OU School of Art & Art History VLS 6.6 Laser Operation Manual : Carver Digital Fabrication Lab

The following information should be used by students as a reference manual for the safe and efficient operation of the **Universal VLS 6.6, 50-watt laser cutter/engraver**. This information is provided in conjunction with your instructor's directions and does not substitute for in-class demonstrations or instruction. Failure to use the laser properly will result in the loss of laser privileges and in the case of damage caused to the equipment through negligence-- students may be charged for repairs or replacement costs as the laser and it's working components are very expensive.

If you are not sure about how to use the laser for your particular project or have any questions about hoe best to do something---- PLEASE ASK.

VLS 6.6 50-watt laser

There is a risk of fire and/or toxic fumes associated with the laser. You will be instructed on the safe operation of this equipment in class. There is also a chemical/electronics fire extinguisher mounted inside the lab next to the door. Be aware of it's location and follow all fire safety procedures outlined by your instructor.

BASIC GUIDELINES FOR USING THE LASER:

1. ***Only approve materials are allowed to be cut/engraved on the laser***. In instances where you have a material not specified below, you must consult with your instructor first.

APPROVED:

- Cardboard
- 1/4" plywood with wood or MDF core
- Acrylic / Plexiglass (clear or colored)
- Fabrics (non-synthetic)
- Paper
- Some organic materials and/or dry food goods
- Some wood 1/4" thick or less
- Some polystyrene foams
- Foam-core
- Cork board
- Leather
- Thin Rubber
- Mat Board
- Vinyl (thin)
- Glass-- etching/engraving only (material cannot be cut)
- Ceramic/tile-- etching/engraving only (material cannot be cut)
- Metals-- etching/engraving only (material cannot be cut)
- Marble-- etching/engraving only (material cannot be cut)

NOT APPROVED:

- Wood or plywood thicker than 1/4" (vector cutting)
- PVC, polycarbonate, or polyethylene
- Other non-identifiable plastics
- Petroleum based products (i.e. roof shingles)
- Mirrors

****Because of the air-cleaning system capabilities students will be prohibited from cutting thick materials that generate substantial amounts of smoke or odor. Wood products thicker than 1/4" may not be vector cut but they may still be raster engraved or vector etched.*

2. **ANY MATERIAL PLACED IN THE LASER MUST BE FLAT.** Do not use warped or irregular materials with varying heights. There are some materials on-hand to purchase through your bursar account from the **sculpture program**. Please ask your instructor about the materials and costs. If you bring your own materials-- they must prescribe to the approved list above and must be **FLAT.**

3. ***Students will be charged $ 0.20/minute ($12/hr.) for cutting time.*** These charges assist with the maintenance and replacement costs associated with the laser & the air cleaner system. Charges are done using a swipe card system that tracks cut times and charges are billed to your bursar account. ****See swipe card access on next page*
4. ***Students MUST LOG-OUT of the main PC operating the laser when they are done using the machine.*** DO NOT SHUT DOWN THE PC!
5. When the laser is running you must remain in the lab until your job is done. ***DO NOT LEAVE THE LASER UNATTENDED***. There is a fire risk, equipment malfunction risk, and air quality risk if something goes wrong. You will be suspended from using the laser and/or billed for damages if something happens because you weren't in the lab to address the problem.
6. ***The lab is not 24-hour access.*** You should make arrangements with your professor to access the lab outside of class.
7. ***The lab and it's equipment are for ACADEMIC projects only***. Anyone caught using the lab equipment for commercial purposes will be suspended.
8. Do not leave the lab unlocked and unattended. When you leave be sure that all the equipment is turned OFF, nothing is running, and log-off the main PC.
9. ***PLEASE DO NOT STORE MATERIALS IN THE LAB***. Also discard unwanted materials in the trash. Do not leave waste on the worktables or machines.
10. Do not place drinks, food, liquids on top of ANY equipment in the lab.
11. ***Do not attempt to fix, replace, clean or otherwise service any of the equipment*** unless you have been expressly instructed to do so by your instructor. If a piece of equipment stops working or malfunctions, please contact your instructor immediately. You are not a qualified technician.

SWIPE CARD ACCESS:

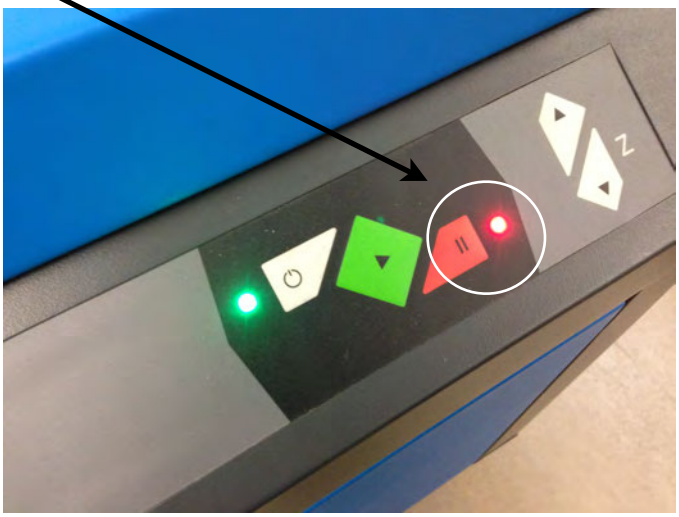
On the top of the laser there is a swipe card reader. You must have a valid OUID *One Card* to use the laser. *The actual laser beam will not fire if you do not swipe-in to activate the beam.*

Once you swipe your card, to engage the laser beam the equipment tracks the time that you will be charged until you SWIPE again (turning off the beam). Thus--your billing is between card swipes. You swipe with the back magnetic strip facing the wall. If your card does not work, you need to notify your professor.

If you do not swipe-out (turn off your clock) another student may use the laser and ***you*** *will be charged for their cutting time.*

LASER OPERATION:

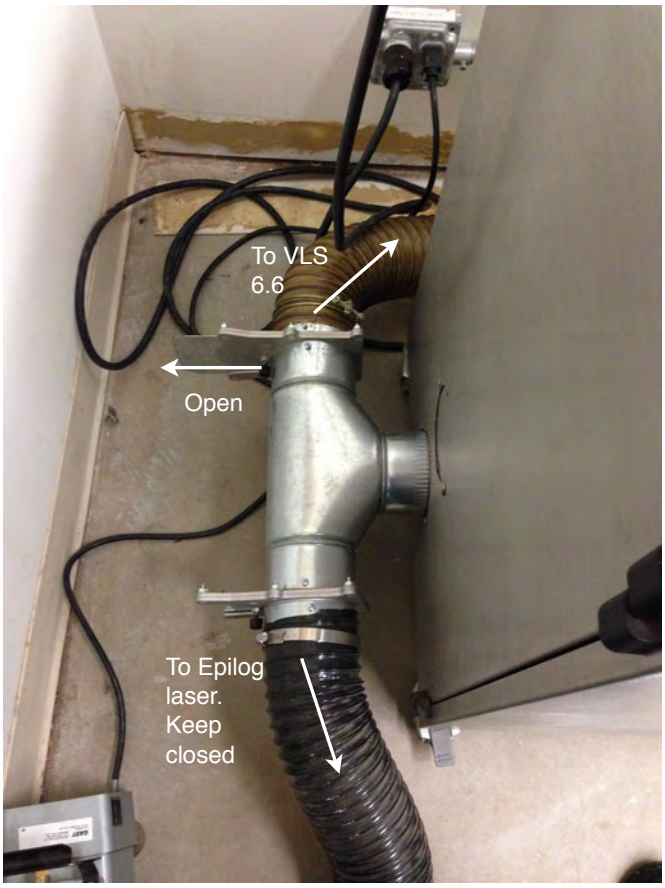
The front panel of the laser indicates the status of the beam. If you turn on the laser and the red light *remains blinking*-- the beam is OFF. If it does not remain illuminated or blinking-- the last person to use the laser did not swipe out properly. It would be nice if you would swipe your card to turn off the beam and then swipe again *immediately* to verify that your bursar account will be charged correctly. It's really up to everyone to make sure charges are allocated properly.



Air cleaner: The PUREX air cleaner is a 3-stage system that catches particles and fumes that are generated by the laser. These are sometime toxic in nature and the air cleaner MUST be turned on while using the laser.

You turn on/off the cleaner by pushing the middle button inside the delineated diamond shape **HERE** When you turn on, it should illuminate with a green light and you should here the motor/blowers start up. The front indicator panel will show the status of the filters, internal temperature of the machine and the blower speed. You should not attempt to change settings.

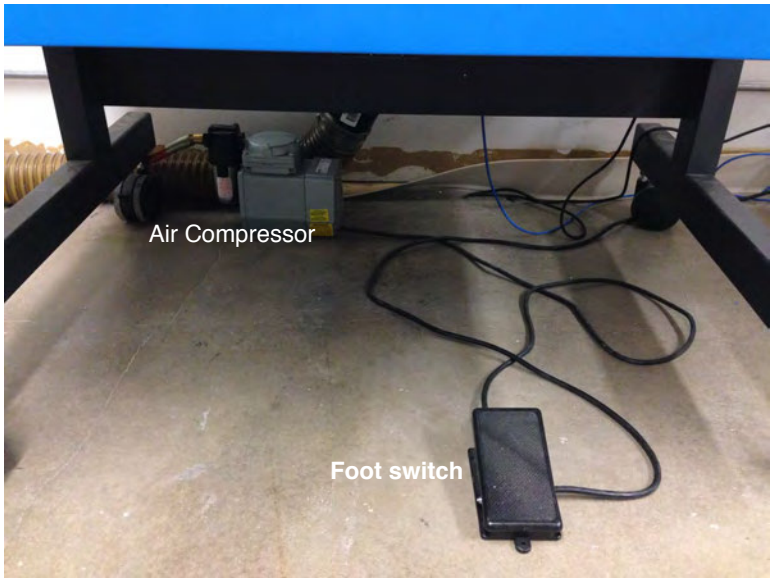
At times the the 4 buttons around the power button may start blinking red and you will hear beeping associated with the lights. This means something is wrong with the status of the filters,



temp. or something else. You need to PAUSE the laser, turn off the air cleaner, and then inform the instructor of this problem immediately. DO NOT continue cutting as you may damage the cleaner or toxic fumes are being dispersed into the room.

There are 2 lasers connected to the air cleaner--the EPILOG laser is not for student use. However, there is an air baffle that connect both. Make sure that the baffle leading to the Universal Laser is OPEN as shown.

Air Compressor: There also an air compressor that provides forced air assist into the cone of the laser head. The laser will not work unless the air compressor is ON by using the foot switch on the floor.



Laser bed:

The available cutting/engraving area is 18" wide x 32" long. There is a honeycomb cutting table installed in the laser nearly 95% of the time and this limits the available depth of material to just under 4" high. The cutting table can be uninstalled, however your instructor is the only person allowed to remove the table. If you remove the table without resetting something called the *table focus*, you may damage the machine. Without the cutting table, material up to 7" high may be placed in the laser. ***Consult with your instructor if you need the cutting table removed.***

Laser Axis':

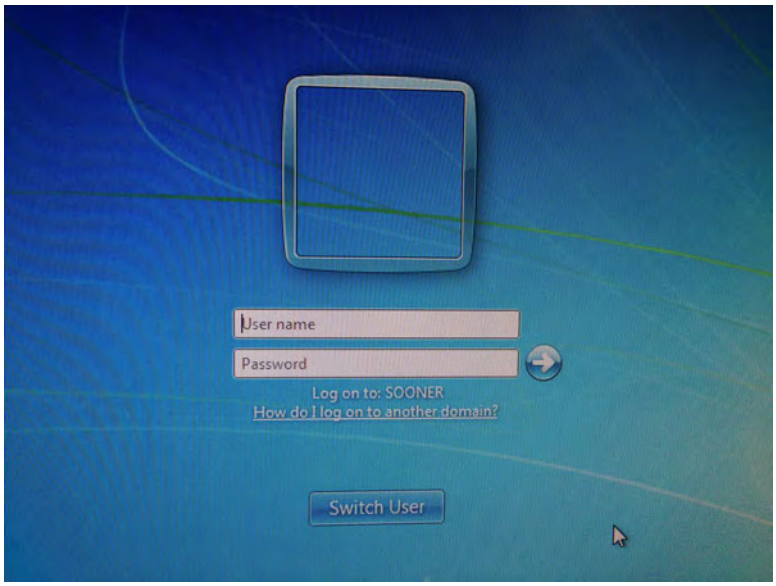
The laser uses an X, Y and Z axis system where X, Y represent the width and length of the cutting table and Z is the height. The laser head housing travels along a gantry arm for the X,Y while the Z is controlled by motors that raise or lower the actual cutting bed.

Depending on the thickness of the material being used, occasionally the last Z height that was used is much thinner than your material. Because of the HOME POSITION (upper right corner) the laser housing cone may not allow you to fit your material under it if it's a true 32" length. Be careful when loading your material-- and if your material is too thick to fit under the cone-- PLEASE ASK YOUR INSTRUCTOR to set the Z lower. Once you are shown how to do this properly, you should be able to do it yourself in the future.

PC computer/Log-in:

The log-in screen is shown here. Your USERNAME is you OU 4x4 and your PASSWORD is your OU account password. If a username is visible on this screen, press SWITCH USER, select OTHER USER, and you will see this screen to log-in.

IF your OU credentials do not work for the log-in, please see your instructor.



HOW THE LASER WORKS:

You can use any vector based software to generate artwork or designs to cut or engrave with the laser. We will be using either CorelDraw (PC only) or Adobe Illustrator (PC/Mac). Within both software programs there are 2 types of objects/graphics that can be created-- either **VECTOR** or **RASTER** (also called Bitmap).

Vector = mathematical based object no dependent on scale. It is a non-pixel based graphic.
Raster = pixel based graphic comprised of square fills of color.

To CUT out an object along a line or boundary a VECTOR graphic must be used.
To ENGRAVE an image (photo) a RASTER graphic is used.
To engrave a solid block of vector based color or any object with a thickness exceeding the smallest vector line width the laser will treat this area like a RASTER image.

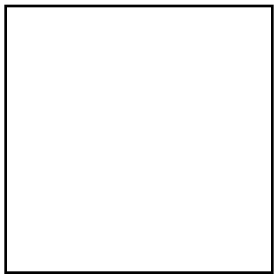
What's the difference?

A **vector cut line** will be done in a smooth uniform motion with substantial speed. The laser essentially moved the laser head along the line smoothly in space.

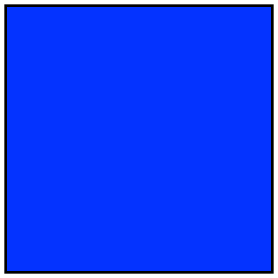
A raster image or vector block of color above a cut line thickness will be done in the same manner an inkjet printer prints ink. The laser head will move back & forth in the Y axis while incrementally moving down the X axis. Even at high speeds, this process can be time consuming and will increase your cutting/engraving times.

More information about how the laser “reads” either a vector or raster object/image will be covered in more detail in this manual. Below is a quick example of how the laser “sees” things.

To CUT into material to cut out a shape your line(s) must be very thin. In CorelDraw this is defined as a **HAIRLINE** width or .001” stroke in Illustrator (see Illustrator workspace set-up).



Any vector graphic larger than HAIRLINE or .001” stroke OR filled color will be treated like a RASTER image and will take longer to cut/engrave.



Any photographic (pixel based) raster image will be cut/engraved as such. These images can take a lot of time to engrave especially if the image size is large.

WHAT THE LASER "SEES":

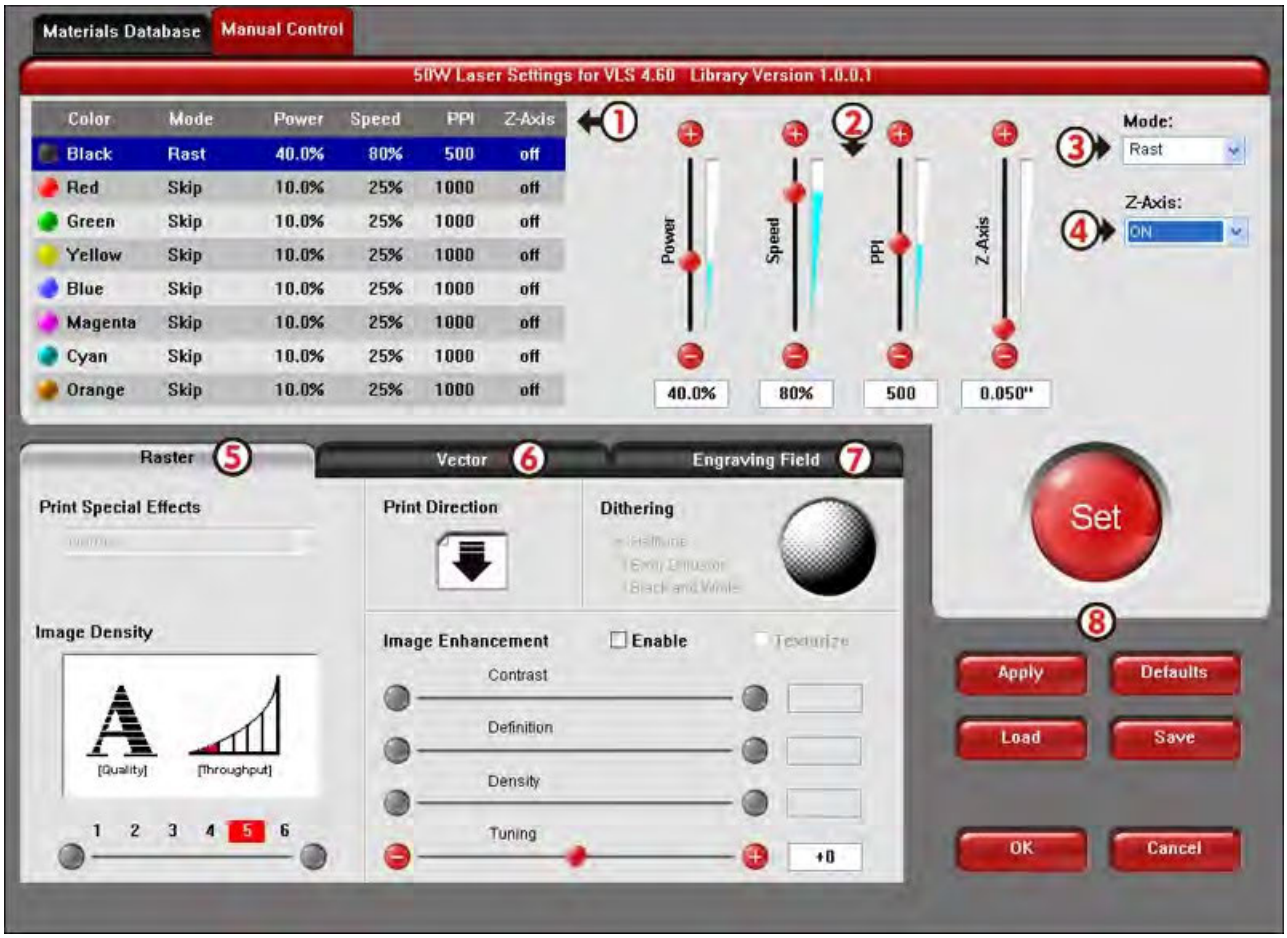
The laser software uses color to help determine what and how a graphic will be handled. There are only a pre-set number of colors that are available and the colors are **RGB** only. When you create your file or set-up your file document you must use RGB-- **CMYK WILL NOT WORK.**

The RGB colors you can use in your file are as follows:

BLACK, RED, GREEN, YELLOW, BLUE, MAGENTA, CYAN, and **ORANGE** (white is nothing)

The color you select must be the correct R, G, B standard values (CorelDraw identifies these colors by these names listed. You can also look up the standard RGB values if you aren't sure of the color you select in the RGB palette.

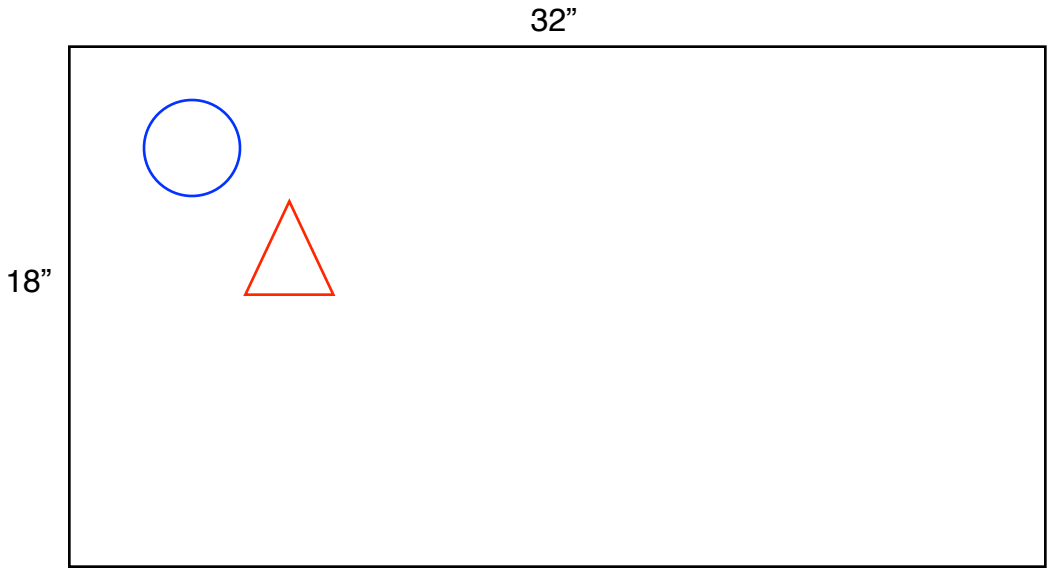
Within the UNIVERSAL CONTROL PANEL or **UCP** you have options for controlling how the laser



implements POWER, SPEED, PPI (pulses/inch) and the depth control of the material being used.
http://www.engraversnetwork.com/uls/ucp/print_manual.html

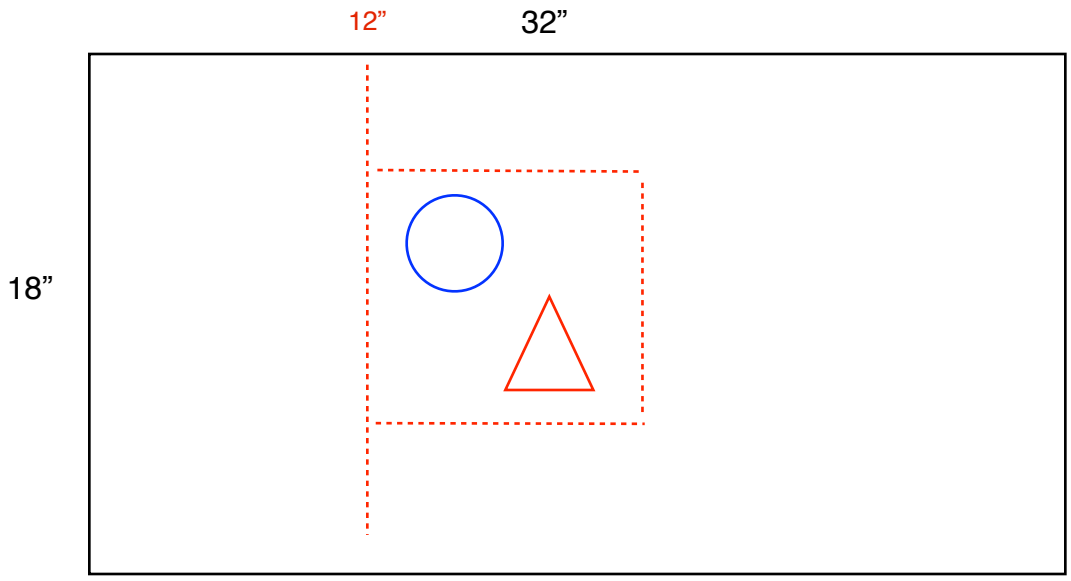
QUICK NOTE ABOUT CREATING FILES:

Remember that your file must be generated in a RGB color workspace. It's also advised that you create your graphics within an 18" x 32" landscape document space. The laser will always orient your file within this space. If you use an alternative size, 10" x 10" or 15" x 21" for example, you do have the opportunity to move your graphics manually in the VIEWER TAB. However, if your material is registered in the wrong place-- your ability to precisely place your graphic within your material can be tricky. Lastly, a graphic file larger than 18"x 32" will need to be created with multiple files as the laser print driver will cut off your graphics to fit the 18" x 32" cutting space.



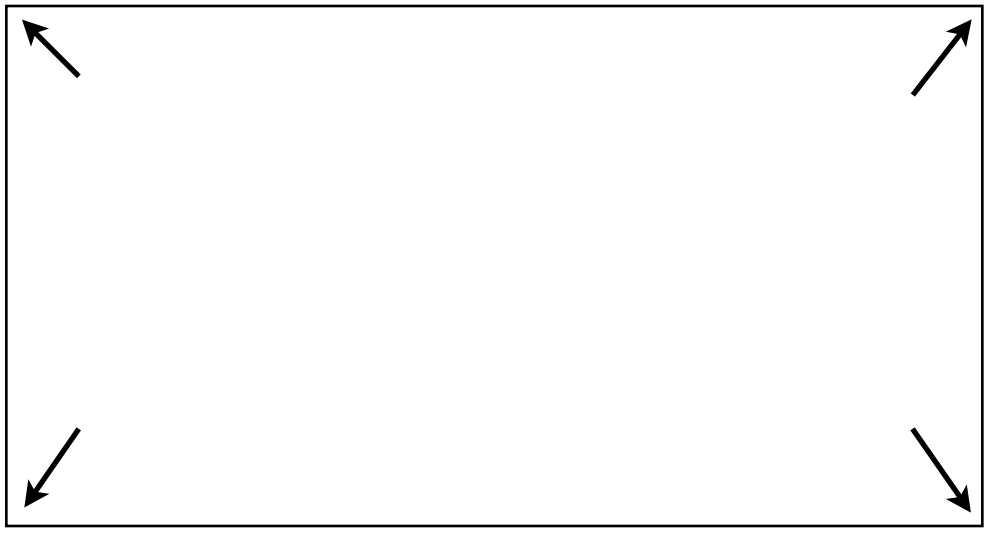
EXAMPLE: If you draw the blue circle and red triangle within your 18" x 32" document size at these locations in CorelDraw or Illustrator they will appear at the same X,Y coordinates in the UCP viewer. So if you put an 18" x 32" piece of material in the laser-- these objects will be cut out in the same location as you drew them in the file.

If you create your graphic in a 12" x 12" document space for example-- when you print the file to the UCP driver, the software will use the 12" coordinate as a ZERO point. In the example below, the graphic will appear at 12" Y axis on the laser bed. If you place your material in the laser and need your file cut at a specific location inside that material-- you may not get the result you want.



As mentioned before, you can move your graphic manually and you can use the UCP VIEWER to relocate the graphic, but the precision may not be within the tolerance you need.

We generally use the corners of the laser bed to register you material. When creating your graphics, you can use any corner-- just make sure you place your material in the right corner.



Your instructor will cover advanced strategies for orienting and aligning graphics within the laser bed to maximize your material.

LET'S GET STARTED!

The User Guide is designed to provide you with information on how to operate your Universal laser system. The Users Guide section will walk you through System Operation, Accessories, and Basic Maintenance.

Laser System Operation

From the Universal Control Panel menus and buttons to the laser system keypad and basic printer driver features, this section describes many of the features of the laser system. If you have not done so already, power ON your computer and let it boot up completely. You do not need to turn on your exhaust system at this time.

CAUTION: Please refer to the Safety Manual before operating the laser system.

The Universal Control Panel (UCP)

The Universal Control Panel (UCP) on the computer provides a convenient interface for interacting with and controlling your laser system. Once you have installed the UCP using the installation disk, a red diamond-shaped icon (Figure 1) will appear in the lower right corner of your Windows taskbar. If for any reason the UCP is deactivated, you can reactivate it by double-clicking on the shortcut (Figure 2) found on your computer's desktop screen. The UCP is organized into three convenient tabs: Viewer, System and Diagnostics. The following describes the features of each tab of the UCP.

Figure 1

Figure 2

Viewer Tab (page 25)

You send jobs to your laser system by printing to it. Anytime you print to the laser system, a job is created and inserted into the laser systems job queue. Selecting the viewer tab allows you to navigate through and manage the jobs in the laser system job queue. The viewer tab also allows you to operate your laser system right from your computer.

System Tab (page 29)

The System Tab allows you to configure certain features of the laser system. If your laser system needs to be calibrated, you will need to do so from this tab.

Diagnostics Tab (page 35)

The Diagnostics Tab gives you important information about your laser system for troubleshooting purposes. When calling the Customer Service Department, please have the laser system serial number available.

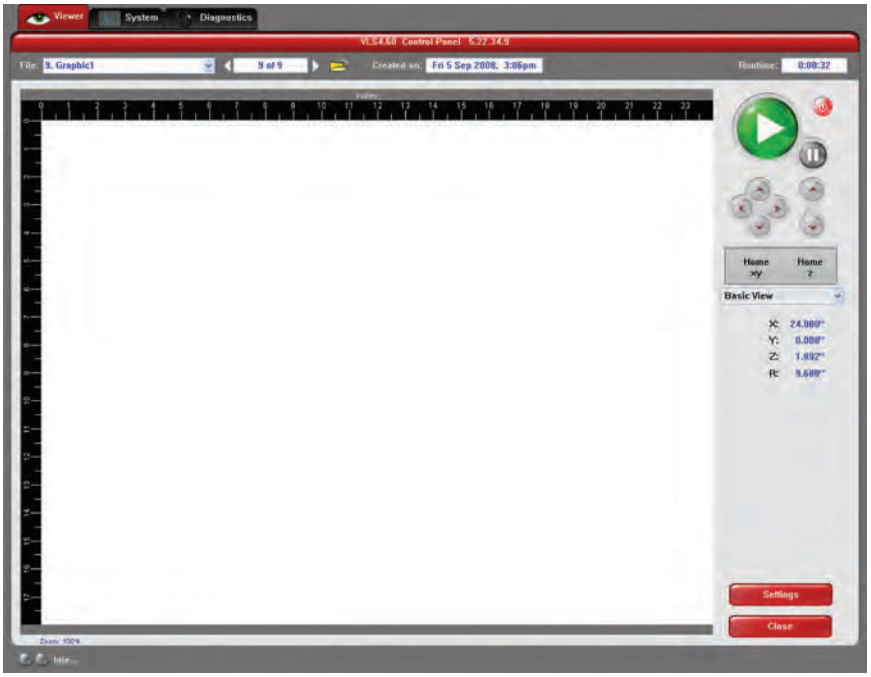
Viewer Tab

System Controls

- The green START button begins the engraving process.
- Clicking the PAUSE button stops the engraving process and clicking the PAUSE button again resumes the engraving process where it was last stopped.
- The four Navigation buttons move the focus carriage back and forth or left and right.
- The two up and down buttons move the Z-Axis engraving table up or down.
- The Home XY button re-homes/moves the focus carriage to the upper right hand corner.
- The Home Z button re-homes/moves the Z-Axis table towards the bottom of the laser system.

Basic View (drop down list)

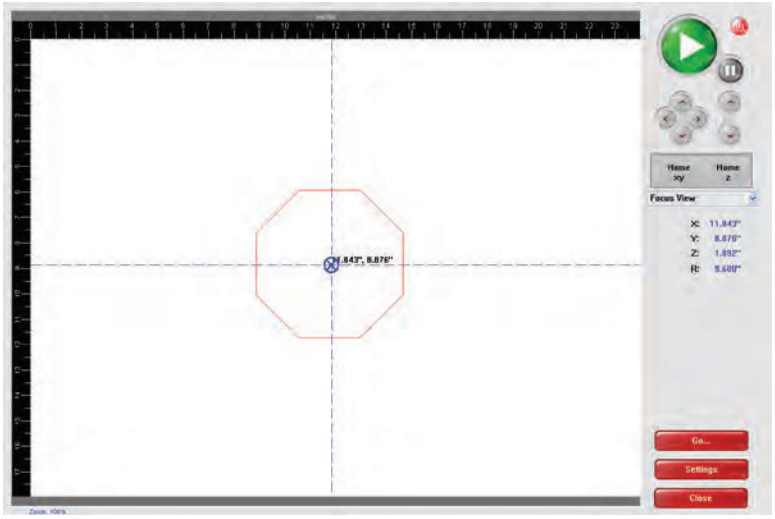
- The Basic View shows a preview window of the job currently selected.
- The cursor becomes a magnifying glass (Zoom Tool) if you pass it over the preview window. Left-clicking the mouse zooms in and right-clicking zooms out.
- Clicking the Settings button takes you back to the printer driver. If mistakes were made or you would like to make additional changes, clicking this button allows for those changes. Further information about the printer driver can be found on page 39 of this guide.

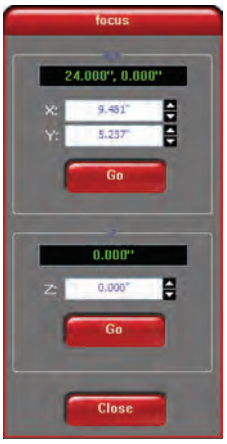


Focus View (drop down list)

The Focus View allows you to move the focus carriage to a desired position on the laser system table.

