining the background is to place masking over the entire surface. Press it down and squeegee it in place several times. Peel it off, and the dust particles will adhere to the masking. Usually after one application of the masking, the sign can be cleaned using a spray cleaner and cloth. On some jobs, especially photos, two or three applications of masking may be necessary.

Out of Focus FlexiBrass

Jobs that utilize Rowmark's FlexiBrass (.020" thickness) and cover a large portion of the engraving bed may start to engrave successfully, but for no apparent reason the cap suddenly does not cut all the way through. If this happens, try taping down all the sheet edges. With such a thin substrate, the air flow from the exhaust can slightly lift the material enough to throw it out of focus. By simply taping down the edges, the problem is usually solved.

Many manufacturers offer a vacuum bed. This does a great job of holding down just about any material, but a roll of 3/4" masking tape should work just fine as long as care is taken not to place it in the live image area.