- To have a full range of motion of the X-Axis arm, verify that you are zoomed out in the preview window by right-clicking on the mouse before entering the manual focus window.
- Moving the cursor over the preview window once the focus button has been clicked changes your cursor to a blue target with dashed vertical and horizontal lines. Clicking once on the preview window moves the focus carriage to that position. Selecting another feature from the drop down list terminates the focus feature and moves the focus carriage to the home position.
- To move the focus carriage to a specific location, click the GO button. Type in the X and Y coordinates. Once you have finished typing in the coordinates, press the GO button within the Focus window and the focus carriage will move to the specified location. You can also move the engraving table to a specific Z-height by entering the height in the Z box.

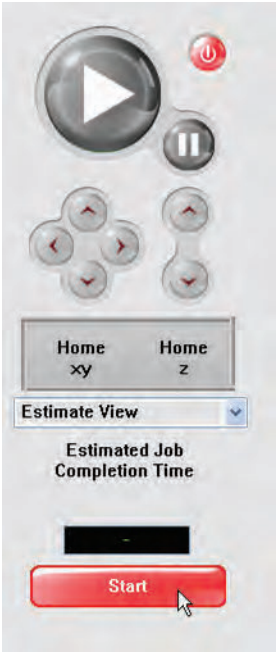




Focus window

Estimate View (drop down list)

The "estimate" feature approximately calculates the amount of time it will take the laser system to finish the engraving or vector cutting job. The more complex the engraving job is, the longer it will take to finish. The less complex the engraving job is, the less time it will take to finish.



Relocate View (drop down list)

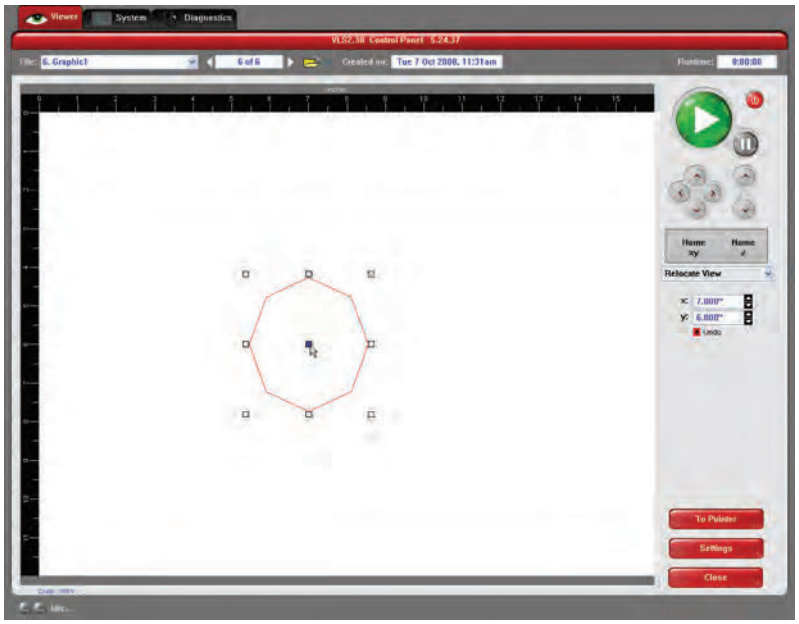
The Relocate feature gives you the opportunity to move the image on the UCP into another area of the engraving field. This feature does not modify your original file's image location.

When this feature is activated, the image is surrounded by nine small white squares (anchor points) allowing you to move it around the basic view screen. The current anchor point selected, in blue, is the axis of movement.

If you would like to move the graphic back to its original location, click on the Undo button under the X and Y cordinates until the grahic is in the desired location.

Relocation Types

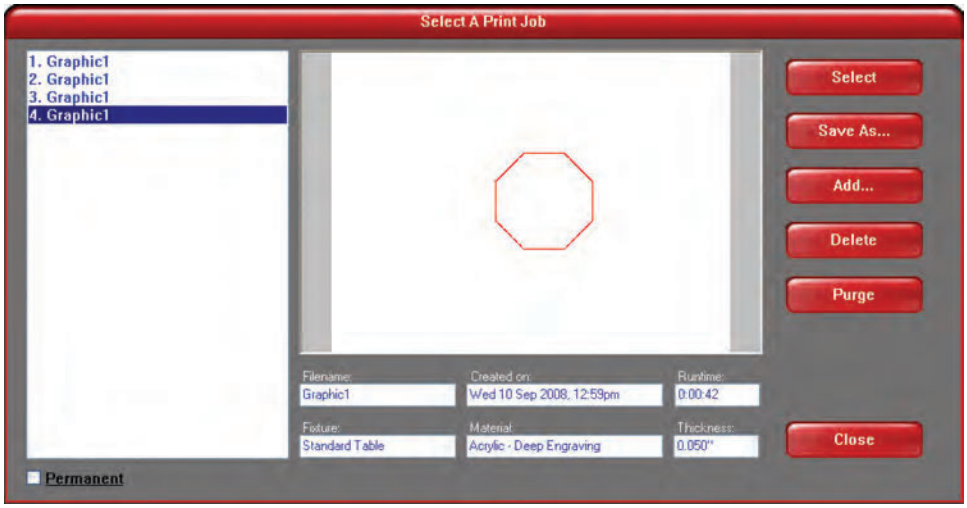
1. You can click on any anchor point available to move the graphic within the basic view area.
2. If you would like to move the graphic to the upper left hand corner, select the top left hand anchor point and type in your desired X Y coordinates into the boxes that appear on the right hand side. This process can be done with any available anchor point.
3. Using your Navigation buttons, move the focus carriage to the desired location where you would like the image to be placed. Use the red LED as a reference point. Click on the TO CARRIAGE button. According to the anchor point you have selected, the image on the Relocate View will move to the location of the focus carriage's red LED.



File Management

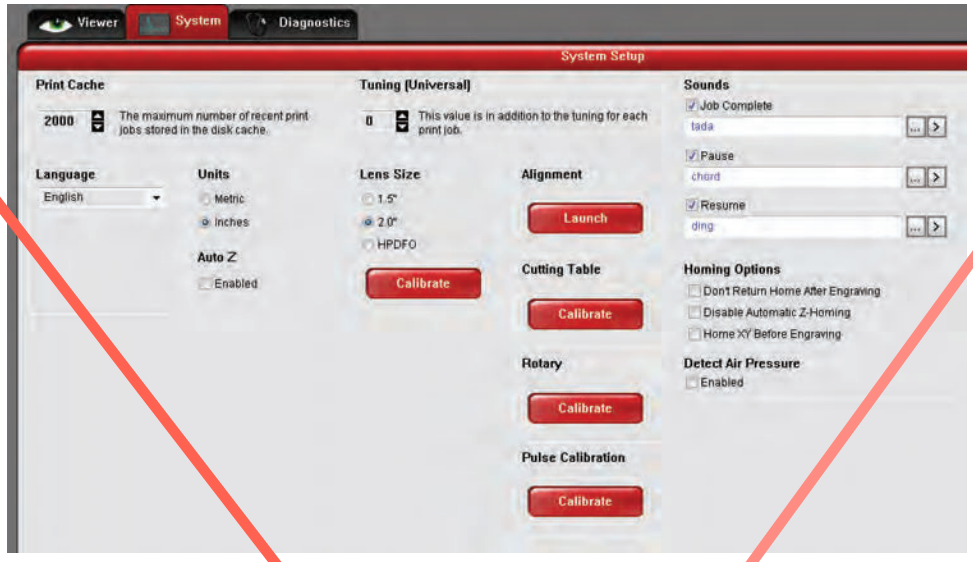
File Management displays the name of the current job, the number of jobs stored, the date and time the job was stored on your hard drive and the run time near the top of the window. Once the Print Cache reaches the maximum number of jobs, the printer driver deletes the oldest jobs as newest jobs enter the cache.

- The print job navigation buttons allow you to preview the print jobs stored on your hard drive.
- The "open folder" button displays and allows you to select your print jobs in a file management style. It also allows you to delete print jobs stored from your hard drive and save print jobs as .efm files.
    - The PURGE button deletes ALL cached print jobs stored on your hard drive.
    - If the Permanent box is marked, this indicates that the selected file will not be deleted from your hard drive even after clicking the PURGE button.



VLS2.30, VLS3.50, VLS3.60, VLS4.60 and VLS6.60 SYSTEM TAB

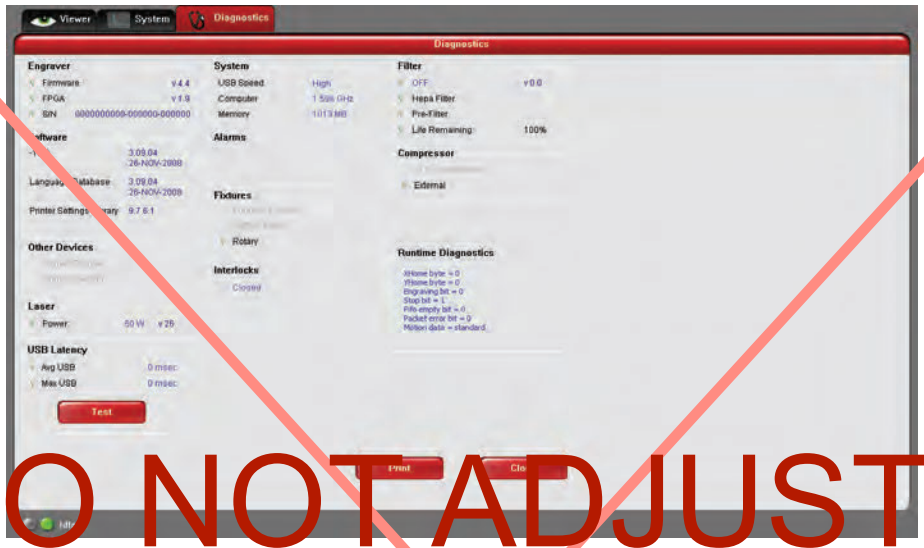
The System Tab allows you to configure certain features of the laser system. Not all features will appear on the System Tab.



- The PRINT CACHE number is adjustable. It indicates the maximum number of print jobs that you would like to be stored on your hard drive. If you exceed the number shown, the software will automatically begin deleting the oldest jobs as newest jobs enter the cache, unless "Permanent" is checked in the File Managment window.
- LANGUAGE allows you to switch between available languages according to your preference.
- UNITS allow you to choose between Metric or Inches.
- AUTO Z should be enabled if you would like the device to focus the laser beam by automatically adjusting the height of the Z-Axis table. This operating principle is based on the material thickness that you specify in the laser system printer driver. If it is disabled, you will need to set focus manually by using the included Focus Tool.
- The TUNING (UNIVERSAL) number is a value set by the ULS factory for your particular machine. In the future, as your laser system is used, it may be necessary to change this value to sharpen the resulting image. Do not change this number unless instructed to do so by our Customer Service Department.
- The LENS SIZE selected from the list should be the same as the number printed on the lens assembly on the front of your Focus Carriage. If you change lens (available accessory) and use something other than the standard 2.0 lens, then you MUST select the value that matches your installed lens. You will need to calibrate the focus lens to the top surface of the table by clicking the red CALIBRATE button, otherwise the system will not focus the laser beam properly. Contact the Customer Service Department if you have any question about lens calibration.
- The ALIGNMENT Launch button opens the Alignment Mode window. The Alignment feature should only be used if instructed by our Customer Service Department at ULS.
- CUTTING TABLE allows you to calibrate a new Z-height to the top surface of Cutting Table. You need to have the Cutting Table installed in the system to activate the CALIBRATE button.
- ROTARY is activated once the rotary accessory is installed. Rotary calibration should be done once when the rotary is installed for proper engraving. For more information about the rotary, read the Accessories section of this manual.
- PULSE CALIBRATION manipulates the laser beam to be tuned for finer pulsing. **Do not** use this feature unless you have been ULS factory trained or with factory approval.
- If the SOUNDS box is checked, the computer will play the sound shown indicated once the file has finished engraving. Be sure that your computer speakers are on and at an appropriate volume.
- HOMING OPTIONS disable or enable certain homing features from the laser system.
  - Normally after the engraving job is complete it will return home after engraving. If you would like to keep the focus carriage from going home, check the 'Don't Return Home After Engraving' box.

VLS2.30 and VLS3.50 DIAGNOSTICS TAB

The Diagnostics Tab displays important information about your laser system and personal computer. This information can be used for troubleshooting purposes.



DO NOT ADJUST DIAGNOSTIC TAB SETTINGS. INSTRUCTOR USE ONLY.

- ENGRAVER shows the current Firmware and FPGA version being used. It also displays the Serial Number of your laser system. The Serial Number is needed when calling the Customer Service Department at ULS.
- SOFTWARE displays the current Materials Database, Language Database and Printer Settings Library versions being used.
- OTHER DEVICES displays the current firmware version for the devices listed.
- LASER displays the watts being produced by the laser cartridge. It also displays the current version firmware being used. If a red 'x' appears, this indicates that the laser tube is not functioning properly or a door is opened on the laser system.
- If you press the Test button under USB LATENCY, it displays the time it takes for information to travel on the USB cable. Avg USB should be below 10 msec and Max USB should be below 100 msec.
- SYSTEM displays information about your personal computer.
- ALARMS alerts you if the inside of the laser system is above the recommended temperature or if the Thermal Sensor battery is low in power. If the Thermal Sensor inside the laser system is triggered, an alarm will sound and shut down your laser system.
- FIXTURES indicates if a Engraving Table, Cutting Table or Rotary is installed and properly communicating.
- INTERLOCKS shows you if the Top Door is opened or closed.
- The FILTER box displays the current filters on the cart and the remaining filter life.
- COMPRESSOR displays the current device being used, shown by a green check mark, to supply compressed air to the laser system. If a ULS compressor is connected, it will show the current firmware version.
- The RUNTIME DIAGNOSTICS box is for ULS Engineering use only.

The PRINT button gathers the information displayed on the Diagnostics Tab into a PDF file. This PDF file can be emailed to the Customer Service Department for troubleshooting.

DAMAGE TO THE LASER MAY OCCUR IF IMPROPER SETTINGS ARE USED.

Materials Database Printer Driver

This tab of the printer driver is for the beginning user and automatically calculates the appropriate power and speed settings according the material selected.

Category List

This section allows you to choose from eight original types of material categories.

Material List

Once you select a category, a variety of material types will appear to the right of the category section.

Intensity Adjustments

Intensity Adjustments allows you to change the intensity of your Raster Engraving, Vector Marking and Vector Cutting. The default settings are set to 0%, but they can be changed from -50% to +50%. Increasing the settings increases the intensity of the engraving process, giving you deeper results. Decreasing the setting decreases the intensity of the engraving and gives you shallower results. Always start at 0% on a scrap piece of material and make any appropriate changes accordingly. There is no need to make changes to these controls unless undesired results are produced.

Which Laser? (Dual laser systems only)

If you would like to only use the top or bottom laser tube to engrave or vector cut, select from TOP or BOTTOM. If you only purchased one laser tube, select the appropriate laser tube according to the set-up of your laser system. If you would like to use both laser tubes for your project, select both boxes.

Air Assist (Computer Controlled Air Assist systems only)

If you have the Air Assist accessory on the laser system, you can activate it through this option. You are able to turn on Air Assist for Raster Engraving, Vector Marking and Vector Cutting. If you activate this feature, adjust the air flow according to the desired results. If the laser system does not come equipped with Air Assist, turn the feature OFF.

Material (Only available when Manual Control Tab is activated)

The NEW button allows you to add a custom Category and Material to the printer driver. The EDIT button gives you the opportunity to modify the selected Material by creating a copy of the original.

Note: This part of the Materials Database requires knowledge of the Manual Control features. Learn more about the Manual Control Tab in the Manual Control section of the User Guide.

Material Editing

This feature gives you further control over the Materials Database and has similar features to the Manual Control Tab in the printer driver. Custom categories and materials can be added and deleted. They can also be modified to your specific requirements. Once you have added the new material, the printer driver will add the new material to the list. This new material will be available for you to use in future jobs.

To access this window, you will need to select a current category or material and click the NEW or EDIT button. The Materials Editing window and the Manual Control Tab have similar features. You can refer to the Manual Control section for further explanation of these features.

Material Code

The Material Code box will automatically display a new material code number when making a new material and category. You can add a custom Material Code from 9000-9999 if desired.

Taper

This drop down menu is activated when Print Mode is set to Rubber Stamp. This feature is similar to the one in the Raster sub-tab for Rubber Stamping.

3D Power

This button can be activated by setting the Print Mode to 3D. This feature can be modified similarly to the Raster sub-tab for 3D.

Vector Marking - Blue Pen

These settings are similar to the settings on the Raster Sub-Tab under the Manual Control Tab.

Vector Cutting - Red Pen

This section of the Material Editor window allows the user to input preliminary numbers for the Material Editor to properly calculate future power and speed settings. To properly configure the Vector Cutting - Red Pen section, you will need to vector cut two materials in the laser system so the Material Editor can calculate the appropriate percentage amounts for different thicknesses.

If the material being added to the Material Editor can be vector-cut, check the empty box called "Material Can Be Vector Cut" and input the percentages.

The Shallow Cut Settings and Deep Cut Settings sections are similar to one another. First measure two identical material types, but with different thicknesses. For example, test a 1/8" piece of acrylic and a ½" of acrylic. Input the thinnest material measurement in the Cut Depth box of the Shallow Cut Settings. Next, type in the thickest material measurement in the Cut Depth box of the Deep Cut Settings section. The Power and Speed in both settings refer to the least amount of percentage power required to cut through the material without causing undesired results. You may have to experiment with this section several times to get the exact results you desire.

Max Depth

The number input in this box refers to the maximum material thickness that the laser system is able to cut.

PPI

Available settings are 1 to 1000. For further explanation about this setting, read the Manual Control section of the User Guide.

Shallow Cut Settings

These parameters set the starting point for the Printer Driver's Material Editor.

Deep Cut Settings

These parameters set the ending point for the Printer Driver's Material Editor.

How to create a new Category and Material

1. Select one of the existing Categories on the left and click on the NEW button.
2. From the Category drop down menu list on the left, select '**New Category.'
3. The Material Category window appears allowing you to type a name of the new category in the blank space. A Category ID (900-999) will automatically be assigned once a new category is made.
4. Click the OK button.
5. Once a category is made, you can add a material name to the new category by typing in a name in the Material Name blank area.
6. Once that is done you can make your necessary modifications to each area in the Material Editing window.
7. To save your new category and material, you must click the APPLY button, then click the CLOSE button. If you click the CLOSE button, without first clicking APPLY, your changes will not be saved in the Materials Database Tab.

Material Thickness

In order for the laser system to properly vector cut and/or engrave on the material, the printer driver needs to know the thickness of the material before it starts engraving. Using a caliper or similar measuring device, measure the thickness of your material and enter it into the Material Thickness box.

Units

This section allows you to switch between Metric and Inches.

Fixture Type

None

If you are not using any type of fixture, set the drop down menu to NONE.

Rotary

If you have purchased this accessory, read how to install and operate this fixture in the Accessories section of the User Guide.

Custom

If you use a prop (other piece of material) to adjust the height of the material you want to process, you need to compensate for that additional height by using the Custom Height field.

The VersaLASER Keypad

The Keypad on the laser system provides limited access to controls necessary for cutting and engraving operations. When the laser system has finished initializing and homing, and if all the doors are closed, the red light on the keypad will be illuminated and ready to run a file.

The Green or Red LED (Light Emitting Diode) will display differently depending on the current state of the laser system. Please refer to the chart below.

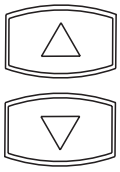
CONDITION	RED LED	GREEN LED
Off	The doors are closed	The VersaLASER is off
On	The front, top or back door is open	The VersaLASER is on

VLS2.30 and VLS3.50 | VLS3.60, VLS4.60 and VLS6.60

POWER: This button turns the VersaLASER on, only if the computer is powered on, booted into Windows, the Universal Control Panel is running and the USB cable is connected from the computer to the VersaLASER. Holding the key down for about five seconds will power the VersaLASER off.

START: Begins laser processing of the current file displayed on the UCP. If any of the doors are opened when you press this button, the motion system will start to move as if it is processing the file, however, the CO_2 laser beam is disabled and the red diode pointer will be enabled to simulate the laser process.

PAUSE: If a file is running, the PAUSE button halts the engraving or cutting process and the focus carriage will move to its home position in the upper right corner of the engraving area. If the PAUSE button is pressed again after the initial pause it will resume cutting or engraving again at the location where the motion system was paused. Please wait for the motion system to stop and move to the home position before opening any door otherwise the laser beam will not resume from the position it stopped at.



UP and DOWN: These buttons allow you to move the table up and down.

Advanced Laser System Operation

From the PPI and speed settings to Rubber Stamp and Image Enhancement settings, this section covers how each feature of the Manual Control Printer Driver funtions for the advanced user.

> ***Note:*** When adjusting the printer driver settings in the Manual Control Tab, it is highly recommended that you practice engraving or cutting on a scrap portion of that material in case the settings need to be re-adjusted to obtain the desired results.

Manual Control Printer Driver

The Manual Control Tab in the printer driver gives you full control of the engraving and vector settings. This tab of the printer driver is meant for the advanced user.

Color, Power, Speed, and PPI

To change the % Power, % Speed and/or PPI of a color, position the mouse arrow on the color name and click once. This will highlight the color's parameters and will allow you to change the settings by using the scroll bars, plus (+) or minus (-) buttons or by typing in each setting in the appropriate control box. It is possible to click on more than one color to set them to the same setting at the same time.

% Power

Available settings are from 0 to 100%. This setting is directly related to how deep the engraving will be. The higher the setting, the deeper it engraves, marks or cuts, and vice-versa.

% Speed

Available settings are from 0 to 100%. This setting determines the maximum rate of travel of the motion system. Actual engraving time (throughput) is not only dependent on the % Speed setting, but is also dependent on the size and the placement of the graphic in the engraving field. The motion system will accelerate/decelerate as fast as it can up to the chosen speed. If the motion system cannot achieve the chosen speed based on the size of the graphic or graphical placement in the field, it will automatically adjust its speed internally to the maximum speed it can achieve. This is evident when you see the motion system automatically slow down while cutting curves or circles as opposed to straight lines. Automatic proportional pulsing (see PPI) of the laser beam will ensure that there is no difference in the depth of cut from straight lines to curves. We will discuss how to optimize the throughput of the system later in this manual.

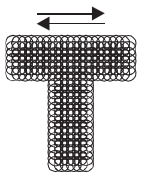
% Power and % Speed work together in determining how deep the engraving or cutting will be. Higher power and slower speeds produce deeper results. Lower power and higher speeds produce shallower results.

> ***Note:*** 100% raster speed is different than 100% vector speed. Due to the inertia of the X-Axis arm, movements in the Y-direction, and also depending on which model you have, vector speeds will range from one-third to one-half the maximum raster speed.

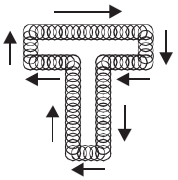
WE WILL USE THE MANUAL CONTROL PRINT DRIVER EXCLUSIVELY The instructor will go over how to use the settings properly.

PPI

Available settings are 1 to 1000. The laser beam is always pulsing and never "on" continuously even though it may appear that way. The PPI setting indicates how many laser pulses, per linear inch, the laser cartridge will emit. The pulsing of the laser beam is electronically linked to the motion system. These pulses will always fire, equally spaced, from one to the next, regardless of changes in speed.



In raster mode, dot positioning is determined by the driver based on image dark areas. The print driver has the ability to place dots at any resolution up to 1000 PPI according to the image composition. For solid filled areas (solid black for example) the machine places dots at 1000 PPI because all pixels are completely filled with color. For halftones, the print driver determines laser pulse location based on whether image pixels are black or white (and edge threshold decisions). For grayscale, the print driver determines laser pulse location and power based on image pixel color value (and edge threshold decisions).



In vector mode, laser pulsing follows the path of the outline of the object. Imagine the laser system working like a sewing machine where the stitching always remains consistent whether you sew fast, slow or around curves. The setting you use will be application material dependent. Using less than 150 PPI may result in the pulses being spread so far apart that they may or may not touch one another. Perforated paper has this characteristic. Higher PPI settings may cause more of a melting or burning effect on the edges whereas lower PPI settings may reduce the burning, melting or charring, but may result in a serrated or perforated-looking edge. Increasing or decreasing the PPI setting does not affect engraving speed, only the frequency of the pulses.

Mode (Drop Down Menu)

The driver uses the word "MODE" because the laser system works similarly to the operation of a pen plotter output device. A pen plotter physically selects a colored pen that matches the same colored objects in your graphic, called "color mapping," and draws the graphic, on paper, in that color. The laser system, however, applies a Mode, % Power, % Speed and PPI setting, to the individually colored objects in your graphic. Up to eight (8) sets of user-adjustable parameters, which control laser beam delivery to your application material, can be "mapped" to the respectively color filled or outlined objects in your graphic.

Note: Black and white, grayscale and color bitmaps are all mapped to the black color's settings.

Selecting the appropriate color and clicking the drop down menu button toggles through the following laser beam delivery modes for the each of the eight respective pen colors.

- RAST/VECT (default) raster fills and vector marks or cuts proper outlines.
- RAST rasters all fills AND outlines regardless of outline thickness.
- VECT only vector marks or cuts proper outlines. It will skip all fills and will skip all outlines with line weights thicker than a hairline.
- SKIP ignores all fills and outlines.

Laser (Dual laser cartridge system only)

If your laser system comes equipped with more than one laser cartridge, you are given the choice of using either both laser cartridges or a single laser cartridge (Top or Bottom.) If your laser system has one laser tube, select the appropriate laser cartridge according to your laser system set-up.

Z-Axis

This control on the Printer Driver lets you offset the Z-Axis table from the current focal point. When the feature is turned on and a height is set, the table lowers to the height entered and starts engraving. This feature can be used as a Material Thickness focusing method.

Flow (Computer Controlled Air Assist only)

This feature will not appear if you do not have the Computer Controlled Air Assist option. If you do have Computer Controlled Air Assist, but are not using it, you **MUST** leave the setting to OFF, otherwise your system will hesitate up to 10 seconds after you press the start button on the machine. If you purchased the Computer Controlled Air Assist option, please refer to the Accessories Guide for detailed instructions on how to use the printer driver controls properly.

Flow Rate (Computer Controlled Air Assist only)

To control the Flow Rate of the Computer Controlled Air Assist accessory, select from the percentage rates available.

Set Button

After making % Power, % Speed, PPI and any other adjustments for the Pen parameters, you must click the SET button to register the changes. The changes will not be saved until the OK or APPLY buttons are clicked.

Save Button

By clicking Save, the "Save Engraving Setup" dialog box will appear and will allow you to enter in a file name. All settings will be stored in this file that has a ".LAS" extension. These files can be stored in any directory on your hard drive and you can have as many setting files as your disk can hold. Verify that you have clicked the SET button before you save any .LAS files to ensure you have properly saved your settings.

Load Button

To recall printer driver settings that have been previously saved, click on the "Load" button and choose the desired .LAS settings file. The settings that are currently on screen will be replaced by the settings from the .LAS file. You may abort this change by clicking Cancel; clicking OK will approve the change.

Default Button

The Default button will reset the driver settings to the original manufacturer values.

Cancel Button

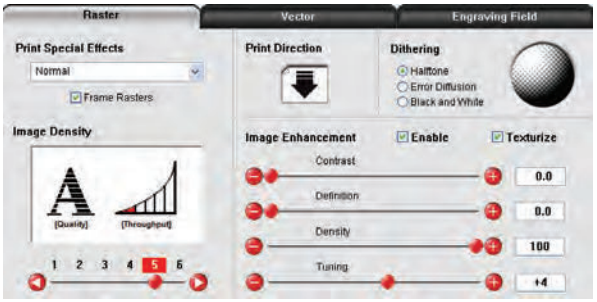
The Cancel button closes the printer driver window and takes you back to the previous window. If the SET, OK or APPLY buttons were not clicked, the changes will not be saved by the Printer Driver.

Apply Button

The APPLY button saves all changes made to the Manual Control Tab. These changes include any modifications made to the Raster, Vector or Engraving Field sub-tabs.

Raster Sub-Tab

Print Special Effects



In this dropdown list, you can choose from four different printing modes, Normal (default), Clip art, 3D and Rubber Stamp.

Clip Art

This control simulates laser printer output and is very useful if using a drawing with many colors, shades of gray or many outlines. It is recommended to turn this control ON when using DRAWN clip art because there may be some underlying cutting lines hiding behind filled areas. Having this control ON gives a what-you-see-is-what-you-get output very similar to laser printer output. The entire drawing will be raster engraved, including all outlines, and only the Black color setting is used. The driver automatically turns OFF its color-mapping feature and all colors are engraved as different shades of gray, represented by a halftone pattern. The type of halftone pattern is based upon the "Quality" setting of the driver the same way grayscale bitmaps are interpreted. Since clip art images use a wide variety of colors, shades and outlines, the only effective way to engrave these images is to have this control turned ON. Clip art mode also provides greater compatibility with Windows software that does not work well with vector devices such as the laser system. Do not activate this control when printing photographs or bitmapped images; use it **only** with DRAWN clip art.

3D

There are two ways to use the 3D feature. The first method is used to produce an engraving that has a contoured depth, giving it a three dimensional feel. It is used in combination with grayscale bitmaps by automatically assigning laser power levels to the shades of gray of the bitmap without converting the image to a halftone. These power settings are based on the setting you entered for the color black in the printer driver. The darkest shades of gray (black) will be assigned the value of the setting for the black color. The lightest shade of gray (white) will automatically be assigned a 0% power. All other shades of gray that fall between black and white will automatically be assigned an appropriate power level that matches the darkness of the color. The engraving will appear "3D" because the depth of the engraving will vary according to the image. Sometimes it takes several passes to create enough relief in the engraving to get the desired results.

Special 3D software is required to produce the type of grayscale images that are compatible with this mode. You cannot simply use ANY grayscale bitmap to produce a "3D" effect. Please contact our Applications Department for the latest 3D software recommendations.

The second way to use the 3D feature is to engrave any photograph lightly onto the surface of hard materials, such as black marble, anodized aluminum, painted brass, micro-surface engravers plastic, etc., to produce exceptional photographic quality. Using the appropriate materials and settings, the end result is an engraving that looks more like a photograph than a halftoned or diffusion dithered image does. To use the 3D feature in this method you must first follow the steps below.

Choose Your Material

The best material to use is one that has the highest contrast, such as black anodized aluminum, black marble or black cored engravers plastic with a white micro surfaced coating. While other materials may work okay, they may not produce the highest quality.

Establishing Nominal Power

Choose your % Speed and your Image Density settings. Set the PPI to 1000, but don't set the % Power setting just yet. The objective is to use the LOWEST % Power setting that produces the most contrast such as the whitest (as in black anodized aluminum) or the darkest (as in black cored engravers plastic with a white micro surfaced coating) results.

This is what we call the "nominal" power setting. Over-powering the material will produce poor results.

In your graphics software, create a series of five rectangles that are about ¼ inch high and 6 inches wide as in the following diagram:

Starting with the top rectangle, set the power setting to a value that you know will be too low. For example, engrave the first rectangle at 5% power, increasing the power for each subsequent rectangle in 5% increments, finishing the series off at 25% power and note the results. Choose the rectangle that uses the lowest % Power setting to achieve the most contrast. If 25% is not enough power, then engrave the rectangles once again, this time starting at 25% and increasing in 5% increments as above.

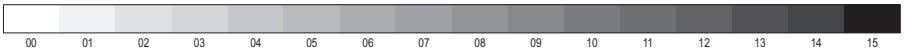
In this particular example, we'll say that 20% power looks over-burned, but 15% appears under-burned. Since the material may be sensitive to small power changes, you may need to narrow it down a bit further. Engrave a new series of rectangles, but this time start the top rectangle at 15% then add 1% for the next rectangle, and so forth, until you find the best setting between 15% and 20%.

The setting that produces the highest contrast using the least amount of % Power is called the "nominal power setting."

Engraving a Calibration Scale

Now that you have established the nominal power setting, you will need to engrave a grayscale calibration scale. You can create one of your own or use the one provided for you which can be found on the Software Installation CD-ROM called "3D Calibration Scale.cdr." This is a CorelDRAW 8 file so using versions 8 and higher will open the file.

The scale looks like this:



Each rectangle is 0.5 inches wide (12.7 mm) and 0.25 inches tall (6.35 mm). Each successive shade of gray is incremental by 16 levels starting at 0 and ending at 255. The numbers below the scale are there as a reference to the 16 levels of power control (explained later) and do not need to be engraved if you do not want to.

Engrave the calibration scale, onto your material, using the nominal power setting you established earlier. Compare it to the actual calibration scale that you see on screen or in this manual. If the response of your material to the laser beam was perfectly linear, then the result should look exactly like the calibration scale. Most likely you will find that several rectangles appear to have the same appearance of shading. The objective would be to engrave the calibration scale and produce a result that would appear as if each rectangle would have its own distinguishable level of gray, starting from white all the way to black. To help you achieve those results, the printer driver gives you the ability to calibrate the power level of each one of the rectangles. To access the feature, click on the "Setup" button.

Setup Button
When you click this button, the ULS 3D Power Calibration screen will appear. Notice that there are 16 slider bars representing the 16 shades of gray of the calibration scale. The 00 and the 15 are not adjustable as they represent white and black. The other 14 can be adjusted. The objective is to go back and forth between adjusting the corresponding slider bars and re-engraving the calibration scale until you can duplicate the appearance of the calibration scale as best as possible. As you are progressing, **make sure you keep saving your settings in an LAS file** just in case your computer crashes, etc. This is a lengthy procedure so you do not want to have to do it twice.

Once you have duplicated the 3D Calibration Scale onto your material, calibration is now complete. You only need to do this calibration one time for each material you intend on using to produce photographs.

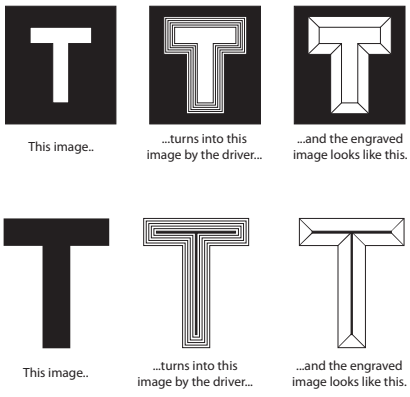
Note: If you are using a type of material that becomes lighter when you engrave, such as black marble, you will need to invert the photograph first (make a negative image) in your photo editing software, otherwise when you engrave the image, it will appear like a negative image.

APPLY Button
Click Apply to enable the settings that you just set.

CLOSE Button
The Close button closes the 3D Power Calibration settings window and cancels any changes you made to the scale if you didn't click the APPLY button.

DEFAULTS Button
The Defaults button applies the factory default settings to the 3D Power Calibration settings.

Rubber Stamp
Rubber Stamp mode causes a "shouldering" effect when raster engraving rubber stamp material or any other material that requires a "shouldered" engraving. The effect looks as if the laser beam engraved the material on an angle, but in actuality it is the precise control of laser power that creates this appearance. This is a "raster only" feature that only works with black colored graphics and uses the power setting of the black color in the printer driver. Vectors are processed normally and can be used for vector engraving or cutting by assigning any of the seven other printer driver colors to the outline desired.



To obtain a "raised" engraving such as a rubber stamp, simply create a "negative" graphic so that the background is black and the text or graphic objects are white. This way, the background engraves and the text or objects remain untouched, producing a "pyramid" effect.

To obtain a "chiseled" or "sunken" engraving, create a "positive" graphic so that the background is white and the text or objects are black. This way, the text or graphic engraves and the background remains untouched, producing a "chiseled" effect.

Setup Button
Selecting the Setup button opens a pop-up window so you can choose from the following settings:

Taper Selection
Choose from various types of shoulder angles. Experiment with each setting and note the result.

Image Options

Invert Page

This converts all black objects into white and all white objects into black for the entire page. This is very useful for engraving a full sheet of rubber stamps.

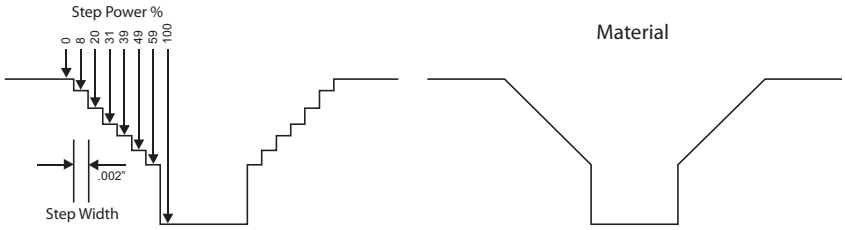
> ***CAUTION:*** When using the "Invert Page" feature you may need to reduce your page size so that the entire work area is not engraved.

Mirror Page

This mirrors the entire page from left to right (horizontally). It will not mirror individual objects or selections. This is very useful for engraving full sheets of rubber stamps because the graphics on screen are non-mirrored and can be proof-read easily.

Power

Notice that when you click on different Taper Selections that the power table changes. This is because the laser applies power in different profiles to produce different styles of taper. You will notice that you cannot adjust the pre-defined Taper; however, if you would like to create a custom taper of your own, first select the Taper Selection that you would like to start with and then click the "NEW" button. This will copy the taper as a "Custom Shoulder" that you can rename by typing a new name in the dialog box and clicking "Rename." You can also adjust the profile however you desire. Each slider bar controls the laser's power for that step. The numbers at the bottom of that slider bar define the width of the step in 0.001 inches (mils). The square at the top of each slider bar is the activate/deactivate button. Always deactivate the steps you are not using so that it will apply 100% power to that level.



Normal Rubber Stamp Setting ...will give you these results

The diagram on the previous page is an example of the Normal Rubber Stamp Taper Selection. You can see that there are 8 steps used to create the shoulder. The surface of the material is considered the first step and the bottom of the engraving is considered the last step. You can define as many as 16 steps, but the first or the last steps are not definable because they are fixed at a power setting of 0% and 100% respectively. You can only define the parameters for the 14 steps in between.

> ***Note:*** The maximum shoulder width is 0.056 inches (1.42 mm).

Reduction

Raster Block Reduction (also known as Print Growth Management) reduces the number of pixels of a raster image only in the X and Y directions. Raster Block Reduction does not affect vector images. Sliding the bar to the right will remove pixels from the image that is being engraved, practically thinning the raster image. This feature does not affect your original file, only the file that is in cache storage. This feature is useful for bar code labels with thin lines.

Image Density

The Image Density setting determines how many raster strokes per vertical inch of travel the motion system steps down to produce the engraving. It can also be referred to as the vertical lines per inch or fill spacing. In the Windows XP driver it is termed Image Density and there are six Image Density choices in all models. Higher Image Density (DPI) settings produce better quality raster images, but reduce productivity by increasing engraving time. Lower Image Density (DPI) settings produce lower quality raster images, but increase productivity by decreasing engraving time.

Image Density (DPI) settings will also have an effect on vector quality and vector speeds when vectoring lines other than straight horizontal or vertical lines. For example, a circle is made up of very small straight-line segments linked together at very small angles. If you choose a high quality setting such as 6 (1000 DPI), then these segments are as small as possible and they are high in quality. The result is the smoothest looking circle, but it will take longer to vector engrave or cut because the focus carriage must start and stop at the ends of each line segment. Since there are many segments, it will take longer to process, but the quality will be the highest that the machine can produce. If using a low quality setting such as 1 (DRAFT), these segments become longer, but there are less of them, resulting in more flat-edged looking curves that will process faster.

By running samples on scrap materials and practicing with different settings, you can find a compromise between throughput and engraving quality.

Print Direction

The default direction is Down which begins engraving at the top of the field and finishes at the bottom. On some materials you may get better results by starting at the bottom and engraving towards the top of the field (Up). This is because the engraving smoke is being drawn towards the top of the field. On some materials engraving Down causes the smoke or debris from the engraving to be deposited onto the previously engraved surface, possibly damaging the engraved area. Experiment with the different directions using different materials and choose the best method for your application.

> ***Note:*** The Up direction is especially useful when engraving rubber stamps and utilizing the Back Sweep Air Assist option.

Dithering

Dithering settings are used when printing grayscale or color bitmapped images such as TIF, JPG and BMP formatted images. Since the laser system is essentially a black and white printer (black turns the laser ON and white turns the laser OFF), and if you choose the correct settings, the driver will automatically convert the grayscale or color bitmap into a 1-bit "halftoned" black and white image. This process is very similar to how newspaper photographs, as well as laser printer photographs, are printed. For a more detailedexplanation of the terms "grayscale," "bitmap," "halftone" or "dither," please refer to the "Graphic Software Setup" section in this manual.

Halftone

This halftone pattern generator converts grayscale bitmaps into a halftoned image based on your Image Density choice in the driver.

Image Density	Angle	Shape	Lines Per Inch
6	45 Degrees	Round	180
5	45 Degrees	Round	90
4	45 Degrees	Round	60
3	45 Degrees	Round	45
2	45 Degrees	Round	36

Error Diffusion

Unlike halftone, error diffusion scatters the black pixels in a random pattern to represent shading. It uses the quantity of black dots instead of the size of the black dots to represent the different shades of gray. The pattern created will be dependent on the quality setting that you choose in the driver with the exception that there is no chart to reference. Higher quality settings, such as 5, will produce a more densely packed, higher dot quantity pattern, whereas a lower resolution setting, such as 2, will produce a loosely packed, lower quantity dot pattern.

> ***Note:*** **Do not** use Error Diffusion when engraving rubber stamps, otherwise dots will appear in the background. Choose only Halftone.

Black and White Mode

The Black and White mode thresholds the image at 50% black. Each pixel that is greater than 50% black will be converted into white and each pixel that is 50% black or less will be converted into black. This effect is very similar to trying to duplicate a photograph using a photocopier.

Helpful Tip

Engraving grayscale bitmaps using a dithering pattern requires some practice and a bit of trial and error to achieve perfection. It also requires some knowledge of bitmap editing software. These images will visually appear different on one material as opposed to another material even if you use the same driver settings. As a rule of thumb, use an Image Density setting of 5 using halftone or diffusion pattern on harder materials, such as marble, anodized aluminum or microsurfaced engraver's plastic. Use an Image Density setting of 3 using the halftone or diffusion pattern for softer materials, such as wood or materials that you intend to engrave very deeply.

Image Enhancement

The Image Enhancements controls allow the user to "fine tune" the image to enable the laser system to produce the highest quality, highest detailed images at high or low speeds. Image Enhancement may be used at any engraving speed and with any material.

Note: Image Enhancement will cause files to take longer to print. Since most materials do not require the use of Image Enhancement, use this feature only as needed. Image Enhancement and 3D Effects cannot be selected at the same time. The printer driver will automatically notify you if you attempt to do so. Image Enhancements work best for low power, high speed applications such as marking anodized aluminum, etc.

The following procedure may appear lengthy, but when you learn how to use the controls, establishing the correct parameters is easy and quick. Once you have established those parameters you can "SAVE" them in the ULS printer driver as .LAS settings and recall them when needed. Many users choose to name these saved settings according to the application material's name.

Note: The Image Enhancement settings are designed to work with the BLACK pen color in the printer driver. However, the other seven pen colors of the printer driver will use the same Image Enhancement settings. Keep in mind that those settings will have a different resulting effect on if the other colors' % power, % speed and PPI are different than the black pen color's setting.

Texturize

The Texturize feature adds random textured laser pulse patterns to an engraving job while using Image Enhancements. It reduces motion system marks like banding from appearing on some materials like tile and marble.

Definitions

CONTRAST: Contrast adjusts the difference between the unengraved and engraved areas in the high density part of the graphic or where there is the most concentration of graphic pixels (in between the dotted lines), as the following diagram illustrates:

Within this effective area, using too little CONTRAST may cause some parts of the letters to appear thin, faint, fuzzy or even non-existent. Having too much CONTRAST will cause the effective area to appear thick, bold or over-powered.

DEFINITION: Definition adjusts the difference between low density and the high density part of the graphic. The low density parts of the graphic are typically the ascenders and descenders of text, single pixels that may be horizontally spaced far from other pixels or the start of the graphic in the direction of the raster stroke. Refer to the following diagram:

Setting this parameter too low may cause the effective part of the graphic to appear thin, faint, fuzzy or non-existent. Too high of a parameter will cause these objects to appear thicker, bolder or more powered than the high density areas of the graphic.

DENSITY: Density adjusts the difference between the entire unengraved and engraved areas. If the parameter is too high, then the entire engraved image may appear thick, bold or over-powered. Too low of a setting may cause the image to appear thin and pixels or parts of characters may disappear altogether. The opposite effect would occur on inverted images such as white text on a black background.

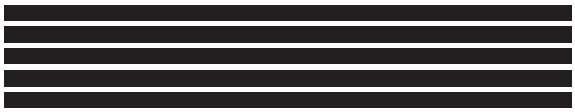
TUNING: Tuning adjusts the image so that the pixels vertically line up with each other during the left and right bidirectional raster strokes. A misadjusted TUNING value will cause the image to appear double-imaged or inadvertently bolder than normal. A typical **non**-Image Enhanced TUNING value can be from -4 up to 0, whereas a typical Image Enhanced TUNING value generally averages around +4. TUNING will be different if you have Image Enhancements enabled or disabled. Saving the printer driver settings will also save the TUNING value.

Procedure

The following procedure assumes that you have some experience working with the laser system and have a general idea of the Power, Speed, PPI and Image Density settings that you intend to use for the chosen application material.

In the following example, we will be engraving painted brass choosing 100% speed for good throughput, and Image Density 5 for good quality.

Step 1: Establish the nominal power setting.
In your graphics software, create a series of five rectangles that are about ¼ inch high (6.35 mm) and 6 inches wide (152.4 mm) as in the following diagram:



Starting with the top rectangle, set the power setting to a value that you know will be too low. For example, set it to 5% power and the rest of the parameters to 100% speed, 1000 PPI and Image Density 5. At this time, ensure that Image Enhancement is NOT enabled. Engrave the first rectangle at 5% power, increasing the power for each subsequent rectangle in increments of 5%, finishing the series off at 25% power and note the results. Look for the LOWEST power setting that has the cleanest removal of material. This would be the nominal power setting. While higher than nominal settings may also produce clean engraving, it will overpower the material and may cause highly detailed engraving, unlike these rectangles, to appear too thick, bold or washed-out. If 25% is not enough power, then engrave the rectangles again, this time starting at 25% and increasing in 5% increments and so on. In our particular example, let's say that 20% power looks good, but 15% appears underpowered. Since we know that this material happens to be sensitive to small power changes, we'll need to narrow it down a bit further. Engrave the rectangles once again, but this time start the top rectangle at 15% then add 1% for the next rectangle and so on until you reach 20%. The results now indicate that the nominal power setting of 17% power looks as if it is the LOWEST power setting that produces the cleanest results at 100% Speed, 1000 PPI and Image Density 5.

Step 2: Using text to set the CONTRAST parameter.
Type in a random line of text, using the Times New Roman font, set at 8 or 10 points in size. Make sure that the text string is at least 6 inches long and that the string includes punctuation marks, spaces and lower and upper case letters as in the following example:

Universal Laser Systems, Inc. produces the "BEST" laser systems in the world!

Engrave the sample text with the settings determined in step 1, but this time ENABLE Image Enhancement and set CONTRAST to 0, DEFINITION to 0, DENSITY to 100 and the TUNING value to +4. You should expect the results to appear fuzzy, some of the characters will be missing and overall engraving quality will not be as good as expected. This is normal. Move the line of text slightly downward in your graphics software so that you will engrave a clean part of the material, but keep it close enough to the previous engraving so that you have something to compare it to. Keep engraving samples and adjusting the CONTRAST upward in increments of 5 and note the results. The objective is to adjust the CONTRAST just enough to cause the high density areas of the text to be sharp and clear. Ignore the appearance of the ascenders (like quotation marks or the tops of h's) and descenders (like commas or the bottom of lower case p's) as they will appear faint and unclear. This is to be expected. DO NOT adjust the CONTRAST setting to try to force these to appear; use the DEFINITION adjustment for those characters. Right now, ONLY concentrate on the high density part of the characters. Setting CONTRAST too high can cause the characters to appear "fat" or "bold." Adjusting the CONTRAST by just one number can make a big difference in appearance, so continue adjusting the setting by first increasing by 5 points until you get close, but then fine tune the setting by increasing or decreasing by 1 point until the exact setting is achieved.

Step 3: Adjusting DEFINITION to enhance the ascenders and descenders.
Now, increase the DEFINITION in increments of 5 at a time until the ascenders, descenders, commas, quotation marks and any other low density area characters begin to appear. The objective is to increase the setting just enough to cause these parts of the graphic to match the appearance of the high density areas. Setting the DEFINITION too high will result in ascenders and descenders appearing too "fat" or "bold" compared to the rest of the graphic.

Step 4: Reducing DENSITY as needed.
Once CONTRAST and DEFINITION have been set to the appropriate levels, the graphic may or may not appear to be "fat" or "bold." In most cases, the appearance will look great without making any more adjustments. However, if everything appears overpowered or bold, try reducing the DENSITY down from 100 in increments of 5 and note the results. If the characters begin appear to be "chunky" or appear as if pixels have been eliminated, then you have reduced it too much. Normally you can leave the DENSITY at 100. However, there may be cases where you need to reduce it. Reducing DENSITY can be very useful when the image is inverted, such as white text with a black background. In this case, if the engraved area (the background) is overpowering the text (foreground), then reducing the DENSITY may help thicken the text.

Step 5: Fine tuning the raster strokes.
At this point, you are finished with Image Enhancements. Make sure that you save your settings, but your graphic may need a little more "fine tuning." The typical TUNING setting is +4 when Image Enhancement is enabled. However, this may or may not be the best setting for your system. To check this setting, you should perform this last test. Engrave the same text with all your Image Enhancement settings, but this time set the TUNING value to 0. Then move the graphic down and engrave it again with TUNING setting +1, then +2 and so on all the way to +8. Compare each one to the other and find the one that is the sharpest and clearest. Go back and set the TUNING value to the appropriate number and SAVE your settings once again.

The Image Enhancement settings for that material are now complete. If you feel that you can fine tune it a little more, go back to step 2 and try again, but this time start with the current Image Enhancement settings that you saved. It is not necessary to reset your nominal power setting and we recommend that you leave it the same as the value you determined in step 1.

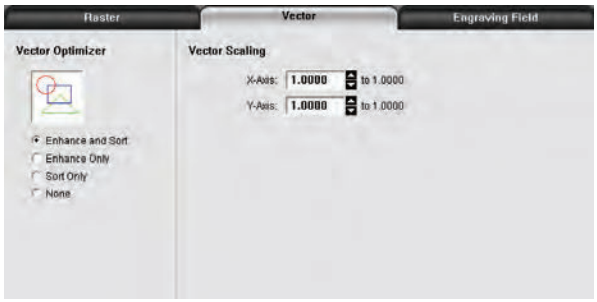
Setting the Image Enhancement parameters using this procedure will cause all of your graphics, whether big or small, inverted or not, dense or highly detailed, to appear better than ever. We suggest that you run

this procedure for all your materials and save your parameters. This may sound like a big job, but the additional productivity and engraving quality that your system is capable of producing is well worth the small amount of time spent.

Vector Sub-Tab

Vector Optimizer

The four available selections apply to vector output only and have no effect on raster images. Regardless of which of the following selections you choose, vectors are grouped by pen color and will always output in the color order listed in the printer driver.



Enhance and Sort

Enchance and Sort turns on both features simultaneously.

Enhance Only

The printer driver collects all the vectors from the application software and reconstructs them (so to speak) by removing start and stop points within the vector curves so that they run smoother with less jitter. It has no effect on straight, horizontal or vertical lines.

Sort Only

The printer driver collects all the vectors from the application software, stores them in temporary memory, sorts them and then outputs them in the following order:

- All open path vectors are output first (not closed path vectors like circles and squares) beginning with the end point of the vector path that is closest to the current position of the focus carriage. All subsequent open vector paths are output using the same "nearest neighbor" starting point method which eliminates the random "vector hopping" that causes longer processing times.
- Closed paths will follow, beginning with the innermost closed path and ending with the outermost closed path. This is particularly useful in an elevated cutting application to prevent the outer piece from falling first. The beginning point of a closed path is automatically selected by the printer driver by the "nearest neighbor" vector path that has the steepest angle in the Y-Axis direction.

None

This selection turns off Vector Optimizer. Vectors will be ordered exactly as sent from the user's graphics program and ordered by pen color.

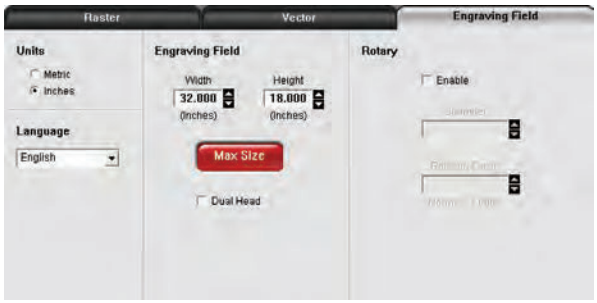
Vector Scaling

This feature allows you to calibrate vector cutting or vector engraving to your particular application. To calibrate the system, as an example, draw a precise 5" x 5" (127 x 127 mm) square in your graphics software. In the printer driver, set the laser power and speed setting to vector mark (do not cut through) this square onto some scrap material. After marking, remove the material and with a precision measuring device, such as a caliper, measure the square in both the horizontal (X) and vertical (Y) directions. Let's say that the measurement was 4.997"x (126.92 mm) and 4.996"y (126.89 mm). Use the formula (desired length/measured length) and enter the result into the X-axis and Y-axis boxes respectively. In this example, the result would be X-axis = 1.0006 to 1.0000 and Y-axis = 1.0008 to 1.0000. The printer driver will scale the images larger for numbers greater than 1.0000 and will scale the image smaller for numbers less than 1.0000. After changing the numbers, repeat the marking procedure and verify that the square is scaled correctly. We used a 5" by 5" (127 x 127 mm) square just as an example, but you can use any size object that is smaller than the maximum size of the engraving field. Using the Vector scaling feature with larger images produces more accurate results. Keep in mind that this feature DOES NOT scale raster images so if you combine raster and vector images in one file, the raster image may not align with your vectors. You will need to manually position your raster images in their desired positions.

CAUTION: Do not attempt to use the vector-scaling feature when your graphic extends out to the absolute edge of the engraving field. You may accidentally cause the driver to attempt to print past the edge of the maximum allowable page size. Unexpected results may occur. If you use this feature, the actual allowable page size decreases by the same amount that you are attempting to offset.

Engraving Field Sub-Tab

Units
Units allows you to change between Metric and Inches.



Language
Select from many different languages in this drop down list. Some language changes will not take effect until the printer control panel is closed and then re-opened.

Engraving Field

Width and Height
The page size that you enter in Width and Height **must** match the page size in your graphics software program EXACTLY and it is up to the operator to enter in the correct settings. Select the metric box if metric units are desired.

> ***Note:*** Incorrect use of this feature may cause no graphics, partial graphics, erroneous graphics or a misaligned graphics output relative to the application material to occur. To avoid problems, we recommend that you set the Width and Height to the maximum field size of your laser system (click the Max Size button) and also set your graphics software programs page size to match.

Max Size Button
Clicking on the Max Size button restores the driver back to the default maximum page size that your model can accept.

Dual Head (PLS Only)
Dual Head is also an optional accessory. If you have purchased this option, please refer to the ACCESSORIES section of the manual for more information.

Rotary
This option is available for all models. Please refer to the Accessories section of this manual on how to install and use the Rotary Fixture.

Diameter
The diameter of the cylindrical object being engraved will be entered in this field.

Rotation Factor
If you have purchased the optional Rotary fixture, you may need to calibrate your fixture if your application requires you to engrave or cut completely around the cylinder precisely 360 degrees. Only use this option if you completely understand and have used the Rotary Fixture in the past. If you are familiar with the operation of the Rotary Fixture and in your application you create a vector line or raster graphic that extends from the top of the page (in your graphic software) all the way to the bottom of the page, you should expect that the Rotary Fixture would rotate a full 360 degrees. If the fixture comes up short or long by a few degrees, you can compensate for this in the driver. If your application comes up short, increase the number past 1.0000 as much as you need to and run your sample again. If your application rotates past 360 degrees, then decrease the number of degrees below 1.0000 to get the ends to line up. You can calculate the exact number (refer to the Vector Scaling technique on the previous page), but it may be difficult to measure circumference.

Third-Party Graphic Software Configuration

Choosing the right graphics software program to run the laser system is essential for maximum usage and control of the laser system. Not all software can be used to run the laser system because many have limitations. Setting up your software correctly is essential to running the laser system properly.

The following examples assume that you are configuring the software for a VersaLASER system. If you have a different laser system, substitute the correct maximum page size.

We have provided specific instructions for setting up CorelDRAW X3/X4, AutoCAD 2000i/2002/2004/LT 2007 & 2008, and Adobe Illustrator CS/CS2/CS3 in order for these programs to work well with the laser system.

Specific Software Setup

Some graphics software programs require a special setup procedure in order for the software to function correctly with the ULS printer driver. In the following pages, you will find setup instructions for the most popular software programs that our customers use. As a reminder, ULS provides no warranties whatsoever on any software used in connection with a ULS Laser Engraving System, express or implied. Neither does it guarantee software compatibility with any off-the-shelf software package or any software program that has not been written by ULS.

The following suggested programs are widely used by ULS customers and are considered to be the most functional and compatible programs to use with the laser system.

- Vector Graphics Programs (User Supplied)
  CorelDRAW X3/X4*, Adobe Illustrator CS3
- Bitmap / Scanning Software (User Supplied)
  Corel PHOTO-PAINT or Adobe Photoshop
- Raster to Vector Conversion Software (User Supplied)
  CorelTRACE
- CAD Software (User Supplied)
  AutoCAD for Windows
- Fonts (User Supplied)
  Use True Type fonts **only**. Do not use PostScript or bitmapped fonts.

*Earlier versions of CorelDRAW, such as 8 or 9, have problems with the XP Operating System, which in turn, causes problems with the operation of the laser system. As a result, ULS recommends CorelDRAW X3/X4 over earlier versions. While ULS has made reasonable efforts to ensure the laser system as compatible as possible with graphics and CAD software written for the Windows XP operating system, ULS cannot guarantee complete compatibility with any software.

Adobe Illustrator CS or CS2

Note: Adobe Illustrator CS or CS2, in combination with the new ULS printer driver version 5.24.38 or later, is now capable of both raster and vector output as well as full-field engraving capability. The following procedure assumes that you are familiar with the use and operation of Windows XP and Adobe Illustrator CS or CS2.

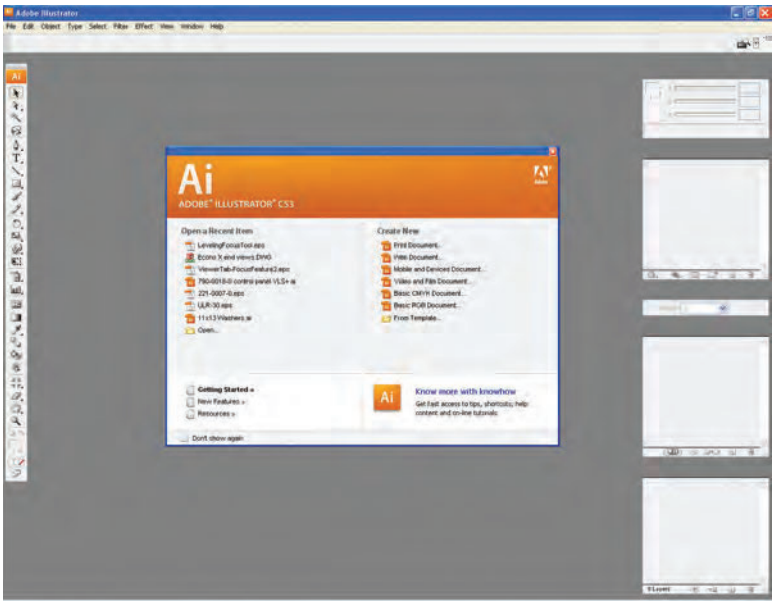
1. Close all Windows programs.
2. Upgrade to Adobe Illustrator CS, but do not launch it yet.
3. Upgrade to ULS printer driver version 5.24.38 or later.
4. Set your Windows default printer to the ULS printer driver.
5. Launch Adobe Illustrator CS and start a new graphic.
6. You will now need to set the Page Setup, in Adobe, to the largest square page that is equal to the width of your laser system's field. For example, if your laser system has a 24 x 12 inch (610 x 305 mm) field, then set the page in Adobe to 24 x 24 inch (610 x 305 mm) Portrait mode (not Landscape). If you laser system has a 32 x 18 inch (813 x 457 mm) inch field, set the page in Adobe to 32 x 32 (813 x 813 mm) Portrait.
7. Now, place your graphics ONLY within the top portion of your page in Adobe. Don't use the bottom portion that extends below the physical size of the engraving area of your laser system. Since your laser system truly doesn't have a usable area as big as the page size you created, the only way to make Adobe work is to trick it into thinking it is outputting to a larger, square-fielded, device.
8. If you would like vector output, set your stroke weight to either 0.001 inches (0.025 mm) or 0.1 points. You will have to type in this setting because it is not available from the dropdown list.

Adobe Illustrator CS3

Part 1: Setting the Default Workspace

1. Start Illustrator CS3 from your Windows XP/Vista compatible PC.

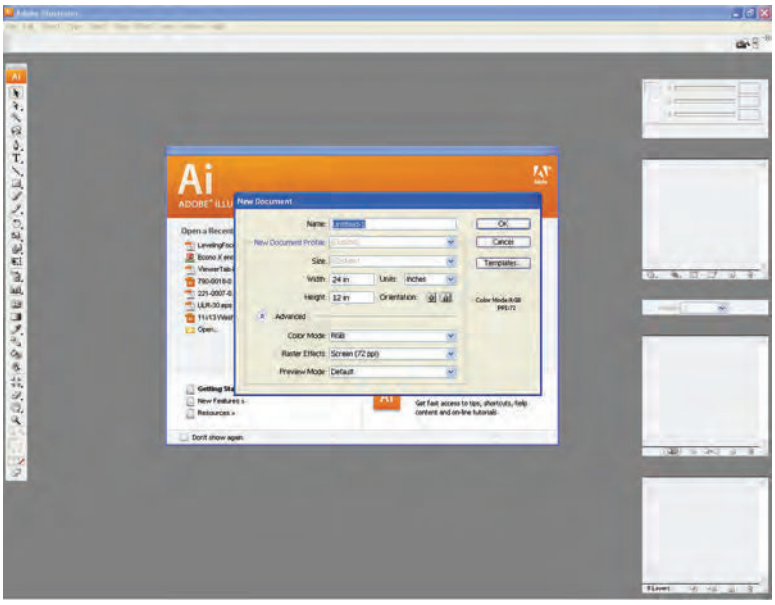
- Illustrator CS3 Preferences box will open.



2. Select FILE CREATE NEW BASIC RGB DOCUMENT.

- The new document options box will open. Make the following settings:

a. Set Units to inches.
b. Set the Height and Width to match the size of your laser system's work table.
c. Set the Color Mode to RGB.
d. Click "OK".



Part 2: Setting the Stroke

1. Next, change the weight of your Stroke to 0.001" (0.025 mm). This is essential for vector cutting and scoring.

Part 3: Editing the Swatch Palette

1. Open your Swatch Palette as follows:
   - Main Menu → Window → Swatches → Left Click "OK"
   - Delete all swatches that are not basic RGB or gray scale by left clicking to select them and then clicking the "Delete Swatch" garbage can icon is the lower right-hand corner of the swatch box. Keep RGB BLACK, RED, GREEN, BLUE, YELLOW, MAGENTA, CYAN.
   - If you wish to use the color ORANGE for full palette cutting and engraving operations, you can create a swatch for it using the following settings:

     R = 255

     G = 102

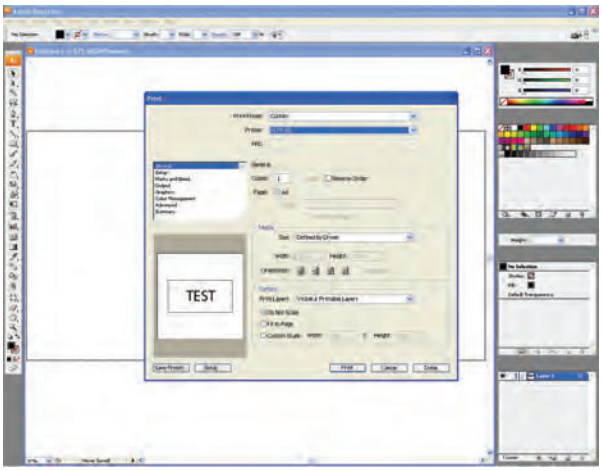
     B = 0

Part 4: Saving the Template

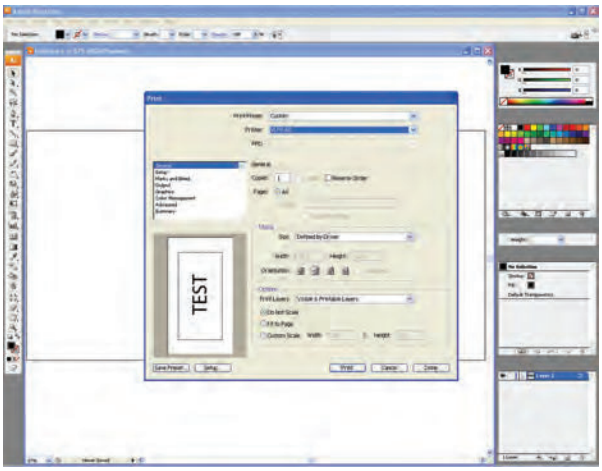
1. Illustrator CS3 is now correctly configured to work with your Universal Laser System. Be sure to save the document as a template for future documents as follows:
   - FILE → SAVE AS TEMPLATE → (ENTER FILE NAME) → CLICK "OK"

Part 5: Some notes about printing

1. When you are ready to print to your laser system, disregard the print preview dialog box and select the following from the Main Menu:
   - FILE → PRINT → SETUP → PREFERENCES



2. Prepare the file for printing using the Universal Laser System print driver.
3. When your settings are complete, choose print. The image in the print preview box will appear sideways, but the placement of your images will be correct.



4. Print as usual from the Universal Laser System Universal Control Panel.

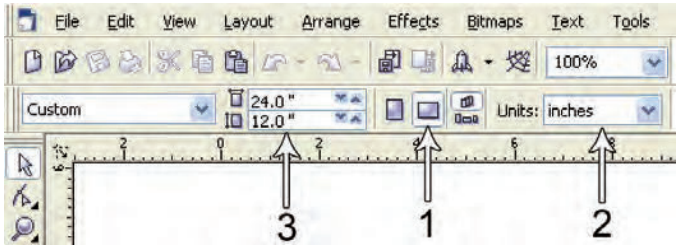
CorelDRAW X3 or X4

Note: CorelDRAW X3 or X4 is compatible with Windows XP and Windows Vista. We also suggest not running it with Windows 95/98. Therefore, we have only included setup instructions for Windows XP and Windows Vista.

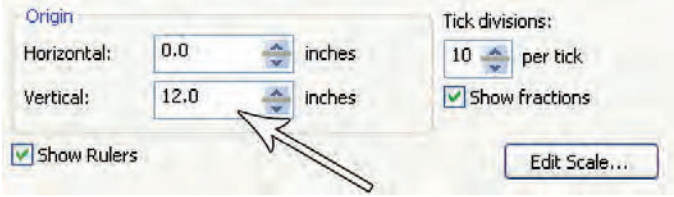
1. Make sure that you have installed all Service Packs and software patches from Microsoft. Please contact Microsoft if you have any questions regarding these upgrades. ULS is not responsible for any problems as a result from the usage of these patches.
2. If you have not already done so, install CorelDRAW on your computer, but do not open it yet.
3. It is important that your version of CorelDRAW is updated with the latest patches and service releases. For the latest patches and updates go to CorelDRAW's website at www.corel.com. Please contact CorelDRAW if you have any questions regarding these upgrades. ULS is not responsible for any problems as a result from the use of these patches.
4. The ULS Windows Printer Driver must be loaded before continuing. Please refer to the Installation and Setup Guide for your specific laser system, starting on page 200, for instructions on installing the driver. If you have already installed the printer driver, you will need to re-insert the Software Installation CD-ROM back into your CD drive at this time.
5. Using Windows Explorer, locate the file named "ADVANCED COLOR PALETTE.CPL" and "MD COLOR PALETTE.CPL" in the folder named "Color Palette" on the Software Installation CD-ROM and copy these files over to the C:\Program Files\Corel\Corel Graphics SUITE X3 (13)\Languages\EN\Custom Data\Palettes folder or C:\Program Files\Corel\Corel Graphics SUITE X4 (14)\Languages\EN\CustomData\Palettes folder.

   Note: ADVANCED COLOR PALETTE.CPL may not show up with a .CPL file extension. It may be listed as ULS with "Control panel extension" shown as a detail.

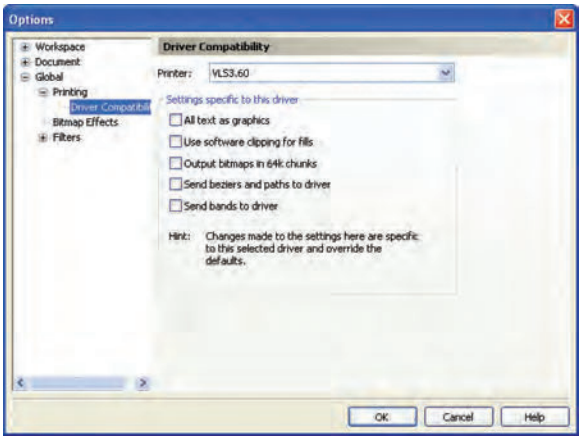
6. Open CorelDRAW and start a new graphic.
7. In the main menu at the top of the screen, click on "Window," then "Color Palettes" and then click on "None." Once again click on "Window," then "Color Palettes" and then click on "Open Palette."
   - If you have a VLS2.30, 3.50, 3.60, 4.60 or 6.60, double-click on "MD COLOR PALETTE.CPL." The color palette will now appear on the right side of the screen.
   - If you have a PLS3.75, 4.75, 6.75, 6.150D or ILS9.150D, 12.150D, double-click on "ADVANCED COLOR PALETTE.CPL." The color palette will now appear on the right side of the screen.
8. On the property bar, click on the landscape orientation (1). If you would like the drawing units in metric, choose millimeters from the drop down list (2). Now type in the page width and height that matches your laser system (3).



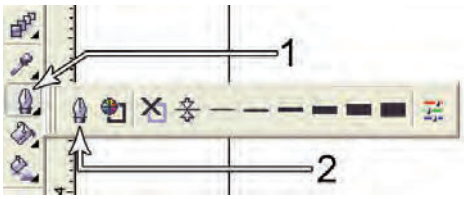
9. Now you need to adjust the vertical ruler on the left side of the screen to match the rulers in the laser system. Double-click directly on the vertical (side) ruler. The "Options" dialog box will appear. In the vertical origin box, type in the same height value as you did when you set up the page height in the previous step. For example, 12 inches (305 mm) for a VLS3.60. If you would like the scale to be displayed in tenths, choose "10 per Tick" in the "Tick Division" drop-down list box.



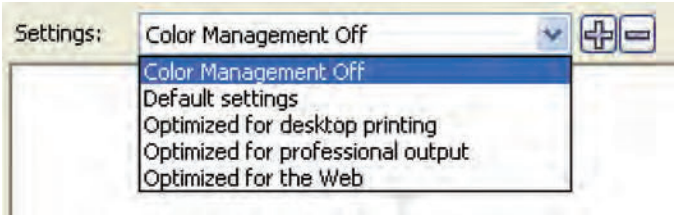
10. While still in the "Options" dialog box, double-click on "Global" to expand the list. Double-click on "Printing" to expand the list. Now click on "Driver Compatibility." Make sure that the laser system name is displayed in the printer drop-down list. In the "Settings specific for this driver" dialog box, make sure that ALL the check boxes are UNCHECKED. Now click on "OK" to close the "Options" dialog box.



11. Click on the outline tool (1), then the outline pen (2) in the flyout. With "Graphic" being the only one selected, click "OK." Click the down arrow in the Color dropdown box to expand the list and click on the color red. Click the down arrow in the "Width" dropdown box to expand the list and click "Hairline." The units can be "Inches," "millimeters" or anything else you prefer. Click OK to close the Outline Pen dialog box.



12. In the top menu, click "Tools" and then click "Color Management." Click on the down arrow to expand the "Settings" dropdown list. Click "Color Management Off" and then click "OK."



13. Finally, at the top of the screen, click on "Tools," then "Save settings as Defaults."

14. The setup defaults for CorelDRAW X3/X4 are now complete. Whenever you start a new document, all of the default settings that you set up will automatically apply to the new document.

Remove the Software Installation CD-ROM from your CD-ROM drive and store it either back into its sleeve or in a safe place.

General Software Set-up

There are many software programs that you can purchase off-the-shelf that will work with the laser system. Some of them can access more features of the laser system than others may. Whichever program you choose, it must be set up to work with the laser system, otherwise unexpected results may occur. Use the following GENERAL guidelines when configuring your software program.

Page Setup

To properly generate and position artwork, most graphics software will permit the customization of the page size and orientation. Set the page orientation in the graphics software to Landscape and the page size to match the maximum engraving area of your laser system. The driver's orientation and page size MUST then be set to match these specifications EXACTLY, otherwise the artwork may not print correctly. When setting page orientation and driver orientation to Landscape mode, the laser system will operate in the horizontal direction, left to right. If page orientation and driver orientation is set to Portrait mode, the laser system will operate in the vertical direction, front to back. The laser system is designed to operate best in the Landscape mode and this orientation is highly recommended. The page size may also be reduced to match the size of the engraving material, but remember to adjust the page size in the driver to correspond to the graphics software's page size. Note that in production situations it is often more efficient to leave the page size at its maximum page size and engrave or cut more than one object at a time. This is accomplished by duplicating the image on screen as many times as possible to fill up the entire page.

Ruler Setup

Usually the graphics software will provide on-screen rulers, which can be configured to match the rulers in the laser system. Using rulers in the software and matching them with the ones provided in the laser system optimizes the alignment of the graphic on the screen with the material in the laser system. For now, assume that the laser system's origin is fixed in the upper left corner of the engraving area and cannot be altered. Later on you will learn how to relocate the origin. Change the ruler position on screen to match the laser system with the origin (0,0) in the upper left corner. It is also possible to use a page size smaller than the maximum engraving area. For example, if you desire an 8-inch (203.2 mm) x 10-inch (254 mm) page size, set this page size in the graphics software as well as in the printer driver. The laser system will automatically move the engraving area to the origin, so place the object all the way up into the left-hand corner against the rulers in the laser system.

Power Control through Color Selection

The laser system allows the use of eight different colors to access eight different power settings when cutting and engraving. When using this power change feature, the driver colors used MUST exactly match the colors listed in the driver. The colors are black, red, green, yellow, blue, magenta, cyan and orange. Some programs will provide pre-defined basic colors and other programs may require the creation of each of the colors by defining them in RGB. If you are using CorelDRAW, we have made our own custom palette and placed the file on the Software Installation CD-ROM. Please refer to the software setup instructions for your specific version of CorelDRAW. If you are using other graphics software and need to mix your own colors, use the chart below to create them.

		RED (R)	GREEN (G)	BLUE (B)
COLORS	BLACK	0	0	0
	RED	255	0	0
	GREEN	0	255	0
	YELLOW	255	255	0
	BLUE	0	0	255
	MAGENTA	255	0	255
	CYAN	0	255	255
	ORANGE	255	102	0

If using a color other than the exact colors listed above, the driver will attempt to match it to a color in the driver that it most closely resembles. The driver will then use that color's power setting and apply a halftone pattern to represent the original color's shade. For example, if using a color like pink to fill a rectangle, the driver takes a reading of the percentage of different colors used to create that color and will use the power setting assigned to one of the eight colors of the driver that it most closely resembles. It might be expected that the driver will use the power setting assigned to the color red, but instead the driver may choose the magenta setting and halftone the rectangle as a representation of the pink color's lighter shade. To prevent the incorrect assignment of laser power, be sure to use the correct colors. If using graphics with colors other than the eight listed above or to simplify the assignment of power settings, try using the Clipart Mode feature in the driver. This feature will cause the system to only use the power setting assigned to the color black and halftone all of the other colors.

Outlines and Fills

The driver distinguishes between raster mode (engraving) and vector mode (cutting) by the type of graphic artwork being used. All graphics, other than outlines of very thin line widths will be interpreted as engraved images and the raster mode will be used for output. If laser cutting is desired, set the line thickness of the lines that are drawn in the graphics software to 0.001 inches (0.025 mm) or the smallest possible line thickness available. The printer driver will interpret these objects as vectors and will cut them out providing that your software has the capability of vector output. Basically, all software programs have the ability to provide raster output. However, not all programs have the ability to provide vector output even if you set the line width to the smallest thickness possible. Check page 61 of this guide for software that can vector output. The use of color fills or bitmaps will cause the laser system to engrave. The combination of engraving and cutting is available in most graphics software. We suggest that when combining engraving and cutting objects, use different colors for the fills and outlines since engraving requires different power settings than cutting objects. One thing to keep in mind when creating cutting objects is that if the outline thickness is set too thick, the driver might interpret the outline as a filled object and will engrave the outline instead of vector. This might be desirable if engraving thick outlines is necessary. The outline thickness at which the driver will interpret cut lines as filled objects is dependent on the software used. Usually, any line thickness 0.008 inches (0.2 mm) or greater will engrave. The only way to determine the cross-over point for line thickness is to experiment with different line widths. Software programs that do not have outline capabilities definitely will not have the ability to cut.

Image Processing Order

When cutting or engraving a graphic image, the laser system will perform all engraving first, and then proceed to vector cutting. Raster engraving will proceed in the exact order of the colors listed in the driver. For example, all black filled objects will engrave first, then all red filled objects, then all green filled objects and so on. When all engraved objects have been completed, the laser system will proceed to vector cut any outlines present in the artwork. Vector output order is dependent on the "Soft" feature of the printer driver. Refer to the printer driver controls for more details.

Overlapping Fills

If the artwork created has overlapping filled areas, the driver will automatically filter these fills to prevent the overlapped area from being engraved twice. This is similar to color separation in the printing industry. The entire filled area of the object on top will be engraved and only the visible part of the underlying filled area will be engraved. The final result is a what-you-see-is-what-you-get output. This way the color white can be used as an effective drawing tool. Since the laser system will not engrave the color white (this is the background color), it can be used to block out the undesired engraving areas of filled regions and/or bitmaps. However, you cannot use a white fill to cover an outline, the outline will vector cut even though you cannot see it on screen.

Overlapping Outlines

The driver does not filter outlines that overlap each other. If you are placing one outline on top of another, both outlines will be cut by the laser system. This is a useful feature that will allow deeper cutting by passing the laser over a single outline path twice or more. To take advantage of this feature, duplicate the outline on top of itself.

Hidden Vector Lines in Artwork

The driver does not automatically filter out outlines that are overlapped by engraved objects such as fills. If there are filled objects with some hidden outlines underneath, the laser system will engrave the fill and cut the hidden outline on top of the fill. This is a common occurrence when using pre-drawn clipart designed for laser printers. To prevent this from happening, turn on the Clipart Mode feature in the driver. This feature disables the cutting mode and converts all visible outlines to engraved objects and ignores all hidden outlines.

Speed Optimizing

It is advantageous to engrave an object in its longest direction because total engraving time will be reduced when the motion system has to make fewer stops and starts. If the engraving object is taller than it is wide, rotating the graphic 90 degrees and placing the material in the laser system sideways can achieve a greater engraving speed. Be aware that some graphics programs do not allow the rotation of bitmaps. In this case, it may be necessary to use a bitmap image processing software to first rotate the bitmap before importing the bitmap into the graphics program. If the artwork contains engraved objects of the same color with a great deal of space between them in the engraving direction, processing time can be longer since the laser must make long strokes to engrave both objects at the same time. To reduce engraving time in cases like these, use different colors for each of the objects, but assign the same power setting to both colors. This will cause the laser to engrave one object at a time, skipping over all blank space, which in many cases will reduce engraving time. On the other hand, if the objects are relatively close together in the engraving direction, then leave them the same color because it will be quicker to engrave them both at the same time. Experiment with these techniques to optimize the speed of engraving.

Bitmapped / Scanned Images

There are primarily three types of bitmaps available: monochrome (black and white), grayscale and color. Bitmaps are patterns of dots (pixels) blended to form pictures. Scanning artwork into a computer through a scanner creates most bitmaps. Drawing them in a bitmap image-processing program creates others.

The laser system can print all three types of bitmaps providing that either the driver or the bitmap image-processing program converts the grayscale and/or color bitmaps into a monochrome bitmap. Essentially, the laser system is a monochromatic printer, either it fires the beam to burn a dot or it does not fire the beam to leave an empty dot on the material.

There are several different bitmap storage formats available: TIF, JPG, BMP, PCX and others. The format makes no difference to the laser system. The difference in formats involves how they are stored on your computer's hard disk. Bitmaps cannot be edited in most graphics software. Some basic functions such as cropping, scaling or mirroring might be possible. It is usually necessary to use a bitmap image processing software to perform a dot by dot editing, rotation or scaling of the bitmap.

Monochrome Bitmaps

If you scan the image in monochrome (black and white) mode, set your scanner to at least 600 DPI. The higher the DPI, the smoother the image will be. Scanning monochrome images at 300 DPI is the minimum recommended resolution, but scanning them at 600 DPI will provide a significant improvement in image quality. You can either print the image directly from your bitmap image processing program or import the bitmap into a graphics program and print it from there. Monochrome bitmaps are engraved in the same manner as black filled text. The black area will turn the laser on and the white area turns the laser off.

Grayscale Bitmaps

When scanning an image in grayscale mode, you should scan the image at no more than 300 DPI. Scanning at a higher DPI does not improve image quality and it consumes more memory and will take longer to print. Grayscale images cannot be printed directly to the laser system. Since the laser system actually works like a black and white printer, grayscale images must be converted into black and white images. To do this, the driver will do it automatically or you can convert the grayscale image to a black and white image in your bitmap image-processing program.

The two primary grayscale image conversion techniques are Halftone or Error Diffusion. The printer driver can print either one and it is selected in the driver under the Raster Sub-Tab. Please refer to the printer driver section for more details on how to set these parameters. Since the driver has a fixed method of conversion,

you may want to experiment by using your bitmap image-processing program to make the conversion. These software programs usually have more options for controlling the size, angle, shape and the amount of black and white dots (pixels) created when converting the image. Experiment with all of the controls to see which looks the best. Big dots look good on some materials and small dots look better on others. Once the image is converted by your program, save and print it directly from that program or import it into your graphics program and print it. Essentially, a Halftone image and an Error Diffusion image are monochrome images and can be treated as such. If you decide not to convert the grayscale image to a monochrome image in your bitmap image editing program, then the driver will do it automatically and will use settings based on the Resolution settings in the driver.

Color Bitmaps

The printer driver handles color bitmaps the same as grayscale bitmaps. Since color bitmaps use more memory, they are unnecessary and therefore **not** recommended, however, you can still use them.

Encapsulated Postscript (EPS) Images

Bitmap images cannot be cut by the laser system, only engraved. The only way to have the laser system cut out or vector a bitmap is to first convert it to a vector file format such as an EPS. Raster to vector conversion programs are available that trace the bitmap (this only works well with monochrome bitmaps) and create a separate EPS vector file. These EPS files can then be imported into the graphics program and printed out from there. Since tracing programs have many adjustments, some practice may be necessary to produce desirable results.

The laser system does not support Encapsulated PostScript (EPS) printing directly. EPS files can only be edited and printed if they are first imported into a graphics program. However, since EPS files support engraving and cutting objects, they are useful for transferring artwork from one graphics program to another. Once an EPS file has been imported into a graphics program, the objects can be outlined, stretched, rotated, mirrored, filled with different colors or anything else desired as long as your graphics software can edit EPS images. Be careful when using EPS files in layout software as opposed to true graphics software. Layout software may allow the placement of EPS files in the artwork, but may not actually import and convert the EPS file to a useful format for the printer driver and therefore may not print correctly. Please refer to your graphics softwares documentation on whether or not it can edit and print EPS images to a non-Postscript printer.

Postscript (PS) Images

The laser system is **not** a postscript device. This means that postscript fills, postscript textures and especially **Postscript fonts will not** be able to print to the laser system. Sometimes using Adobe Type Manager (ATM) will allow postscript fonts to print correctly, but the majority of the time it does not work properly.

Helpful Tip

If you are having any problems printing a font and you cannot figure out what is going on, select the font and “convert to curves” or “convert to paths” in your graphics software. This will convert the font into a bitmapped image and will print correctly to the laser system. Refer to your graphics software on how to convert fonts. However, postscript textures and postscript fills cannot be converted and will not print to the laser system.

Section 5

Material Settings Guide

This section provides sample driver settings and helpful hints to get started engraving and/or cutting the materials listed.

Safety

NEVER LEAVE THE LASER SYSTEM RUNNING UNATTENDED FOR ANY REASON. Exposure to the laser beam can cause ignition of combustible materials. All laser cutting and engraving should be constantly supervised.

NEVER OPERATE THE LASER SYSTEM WITHOUT A PROPERLY INSTALLED AND OPERATING EXHAUST SYSTEM. Some materials when cut or engraved can produce fumes that are hazardous in concentrated amounts. Also make sure that your room is adequately ventilated as some materials will continue to produce fumes for several minutes to possibly hours after the cutting or engraving process has been completed. Since many materials can produce toxic and possibly caustic fumes or residue, it is advisable to obtain the Material Safety Data Sheet (MSDS) from the materials manufacturer. The MSDS discloses all of the hazards when handling or processing that material. The law requires all manufacturers to provide this information to anyone who requests it.

DO NOT ENGRAVE OR CUT PVC (Polyvinylchloride) BASED MATERIALS. The fumes are extremely toxic if you inhale them. The fumes are so caustic that it can chemically destroy the metal parts of the laser system. Damage to the laser system from this type of abuse **ARE NOT** covered under warranty.

DO NOT ENGRAVE OR CUT UNCOATED METALS OR REFLECTIVE SURFACES. The laser beam can reflect off of these materials causing damage to the laser system as well as being a safety hazard. Damage to the laser system from this type of abuse **ARE NOT** covered under warranty.

This section is provided as reference only. The suggested settings that follow are guidelines. Your actual settings will vary especially if your material thickness is different form the values listed in the tables. Consult our material samples in the lab and do your own test cuts before committing to final cuts/engraving. You might waste a lot of time. When in doubt— ask your instructor for assistance. It's advised that you keep notes on your successful settings for your projects.

If you experience poor cut quality (insufficient cut depths) either your UCP settings are not appropriate OR the laser lens has become dirty and needs to be cleaned (done by the instructor) OR the mechanical alignment of the beam is not correct and needs to be adjusted (done by the instructor).

- Laser engraving or cutting materials other than those described in this manual can be a safety hazard and can damage the laser system.
- Damages to the laser system due to neglect, misuse, or operator error ARE NOT covered under warranty.
- Damage to the laser system due to an inadequate or improper operating environment is considered abuse and **ARE NOT** covered under warranty.
- In no event will ULS be liable for any damages caused, in whole or in part, by customer, or for any economic loss, physical injury, lost revenue, lost profits, lost savings or other indirect, incidental, special or consequential damages incurred by any person, even if ULS has been advised of the possibility of such damages or claims.

Materials

There are many variables that can affect the cutting and engraving process such as differences in the thickness of the material, density of the material, composition of the material, and the manufacturing processes used to make the material.

Please use these settings as a guideline or starting point, in most cases these settings should work out well, but sometimes may have to be adjusted to produce desirable results.

PRINTER DRIVER SETTING TIPS

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. Has no effect on running time and very little effect on depth.
- 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. Very low settings are used to perforate the material.

Rule of Thumb
- 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.

NOTE

When engraving very small objects, top speed cannot be achieved because acceleration and deceleration of the motion system requires time and distance. The laser system will automatically adjust itself to a maximum engraving speed that it can achieve due to the size and position of the graphic. This is why you might notice that there might be no difference in engraving time on certain graphics whether you choose 100% speed or less.

The following materials were tested with the laser system set at an Image density of 5 and in Single Beam mode using one laser (except where noted otherwise). The following pages will fully describe the results of these tests and will offer helpful hints when choosing materials, setting parameters, and using different techniques to provide the best laser cutting and engraving results.

If your system is equipped with two lasers, total the power of the two lasers and refer to the charts. For example, if you have two 30-watt lasers, refer to the settings of a single 60-watt laser. If the total wattage is more that the charts show, then refer to the setting of one laser and either reduce the power setting in half or double the speed (if speed is 50% or less). If you are using a SuperSpeed, and running in Dual Beam mode, use the settings of the wattage of one laser.

Please use these settings as a guideline or starting point, in most cases these settings should work out well, but sometimes may have to be adjusted to produce desirable results.

ACRYLIC - CAST AND EXTRUDED

ACRYLIC – MIRRORED

ALUMINUM – ANODIZED
BRASS – PAINTED

CORK

CORIAN / AVONITE / FOUNTAINHEAD

DELRIN (SEAL PRESS)

GLASS / CRYSTAL

LEATHER

MARBLE

MAT BOARD

MELAMINE

PLASTIC – MICROSURFACED

RUBBER STAMPS

VINYL – SIGN (3 MIL)

WOOD / WOOD INLAY

ACRYLIC - CAST AND EXTRUDED

LIGHT RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	53	100	500	1	.002”
30	44	100	500	1	.002”
35	38	100	500	1	.002”
40	34	100	500	1	.002”
45	30	100	500	1	.002”
50	27	100	500	1	.002”
55	24	100	500	1	.002”
60	22	100	500	1	.002”

DEEP RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	100	60	500	1	.010”
30	100	64	500	1	.010”
35	100	68	500	1	.010”
40	100	73	500	1	.010”
45	100	77	500	1	.010”
50	100	81	500	1	.010”
55	100	86	500	1	.010”
60	100	90	500	1	.010”

VECTOR ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	6	4.0	1000	1	.005””
30	5	4.0	1000	1	.005””
35	4	4.0	1000	1	.005””
40	3	4.0	1000	1	.005””
45	3	4.0	1000	1	.005””
50	3	4.0	1000	1	.005””
55	2	4.0	1000	1	.005””
60	2	4.0	1000	1	.005””””

VECTOR CUTTING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	100	0.1	1000	1	.25”
30	100	0.4	1000	1	.25”
35	100	0.6	1000	1	.25”
40	100	0.9	1000	1	.25”
45	100	1.2	1000	1	.25”
50	100	1.5	1000	1	.25”
55	100	1.7	1000	1	.25”
60	100	2.0	1000	1	.25”

COMMENTS

There are two types of acrylic available, cast and extruded. Cast turns white or frosted and extruded remains clear when engraved. Use extruded acrylic for paint filled engraving and cast for regular engraving. Cast engraves better without masking. Lightly engrave the surface to frost it with a low power setting such as the first setting listed above. If deep engraving is desired, it is necessary to mask the acrylic with transfer tape to prevent the smoke from damaging the clear surface of the acrylic. However, another problem with deep acrylic engraving is that the intense heat creates a white, crusty, deposit that accumulates along the edges of the area that was just engraved and is impossible to remove without causing damage. Engraving lightly and without masking seems to be the better all around alternative.

If only cutting acrylic, extruded works better and is less expensive than cast. The cut edges of extruded acrylic will appear to be more highly polished and clearer than cast acrylic when laser cut. When cutting acrylic, it might be necessary to remove both sides of the original masking and re-mask with transfer tape if cutting through the original masking produces flaming. The original masking is coated with wax and will not absorb water. If cutting through very thick acrylic, re-mask both sides with transfer tape and dampen the masking on both sides of the acrylic with water from a spray bottle. Elevate the acrylic off the table at least 1/2 inch, re-focus, and then proceed to cut. Elevating the acrylic will allow the beam to completely pass through the material which allows the smoke and heat to escape from underneath. If cutting directly on the engraving table, the trapped heat might cause the bottom edge of the cut to pit and distort. Re-masking and dampening with water will act as a heat sink to pull the laser heat away from the cutting area resulting in less distortion or heat affected zones (HAZ). When dampening, be sure not to leave puddles of water. Puddles of water will reduce cutting depth significantly. For the best results when combining engraving and cutting on the same piece, first engrave lightly and unmasked. Then mask with transfer tape, dampen, elevate, re-focus, and cut as a second step.

Paint filling the engraved area is possible by first masking the acrylic or leave on the original masking then engraving through the masking. Before removing the masking, brush or spray on some acrylic based or water based paint right on to the masking. When the paint is dry, remove the masking and the paint will remain in the recessed area of the engraving. Remember to use extruded acrylic when paint filling and cast acrylic when simply engraving.

Acrylic is extremely flammable. Do not leave the laser system unattended when cutting or engraving.

ACRYLIC - MIRRORED

LIGHT RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	58	100	500	1	.003”
30	49	100	500	1	.003”
35	43	100	500	1	.003”
40	40	100	500	1	.003”
45	35	100	500	1	.003”
50	32	100	500	1	.003”
55	29	100	500	1	.003”
60	27	100	500	1	.003”

DEEP RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	100	60	500	1	.010”
30	100	64	500	1	.010”
35	100	68	500	1	.010”
40	100	73	500	1	.010”
45	100	77	500	1	.010”
50	100	81	500	1	.010”
55	100	86	500	1	.010”
60	100	90	500	1	.010”

VECTOR ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	6	4.0	1000	1	.005””
30	5	4.0	1000	1	.005””
35	4	4.0	1000	1	.005””
40	3	4.0	1000	1	.005””
45	3	4.0	1000	1	.005””
50	3	4.0	1000	1	.005””
55	2	4.0	1000	1	.005””
60	2	4.0	1000	1	.005””””

VECTOR CUTTING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	100	0.1	1000	1	.25”
30	100	0.4	1000	1	.25”
35	100	0.6	1000	1	.25”
40	100	0.9	1000	1	.25”
45	100	1.2	1000	1	.25”
50	100	1.5	1000	1	.25”
55	100	1.7	1000	1	.25”
60	100	2.0	1000	1	.25”

COMMENTS

Engraving mirrored acrylic is similar to engraving regular acrylic. The idea is to engrave through the mirrored backing enough to begin to penetrate into the acrylic. Engraving deeply will cause a crusty residue to form just like with non-mirrored acrylic. A double image will appear if engraving on the front side of the mirror. It is not necessary to mask the backside when engraving because the mirrored backing shields the acrylic from smoke damage. To cut mirrored acrylic, it might be necessary to remove all original masking, re-mask with transfer tape, and dampen the tape with water from a spray bottle. Next, place the acrylic in the laser with the mirrored surface facing upwards and elevate at least 1/2 inch above the table. The laser beam will not reflect off of the mirrored surface because it is absorbed by the acrylic first. Sometimes cutting the acrylic from the backside will cause the mirrored backing to distort and crack from the intense heat required to cut. If the combination of engraving and cutting is desired, our suggestion is to engrave the backing, unmasked, remove the acrylic, mask both sides with transfer tape, flip the acrylic over, dampen, elevate, re-focus, and cut from the front side. When paint filling the engraved area, make sure to use an acrylic-based paint or paint that does not contain acetone or alcohol, as these chemicals will crack the acrylic. Water based paints also work very well. Since the mirrored backing serves as a masking, it is not necessary to mask the backside before engraving.

Acrylic is extremely flammable. Do not leave the laser system unattended when cutting or engraving.

ANODIZED ALUMINUM

RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	72	100	500	1	.001”
30	60	100	500	1	.001”
35	52	100	500	1	.001”
40	45	100	500	1	.001”
45	40	100	500	1	.001”
50	36	100	500	1	.001”
55	32	100	500	1	.001”
60	30	100	500	1	.001”

VECTOR ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	12	4.0	1000	1	.001”
30	10	4.0	1000	1	.001”
35	9	4.0	1000	1	.001”
40	8	4.0	1000	1	.001”
45	7	4.0	1000	1	.001”
50	6	4.0	1000	1	.001”
55	5	4.0	1000	1	.001”
60	4	4.0	1000	1	.001”

COMMENTS

There is a process called Laser Color Marking, which enables the color filling of anodized aluminum. First, coat or spray the aluminum with a clear acrylic finish. After the finish has thoroughly dried, laser engrave the graphic onto the aluminum. Then take a water based marker, such as those found in an art supply store, and swab on the ink into the engraved area. You can actually see the ink get absorbed into the engraved area but not the unengraved area. The ink will appear lighter in color because the white engraved area tends to lighten the shade. Use a darker tint marker to compensate for the lighter effect. Wipe off the excess with a soft, lint free cloth. Finish the piece by applying another coat of clear acrylic finish and let dry.

DO NOT ATTEMPT TO ENGRAVE DEEPLY OR ATTEMPT TO CUT THIS MATERIAL WITH THE LASER SYSTEM. High Power and low Speed settings can cause the laser beam to reflect off of this material, which can damage the laser system and can be a safety hazard. Damage caused by this type of abuse **ARE NOT** covered under warranty.

ENGRAVING THIS MATERIAL PRODUCES ABRASIVE PARTICLES. Clean the laser system more frequently to reduce wear and tear on the motion system components and optics. Damage to the laser system from inadequate or insufficient maintenance **ARE NOT** covered under warranty.

BRASS - PAINTED

RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	29	100	500	1	.001”
30	27	100	500	1	.001”
35	25	100	500	1	.001”
40	23	100	500	1	.001”
45	21	100	500	1	.001”
50	19	100	500	1	.001”
55	17	100	500	1	.001”
60	15	100	500	1	.001”

VECTOR ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	6	4.0	1000	1	.001”
30	5	4.0	1000	1	.001”
35	4	4.0	1000	1	.001”
40	3	4.0	1000	1	.001”
45	3	4.0	1000	1	.001”
50	3	4.0	1000	1	.001”
55	2	4.0	1000	1	.001”
60	2	4.0	1000	1	.001”

COMMENTS

The manufacturing process for coated brass varies from one vendor to another. Some manufacturers do not polish the brass before coating it. Since CO_2 lasers at this power level do not engrave into metals when the coating is removed, the tarnished brass underneath will have a dull appearance that will need to be polished with a brass polishing compound. This type of brass is designed for mechanical engravers that actually remove the metal when engraving which gives the brass a shine without polishing. Brass that is produced for the laser engraving industry is polished, then clear coated, and finally coated with paint. When laser engraving this type of material, adjust the power so that the laser beam removes the painted coating but not the clear coating. This will expose the polished, clear-coated brass without penetrating all the way down to the metal. Since the brass is already clear coated and polished, it will not require any cleanup after engraving nor will it ever oxidize. If too much laser power is used, the brass the clear coat will be removed and the brass underneath will be exposed to the heat of the laser beam causing instant tarnish. If polishing the brass, use a soft, non-abrasive cloth or tissue (not paper towels) and good quality brass polish. Do not rub too hard, as this will scratch the painted coating.

DO NOT ATTEMPT TO ENGRAVE DEEPLY OR ATTEMPT TO CUT THIS MATERIAL WITH THE LASER SYSTEM. High power and low speed settings can cause the laser beam to reflect off of this material, which can damage the laser system and can be a safety hazard. Damage caused by this type of abuse **ARE NOT** covered under warranty.

CORIAN / AVONITE / FOUNTAINHEAD

RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	100	44	500	1	.005”
30	100	53	500	1	.005”
35	100	61	500	1	.005”
40	100	70	500	1	.005”
45	100	79	500	1	.005”
50	100	88	500	1	.005”
55	100	95	500	1	.005”
60	100	100	500	1	.005”

DEEP RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	100	13	1000	1	.015”
30	100	15	1000	1	.015”
35	100	18	1000	1	.015”
40	100	20	1000	1	.015”
45	100	23	1000	1	.015”
50	100	26	1000	1	.015”
55	100	28	1000	1	.015”
60	100	30	1000	1	.015”

VECTOR ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	60	4.0	1000	1	.010”
30	50	4.0	1000	1	.010”
35	43	4.0	1000	1	.010”
40	38	4.0	1000	1	.010”
45	34	4.0	1000	1	.010”
50	30	4.0	1000	1	.010”
55	27	4.0	1000	1	.015”
60	25	4.0	1000	1	.015”

COMMENTS

If paint filling, mask the material first, then engrave through the masking. In this way, when ready to paint fill, the material is already masked. Spray painting seems to be the easiest. Use the paint sparingly. Excess paint can accumulate on the edges of the engraving, which will make mask removal difficult and leave unsightly ridges. It is best to apply several lighter coats than one heavy coat of paint. Remove the masking after the paint has dried.

ENGRAVING THIS MATERIAL PRODUCES ABRASIVE PARTICLES. Clean the laser system more frequently to reduce wear and tear on the motion system components and optics. Damage to the laser system from inadequate or insufficient maintenance **ARE NOT** covered under warranty.

CORK

RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	80	38	500	1	.010”
30	80	45	500	1	.010”
35	80	52	500	1	.010”
40	80	60	500	1	.010”
45	80	67	500	1	.010”
50	80	75	500	1	.010”
55	80	84	500	1	.010”
60	80	90	500	1	.010”

VECTOR ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	12	4.0	500	1	.010”
30	10	4.0	500	1	.010”
35	9	4.0	500	1	.010”
40	8	4.0	500	1	.010”
45	7	4.0	500	1	.010”
50	6	4.0	500	1	.010”
55	5	4.0	500	1	.010”
60	4	4.0	500	1	.010”

VECTOR CUTTING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	60	1.6	100	1	.060”
30	50	1.6	100	1	.060”
35	43	1.6	100	1	.060”
40	38	1.6	100	1	.060”
45	33	1.6	100	1	.060”
50	30	1.6	100	1	.060”
55	27	1.6	100	1	.060”
60	25	1.6	100	1	.060”

COMMENTS

Cork is not very popular for engraving but it does engrave and cut nicely. Cork is mainly used for making gaskets by vector cutting the gasket patterns.

LASER CUTTING THIS MATERIAL CAN CAUSE FLAMING AND SPARKING. Use caution when attempting to cut this material. It would be better to use a longer focal length lens to prevent the lens from being damaged during processing. **NEVER** leave the machine unattended while processing any material. Damages caused by processing any material **ARE NOT** covered under warranty.

DELRIN

RASTER ENGRAVING

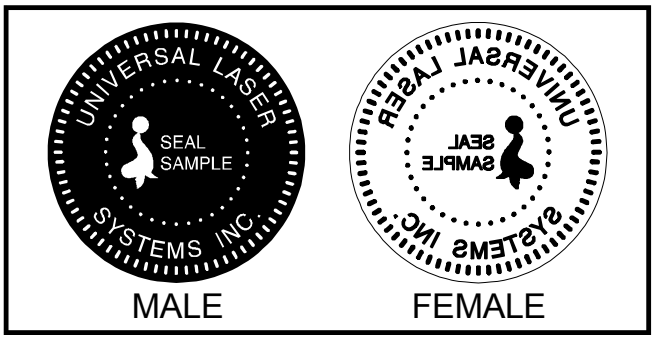
LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	100	22	500	1	.015”
30	100	26	500	1	.015”
35	100	30	500	1	.015”
40	100	35	500	1	.015”
45	100	39	500	1	.015”
50	100	44	500	1	.015”
55	100	48	500	1	.015”
60	100	52	500	1	.015”

VECTOR CUTTING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	75	2.0	200	1	.060”
30	75	2.4	200	1	.060”
35	75	2.8	200	1	.060”
40	75	3.2	200	1	.060”
45	75	3.6	200	1	.060”
50	75	4.0	200	1	.060”
55	75	4.4	200	1	.060”
60	75	4.8	200	1	.060”

COMMENTS

The laser system can be used to make dies for seal presses. It can engrave and cut out a typical Notary Seal in less than 5 minutes. Create the male with a white graphic and a black background. Mirror the image and invert it by making the background white and the graphic black. Add a .010 inch black outline to the graphic portion of the female side. This will give the greater clearance to the female side to prevent the paper from piercing through when the male side of the seal presses into the female side. Once the seal is made and fastened to the press, make several impressions onto 400-grit sandpaper to smoothen out the edges of the plastic. Make sure you turn the sandpaper over to get both sides of the seal.



WARNING

LASER CUTTING THIS MATERIAL CAN CAUSE FLAMING. Use caution when attempting to cut this material. Make sure that the flame does not come in contact with any part of the laser system. **NEVER** leave the machine unattended while processing any material. Damages caused by processing any material **ARE NOT** covered under warranty.

GLASS / CRYSTAL

RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	100	13	300	1	.001
30	100	15	300	1	.001
35	100	18	300	1	.001
40	100	20	300	1	.001
45	100	23	300	1	.001
50	100	26	300	1	.001
55	100	28	300	1	.001
60	100	30	300	1	.001

COMMENTS: Engrave at Image Density 4.

VECTOR ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	10	3.3	300	1	.001
30	10	4.0	300	1	.001
35	10	4.6	300	1	.001
40	10	5.3	300	1	.001
45	10	5.9	300	1	.001
50	10	6.6	300	1	.001
55	10	7.3	300	1	.001
60	10	7.9	300	1	.001

COMMENTS

Glass engraving is different from other types of engraving. A CO_2 laser cannot engrave into the glass nor can it cut glass. Instead, laser interaction with glass causes the surface of the glass to appear frosted. Sometimes, placing a piece of newspaper on the glass and dampening is with water will improve the appearance of the engraving. Another method is to apply transfer tape to the glass, wet it with water from a spray bottle, and laser engrave it. The transfer tape and water will act as a heat sink and pull the heat away from the glass as the laser system engraves it. This helps reduce chipping or flaking of the glass.

Be especially careful when engraving leaded crystal. The lead in crystal conducts heat, which can cause much more flaking or even the cracking of the crystal. Use a lower power setting to try to reduce the chance of damage. It is always good to have at least one extra piece to use as a test piece to get the right settings especially if you have never tried to engrave that material before.

ENGRAVING THIS MATERIAL PRODUCES ABRASIVE PARTICLES. Clean the laser system more frequently to reduce wear and tear on the motion system components and optics. Damage to the laser system from inadequate or insufficient maintenance **ARE NOT** covered under warranty.

LEATHER

RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	45	100	500	1	.001”
30	38	100	500	1	.001”
35	33	100	500	1	.001”
40	28	100	500	1	.001”
45	25	100	500	1	.001”
50	23	100	500	1	.001”
55	20	100	500	1	.001”
60	19	100	500	1	.001”

VECTOR ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	6	4.0	500	1	.001”
30	5	4.0	500	1	.001”
35	4	4.0	500	1	.001”
40	4	4.0	500	1	.001”
45	3	4.0	500	1	.001”
50	3	4.0	500	1	.001”
55	3	4.0	500	1	.001”
60	3	4.0	500	1	.001”

VECTOR CUTTING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	50	1.7	200	1	.1”
30	50	2.0	200	1	.1”
35	50	2.4	200	1	.1”
40	50	2.7	200	1	.1”
45	50	3.1	200	1	.1”
50	50	3.4	200	1	.1”
55	50	3.7	200	1	.1”
60	50	4.1	200	1	.1”

COMMENTS

Leather is a very simple material to engrave and most types of leather engrave very well with the laser system. Simulated leather engraves well also, but the results are not as nice as with the real thing. Engraving lightly will turn the surface of the leather dark brown giving it a high contrast in appearance. Try engraving at a light power setting first. If the result is not deep enough the job can be run again over the same spot. Experiment with different depths of engraving and note the results.

MARBLE

RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	100	35	500	1	.003”
30	100	42	500	1	.003”
35	100	48	500	1	.003”
40	100	55	500	1	.003”
45	100	62	500	1	.003”
50	100	69	500	1	.003”
55	100	77	500	1	.003”
60	100	82	500	1	.003”

VECTOR ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	24	4.0	500	1	.003”
30	20	4.0	500	1	.003”
35	17	4.0	500	1	.003”
40	15	4.0	500	1	.003”
45	13	4.0	500	1	.003”
50	12	4.0	500	1	.003”
55		4.0	500	1	.003”
60		4.0	500	1	.003”

COMMENTS

Most marble and polished stones will turn white when engraved. Masking is not necessary and light engraving works out better than heavy and deep engraving. Engraving deeply will cause a highly detailed image to appear washed out. The objective is to engrave deep enough to turn the marble white and provide a good contrast. Too much power can also cause the material to discolor and turn brown as if it were burned. Photographs look great when engraved on marble, especially darker marbles where the whiteness of the engraving really stands out. Avoid using marble that is very textured looking. The texture washes out the details of the engraving. Try to use uniformly colored marble and related stones. Marble can also be paint filled by using a wax based paint. Rub the paint on with a fingertip, let dry and then buff with a soft cloth. The paint will only adhere to the engraved surface and not the surrounding areas.

ENGRAVING THIS MATERIAL PRODUCES ABRASIVE PARTICLES. Clean the laser system more frequently to reduce wear and tear on the motion system components and optics. Damage to the laser system from inadequate or insufficient maintenance **ARE NOT** covered under warranty.

MAT BOARD

RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	72	80	250	1	.005”
30	60	80	250	1	.005”
35	52	80	250	1	.005”
40	45	80	250	1	.005”
45	40	80	250	1	.005”
50	36	80	250	1	.005”
55	32	80	250	1	.005”
60	30	80	250	1	.005”

VECTOR ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	24	4.0	250	1	.005”
30	20	4.0	250	1	.005”
35	17	4.0	250	1	.005”
40	15	4.0	250	1	.005”
45	13	4.0	250	1	.005”
50	12	4.0	250	1	.005”
55	11	4.0	250	1	.005”
60	10	4.0	250	1	.005”

VECTOR CUTTING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	60	3.2	200	1	.050”
30	50	3.2	200	1	.050”
35	43	3.2	200	1	.050”
40	38	3.2	200	1	.050”
45	34	3.2	200	1	.050”
50	30	3.2	200	1	.050”
55	27	3.2	200	1	.050”
60	25	3.2	200	1	.050”

COMMENTS

Mat board (thick cardboard) is an excellent material to use for architectural modeling and for picture framing. It cuts and engraves very neatly and cleanly. It comes in a variety of shades and colors. Patterns can be engraved on the surface with a power setting for light engraving, which just breaks through the very thin top layer and exposes the lighter colored underlying substrate. When engraving, a low PPI setting is used to prevent overexposure of the underlying substrate material, which causes excessive dark discoloration. Masking is not necessary on the top surface when engraving. When cutting, both sides might need to be masked and the material elevated above the engraving table. This will produce an extremely clean edge on both sides of the material.

MELAMINE - STANDARD ENGRAVING

LIGHT RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	100	25	500	1	.015”
30	100	30	500	1	.015”
35	100	34	500	1	.015”
40	100	39	500	1	.015”
45	100	44	500	1	.015”
50	100	50	500	1	.015”
55	100	55	500	1	.015”
60	100	59	500	1	.015”

DEEP RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	100	17	500	1	.020”
30	100	21	500	1	.020”
35	100	24	500	1	.020”
40	100	27	500	1	.020”
45	100	31	500	1	.020”
50	100	35	500	1	.020”
55	100	38	500	1	.020”
60	100	41	500	1	.020”

VECTOR ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	24	4.0	500	1	.010”
30	20	4.0	500	1	.010”
35	17	4.0	500	1	.010”
40	15	4.0	500	1	.010”
45	13	4.0	500	1	.010”
50	12	4.0	500	1	.010”
55	11	4.0	500	1	.010”
60	10	4.0	500	1	.010”

COMMENTS

Engraving melamine is very similar to engraving regular wood with the added benefit of a consistent surface finish and uniform base material composition. Unlike regular wood that has grain patterns and density variations, melamine, when laser engraved, produces a flat and even engraved area. This characteristic gives this material superior engraving and paint filling qualities. Masking can be used if desired but it is just as easy to spray the engraved area with water and wipe down with a chamois cloth to remove the smoke residue. Since the top surface material is consistent in texture and color, engraving photographs or highly detailed images produces exceptional results. Refer to the next example on engraving photographs and/or ClipArt.

MELAMINE - PHOTO/CLIPART ENGRAVING

RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	80	38	500	1	.008”
30	80	45	500	1	.008”
35	80	52	500	1	.008”
40	80	60	500	1	.008”
45	80	67	500	1	.008”
50	80	75	500	1	.008”
55	80	84	500	1	.008”
60	80	90	500	1	.008”

COMMENTS: Engrave unmasked. Use an Image Density of 5.

RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	80	25	500	1	.008”
30	80	30	500	1	.008”
35	80	35	500	1	.008”
40	80	40	500	1	.008”
45	80	45	500	1	.008”
50	80	50	500	1	.008”
55	80	56	500	1	.008”
60	80	60	500	1	.008”

COMMENTS: Engrave unmasked. Use an Image Density of 3.

COMMENTS

Engraving photographs can be challenging at first but becomes easier once there is an understanding of what to look for and how to achieve the desired results. In an image processing software, scan the image in at 300 DPI. Adjust the brightness and the contrasts to brighten the light colors and darken the dark colors. The photo might look better by using a sharpening filter to sharpen up the image slightly. The next step is to select a halftone pattern. Usually, imaging software gives the choice of using different halftone patterns including frequency of lines per inch and pattern angles. Use a line frequency above 20 and below 100. The size of the dots decreases as the line frequency increases. Experiment to see which pattern looks the best. Big dots look good on some materials and small dots look better on others. If it is not possible to assign a halftone pattern in the imaging software, the printer driver will automatically default to a predetermined pattern based on **Image Density**. When using the Clipart mode switch, which prints all Clipart or drawings as grayscale bitmaps, use the same parameters and techniques as for engraving photographs.

PLASTIC - ENGRAVERS MICROSURFACED

RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	29	100	500	1	.001”
30	27	100	500	1	.001”
35	25	100	500	1	.001”
40	23	100	500	1	.001”
45	21	100	500	1	.001”
50	19	100	500	1	.001”
55	17	100	500	1	.001”
60	15	100	500	1	.001”

VECTOR CUTTING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	60	1.2	150	1	.060”
30	50	1.2	150	1	.060”
35	43	1.2	150	1	.060”
40	38	1.2	150	1	.060”
45	34	1.2	150	1	.060”
50	30	1.2	150	1	.060”
55	27	1.2	150	1	.060”
60	25	1.2	150	1	.060”

COMMENTS

Laser engraveable plastic comes in many different colors, thickness, coatings, and surface textures. Most engravers plastic will engrave and cut well with the laser system as long as it is microsurfaced and formulated for laser engraving. Removal of large amounts of material will warp the plastic. You might need to tape it down or hold it down flat somehow to prevent it from curling as you engrave. Since these plastics have low melting point, a low PPI setting is used when cutting to reduce the possibility of melting. Masking and dampening with water also helps to reduce melting and keeps the plastic clear of smoke residue. Always remove the original clear masking from the plastic because it does not react well with the laser. Since there are so many types of engravers plastics, the only true way to find out if a particular brand and type will work well with the laser is to experiment. Use these power settings as a guideline for experimentation and adjust as necessary. Thicker top coated plastics are not recommended because it requires too much power to remove the material and the large amount of smoke created usually stains the substrate.

LASER ENGRAVING OR CUTTING PLASTIC CAN IGNITE THE MATERIAL. Never leave the laser system running unattended for any reason.

RUBBER STAMPS

RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	100	10	500	1	.030”
30	100	12	500	1	.030”
35	100	14	500	1	.030”
40	100	16	500	1	.030”
45	100	17	500	1	.030”
50	100	20	500	1	.030”
55	100	22	500	1	.030”
60	100	23	500	1	.030”

PERFORATED VECTOR CUTTING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	60	1.3	90	1	.040”
30	60	1.6	90	1	.040”
35	60	1.8	90	1	.040”
40	60	2.1	90	1	.040”
45	60	2.3	90	1	.040”
50	60	2.6	90	1	.040”
55	60	2.9	90	1	.040”
60	60	3.1	90	1	.040”

COMMENTS

To create a rubber stamp, use the Rubber Stamp Mode the printer driver. In the above example, only one pass is necessary to achieve a deeply engraved rubber stamp. When cutting out the rubber stamp, we recommend using a very low PPI setting. This setting spreads the laser pulses far enough apart that they just touch at the edges. The result is a perforated cut that allows the rubber stamp to remain attached to the entire sheet but easily removed by simply tearing it off. The advantage to this is that the possibility of distortion or melting while cutting is virtually eliminated and the entire sheet of rubber stamps can be removed from the machine at one time instead of having to pick them up one by one.

- **LASER ENGRAVING OR CUTTING RUBBER CAN IGNITE THE MATERIAL.** Never leave the laser system running unattended for any reason.
- **LASER ENGRAVING OR CUTTING RUBBER CAN PRODUCE FOUL ODORS.** You might need to particulate filter and/or odor filter your exhaust depending on your environment, installation location, and/or your local air quality control laws.
- **LASER ENGRAVING OR CUTTING RUBBER PRODUCES ABRASIVE DUST.** Clean the laser system more frequently to reduce wear and tear on the motion system components and optics. Damage to the laser system from inadequate or insufficient maintenance **ARE NOT** covered under warranty.

SIGN VINYL

RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	100	19	500	1	.015”
30	100	23	500	1	.015”
35	100	26	500	1	.015”
40	100	30	500	1	.015”
45	100	34	500	1	.015”
50	100	38	500	1	.015”
55	100	42	500	1	.015”
60	100	45	500	1	.015”

VECTOR CUTTING (KISS CUT)

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	5	3.3	500	1	.003”
30	5	4.0	500	1	.003”
35	5	4.7	500	1	.003”
40	5	5.3	500	1	.003”
45	5	6.0	500	1	.003”
50	5	6.7	500	1	.003”
55	5	7.4	500	1	.003”
60	5	8.1	500	1	.003”

COMMENTS

Sign vinyl comes in a wide variety of colors, patterns, thickness, finishes, and reflectivity. There are a few methods for using sign vinyl with the laser system. One method is to vector cut (unmasked) through the vinyl but not through the backing. This technique provides results equivalent to a vinyl cutter machine. Once the vinyl has been cut, remove the excess vinyl, apply transfer tape and use a squeegee to remove trapped air bubbles. The transfer tape can then be lifted off and the vinyl lettering or objects that were vector cut will be stuck to the transfer tape and maintain their correct spacing with respect to each other. Now apply the tape to the desired surface and squeegee, peel off the transfer tape, and the lettering will remain adhered to the surface. The other method is to apply a piece of vinyl to the desired surface (unmasked) and adjust the laser power so as to cut through the vinyl without engraving into the material below. Another example is to cover the entire surface of a wooden plaque with vinyl, use a squeegee to remove all air bubbles, and then mask the entire surface with transfer tape to protect the vinyl from smoke damage. In the graphics software, color the background black and place white filled text on top of the colored background. Since the laser system does not engrave white filled objects, the background will be engraved and the lettering will be untouched. Peel off the excess vinyl and transfer tape to reveal the final product.

MOST SIGN VINYL IS MADE FROM PVC (Polyvinylchloride). DO NOT USE PVC BASED VINYL. The fumes are extremely toxic if you inhale them. The fumes are also caustic and can chemically destroy the metal parts of the laser system. Damage to the laser system from this type of abuse **ARE NOT** covered under warranty.

WOOD

RASTER ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	100	25	500	1	.020”
30	100	30	500	1	.020”
35	100	34	500	1	.020”
40	100	39	500	1	.020”
45	100	44	500	1	.020”
50	100	50	500	1	.020”
55	100	55	500	1	.020”
60	100	59	500	1	.020”

VECTOR ENGRAVING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	80	4.2	500	1	.030”
30	80	5.0	500	1	.030”
35	80	5.9	500	1	.030”
40	80	6.7	500	1	.030”
45	80	7.6	500	1	.030”
50	80	8.4	500	1	.030”
55	80	9.2	500	1	.030”
60	80	10.1	500	1	.030”

VECTOR CUTTING

LASER WATTAGE	POWER	SPEED	PPI	PASS	DEPTH
25	50	1.3	250	1	.125”
30	50	1.6	250	1	.125”
35	50	1.8	250	1	.125”
40	50	2.1	250	1	.125”
45	50	2.3	250	1	.125”
50	50	2.6	250	1	.125”
55	50	2.9	250	1	.125”
60	50	3.1	250	1	.125”

COMMENTS

When engraving wood with a laser, a brown, maple syrup like residue will deposit on the surface of the wood. This is normal and impossible to eliminate by **POWER**, **SPEED**, or **PPI** changes. More residue will be present when engraving deeper and/or slower. This residue washes off with water and a sponge. We recommend using a kitchen sponge with a nylon string mesh wrapped around it. Dampen the sponge and wipe off the residue. A damp chamois cloth works well also. Do not use paper towels or a regular sponge because these materials will get lodged in the engraved area when wiping and are extremely difficult to remove. A method to avoid cleanup is to mask the wood with transfer tape and peel off the tape after engraving. If desired, after engraving and before peeling off the tape, spray paint can be applied to color fill the engraved areas. After the paint dries, peel off the tape. If an intricate drawing has been engraved and there are many small pieces of tape to remove, it may be easier to flood the masking, after engraving, with water. This will loosen the tape and it can be easily removed by rubbing it off by hand. In the vector cutting example, the wood was elevated from the table to let smoke and heat escape from underneath. If you elevate the wood, mask and/or dampen the bottom side of the wood very lightly, in which the water acts as a heat sink to prevent the underside from flaming and charring.

Elevating the wood also helps to determine whether the laser has passed completely through since the cut pieces will fall through to the table when cutting is finished. Also, set up the drawing so that the inner pieces of the drawing are cut first, otherwise pieces may fall through at the wrong time.

Not all wood finishes are created equal. When ordering wood from a supplier, be sure to specify that it is being used for laser engraving. Some finishes cannot handle the heat from the laser and will bubble, blister, and possibly turn white. For engraving softer woods such as pine or balsa, reduce the power settings to acquire the best depth. Engraving too deep on soft woods will reduce quality. Every type of wood will engrave differently. It is better to engrave woods that are finished. If engraving unfinished wood and it is not masked with transfer tape, the smoke residue tends to embed in the wood and is impossible to remove without sanding. To prevent this, mask all unfinished wood with transfer tape.

WOOD INLAYS - VENEERS

Create a drawing with no outlines, only filled areas. Engrave the filled areas almost as deep as the thickness of the veneer (usually about .003 inches (.1 mm) or less). With some water and a nylon brush, remove all residue from the engraved area. When cutting veneers make sure they are lying absolutely flat. In the drawing, give the objects an outline of .001 inches (.1 mm) and remove the fill. Adjust the power so that there is just enough power to cut completely through the veneer. Overpowering the cut will cause too much material removal and the fit will not be snug. Some software programs allow outline offsetting to compensate for the thickness of the beam called contouring. Usually, a contour to the outside of the vector line of .006 inches provides a tight fit. Remember if using more power to cut through the veneer, compensate for the thicker width of the laser cut by contouring a little further to the outside.

Another method is to first create your graphic and fill it with the color black. Then give it a white outline of .012 inches (.3 mm). If you look at the graphic when you add the outline, you will see that it appears to shrink. Now raster engrave the graphic to a depth slightly shallower than the thickness of the veneer. When the engraving is finished, place the veneer into the laser system. Remove the black fill and change the outline to a different color. Cut out the veneer with the laser system, add glue to the veneer, and apply the veneer into the engraved area of the other piece of wood and let dry. After the glue has thoroughly dried, sand the veneer until it is flush with the base wood. A good veneer to use is one with an adhesive backing. Once cut, place the veneer into its proper place on the engraved wood block and with a clothes iron, and iron the veneer into the engraved wood. This melts the glue and causes the veneer to stick to the engraved area. Finish the wood as you desire and the finished product will look fantastic. The veneer can now be sanded flush with the surface and a finish coat applied.

LASER ENGRAVING OR CUTTING WOOD CAN IGNITE THE MATERIAL. Never leave the laser system running unattended for any reason.

SUPPLEMENTAL INFO PROVIDED BY NETWORK ENGRAVERS INCLUDING SOME CorelDraw tutorial

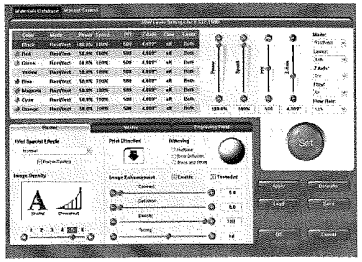
Advanced Laser System Operation

From the PPI and speed settings to Rubber Stamp and Image Enhancement settings, this section covers how each feature of the Manual Control Printer Driver funtions for the advanced user.

Note: When adjusting the printer driver settings in the Manual Control Tab, it is highly recommended that you practice engraving or cutting on a scrap portion of that material in case the settings need to be re-adjusted to obtain the desired results.

Manual Control Printer Driver

The Manual Control Tab in the printer driver gives you full control of the engraving and vector settings. This tab of the printer driver is meant for the advanced user.



Color, Power, Speed, and PPI

To change the % Power, % Speed and/or PPI of a color, position the mouse arrow on the color name and click once. This will highlight the color's parameters and will allow you to change the settings by using the scroll bars, plus (+) or minus (-) buttons or by typing in each setting in the appropriate control box. It is possible to click on more than one color to set them to the same setting at the same time.

% Power

Available settings are from 0 to 100%. This setting is directly related to how deep the engraving will be. The higher the setting, the deeper it engraves, marks or cuts, and vice-versa.

% Speed

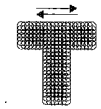
Available settings are from 0 to 100%. This setting determines the maximum rate of travel of the motion system. Actual engraving time (throughput) is not only dependent on the % Speed setting, but is also dependent on the size and the placement of the graphic in the engraving field. The motion system will accelerate/decelerate as fast as it can up to the chosen speed. If the motion system cannot achieve the chosen speed based on the size of the graphic or graphical placement in the field, it will automatically adjust its speed internally to the maximum speed it can achieve. This is evident when you see the motion system automatically slow down while cutting curves or circles as opposed to straight lines. Automatic proportional pulsing (see PPI) of the laser beam will ensure that there is no difference in the depth of cut from straight lines to curves. We will discuss how to optimize the throughput of the system later in this manual.

% Power and % Speed work together in determining how deep the engraving or cutting will be. Higher power and slower speeds produce deeper results. Lower power and higher speeds produce shallower results.

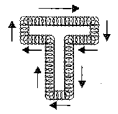
Note: 100% raster speed is different than 100% vector speed. Due to the inertia of the X-Axis arm, movements in the Y-direction, and also depending on which model you have, vector speeds will range from one-third to one-half the maximum raster speed.

PPI

Available settings are 1 to 1000. The laser beam is always pulsing and never "on" continuously even though it may appear that way. The PPI setting indicates how many laser pulses, per linear inch, the laser cartridge will emit. The pulsing of the laser beam is electronically linked to the motion system. These pulses will always fire, equally spaced, from one to the next, regardless of changes in speed.



In raster mode, dot positioning is determined by the driver based on image dark areas. The print driver has the ability to place dots at any resolution up to 1000 PPI according to the image composition. For solid filled areas (solid black for example) the machine places dots at 1000 PPI because all pixels are completely filled with color. For halftones, the print driver determines laser pulse location based on whether image pixels are black or white (and edge threshold decisions). For grayscale, the print driver determines laser pulse location and power based on image pixel color value (and edge threshold decisions).



In vector mode, laser pulsing follows the path of the outline of the object. Imagine the laser system working like a sewing machine where the stitching always remains consistent whether you sew fast, slow or around curves. The setting you use will be application material dependent. Using less than 150 PPI may result in the pulses being spread so far apart that they may or may not touch one another. Perforated paper has this characteristic. Higher PPI settings may cause more of a melting or burning effect on the edges whereas lower PPI settings may reduce the burning, melting or charring, but may result in a serrated or perforated-looking edge. Increasing or decreasing the PPI setting does not affect engraving speed, only the frequency of the pulses.

Mode (Drop Down Menu)

The driver uses the word "MODE" because the laser system works similarly to the operation of a pen plotter output device. A pen plotter physically selects a colored pen that matches the same colored objects in your graphic, called "color mapping," and draws the graphic, on paper, in that color. The laser system, however, applies a Mode, % Power, % Speed and PPI setting, to the individually colored objects in your graphic. Up to eight (8) sets of user-adjustable parameters, which control laser beam delivery to your application material, can be "mapped" to the respectively color filled or outlined objects in your graphic.

Note: Black and white, grayscale and color bitmaps are all mapped to the black color's settings.

Selecting the appropriate color and clicking the drop down menu button toggles through the following laser beam delivery modes for the each of the eight respective pen colors.

- RAST/VECT (default) raster fills and vector marks or cuts proper outlines.
- RAST rasters all fills AND outlines regardless of outline thickness.
- VECT only vector marks or cuts proper outlines. It will skip all fills and will skip all outlines with line weights thicker than a hairline.
- SKIP ignores all fills and outlines.

Laser (Dual laser cartridge system only)

If your laser system comes equipped with more than one laser cartridge, you are given the choice of using either both laser cartridges or a single laser cartridge (Top or Bottom.) If your laser system has one laser tube, select the appropriate laser cartridge according to your laser system set-up.

Z-Axis

This control on the Printer Driver lets you offset the Z-Axis table from the current focal point. When the feature is turned on and a height is set, the table lowers to the height entered and starts engraving. This feature can be used as a Material Thickness focusing method.

Flow (Computer Controlled Air Assist only)
This feature will not appear if you do not have the Computer Controlled Air Assist option. If you do have Computer Controlled Air Assist, but are not using it, you **MUST** leave the setting to OFF, otherwise your system will hesitate up to 10 seconds after you press the start button on the machine. If you purchased the Computer Controlled Air Assist option, please refer to the Accessories Guide for detailed instructions on how to use the printer driver controls properly.

Flow Rate (Computer Controlled Air Assist only)
To control the Flow Rate of the Computer Controlled Air Assist accessory, select from the percentage rates available.

Set Button
After making % Power, % Speed, PPI and any other adjustments for the Pen parameters, you must click the SET button to register the changes. The changes will not be saved until the OK or APPLY buttons are clicked.

Save Button
By clicking Save, the "Save Engraving Setup" dialog box will appear and will allow you to enter in a file name. All settings will be stored in this file that has a ".LAS" extension. These files can be stored in any directory on your hard drive and you can have as many setting files as your disk can hold. Verify that you have clicked the SET button before you save any .LAS files to ensure you have properly saved your settings.

Load Button
To recall printer driver settings that have been previously saved, click on the "Load" button and choose the desired .LAS settings file. The settings that are currently on screen will be replaced by the settings from the .LAS file. You may abort this change by clicking Cancel; clicking OK will approve the change.

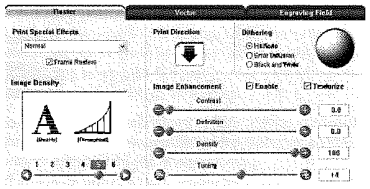
Default Button
The Default button will reset the driver settings to the original manufacturer values.

Cancel Button
The Cancel button closes the printer driver window and takes you back to the previous window. If the SET, OK or APPLY buttons were not clicked, the changes will not be saved by the Printer Driver.

Apply Button
The APPLY button saves all changes made to the Manual Control Tab. These changes include any modifications made to the Raster, Vector or Engraving Field sub-tabs.

Raster Sub-Tab

Print Special Effects
In this dropdown list, you can choose from four different printing modes, Normal (default), Clip art, 3D and Rubber Stamp.



Clip Art
This control simulates laser printer output and is very useful if using a drawing with many colors, shades of gray or many outlines. It is recommended to turn this control ON when using DRAWN clip art because there may be some underlying cutting lines hiding behind filled areas. Having this control ON gives a what-you-see-is-what-you-get output very similar to laser printer output. The entire drawing will be raster engraved, including all outlines, and only the Black color setting is used. The driver automatically turns OFF its color-mapping feature and all colors are engraved as different shades of gray, represented by a halftone pattern. The type of halftone pattern is based upon the "Quality" setting of the driver the same way grayscale bitmaps are interpreted. Since clip art images use a wide variety of colors, shades and outlines, the only effective way to engrave these images is to have this control turned ON. Clip art mode also provides greater compatibility with Windows software that does not work well with vector devices such as the laser system. Do not activate this control when printing photographs or bitmapped images; use it **only** with DRAWN clip art.

3D
There are two ways to use the 3D feature. The first method is used to produce an engraving that has a contoured depth, giving it a three dimensional feel. It is used in combination with grayscale bitmaps by automatically assigning laser power levels to the shades of gray of the bitmap without converting the image to a halftone. These power settings are based on the setting you entered for the color black in the printer driver. The darkest shades of gray (black) will be assigned the value of the setting for the black color. The lightest shade of gray (white) will automatically be assigned a 0% power. All other shades of gray that fall between black and white will automatically be assigned an appropriate power level that matches the darkness of the color. The engraving will appear "3D" because the depth of the engraving will vary according to the image. Sometimes it takes several passes to create enough relief in the engraving to get the desired results.

Special 3D software is required to produce the type of grayscale images that are compatible with this mode. You cannot simply use ANY grayscale bitmap to produce a "3D" effect. Please contact our Applications Department for the latest 3D software recommendations.

The second way to use the 3D feature is to engrave any photograph lightly onto the surface of hard materials, such as black marble, anodized aluminum, painted brass, micro-surface engravers plastic, etc., to produce exceptional photographic quality. Using the appropriate materials and settings, the end result is an engraving that looks more like a photograph than a halftoned or diffusion dithered image does. To use the 3D feature in this method you must first follow the steps below.

Choose Your Material
The best material to use is one that has the highest contrast, such as black anodized aluminum, black marble or black cored engravers plastic with a white micro surfaced coating. While other materials may work okay, they may not produce the highest quality.

Establishing Nominal Power
Choose your % Speed and your Image Density settings. Set the PPI to 1000, but don't set the % Power setting just yet. The objective is to use the LOWEST % Power setting that produces the most contrast such as the whitest (as in black anodized aluminum) or the darkest (as in black cored engravers plastic with a white micro surfaced coating) results.

This is what we call the "nominal" power setting. Over-powering the material will produce poor results.

In your graphics software, create a series of five rectangles that are about ¼ inch high and 6 inches wide as in the following diagram:

Starting with the top rectangle, set the power setting to a value that you know will be too low. For example, engrave the first rectangle at 5% power, increasing the power for each subsequent rectangle in 5% increments, finishing the series off at 25% power and note the results. Choose the rectangle that uses the lowest % Power setting to achieve the most contrast. If 25% is not enough power, then engrave the rectangles once again, this time starting at 25% and increasing in 5% increments as above.

In this particular example, we'll say that 20% power looks over-burned, but 15% appears under-burned. Since the material may be sensitive to small power changes, you may need to narrow it down a bit further. Engrave a new series of rectangles, but this time start the top rectangle at 15% then add 1% for the next rectangle, and so forth, until you find the best setting between 15% and 20%.

The setting that produces the highest contrast using the least amount of % Power is called the "nominal power setting."

Engraving a Calibration Scale

Now that you have established the nominal power setting, you will need to engrave a grayscale calibration scale. You can create one of your own or use the one provided for you which can be found on the Software Installation CD-ROM called "3D Calibration Scale.cdr." This is a CorelDRAW 8 file so using versions 8 and higher will open the file.

The scale looks like this:

Each rectangle is 0.5 inches wide (12.7 mm) and 0.25 inches tall (6.35 mm). Each successive shade of gray is incremental by 16 levels starting at 0 and ending at 255. The numbers below the scale are there as a reference to the 16 levels of power control (explained later) and do not need to be engraved if you do not want to.

Engrave the calibration scale, onto your material, using the nominal power setting you established earlier. Compare it to the actual calibration scale that you see on screen or in this manual. If the response of your material to the laser beam was perfectly linear, then the result should look exactly like the calibration scale. Most likely you will find that several rectangles appear to have the same appearance of shading. The objective would be to engrave the calibration scale and produce a result that would appear as if each rectangle would have its own distinguishable level of gray, starting from white all the way to black. To help you achieve those results, the printer driver gives you the ability to calibrate the power level of each one of the rectangles. To access the feature, click on the "Setup" button.

Setup Button

When you click this button, the ULS 3D Power Calibration screen will appear. Notice that there are 16 slider bars representing the 16 shades of gray of the calibration scale. The 00 and the 15 are not adjustable as they represent white and black. The other 14 can be adjusted. The objective is to go back and forth between adjusting the corresponding slider bars and re-engraving the calibration scale until you can duplicate the appearance of the calibration scale as best as possible. As you are progressing, **make sure you keep saving your settings in an LAS file** just in case your computer crashes, etc. This is a lengthy procedure so you do not want to have to do it twice.

Once you have duplicated the 3D Calibration Scale onto your material, calibration is now complete. You only need to do this calibration one time for each material you intend on using to produce photographs.

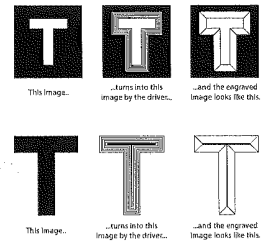
> ***Note:*** If you are using a type of material that becomes lighter when you engrave, such as black marble, you will need to invert the photograph first (make a negative image) in your photo editing software, otherwise when you engrave the image, it will appear like a negative image.

APPLY Button
Click Apply to enable the settings that you just set.

CLOSE Button
The Close button closes the 3D Power Calibration settings window and cancels any changes you made to the scale if you didn't click the APPLY button.

DEFAULTS Button
The Defaults button applies the factory default settings to the 3D Power Calibration settings.

Rubber Stamp



Rubber Stamp mode causes a "shouldering" effect when raster engraving rubber stamp material or any other material that requires a "shouldered" engraving. The effect looks as if the laser beam engraved the material on an angle, but in actuality it is the precise control of laser power that creates this appearance. This is a "raster only" feature that only works with black colored graphics and uses the power setting of the black color in the printer driver. Vectors are processed normally and can be used for vector engraving or cutting by assigning any of the seven other printer driver colors to the outline desired.

To obtain a "raised" engraving such as a rubber stamp, simply create a "negative" graphic so that the background is black and the text or graphic objects are white. This way, the background engraves and the text or objects remain untouched, producing a "pyramid" effect.

To obtain a "chiseled" or "sunken" engraving, create a "positive" graphic so that the background is white and the text or objects are black. This way, the text or graphic engraves and the background remains untouched, producing a "chiseled" effect.

Setup Button

Selecting the Setup button opens a pop-up window so you can choose from the following settings:

Taper Selection
Choose from various types of shoulder angles. Experiment with each setting and note the result.

Image Options

Invert Page

This converts all black objects into white and all white objects into black for the entire page. This is very useful for engraving a full sheet of rubber stamps.

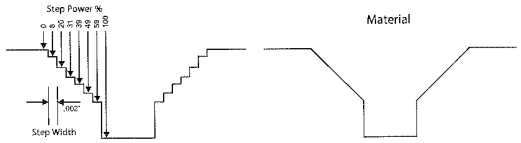
CAUTION: When using the "Invert Page" feature you may need to reduce your page size so that the entire work area is not engraved.

Mirror Page

This mirrors the entire page from left to right (horizontally). It will not mirror individual objects or selections. This is very useful for engraving full sheets of rubber stamps because the graphics on screen are non-mirrored and can be proof-read easily.

Power

Notice that when you click on different Taper Selections that the power table changes. This is because the laser applies power in different profiles to produce different styles of taper. You will notice that you cannot adjust the pre-defined Taper; however, if you would like to create a custom taper of your own, first select the Taper Selection that you would like to start with and then click the "NEW" button. This will copy the taper as a "Custom Shoulder" that you can rename by typing a new name in the dialog box and clicking "Rename." You can also adjust the profile however you desire. Each slider bar controls the laser's power for that step. The numbers at the bottom of that slider bar define the width of the step in 0.001 inches (mils). The square at the top of each slider bar is the activate/deactivate button. Always deactivate the steps you are not using so that it will apply 100% power to that level.



Normal Rubber Stamp Setting ...will give you these results

The diagram on the previous page is an example of the Normal Rubber Stamp Taper Selection. You can see that there are 8 steps used to create the shoulder. The surface of the material is considered the first step and the bottom of the engraving is considered the last step. You can define as many as 16 steps, but the first or the last steps are not definable because they are fixed at a power setting of 0% and 100% respectively. You can only define the parameters for the 14 steps in between.

Note: The maximum shoulder width is 0.056 inches (1.42 mm).

Reduction

Raster Block Reduction (also known as Print Growth Management) reduces the number of pixels of a raster image only in the X and Y directions. Raster Block Reduction does not affect vector images. Sliding the bar to the right will remove pixels from the image that is being engraved, practically thinning the raster image. This feature does not affect your original file, only the file that is in cache storage. This feature is useful for bar code labels with thin lines.

Image Density

The Image Density setting determines how many raster strokes per vertical inch of travel the motion system steps down to produce the engraving. It can also be referred to as the vertical lines per inch or fill spacing. In the Windows XP driver it is termed Image Density and there are six Image Density choices in all models. Higher Image Density (DPI) settings produce better quality raster images, but reduce productivity by increasing engraving time. Lower Image Density (DPI) settings produce lower quality raster images, but increase productivity by decreasing engraving time.

Image Density (DPI) settings will also have an effect on vector quality and vector speeds when vectoring lines other than straight horizontal or vertical lines. For example, a circle is made up of very small straight-line segments linked together at very small angles. If you choose a high quality setting such as 6 (1000 DPI), then these segments are as small as possible and they are high in quality. The result is the smoothest looking circle, but it will take longer to vector engrave or cut because the focus carriage must start and stop at the ends of each line segment. Since there are many segments, it will take longer to process, but the quality will be the highest that the machine can produce. If using a low quality setting such as 1 (DRAFT), these segments become longer, but there are less of them, resulting in more flat-edged looking curves that will process faster.

By running samples on scrap materials and practicing with different settings, you can find a compromise between throughput and engraving quality.

Print Direction

The default direction is Down which begins engraving at the top of the field and finishes at the bottom. On some materials you may get better results by starting at the bottom and engraving towards the top of the field (Up). This is because the engraving smoke is being drawn towards the top of the field. On some materials engraving Down causes the smoke or debris from the engraving to be deposited onto the previously engraved surface, possibly damaging the engraved area. Experiment with the different directions using different materials and choose the best method for your application.

Note: The Up direction is especially useful when engraving rubber stamps and utilizing the Back Sweep Air Assist option.

Dithering

Dithering settings are used when printing grayscale or color bitmapped images such as TIF, JPG and BMP formatted images. Since the laser system is essentially a black and white printer (black turns the laser ON and white turns the laser OFF), and if you choose the correct settings, the driver will automatically convert the grayscale or color bitmap into a 1-bit "halftoned" black and white image. This process is very similar to how newspaper photographs, as well as laser printer photographs, are printed. For a more detailedexplanation of the terms "grayscale," "bitmap," "halftone" or "dither," please refer to the "Graphic Software Setup" section in this manual.

Halftone

This halftone pattern generator converts grayscale bitmaps into a halftoned image based on your Image Density choice in the driver.

Image Density	Angle	Shape	Lines Per Inch
6	45 Degrees	Round	180
5	45 Degrees	Round	90
4	45 Degrees	Round	60
3	45 Degrees	Round	45
2	45 Degrees	Round	36

Error Diffusion

Unlike halftone, error diffusion scatters the black pixels in a random pattern to represent shading. It uses the quantity of black dots instead of the size of the black dots to represent the different shades of gray. The pattern created will be dependent on the quality setting that you choose in the driver with the exception that there is no chart to reference. Higher quality settings, such as 5, will produce a more densely packed, higher dot quantity pattern, whereas a lower resolution setting, such as 2, will produce a loosely packed, lower quantity dot pattern.

Note: **Do not** use Error Diffusion when engraving rubber stamps, otherwise dots will appear in the background. Choose only Halftone.

Black and White Mode
The Black and White mode thresholds the image at 50% black. Each pixel that is greater than 50% black will be converted into white and each pixel that is 50% black or less will be converted into black. This effect is very similar to trying to duplicate a photograph using a photocopier.

Helpful Tip
Engraving grayscale bitmaps using a dithering pattern requires some practice and a bit of trial and error to achieve perfection. It also requires some knowledge of bitmap editing software. These images will visually appear different on one material as opposed to another material even if you use the same driver settings. As a rule of thumb, use an Image Density setting of 5 using halftone or diffusion pattern on harder materials, such as marble, anodized aluminum or microsurfaced engraver's plastic. Use an Image Density setting of 3 using the halftone or diffusion pattern for softer materials, such as wood or materials that you intend to engrave very deeply.

Image Enhancement
The Image Enhancements controls allow the user to "fine tune" the image to enable the laser system to produce the highest quality, highest detailed images at high or low speeds. Image Enhancement may be used at any engraving speed and with any material.

Note: Image Enhancement will cause files to take longer to print. Since most materials do not require the use of Image Enhancement, use this feature only as needed. Image Enhancement and 3D Effects cannot be selected at the same time. The printer driver will automatically notify you if you attempt to do so. Image Enhancements work best for low power, high speed applications such as marking anodized aluminum, etc.

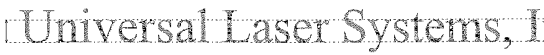
The following procedure may appear lengthy, but when you learn how to use the controls, establishing the correct parameters is easy and quick. Once you have established those parameters you can "SAVE" them in the ULS printer driver as .LAS settings and recall them when needed. Many users choose to name these saved settings according to the application material's name.

Note: The Image Enhancement settings are designed to work with the BLACK pen color in the printer driver. However, the other seven pen colors of the printer driver will use the same Image Enhancement settings. Keep in mind that those settings will have a different resulting effect on if the other colors' % power, % speed and PPI are different than the black pen color's setting.

Texturize
The Texturize feature adds random textured laser pulse patterns to an engraving job while using Image Enhancements. It reduces motion system marks like banding from appearing on some materials like tile and marble.

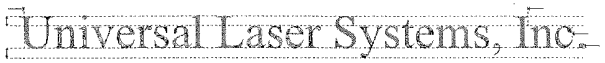
Definitions

CONTRAST: Contrast adjusts the difference between the unengraved and engraved areas in the high density part of the graphic or where there is the most concentration of graphic pixels (in between the dotted lines), as the following diagram illustrates:



Within this effective area, using too little CONTRAST may cause some parts of the letters to appear thin, faint, fuzzy or even non-existent. Having too much CONTRAST will cause the effective area to appear thick, bold or over-powered.

DEFINITION: Definition adjusts the difference between low density and the high density part of the graphic. The low density parts of the graphic are typically the ascenders and descenders of text, single pixels that may be horizontally spaced far from other pixels or the start of the graphic in the direction of the raster stroke. Refer to the following diagram:



Setting this parameter too low may cause the effective part of the graphic to appear thin, faint, fuzzy or non-existent. Too high of a parameter will cause these objects to appear thicker, bolder or more powered than the high density areas of the graphic.

DENSITY: Density adjusts the difference between the entire unengraved and engraved areas. If the parameter is too high, then the entire engraved image may appear thick, bold or over-powered. Too low of a setting may cause the image to appear thin and pixels or parts of characters may disappear altogether. The opposite effect would occur on inverted images such as white text on a black background.

TUNING: Tuning adjusts the image so that the pixels vertically line up with each other during the left and right bidirectional raster strokes. A misadjusted TUNING value will cause the image to appear double-imaged or inadvertently bolder than normal. A typical **non**-Image Enhanced TUNING value can be from -4 up to 0, whereas a typical Image Enhanced TUNING value generally averages around +4. TUNING will be different if you have Image Enhancements enabled or disabled. Saving the printer driver settings will also save the TUNING value.

Procedure

The following procedure assumes that you have some experience working with the laser system and have a general idea of the Power, Speed, PPI and Image Density settings that you intend to use for the chosen application material.

In the following example, we will be engraving painted brass choosing 100% speed for good throughput, and Image Density 5 for good quality.

Step 1: Establish the nominal power setting.
In your graphics software, create a series of five rectangles that are about ¼ inch high (6.35 mm) and 6 inches wide (152.4 mm) as in the following diagram:

Starting with the top rectangle, set the power setting to a value that you know will be too low. For example, set it to 5% power and the rest of the parameters to 100% speed, 1000 PPI and Image Density 5. At this time, ensure that Image Enhancement is NOT enabled. Engrave the first rectangle at 5% power, increasing the power for each subsequent rectangle in increments of 5%, finishing the series off at 25% power and note the results. Look for the LOWEST power setting that has the cleanest removal of material. This would be the nominal power setting. While higher than nominal settings may also produce clean engraving, it will overpower the material and may cause highly detailed engraving, unlike these rectangles, to appear too thick, bold or washed-out. If 25% is not enough power, then engrave the rectangles again, this time starting at 25% and increasing in 5% increments and so on. In our particular example, let's say that 20% power looks good, but 15% appears underpowered. Since we know that this material happens to be sensitive to small power changes, we'll need to narrow it down a bit further. Engrave the rectangles once again, but this time start the top rectangle at 15% then add 1% for the next rectangle and so on until you reach 20%. The results now indicate that the nominal power setting of 17% power looks as if it is the LOWEST power setting that produces the cleanest results at 100% Speed, 1000 PPI and Image Density 5.

Step 2: Using text to set the CONTRAST parameter.
Type in a random line of text, using the Times New Roman font, set at 8 or 10 points in size. Make sure that the text string is at least 6 inches long and that the string includes punctuation marks, spaces and lower and upper case letters as in the following example:

Universal Laser Systems, Inc. produces the "BEST" laser systems in the world!

Engrave the sample text with the settings determined in step 1, but this time ENABLE Image Enhancement and set CONTRAST to 0, DEFINITION to 0, DENSITY to 100 and the TUNING value to +4. You should expect the results to appear fuzzy, some of the characters will be missing and overall engraving quality will not be as good as expected. This is normal. Move the line of text slightly downward in your graphics software so that you will engrave a clean part of the material, but keep it close enough to the previous engraving so that you have something to compare it to. Keep engraving samples and adjusting the CONTRAST upward in increments of 5 and note the results. The objective is to adjust the CONTRAST just enough to cause the high density areas of the text to be sharp and clear. Ignore the appearance of the ascenders (like quotation marks or the tops of h's) and descenders (like commas or the bottom of lower case p's) as they will appear faint and unclear. This is to be expected. DO NOT adjust the CONTRAST setting to try to force these to appear; use the DEFINITION adjustment for those characters. Right now, ONLY concentrate on the high density part of the characters. Setting CONTRAST too high can cause the characters to appear "fat" or "bold." Adjusting the CONTRAST by just one number can make a big difference in appearance, so continue adjusting the setting by first increasing by 5 points until you get close, but then fine tune the setting by increasing or decreasing by 1 point until the exact setting is achieved.

Step 3: Adjusting DEFINITION to enhance the ascenders and descenders.
Now, increase the DEFINITION in increments of 5 at a time until the ascenders, descenders, commas, quotation marks and any other low density area characters begin to appear. The objective is to increase the setting just enough to cause these parts of the graphic to match the appearance of the high density areas. Setting the DEFINITION too high will result in ascenders and descenders appearing too "fat" or "bold" compared to the rest of the graphic.

Step 4: Reducing DENSITY as needed.
Once CONTRAST and DEFINITION have been set to the appropriate levels, the graphic may or may not appear to be "fat" or "bold." In most cases, the appearance will look great without making any more adjustments. However, if everything appears overpowered or bold, try reducing the DENSITY down from 100 in increments of 5 and note the results. If the characters begin appear to be "chunky" or appear as if pixels have been eliminated, then you have reduced it too much. Normally you can leave the DENSITY at 100. However, there may be cases where you need to reduce it. Reducing DENSITY can be very useful when the image is inverted, such as white text with a black background. In this case, if the engraved area (the background) is overpowering the text (foreground), then reducing the DENSITY may help thicken the text.

Step 5: Fine tuning the raster strokes.
At this point, you are finished with Image Enhancements. Make sure that you save your settings, but your graphic may need a little more "fine tuning." The typical TUNING setting is +4 when Image Enhancement is enabled. However, this may or may not be the best setting for your system. To check this setting, you should perform this last test. Engrave the same text with all your Image Enhancement settings, but this time set the TUNING value to 0. Then move the graphic down and engrave it again with TUNING setting +1, then +2 and so on all the way to +8. Compare each one to the other and find the one that is the sharpest and clearest. Go back and set the TUNING value to the appropriate number and SAVE your settings once again.

The Image Enhancement settings for that material are now complete. If you feel that you can fine tune it a little more, go back to step 2 and try again, but this time start with the current Image Enhancement settings that you saved. It is not necessary to reset your nominal power setting and we recommend that you leave it the same as the value you determined in step 1.

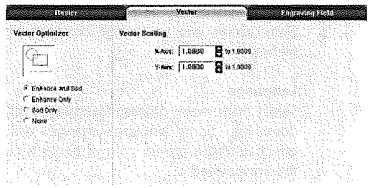
Setting the Image Enhancement parameters using this procedure will cause all of your graphics, whether big or small, inverted or not, dense or highly detailed, to appear better than ever. We suggest that you run

this procedure for all your materials and save your parameters. This may sound like a big job, but the additional productivity and engraving quality that your system is capable of producing is well worth the small amount of time spent.

Vector Sub-Tab

Vector Optimizer

The four available selections apply to vector output only and have no effect on raster images. Regardless of which of the following selections you choose, vectors are grouped by pen color and will always output in the color order listed in the printer driver.



Enhance and Sort

Enchance and Sort turns on both features simultaneously.

Enhance Only

The printer driver collects all the vectors from the application software and reconstructs them (so to speak) by removing start and stop points within the vector curves so that they run smoother with less jitter. It has no effect on straight, horizontal or vertical lines.

Sort Only

The printer driver collects all the vectors from the application software, stores them in temporary memory, sorts them and then outputs them in the following order:

- All open path vectors are output first (not closed path vectors like circles and squares) beginning with the end point of the vector path that is closest to the current position of the focus carriage. All subsequent open vector paths are output using the same "nearest neighbor" starting point method which eliminates the random "vector hopping" that causes longer processing times.
- Closed paths will follow, beginning with the innermost closed path and ending with the outermost closed path. This is particularly useful in an elevated cutting application to prevent the outer piece from falling first. The beginning point of a closed path is automatically selected by the printer driver by the "nearest neighbor" vector path that has the steepest angle in the Y-Axis direction.

None

This selection turns off Vector Optimizer. Vectors will be ordered exactly as sent from the user's graphics program and ordered by pen color.

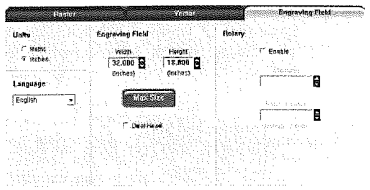
Vector Scaling

This feature allows you to calibrate vector cutting or vector engraving to your particular application. To calibrate the system, as an example, draw a precise 5" x 5" (127 x 127 mm) square in your graphics software. In the printer driver, set the laser power and speed setting to vector mark (do not cut through) this square onto some scrap material. After marking, remove the material and with a precision measuring device, such as a caliper, measure the square in both the horizontal (X) and vertical (Y) directions. Let's say that the measurement was 4.997"x (126.92 mm) and 4.996"y (126.89 mm). Use the formula (desired length/measured length) and enter the result into the X-axis and Y-axis boxes respectively. In this example, the result would be X-axis = 1.0006 to 1.0000 and Y-axis = 1.0008 to 1.0000. The printer driver will scale the images larger for numbers greater than 1.0000 and will scale the image smaller for numbers less than 1.0000. After changing the numbers, repeat the marking procedure and verify that the square is scaled correctly. We used a 5" by 5" (127 x 127 mm) square just as an example, but you can use any size object that is smaller than the maximum size of the engraving field. Using the Vector scaling feature with larger images produces more accurate results. Keep in mind that this feature DOES NOT scale raster images so if you combine raster and vector images in one file, the raster image may not align with your vectors. You will need to manually position your raster images in their desired positions.

CAUTION: Do not attempt to use the vector-scaling feature when your graphic extends out to the absolute edge of the engraving field. You may accidentally cause the driver to attempt to print past the edge of the maximum allowable page size. Unexpected results may occur. If you use this feature, the actual allowable page size decreases by the same amount that you are attempting to offset.

Engraving Field Sub-Tab

Units
Units allows you to change between Metric and Inches.



Language
Select from many different languages in this drop down list. Some language changes will not take effect until the printer control panel is closed and then re-opened.

Engraving Field

Width and Height
The page size that you enter in Width and Height **must** match the page size in your graphics software program EXACTLY and it is up to the operator to enter in the correct settings. Select the metric box if metric units are desired.

> ***Note:*** Incorrect use of this feature may cause no graphics, partial graphics, erroneous graphics or a misaligned graphics output relative to the application material to occur. To avoid problems, we recommend that you set the Width and Height to the maximum field size of your laser system (click the Max Size button) and also set your graphics software programs page size to match.

Max Size Button
Clicking on the Max Size button restores the driver back to the default maximum page size that your model can accept.

Dual Head (PLS Only)
Dual Head is also an optional accessory. If you have purchased this option, please refer to the ACCESSORIES section of the manual for more information.

Rotary
This option is available for all models. Please refer to the Accessories section of this manual on how to install and use the Rotary Fixture.

Diameter
The diameter of the cylindrical object being engraved will be entered in this field.

Rotation Factor
If you have purchased the optional Rotary fixture, you may need to calibrate your fixture if your application requires you to engrave or cut completely around the cylinder precisely 360 degrees. Only use this option if you completely understand and have used the Rotary Fixture in the past. If you are familiar with the operation of the Rotary Fixture and in your application you create a vector line or raster graphic that extends from the top of the page (in your graphic software) all the way to the bottom of the page, you should expect that the Rotary Fixture would rotate a full 360 degrees. If the fixture comes up short or long by a few degrees, you can compensate for this in the driver. If your application comes up short, increase the number past 1.0000 as much as you need to and run your sample again. If your application rotates past 360 degrees, then decrease the number of degrees below 1.0000 to get the ends to line up. You can calculate the exact number (refer to the Vector Scaling technique on the previous page), but it may be difficult to measure circumference.

Robert's CorelDRAW For The Laser

The Road To Success is Always Under Construction

"You are today where your thoughts have brought you;
you will be tomorrow where your thoughts take you."
— James Allen: Was a British philosophical writer

"If you've had wonderful family relationships, you will be able to call yourself a true success in life no matter what else you've achieved."- Vic Conant

"Goals are not only absolutely necessary to motivate us. They are essential to really keep us alive." - Robert H. Schuller

"Ability is what you're capable of doing. Motivation determines what you do. Attitude determines how well you do it."-Lou Holtz

Before We Start

Terms & Conventions Used In This Manual


CorelDRAW Tip - a special tip for the CorelDRAW user.


Notes - a tip just to make sure that you are aware of it.


Laser Tip - a special tip applicable to the laser own.


Wow Tip! - a favorite tip of mine.

X3 New features specifically for CorelDRAW X3

Short-Cuts Keys or 'fast keys' are available throughout CorelDRAW. They are valuable time-savers, and should be utilized. A chart of CorelDRAW's default short-cut keys can be found at **TOOLS|OPTIONS|WORKSPACE|CUSTOMIZATION|COMMANDS|SHORTCUT KEYS.**

Keystroke commands are noted by the **BOLD TEXT** for the key used. When you have a command that uses a combination of keys, press and hold the first key and then press the other key(s). The command **SHIFT+A** tells you while you are holding down the **SHIFT** key, press the **A** key.

Mouse commands are note by the **BOLD-UNDERLINED TEXT** for the mouse command.

CLICK	clicking/touching the left mouse button once and releasing; without moving the mouse.
MOVE	move it without pressing any button.
PRESS & HOLD	press the mouse button and hold it down for a moment.
DOUBLE-CLICK	rapidly tapping the left mouse button twice.
CLICK-DRAG	clicking and holding the left mouse button while you drag the mouse.
RIGHT-CLICK	clicking and releasing the right mouse button once.
RIGHT-CLICK-DRAG	clicking and holding the right mouse button while you drag the mouse.

Mouse and Keyboard commands include both keyboard and mouse commands together. Press the keyboard key and hold, and perform the mouse command. For example, **CTRL+CLICK-DRAG** tells you to first hold press and hold down the **CTRL** key and then **CLICK** and hold down the left

mouse button while you drag the mouse. Make sure you release the mouse button before releasing the keyboard key.

Menu Commands as those commands on the **MENU BAR** at the top of the CorelDRAW window has commands that you **CLICK**, showing other sub-menus and commands. The command **TOOLS | OPTIONS | WORKSPACE | DOCUMENT | RULERS** tells you to follow a sequence of commands, usually through menus, flyouts, and dialogs.

CorelDRAW Tools & Property Bars commands shown in a special font (i.e. PICK TOOL).

Image and File Types

CorelDRAW is a vector based drawing program. But it can import and manipulate bitmap files. It's a good idea to remember that if a customer sends you a CDR file, it may contain either a vector or a bitmap image, or both. A comparison of a vector object as opposed to a bitmap image is shown in Figure 1-1.

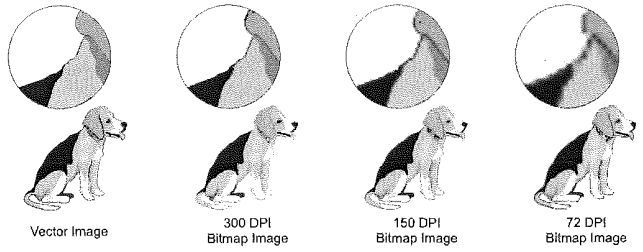


FIGURE 1-1 The vector image is compared with the bitmap image. Note that the quality of the bitmap image decreases as the DPI is decreased.

Bitmap images, also called raster or paint images, are made of individual dots called pixels (picture elements), that are arranged and colored differently to form a pattern. When you zoom in, you can see the individual squares that make up the total image. Increasing the size of a bitmap has the effect of increasing individual pixels, making lines and shapes appear jagged.

Reducing the size of a bitmap distorts the original image, because pixels are removed to reduce the overall image size. Also, because a bitmap image is created as a collection of arranged pixels, its parts can be manipulated (e.g., moved) individually.

Common bitmap file types extensions include (in the order of quality): TIFF, BMP (Windows Bitmap), CPT (Corel PHOTO-PAINT), PCX (Paintbrush), JPEG and GIF (CompuServe Bitmap).

Bitmap images are also referred to as raster images. The back and forth motion of the laser beam to create an image on the laser is referred to as rastering. Lasers can raster either a bitmap or a vector image.

Vector images, also called object-oriented or draw images, are defined mathematically as a series of points joined by lines. Graphical elements in a vector file are called objects. Each object is a self-contained entity, with properties such as color, shape, outline, size, and position on the screen included in its definition.

Since each object is a self-contained entity, you can move and change its properties over and over again while maintaining its original clarity and crispness without affecting other objects in the drawing. Common vector files include: EPS (Encapsulate Postscript, PLT (Hewlett Packard Graphics Language), AI (Adobe Illustrator), WMF (Windows Metafile), DXF and DWG (AutoCAD) and DC2 (Design CAD).

Exploring the CorelDRAW Environment

In Figure 1-2, the various items of the CorelDRAW X3 Application window are noted.

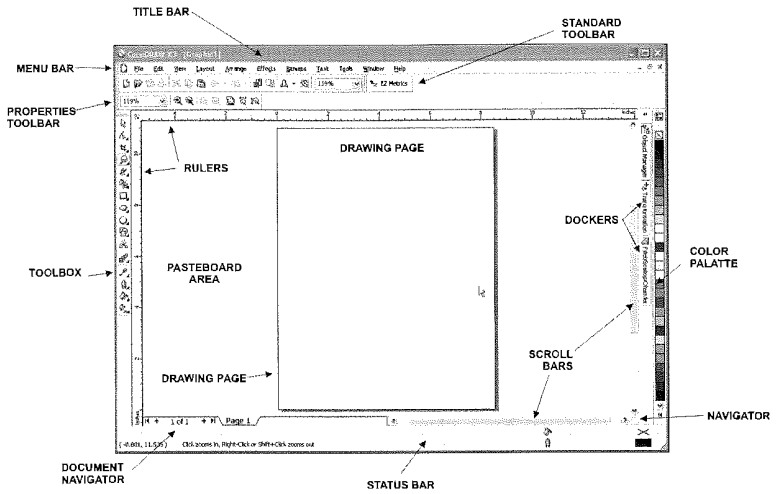


FIGURE 1-2 The CorelDRAW X3 Drawing Window labeled for easy identification.

CorelDRAW Components

Drawing Window all of the area bordered by the scroll bars and application controls which include the drawing page and pasteboard; the large white portion of the CorelDraw Drawing Window.

Pasteboard *the white area outside the page boundary. If you position a shape on the pasteboard, it doesn't print. I like to use the pasteboard to place notes and extra artwork that I may use or alternate when doing multiple plates.*

Drawing Page the rectangle in the center with the drop shadow.

Horizontal & Vertical Rulers by default, the *0* of the CorelDRAW vertical ruler coincides with the bottom of the Drawing Page. Laser operators often change the ruler where the *0* will appear at the top of the Drawing so it will be the same as the laser bed.

After we change the top ruler to 0, CorelDRAW shows negative position values as it moves down the page (i.e. 1" from the top ruler is shown as -1.0).

Scroll Bars used to shift the view in the window to see portions of a document which are outside the current viewing area. The scroll bars are located along the edges of the window.

Navigator opens a smaller display to help you move around a drawing.

Title Bar located at the very top of CorelDraw window. Shows the current job name; *Graphic1* is the default name until you save the job with a different name.

Menu Bar contains various menus that are a list of commands when you **CLICK** a menu name on the Menu Bar.

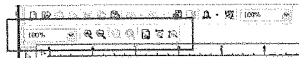
Standard Toolbar contains the most used options – File, Save, Open, etc.

Property Bar is an on-screen context sensitive area that is changing relevant to the active tool or to the task you are performing. For example, if you select the **TEXT TOOL**, the Edit Text Property Bar shows the default text settings and controls. You can also specify the Property Bar's contents, appearance, and location in the Application Window.

The property toolbars are optimized for a 1024 x 768 resolution. If you are working at a lower resolution, portions of the toolbars may appear cut off.

Toolbars – Docked & Floating

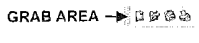
Toolbars can be either docked or floating. Docking a toolbar attaches it to the edge of the application window. Undocking a toolbar pulls it away from the edge of the application window, so it floats and can be easily moved around. Examples of each are shown below:



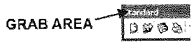
DOCKED ZOOM TOOLBAR (in red)

FLOATING ZOOM TOOLBAR (in red)

When moving, docking, and undocking toolbars, you use the grab area of the toolbar. The grab area for the toolbars are shown below:



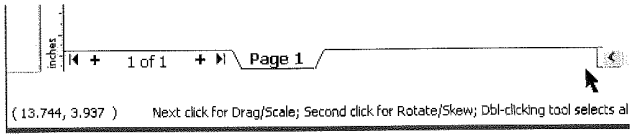
DOCKED TOOLBAR



FLOATING TOOLBAR

The grab area allows you to move the floating or docked toolbars. You can quickly restore the original or docked position of a floating toolbar by double-clicking on the blue grab area. .

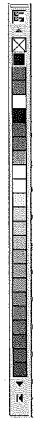
Document Navigator the area at the bottom-left of the application window that contains controls for moving between pages and adding pages. The document navigator also displays the page number of the active page and the total number of pages in a drawing.



Toolbox

The CorelDRAW Toolbox contains Tools for creating, filling, and modifying objects interactively. The Drawing Tools let you design a variety of objects for your drawing, and the **SHAPING TOOL** let you modify your object.

It also contains flyouts which are Toolbars that are accessible through one Tool in the Toolbox. A small black arrow at the bottom right corner of a Tool indicates that it is a flyout grouped with other Tools. You can separate flyouts from the Toolbox to show them as separate Toolbars.

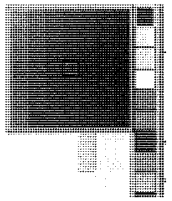


Color Palette

Shows a series of color swatches. It is used to select colors for use in CorelDRAW. You can have multiple on-screen color palettes. They can be docked or left floating in the Drawing Window.

To change an object's fill color, **CLICK** on the color. To change the outline color, **RIGHT-CLICK** on the color in the color palette.

To access more shades of a color, **CLICK-HOLD** on a color swatch in the color palette. A pop-up will appear as shown in the example. Move the cursor to select a color.



Or, you can **CTRL+CLICK** on a color swatch of the color palette, and each **CLICK** adds 10% of that color to existing color. You can see the changes on the fill color box on the **STATUS BAR**. This trick works with outline colors also.

Status Bar is an on-screen display area at the bottom of the CorelDRAW window that shows information about objects, ongoing operations, and mouse position, as shown in Figure 1-3. You can specify the contents, appearance, and location of the **STATUS BAR** in the Application Window.

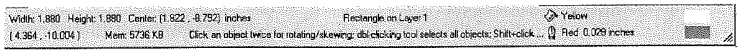


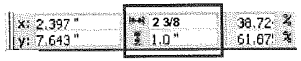
FIGURE 1-3 The STATUS BAR shows information on selected objects, outline and fill color, line width, memory, and other object information.

I find the Status Bar especially useful information when bringing artwork from outside sources as it identifies the type of object – bitmap, envelope, etc. It is also a good place for noting fills, line colors, and line widths.

CorelDRAW Can Do the Math'

Did you know that CorelDRAW can do the math for you? When working with inches, you can type fractions directly in the various numeric input boxes on the various property bars. CorelDRAW will convert the fractions to decimal when you press the **TAB** or **ENTER** keys.

For example, if you input 2 3/8, CorelDRAW will automatically convert it to 2.375.



And, it will also do conversions between various measurements (i.e. metric to decimal). If you input the value 4 cm into one of the numeric input boxes, CorelDRAW will convert it to 1.575". You can convert pixels (PX), yards (YD), and millimeters (MM) to your current units.

Cursors

One of the most useful learning tips in CorelDRAW is to watch the cursor as you use the different tools.

Three of the cursor states are shown for the Text Tool. You can also note your cursor type to see what the current tool is in use.

Standard Text Cursor | Text Onto A Closed Path | Text Into A Closed Path

Help

CorelDRAW features a variety of resources that provide on-screen assistance as you need it. You can find information in online Help by double-clicking specially coded words, phrases, or icons that show the topic. Context-sensitive Help is accessible from anywhere within CorelDRAW. You can

access context-sensitive Help from the menus, dialogs, Docker windows, Property Bars, and all other toolbars in CorelDRAW. ToolTips describe individual features in the application, The Online Hints window provides you with information about the tool you're using, or the possible tasks or actions you can perform.

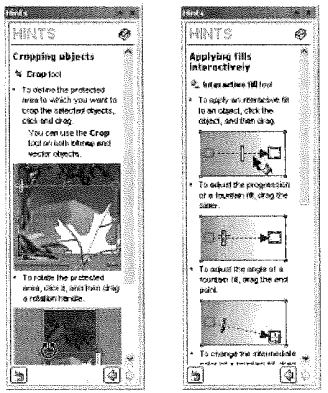
I learned most of the features of CorelDRAW with ToolTips. By placing the cursor over the icons of the many options, ToolTips provides a visual popup which describe the individual features in the application.

Other features that make CorelDRAW learning process easier include:

Hints – X3

Hints help you master each tool in the toolbox as you are using the tool.

Have you ever tried to figure out how to use a tool in any program? X3 now has the Hints Docker. **CLICK** on a Tool in the Toolbox and the Hints Docker displays help features to use the tool you have selected. The next thing you know, you won't need me to show you the way!



Help Topics from help menu or by pressing F1. The main form of assistance is the online Help, which, apart from a minimum of graphics, is an electronic version of the CorelDRAW manual.

CorelTutor provides a series of project-based tutorials that introduce you to basic and advanced features of CorelDRAW.

Insights from the Experts X3 CorelDRAW Graphics Suite experts from diverse graphics industries share with you their ideas, approaches, tips, and methods.

What's New - X3 list of new features and enhancements since the last version of CorelDRAW.

Highlight What's New - X3 you can highlight all menu commands and tools that were new for a specific version by **CLICK**ing **HELP | HIGHLIGHT WHAT'S NEW.**

Online Help there are several Corel support options on the web. My favorite is the Corel Knowledge Base where you can search through Corel's vas archives. It can be found at *http://support.corel.com*

Setting up Your CorelDRAW Workspace

A workspace is a configuration of settings that specifies how the various command bars, commands, and buttons are arranged when you open the application. You can create, choose, and delete workspaces. You can also reset the current workspace to the default settings. This lets you undo changes you make to a workspace.

You can also export and import workspaces to and from other computers that use the same application. For example, you can customize a workspace and share it with a group of users.

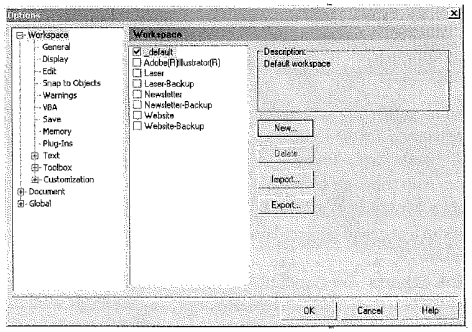
Here are some examples of workspaces I use:

- Newsletter
- Website
- Laser

Other custom workspaces might include those for sublimation, vinyl cutting and more.

Switching Between Workspaces

To get to workspaces, go to **TOOLS | OPTIONS | WORKSPACE**. The Options dialog is shown to the below:



Newer versions of CorelDRAW will automatically change your current workspace immediately after you select the workspace. In CorelDRAW 9, you must close your current job, and start a new job after you select a new or existing workspace for the workspace change to be visible.

Creating a New Workspace

Let's create a new workspace with the settings I like to use for my laser. I'll start with the CorelDRAW default settings. Here are the other changes I prefer:

- I make sure my **STATUS BAR** is visible. It helps you with the description of objects, whether an object is a bitmap or vector, colors, and much more.
- I like the full page of my laser. I set the Page Size to 12" x 24".
- I change ruler where the 0 is as the top of the Drawing Page to match my laser. You can change ruler options in the Rulers dialog at **TOOLS | OPTIONS | WORKSPACE | RULER.**

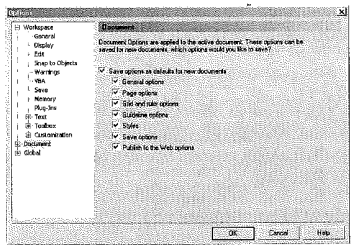
*You can get to the Rulers dialog quicker with a **DOUBLE-CLICK** on any of the rulers.*

- My Dockers of choice – Transformation, Shaping, and Object Manager. If you are new to CorelDRAW, definitely use the new Hints Docker.
- In some of my workspaces, I will change the color palette display options. To get to the Color Palette dialog go to **TOOLS | OPTIONS | CUSTOMIZATION | COLOR PALETTE.**
- I also add several of the Distribute icons to my Multiple Objects Property Bar.

Saving your Settings

In the newer versions of CorelDRAW, you save the defaults with a menu option - **TOOLS | SAVE SETTINGS AS DEFAULTS.**

I don't know if it's computers or operating systems, but on some computers I try to use the menu option for saving defaults and it doesn't save them. I always go to **TOOLS | OPTIONS | DOCUMENT** and "Save options as defaults for new documents" as shown here.



Even if you do not utilize different workspaces, be sure and save the defaults (TEXT options, etc.). For more on workspaces, go to *The CorelDRAW Workspace – Beyond the Basics* in the Appendix.

Essential Object Commands

Selecting an Object

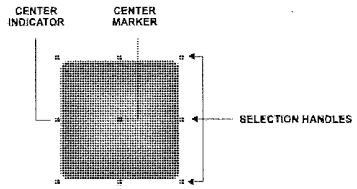
Selecting an object is the most basic of CorelDRAW options. You can select objects using the mouse, keyboard, or menu commands.You can select:

- visible objects, hidden objects, and a single object in a group or a nested group
- objects in the order in which they were created
- all objects at once

The Pick Tool

Before you can change an object, you must first select it. With the PICK TOOL, you can **CLICK** on the object you want to move, change or transform.

When an object is selected, eight black squares or handles appear around the object. An "X", representing the center marker, also appears in the middle of the selected object.



*You can toggle between the current Toolbox tool and the PICK TOOL by pressing the **SPACEBAR**. To reselect the PICK TOOL when the TEXT TOOL is selected, press **CTRL+SPACEBAR**.*

TAB Key

Pressing **TAB** selects an object, starting with the last object created and moving toward the first object created. And **SHIFT + TAB** selects an object, starting with the first object created and moving toward the last object created. See also Stacking Order and Object Manager about the position of objects in a drawing.

Selecting Multiple Objects

There are several techniques for selecting more than one object at a time. Here are some of the selection options:

- **SHIFT + CLICK** - when you **SHIFT+CLICK** an unselected object, it is added to your current selected objects. In addition, if you have several objects selected, use the same method, **SHIFT+CLICK** to unselect the objects one at a time

- Marquee selecting using the PICK TOOL or SHAPE TOOL. You can select all objects in a rectangular area by a **CLICK-DRAG** motion diagonally with the PICK TOOL as shown in Figure 1-5

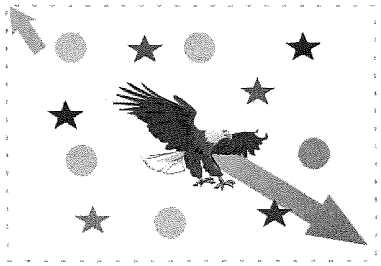


FIGURE 1-5 Marquee-selecting allows you to select or 'box' multiple objects.

- Holding down the **ALT** while marquee-selecting allows partially selected items to be selected
- **DOUBLE-CLICK** on PICK TOOL to select all objects, or Select All in Edit Menu, or **CTRL+A**
- Select through the Object Manager Docker
- Digger Tool - **ALT** key and start **CLICKING** on top object until a selection box appears around the object you want
- **CTRL** key and **CLICK** a single object in a group or a nested group
- **CTRL+ALT** and **CLICK** the topmost object to select a hidden object in a group
- Edit Menu - select All Objects, Guidelines, Text, Nodes
- Edit Menu – using Find and Replace

*The next time you are marquee selecting an object(s) using the left mouse button, **CLICK** and hold the right mouse button also. This allows you to change the location of the marquee. If you release the right mouse button, you can continue changing the marquee area. And – it works with the many other tools including Zoom, Rectangle, Ellipse, Polygons and Shape.*

De-selecting

With the PICK TOOL, **CLICK** in a blank area of the Drawing Page. This is known as de-selecting. Normally you use de-selecting when changing to another tool, or don't want any objects selected.

Selecting and object that is already selected de-selects that object. You can also press ESC to de-select all objects.

Treat As Filled Option

In the default mode, you can **CLICK** in an un-filled area (no color) of an object and it will select the object. On the Default Property Bar, note the Treat as Filled buttons in Figure 1-6.

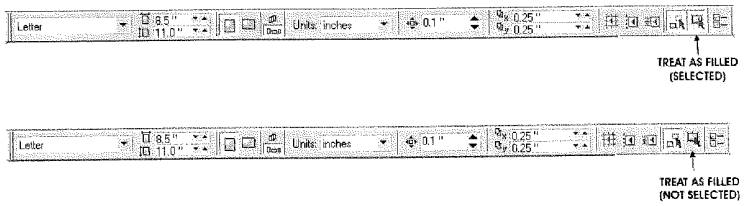


FIGURE 1-6 Default Property Bars with the two states of Treat As Filled; selected and not selected.

The default setting is depressed, or "on". **CLICK** on it and it will change to "off", or not pressed. Moving your cursor over the unfilled object and **CLICKING** will not select the object when the icon is not selected. To select the object you must click on the outline.

In Figure 1-7 below, selecting the dots on the dominos is easier with the Treat As Filled Option turned off. In the examples, the domino borders have 'no fill'.

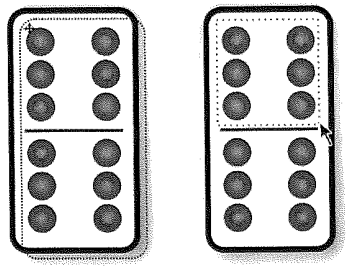
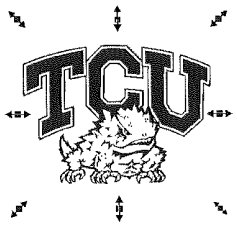


FIGURE 1-7 When you try to marquee select the dots with Treat As Filled turned on, the domino border is treated as filled and the outline moves as shown with the dotted lines. Note that the cursor changes to the 'move state'. But with the option turned off, you can marquee select the dots without moving the outside 'border'.

Transforming Objects Interactively

Transformation is changing an object's orientation or appearance without changing its basic shape. Types of **TRANSFORMATIONS** include moving, rotating, scaling, mirroring, sizing, and skewing.



Constrain Keys

Constrain keys are very important tools when creating objects. They are used to restrict object movement to a particular plane, axis, or angle. The primary way of constraining is to hold down **CTRL** while transforming or creating an object. The **SHIFT** key and the **SHIFT+CTRL** keys are other constrain combinations. Be sure and release the constrain key after you have released the mouse.

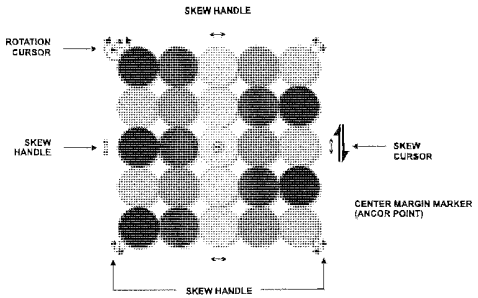
Moving and Scaling Objects

Select an object, and move the cursor towards the center handle. As you move the cursor over the middle handle, the cursor changes to ✕. With the cursor over the center handle, drag the arrow. Move it around. Let go of the mouse, and repeat the selecting and moving of the arrow. After you **CLICK** on the 'X' or center handle, or in any of the area other than the handles, the object can be moved without it being altered.

- Resizing the rectangle by using the side or top handles alters it un-proportionally.
- To resize or scale the rectangle proportionally, **CLICK-DRAG** one of the four corner handles.
- A **SHIFT+CLICK-DRAG** movement changes the width or height of the selected object, and leaves the object anchored in the center. And a **CTRL+CLICK-DRAG** movement changes the width or height in 200-percent increments from the original size.

Skewing and Rotating

You can also rotate or skew an object interactively by **CLICKING** twice on the object. The selection handles change to rotation and skew handles.



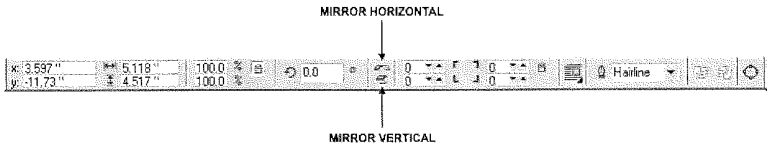
A **CLICK-DRAG** motion rotates the object from the Center Origin Marker. Holding down the **CTRL** key as you rotate the object moves it in 15-degree increments. The default Constrain angle rotation of 15 degrees can be changed at **TOOLS | OPTIONS |WORKSPACE | EDIT**.

Skewing slants an object vertically, horizontally, or both. If you move your cursor over one of the Skew Handles, the cursor will change to the Skew Cursor.

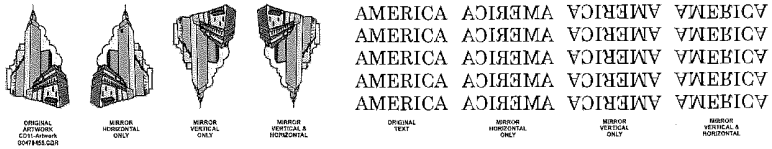
Using the **CTRL** key while skewing a selection, moves the objects in 15 degree increments.

Mirror Horizontal and Vertical

To flip a selected object quickly, either vertically or horizontally, use the Mirror Vertical and Mirror Horizontal buttons on the property bar shown below, while using the **PICK TOOL**.

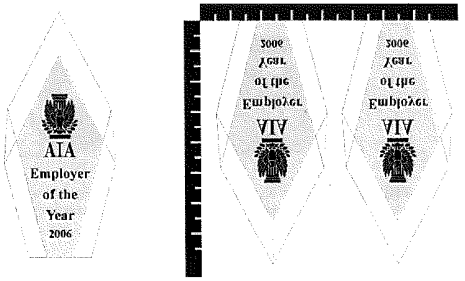


Examples using the Mirror options are shown below:



You can also mirror an object by dragging any one of the handles in the opposite direction. Holding down the CTRL key while dragging mirrors the object proportionally.

When working with acrylics, most of your work is mirrored horizontally. However in the example above it was mirrored vertically so the bottom of the base could be placed against the top ruler of the laser for easier alignment.



Object Ordering

Object order is another of the basics you need to know to organize shapes. Setting the order of objects lets you set whether an object appears in front of, or behind another object.

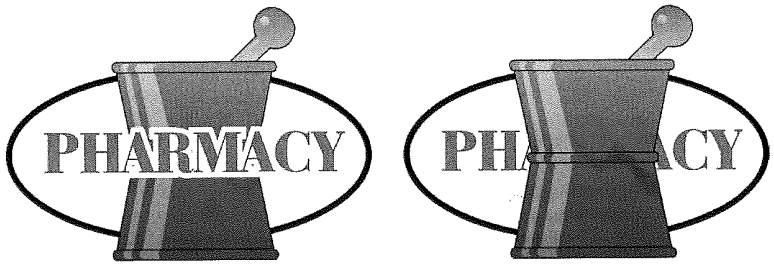


FIGURE 1-8 The order in which objects are created, or the order in which they are displayed can affect the look of the final image.

Stacking Order

The stacking order is the position of objects within a layer. As you create new objects, they are 'stacked' on top of other objects as noted in Figure 1-9. Stacking order is a term also used with the relationship of layers.

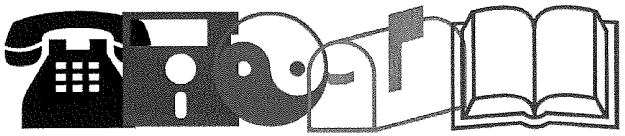
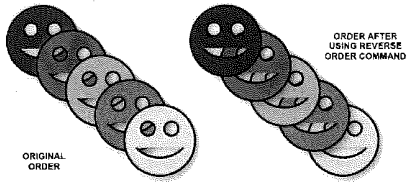


FIGURE 1-9 The objects were created beginning at the left. Note that as a new object was created, it was 'stacked' above the previously created objects. If the objects were not created on top of the preceding object, the stacking order would not be evident.

You can change the stacking order of objects on a layer by sending objects to the front or back, or behind or in front of other objects. You can also position objects precisely in the stacking order, as well as reverse the stacking order of multiple objects.

To order objects go to the **ARRANGE | ORDER** menu. Here are your options:

- **To Front** moves selected object(s) in front of all other objects on or your document page.
- **To Back** moves selected objects(s) behind all other objects on or off your drawing page.
- **Forward One** brings the selected object(s) forward one layer in the current object order.
- **Back One** moves the selected object(s) back one layer in the current object order.
- **In Front Of** causes a targeting cursor to appear, enabling you to specify the object you want your object selection to be placed in front in the current object order.
- **Behind** applying this command causes a targeting cursor to appear, enabling you to specify which object you want your object selection to be layered behind in the current object order.
- **Reverse order** changes the order of only selected objects relative to each other, in reverse of their current order.
- **To Front of layer** moves selected items to the Front of the layer, or as though they were the last objects to be drawn on the layer.
- **To Back of layer** moves selected items to the Back of the layer, or as though they were the first objects to be drawn on the layer.



Knowing the order of engraving is important when vector cutting. The laser I use first engraves bitmaps, staring with black and moving in order down the colors in the print driver. Then it sort's the order of the vector cuts in the printer driver based on colors, and controls in the Vector Optimizer. When the Sort is turned off in the print driver, the order of engraving is based on color first and stacking order second. While you can change the order of the objects in ***ARRANGE -> ORDER****, it's much easier in the Object Manager Docker.*

Zooming & Viewing

Changing the view of a drawing you are working with is one of the easiest ways to make your work flow smoother. A couple of extra **CLICKS** trying to get to a better view can add up during the day. Let's look at the Zoom options available.

Zoom Levels

To increase your current view by a specific or preset view magnification, use the Zoom Levels drop-down menu available in the Standard or **ZOOM TOOL** Property Bars shown in Figure 1-10.

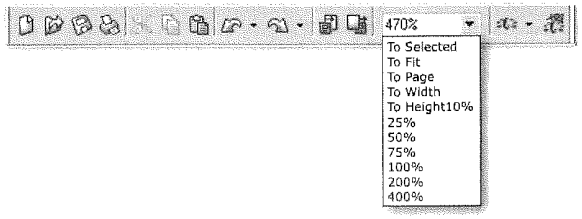
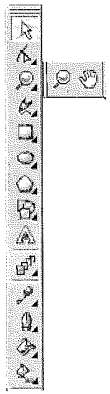


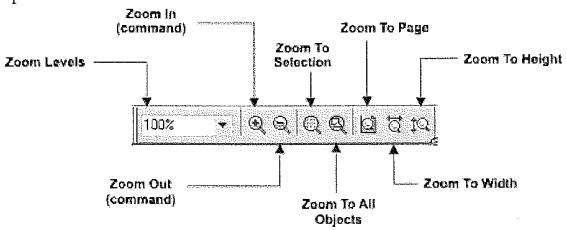
FIGURE 1-10 Standard Property Bar. Note the 470% for the Zoom value. The drop down menu shows other quick Zoom options without having to select the **ZOOM TOOL**.

Using the Zoom Tool and Property Bar



The **ZOOM TOOL** provides a tool-based method to increase (Zoom In) or decrease (Zoom Out) your document's view magnification. You'll find this Tool located in the main Toolbox grouped together with the **HAND TOOL**.

While you're using the **ZOOM TOOL**, the Property Bar includes a series of buttons and menus that provide access to Zoom options and view-specific commands. These conveniences enable you to change your current magnification, apply Zoom options, or apply page-specific or selection-specific Zoom commands:



Zoom In is the default state when the **ZOOM TOOL** is selected. **CLICK** the **ZOOM TOOL** once at any point on or off your page will increase your view magnification 2 times.

You can also use the **ZOOM TOOL** to perform marquee-select zooming, which involves a **CLICK-DRAG** action in a diagonal direction using the **ZOOM TOOL** cursor to define either the width or height of the area you want to Zoom In to, as show in Figure 1-11.

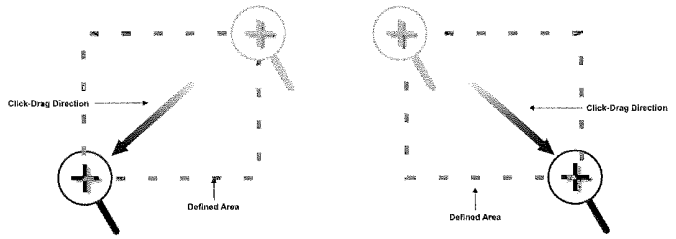


FIGURE 1-11 Two examples of marquee-selecting with the Zoom tool.

One of the most important things to remember about the Zoom Tool is that you cannot ***UNDO*** *a* ***ZOOM****.*

Other Zooming Options

Zoom Out To decrease your view magnification using the **ZOOM TOOL**, **RIGHT-CLICK** anywhere on or off your document page, or **CLICK** the Zoom Out button on the Property Bar.

Zoom One-Shot Enables you to select the **ZOOM TOOL** momentarily for a single Zoom In or Zoom Out command while you are using another Tool. Once the Zoom operation is complete, your previous Tool reappears. Press either the F2 or Z shortcut keys to activate the Zoom One-Shot feature while any tool is selected.

Zoom To Selection Enables you to change your view magnification to show the complete selection to fill your document window. Objects can be on or off of the Drawing Page.

Zoom To All Objects Changes your view magnification to show all objects visible in your document window, regardless of whether or not any objects are select on or off your current document page.

Zoom To Page Changes your view to whichever magnification is required to fit your current page size completely within the current document window.

Zoom to Width/Height of Page accomplishes a similar result to that of Zoom to Page, but you may specify either width or height as the reference point.

Using the Hand Tool

The **HAND TOOL** enables you to "pan" the view of your drawing as an interactive alternative to using scroll bars.

DOUBLE-CLICKING *the* HAND TOOL *button in the main Toolbox instantly centers your page view.*

Page Sorter View

CorelDRAW Page Sorter View becomes available as a special View mode while your document features multiple pages. To enter Page Sorter View mode, choose **VIEW | PAGE SORTER VIEW** as shown in Figure 1-1.

You can change the order of pages in the Page Sorter View by dragging pages.

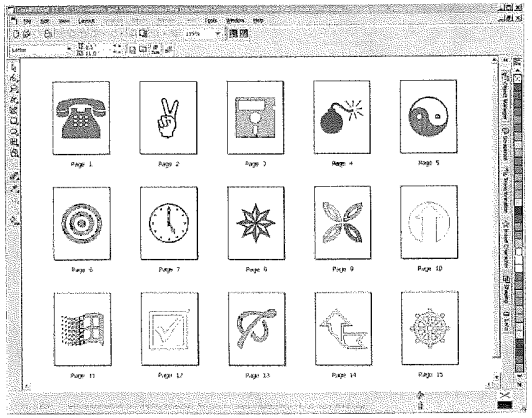


FIGURE 1-12 Page Sorter View with 15 pages displayed.

View Navigator

The View Navigator is essentially a pop-up panning viewer that enables you to see your entire document page while panning at any magnification. You will find the View Navigator pop-up window at the point where your vertical and horizontal scroll bars meet at the lower-right corner of your document window. This feature is shown in Figure 1-13.

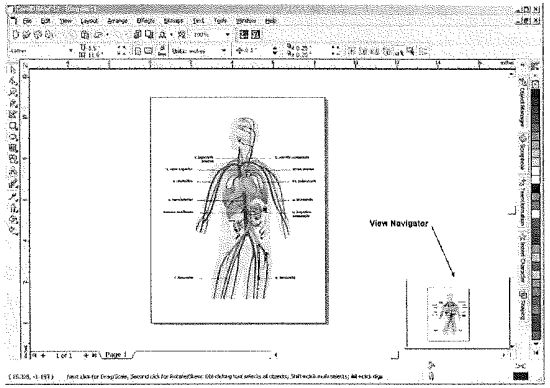


FIGURE 1-13 The View Navigator lets you quickly move around large drawings without having to change your Zoom level.

Viewing a new area while drawing

You can also use the Navigator to view a new area while you are drawing. Using the shortcut key to activate the Navigator minimizes disruptions to your workflow.

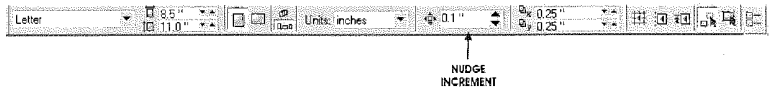
For example, when tracing a bitmap with the **FREEHAND TOOL**, and you get to the edge of the Drawing Window, press **N** to open the Navigator window. The Navigator window appears in the drawing window at the cursor's last position.

The Navigator window stays open and active until you **CLICK** to set a new viewing area. After you set a new area — in this case, an area adjacent to the previous area — you can continue working with the **FREEHAND TOOL**.

Nudging

A more precise movement is achieved by using the Nudge command. After selecting the object, you can move it with the **UP, DOWN, RIGHT** or **LEFT ARROW** keys.

The Nudge distance is controlled on the Standard Properties bar (**PICK TOOL** with no objects selected). The default value for each step is .10 inches.

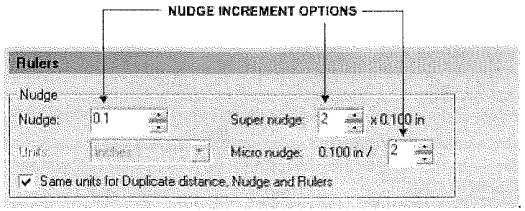


DOUBLE-CLICKING *on either the horizontal or vertical rulers quickly brings up the Rulers Option Dialog. Here you can change the Nudge increments, units of measurements, origin and edit the ruler scale.*

To allow more options for Nudge movements, CorelDRAW added the Super Nudge and Micro Nudge commands. The standard Nudge value is increased or decreased by holding modifier keys while using the arrow keys by the following methods:

- **Super Nudge** moves a selected object by a multiplier set in the Rulers options page. To use Super Nudge, hold the **SHIFT** key while pressing the **UP, DOWN, LEFT** or **RIGHT** arrow keys. With a default value of 2, holding down the **SHIFT** key and pressing one of the arrow keys causes your selected object to move twice the value of your Nudge value.
- **Micro Nudge** moves your object in smaller increments by a preset. To use Micro Nudge, hold down the **CTRL** key while pressing the **UP, DOWN, LEFT** or **RIGHT** arrow keys. With a default value of 2, holding down the **CTRL** key and pressing one of the arrow keys causes your selected object to move half the value of your Nudge value.

You can change all of the Nudge Increment values by accessing the Rulers dialog window at **TOOLS | OPTIONS | DOCUMENT | RULERS** shown below:



As you nudge an object, you can leave a copy of it by pressing + on the numeric keypad.

Undo and Redo Commands

Have you ever been afraid to try a new command, but the fear of failure stopped you from trying. Then CorelDRAW's Undo command is your lifesaver.

Undo

Anytime you need to Undo an action or command, you can access the Undo command by one of these methods:

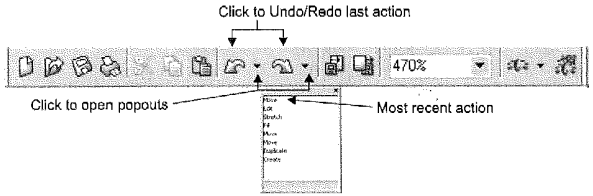
- Press **CTRL+Z**
- Selecting the Undo icon on the Standard Toolbar
- Go to the menu option **EDIT | UNDO**

This option causes your current object to revert back to your previous action or command, one action at time.

You can increase or decrease the number of Undo levels in CorelDRAW. By default, you can reverse your recent 99 actions. However, the range of this option is from 1 to 99,999 steps. To change this option go to **TOOLS | OPTIONS | WORKSPACE | GENERAL.**

I leave my default at 99 because I do numerous Nudging moves. Each press of the arrow keys is saved as an Undo. If you are having computer crashes while in CorelDRAW, which are usually due to a lack of resources, you might change this number to 25.

There is also an Undo pop out on the Standard Toolbar. To reverse either Undo or Redo actions using the pop out, **CLICK** one of the available commands in the list. It reverses the selected actions back to the point you specified in the pop out. The pop out shows you the most recent actions at the top of the listing. An example of the Undo pop out is shown below:



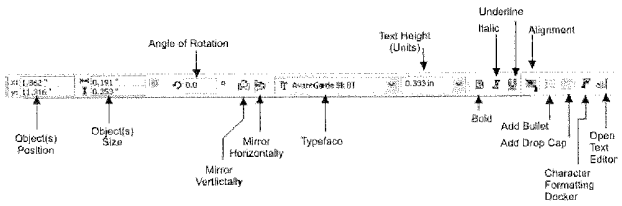
Redo

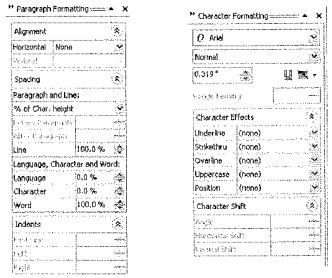
Okay, so you did an **UNDO** and it takes you back. If you decide that the drawing looks better at the point before you did the Undo, you can **REDO**.

Artistic and Paragraph Text

CorelDRAW uses two text options – Artistic and Paragraph text. There are significant changes made with the release of X3.

Formatting options can be accessed from the **TEXT PROPERTY BAR** (shown below) or from the menu **TEXT ->CHARACTER FORMATTING,** or **TEXT ->CHARACTER FORMATTING** shown in Figure 3-1.





Paragraph Formatting Docker

Character Formatting Docker

FIGURE 3-1 Format Text Dialog Options.

Paragraph Text

Paragraph Text is similar to text objects used in desktop publish applications. Paragraph text can be used for larger bodies of text that have greater formatting requirements. It is most often used when creating columns for names on a plaque, or wrapping text around an object. When adding paragraph text, you must first create a text frame. The various options for working with paragraph text objects are shown in Figure 3-2.

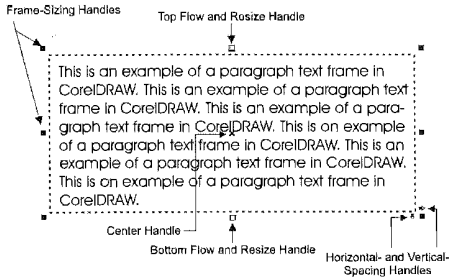
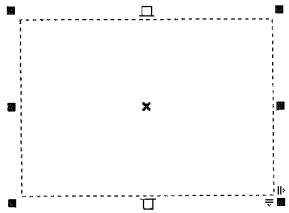


FIGURE 3-2 The handles around the paragraph text firm are used to resize the text frame, link to other frames and adjust spacing.

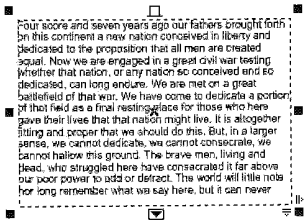
Using Paragraph Text for importing a block of text

In this lesson, I want to create a paragraph text frame and import the Gettysburg Address which I have saved on my hard drive as a Microsoft Word document.

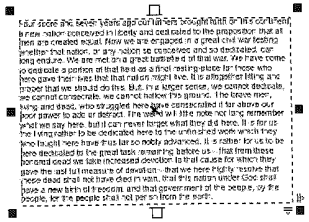
1. First create the actual text frame by selecting the **TEXT TOOL**, and **CLICK-DRAG** to make the text frame.



2. Place the Text cursor inside the text frame and **CLICK**. From the **FILE | IMPORT MENU**, or the Import icon on Standard Property bar, open the import dialog and select the file. I will be using the Gettysburg address. If you get an Importing/Pasting Text dialog, select Discard fonts and Formatting. We will format the text in CorelDRAW. Note the black arrow at the bottom of the text frame. This flow marker indicates there is more text in the flow than is visible.



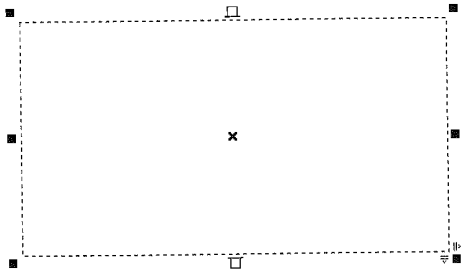
3. To view all of the text, select **TEXT | PARAGRAPH TEXT FRAME | FIT TEXT TO FRAME**. This option will automatically adjust the font size allowing all of the text to be viewed in text frame.



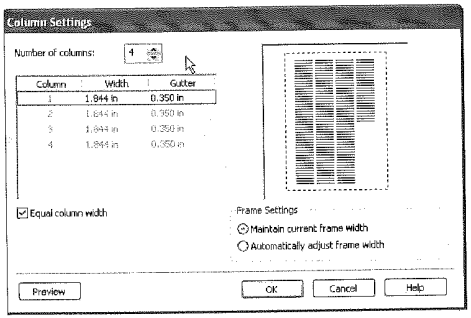
Using Paragraph Text to create columns of text

In this lesson, I want to use several paragraph text frames to create columns for a series of names.

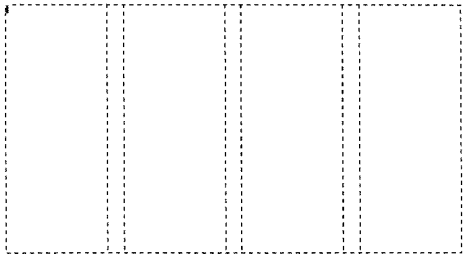
1. First create a text frame with the Text too. This is the area our columns will fit.



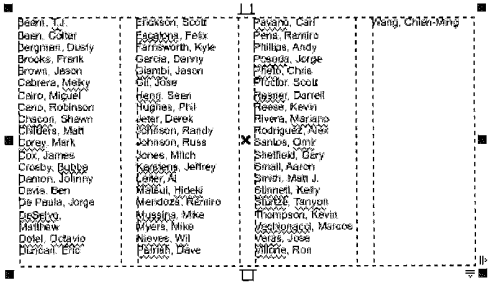
2. Select **TEXT | COLUMNS**. From the Column Settings dialog, select 4 columns, change the gutter to .35, and choose Maintain current frame width under Frame Settings. The dialog is shown.



3. Place your cursor inside of the text frame and you will see the newly created columns.



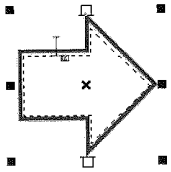
4. You can type in the names or import them.



5. After using the Fit Text To Frame option, here's how my plaque looked.

Creating Paragraph Text Frame within objects

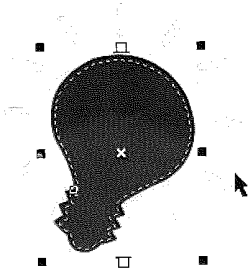
Another popular use for paragraph text frames is to create the frames within objects. When you first select the object with the text tool, the cursor will change to the Text in A Close Path as you move the cursor over the object. After the cursor changes and you click inside, the page frame can be seen inside the object.



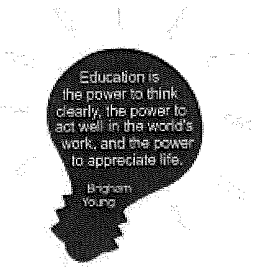
Watch your cursor when you move across an object. You can easily create a text frame within the object by a simple ***CLICK****. In addition, mirroring paragraph text is not as friendly as working with Artistic text.*

Here is my example lesson for created a paragraph text frame within an object.

1. Our first step is to click inside our object, the light bulb, with the Text Tool. Note the dotted lines inside the light bulb denoting the text frame.



2. After entering text and Fitting Text To Frame, we have a unique layout.



Artistic Text

As an engraver and laser operator, I find that 90% of my text needs are accomplished with CorelDRAW's Artistic Text. I use artistic text to add short lines of text, such as titles, or to apply graphic effects, such as fitting text to a path, creating extrusions and blends, and creating all other special effects.

An artistic text object can contain up to 32,000 characters.

Editing Text

CorelDRAW's **TEXT TOOL** uses many of the same rules for editing text used by other Windows applications. To place the text cursor (also referred to s the I-beam cursor) in the text where you want to start typing, simply click with the left mouse button.

- You can use the text cursor to select one character at a time, by words, or by whole paragraphs. You can also the **UP, DOWN, LEFT** and **RIGHT** arrow keys on your keyboard to select strings of sequential text, a word, a line, or a paragraph at a time.
- If some text is already selected, the selection can be extended by clicking at the new endpoint of the selection while holding down the SHIFT key.
- Double-clicking with the cursor selects the word in which you double-clicked.
- Triple-clicking with the cursor selects the entire paragraph in which you triple-clicked.
- Hold down the CTRL when you single-click to select a single sentence.

Moving Text Interactively

Your can move a selection of text with the mouse by dragging-and-dropping. Simply select the word or words you want to move and then click-drag the text to the new location.

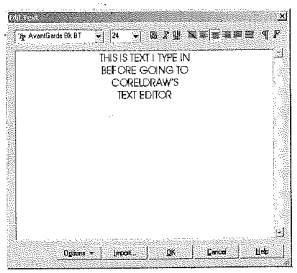
Dragging with the right mouse button causes a pop-up menu to appear when you drop the text, with options of Copy or Move.

Using the Text Editor

Often when editing text in CorelDRAW, it is hard to place the cursor exactly. You can use the **EDIT TEXT** dialog's 'ab' symbol on the Text Properties Toolbar, above.

Although it lacks any extras, it's easy to use. For example, drag-and-drop editing does not work while using the text editor.

To open the **EDIT TEXT** dialog, select a text object and then press **CTRL+SHIFT+T**, or **CLICK** the **EDIT TEXT** button (the 'ab' button) on the **TEXT TOOLBAR** or Property Bar.



Using the Text Property Bar

Most of CorelDRAW's formatting options for Text objects are available on the Property Bar. The Property Bar appears either when a Text object is selected with the PICK TOOL or the TEXT TOOL is active. The options for the Text Property Bar are shown:

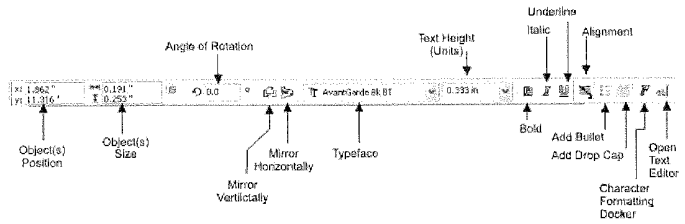


FIGURE 3-3 Text Properties Toolbar.- X3

Editing Text with the Text Tool

Any user who is already familiar with editing text in a word processor will be at home editing text in CorelDRAW. You can use the text cursor to select text a character at a time, by whole words, or even by whole paragraphs. You can also use the **UP, DOWN, LEFT,** and **RIGHT** arrow keys on your keyboard to move around to edit text.

If text is selected, you can apply text styles and formatting only to the selected characters and word.

Selecting with Text Cursor

- To place the text cursor (also referred to as the I-beam cursor) in the text where you want to start typing, simply **CLICK** with the left mouse button.
- If some text is already selected, the selection can be extended by a **CLICK** at the new endpoint of the selection while holding down the **SHIFT** key.
- A **DOUBLE-CLICK** with the cursor selects the word in which you **DOUBLE-CLICKED**.
- A **TRIPLE-CLICK** with the cursor selects the entire paragraph in which you **TRIPLE-CLICKED**.
- **CTRL+CLICK** selects a single sentence.

Transforming Text Interactively

CorelDRAW has many power tools to transform Artistic text for the laser operator. Your can move a selection of text with the mouse and the PICK TOOL. Simply **CLICK** the word or words you want to move, or the center marker in the selected text, and then **CLICK-DRAG** the text to the new location. You can also use the corner Selection Handles (Figure 3-4) to proportionally resize text.

*You can Nudge selected text by using the **UP, DOWN, RIGHT** and **LEFT** arrow keys. If you need a 'shadow effect', you can duplicate the text, send it to the back, and Nudge it to the right and the left.*

FIGURE 3-4 Artistic text shown with the selection handle and center marker.

***RIGHT-CLICKING-DRAG** causes a pop-up menu to appear when you drop the text, with options of Copying or Moving.*

Skewing & Rotating Artistic Text

Your can rotate or skew an object using special Pick Tool states that become available only after clicking a selected object (or objects) a second time. Doing so causes the selection handles to change to rotation and skew handles as shown in Figure 3-5.

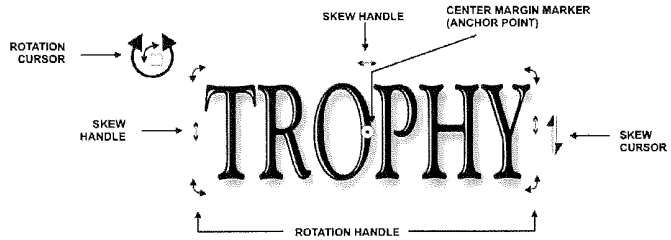


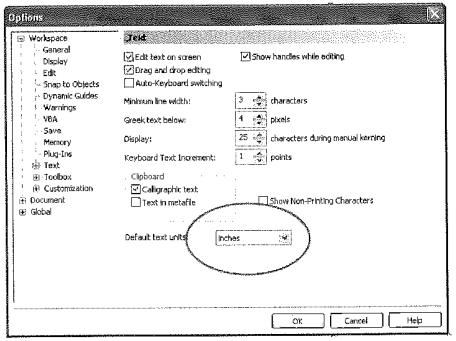
FIGURE 3-5 Text Options available after **DOUBLE-CLICKING** the Artistic text.

You can skew text when the font does not offer italics, or when you need more slant to a font.

Text Height Now Works - X3

In CorelDRAW 12, you had the option of changing the text display units (inches, picas, points, etc). However, it didn't work. Now you can choose inches as one of your options for your text height. And the mirror icons are now on the Text Property Bar. While these changes may seem trivial, most laser and rotary engraver operators use inches when working with text.

If you go to **TOOLS -> OPTIONS -> WORKSPACE ->TEXT,** you will notice the Default Text Units. You can use millimeters, inches, picas & points, points, ciceros & didots and Q as your default.



Artistic Text and the Shape Tool

The **SHAPE TOOL** can be used to make various changes to text, including repositioning individual characters within the Artistic Text object.

Selecting your text with the **SHAPE TOOL** changes the cursor to the **SHAPE TOOL** pointer. With the Text object selected this way, a small Character Control Node appears at the lower-left corner of each character as show in Figure 3-6.

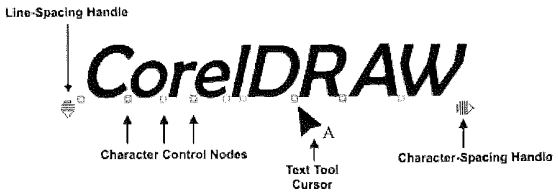


FIGURE 3-6 Artistic Text options after the text is selected with the Shape Tool.

- The Character-Spacing handle changes the tracking, or spacing between letters and handles.
- The Line Spacing Handle changes the leading, or white space between lines. Drag the down-pointing arrow to interactively adjust the inter-line spacing.

Kerning is individual adjustments between specific pairs of characters, or kerning pairs. While you can use the shape tool to adjust these pairs, here's a long forgotten tip. Highlight the pairs (or as many connecting letters you need) with

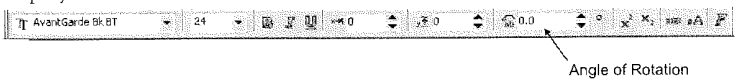
your Text Tool. Hold down the CTRL + SHIFT, and use the ">" key to increase spacing, or "<"key to reduce space between pairs.

You can move individual characters by selecting and dragging the associated node as shown in Figure 3-7. To move several characters at once, **SHIFT+CLICK** each control node, and then **CLICK-DRAG** the selected nodes. You can also use the Nudge option to move the nodes. All of the selected nodes will move together. Or you can marquee-select to encompass and select the appropriate nodes.

FIGURE 3-7 Adjusting the copyright symbol placement using the Shape Tool. It was resized after it was moved to the desired position.

1. Changing the Character Rotating Angle of Text within the Text Dialog

When a single node or multiple nodes are selected with the **SHAPE TOOL**, you have the option of rotating the characters as shown in Figure 3-8. Just change the value of the Angle of Rotation on the Property Bar shown below:



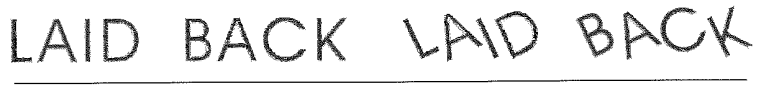


FIGURE 3-8 Single or multiple characters can be rotated by changing the Angle of Rotation on the Property Bar.

Text Outline Properties

When you first install CorelDRAW, you text outline properties are set to a color of None and an outline width of None. The laser operator often changes the outline to Hairline to cut out letters. Changing the Text Outline width and color can produce different text appearances as shown in Figure 3-9. The text outline properties can be changed on the property bar or by changing them in the **OUTLINE TOOL** properties.

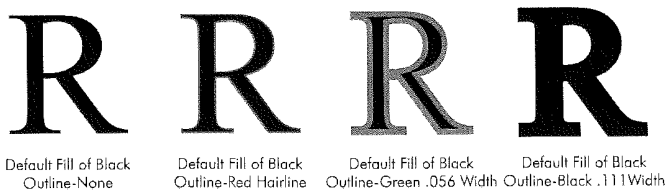


FIGURE 3-9 Text with varying outline widths and colors. The width can change the overall appearance of the text style.

If you are having problems with your laser not vectoring, first make sure your line width is set to hairline (.003) or less in your Universal laser printer driver. If you are not using a Universal, check with you laser manufacturer to see what the maximum line width you can use as a vector line.

TIP *The best way to test your driver's vector capability is to put (7) 2" horizontal lines with vertical space of ½ inch apart on your CorelDRAW page. Change the line widths from .001 to .007. Turn your print driver to 'VECTOR ONLY' and run the job.*

Did you know that hairline is actually .003 inches? You can change the line width to a width smaller than .003 and it will reflect the value you input. However, if you put in .003, it shows Hairline.

Do your screen fonts look terrible or fuzzy in CorelDRAW? See if your text outline color is set to White.

Fattening Up Script Fonts for the Laser

Some script fonts do not laser well due to the thinness of the font. By changing their outline widths, you can 'fatten up' the font where it is more acceptable for laser work. If the line width will vector on your laser, be sure and turn VECTOR off. Examples are shown in Figure 3-10.

FIGURE 3-10 Examples of script fonts with Outline Properties changed from the default setting.

Copying All Properties

One of the easiest ways to copy text properties from one text block to another is to **RIGHT-CLICK-DRAG** the original text over the text that will receive the original text properties. When you release the cursor, several options will appear - choose Copy All Properties as shown in Figure 3-11.

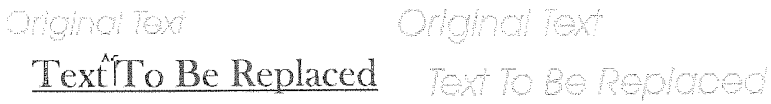
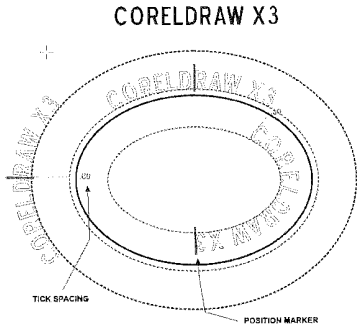


FIGURE 3-11 Example of Copying Text Properties. The original is on the left. Note the black 'A' cursor on the bottom line of the 'Text To Be Replaced' on the original.

Fit Text to Path

The new Fit Text to Path or arcing option is a major change in CorelDRAW X3 compared to earlier versions. It is far more interactive, and it's much easier to use multiple paths on the same arc, or path.

With Fit Text to Path, you can add artistic text along the path of an open object (for example, a line) or a closed object (for example, a square).

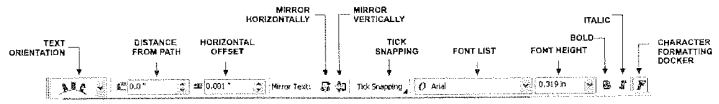


To Fit Text to a Closed Path Interactively

1. Select a text object using the Pick tool
2. Click **TEXT : FIT TEXT TO PATH**. The pointer changes to the Fit text to path pointer. As you move the pointer over the path, a preview of where the text will be fitted is displayed. You will also see the distance between the text preview and the path displayed.

Adjusting Text on a Path

There are several options for adjusting your text on the Text on Curve/Object property bar shown below:



TEXT ON CURVE/OBJECT PROPERTY BAR

After you fit text to a path, you can adjust the text's position relative to that path. Using the Pick tool, you can move text along or off the path by dragging the red glyph that appears beside the text.

Interactively Setting Position Using the Pick Tool

When the Path Text Group is selected with the **PICK TOOL**, a red diamond, the Glyph node, appears at the start of the text. You can drag the Glyph node and the start of the text block is moved along the path to the new position as shown in Figure 3-13. All of the text is then redrawn from that point. This is similar to selecting all of the Characters' Control Nodes with the **SHAPE TOOL** and dragging them to a new position.

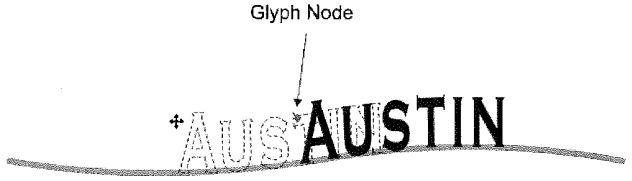
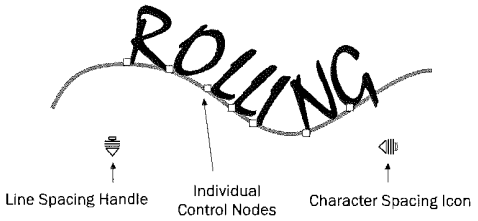


FIGURE 3-13 The Glyph Node can be use to move text along a path.

Interactively Adjusting Spacing and Position Using the Shape Tool

Using the **SHAPE TOOL**, you can interactively change the spacing of characters along the length of the path with the character's control nodes.



If characters are bunched on a specific part of the curve, you can change individual characters' Control Nodes. When working with individual Control Nodes, it's best to start from one end and adjust the first character relative to the one next to it.

*To move several characters at once, **SHIFT+CLICK** each control node, and then **CLICK-DRAG** one of the selected nodes. All of the selected nodes will move together. Or you can marquee-select the appropriate nodes.*

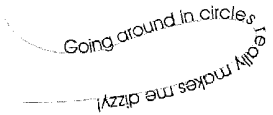
The **SHAPE TOOL** also enables you to space all the characters evenly on the path. When you select text with the **SHAPE TOOL**, two icons appear on the bottom corners of the text. At the lower-left corner is a down arrow, the Line Spacing Handle. It is used for setting the line spacing. The icon on the lower right, the Character Spacing icon, is used to increase or decrease the spacing of all of the characters together.

These control handles also work when the text is on a vertical path.

Other editing options for text on a path include:

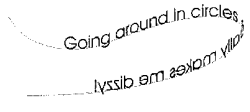
Text Orientation
The angle at which the text sits on the path

Setting Text Orientation
When using the Text Orientation option, you have four choices; rotate, envelope, skew and upright. Examples are shown below:



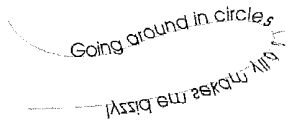
ROTATE Text Orientation

Rotate Each character is rotated and its baseline remains flat on the path and the shape of the character is not altered.



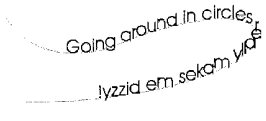
ENVELOPE Text Orientation

Envelope The shape of the character is altered as if it were in an envelope. The effect is similar to looking at 3D text standing on the floor.



SKEY Text Orientation

Skew With rotating the characters, the text characters are horizontally skewed by the angle of the path at that point. If the character angle is greater than 45 degrees, the character is also squashed vertically.



UPRIGHT Text Orientation

Upright The text character's outline shape is not deformed, or even rotated. It's repositioned so the lower-center point rests on the curve

Distance from Path
The distance between the text and the path

Horizontal Offset
The horizontal position of the text along the path

Tick Spacing
Use tick spacing to increase the distance between the path and the text in specified increments. Select the text. On the property bar, click Tick Snapping, enable the Tick Snapping on option, and type a value in the Tick Spacing box.
When you move the text from the path, it moves in the increment you specified in the Tick Spacing box. As you move the text, the distance from the path is displayed below the original text.

The default is Tick Spacing on. When you fit text to path, it will 'snap' to the line or path, at preset intervals specified in the Text on Curve/Object property bar. I normally prefer the Tick Spacing option turned off.

Mirror Text
To mirror text fitted to a path

1. Using the Pick tool, click the text fitted to a path.
2. In Mirror text area of the property bar, click one of the following buttons:
   - Mirror horizontally— flips the text characters from left to right
   - Mirror vertically— flips the text characters upside down

You can apply a 180-degree rotation to text fitted to a path by clicking both the Mirror horizontally and the Mirror vertically buttons.

To Separate Text from a Path
CorelDRAW treats text fitted to a path as one object; however, you can separate the text from the object if you no longer want it to be part of the path.

1. Select the path and the fitted text by using the Pick Tool .
2. Click Arrange -> Break text apart.

When you separate text from a curved or closed path, the text retains the shape of the object to which it was fitted.

To straighten text
Straightening the text reverts it to its original appearance

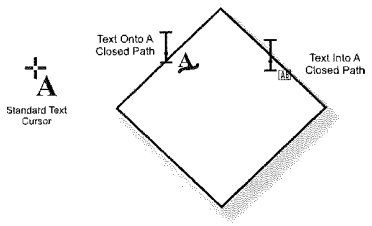
1. Using the Pick tool, select the fitted text and the path.
2. Click Arrange -> Break text apart.
3. Using the Pick tool, select the text.
4. Click Text -> Straighten text.

Other Notes:

- Artistic text can be fitted to open or closed paths. Paragraph text can be fitted to open paths only.
- You can't fit text to the path of another text object.

Entering Text Directly onto a Path

Text can be fitted directly onto most paths – curves, rectangles, ellipses, shapes and stars without using the Fit **TEXT TO PATH** command. With the **TEXT TOOL** selected, move the cursor over the outline of the path. If the path of the object is open, you will get one the '+A' cursor shown. If the path is closed you will get one of two types of cursors. The cursor that has an I-beam with an A is used for typing Text onto a path. The other, an I-beam with an AB in a rectangle is used to type text into a closed path.



In Figure 3-15, the first star shows the Text cursor when it is placed over an existing object. You can then click on the object and type in the Artistic text

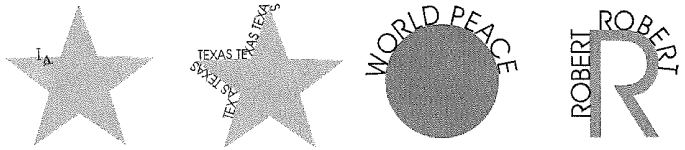


FIGURE 3-15 Examples of entering text onto a closed path.

Changing Graphic and Text Defaults

By default, all new tool shapes you create are applied with a Fill of None and a Black Outline Pen color set to Hairline. All new Artistic and Paragraph Text objects are created using a Black Fill color with the Outline Pen properties set to None. If these defaults properties re not what you most frequently need, you can change them and avoid repeat editing.

To customize or change Graphic and Text defaults in CorelDRAW, go to **TOOLS | OPTIONS | DOCUMENT | STYLES** as shown in Figure 3-16.

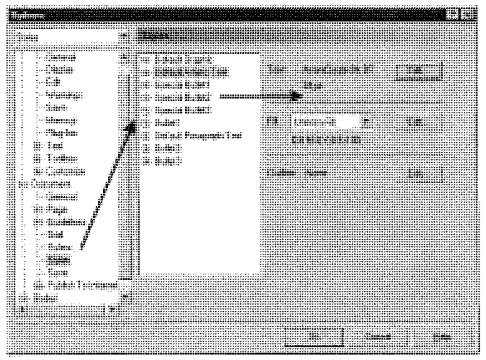


FIGURE 3-16 Options dialog for changing document styles.

The two styles we use most often are the Default Graphic and the Default Artistic Text.

Default Graphics are the shapes you create in CorelDRAW.

Default Artistic Text is the most often used text for the laser. When you open the default settings you get the AvantGarde font as your default.

If you text appears to fatter than normal, check the Outline properties as shown in the example above. It should show as Outline: None.

Saving your Settings

Be sure to go to **TOOLS | OPTIONS | DOCUMENTS** and check the "Save options as defaults for new documents' and make sure all boxes are checked that apply. In the newer versions of CorelDRAW, you save the defaults with a menu option - **TOOLS | SAVE SETTINGS AS DEFAULTS**.

Adding Special Characters

Every need to add special characters in you text like these - √ ☺ © ® Ź Ř . It's really easy. Just follow the steps below:

5. Using the **TEXT TOOL**, and **CLICK** in the text where you want to add the special character.
6. **CLICK TEXT | INSERT CHARACTER.**
7. Choose a category from the list box.
8. **DOUBLE-CLICK** a character in the list.

The size of the character is determined by the current font size of the text.
Here are some actual samples below:

CorelDRAW® ¡Tenga diversión!

Next, place the 'engraving plate' in the upper left corner of the Drawing Page to match the rulers on the laser. While you can drag the plate, it's quicker and more accurate to use the **TRANSFORMATION DOCKER** and Position option.

De-select (uncheck) Relative Position on the **TRANSFORMATION DOCKER. CLICK** on the upper left anchor box, representing the upper left corner of the engraving plate, and enter 0 for the H (horizontal position) and 0 for the V (vertical position). **CLICK** on Apply. The 4 x 6 rectangle will move to the upper left corner of the Drawing Page as shown in Figure 4-2.

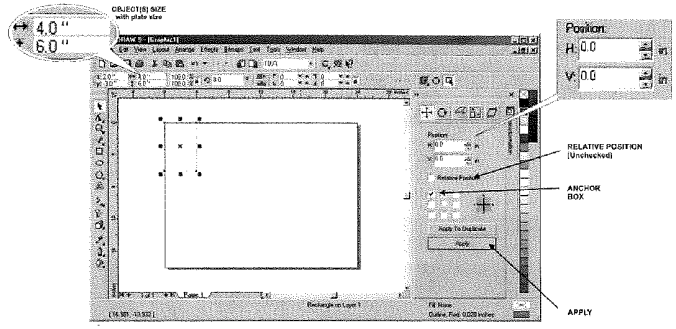


FIGURE 4-2 Using the Transformation Docker to place the object precisely on the Drawing Page.

Now we need to enter the text for our engraving plate.

CLICK on the **TEXT TOOL** option of the Toolbox on the left size of your CorelDRAW Drawing Page. Then place the cursor inside the engraving plate (red rectangle) and **CLICK**.

Enter the text as shown in the example to the right.

Presented To
Jack Jaspersm
For Your
Outstanding
Service To The
Engraver's Network
Service Department
1994-2001

If you need to center the text, **CLICK** on the Alignment flyout on the Text Properties Bar and select center as shown in Figure 4-3.

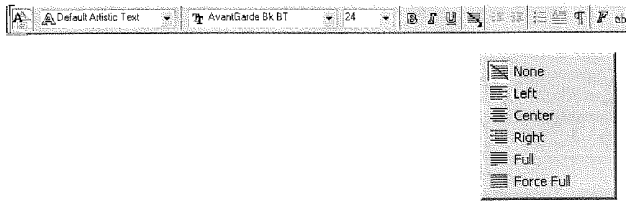


FIGURE 4-3 Text Property Bar showing the Alignment flyout. The None Alignment is show on the Text Property Bar flyout.

Now, we need to add spacing between our text lines on the engraving plate.

With your text still selected, **CLICK** on the **SHAPE TOOL** . You will see the nodes around each letter and the spacing arrows below. To interactively increase the inter-line space, drag the line spacing handles downward (noted by the black arrow in Figure 4-4).

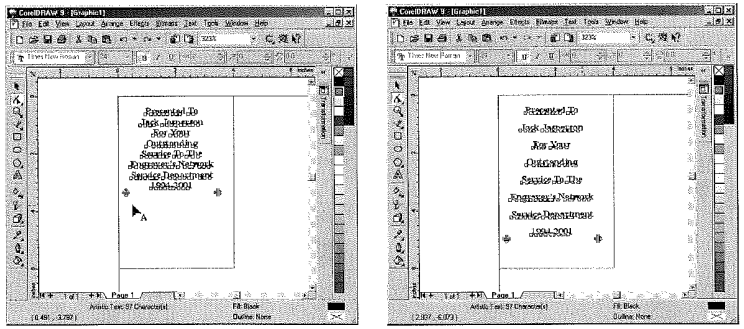
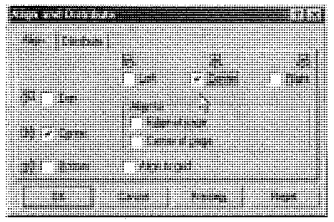


FIGURE 4-4 The illustration on the right is text that has been selected with the Shape Tool. The results are shown on the right after dragging the Line Spacing Handles downward.

Next, we need to center the text on the engraving plate. With the **PICK TOOL** on the CorelDRAW Toolbox, select the text. Then while holding down the **SHIFT** key, select the red plate outline.

Select Arrange | Align and Distribute. Use the example below; select the two Center options.



When aligning, the last object selected is the object to which the other selections will be aligned.

This is the end of this lesson. Our final results are shown in Figure 4-5. You can use the **TEXT TOOL** to change the fonts and their size your to your needs.

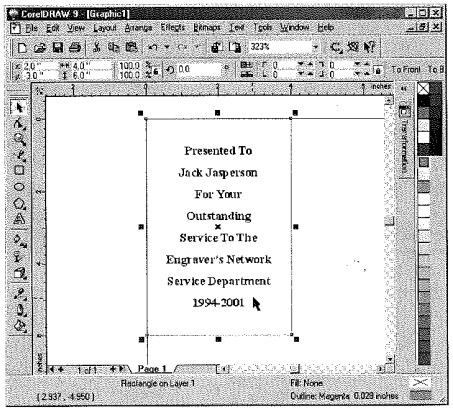


FIGURE 4-5 Our finished layout for the lesson. However, your job is just starting. You can change the font; add ornamentals or any other options to have that professional look.