

# **Vision Max User Manual**

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# 1 Introduction

## About This Manual

This manual is designed to provide you with information about your Vision Max Engraver, beginning with unpacking the machine and continuing through installation, operation and maintenance. This manual does not attempt to teach the user how to become an expert in engraving, computer usage, or engraving software usage. Some previous knowledge of engraving terms and the engraving process is certainly beneficial. **For information on the Vision Engraving Software, see the Vision Engraving Software manual.** For more information on your individual computer system, see your computer's user manual or contact your computer distributor.

## Important Note:

**The Vision software is available in two versions; one with a dongle, and one that is "dongle-less" and is loaded on to a USB Memory stick.**

**If your machine was delivered with, or you currently have the orange software dongle, DO NOT LOSE IT!**

**Without the dongle, you will not be able to run Vision software.**



## 1.1 Disclaimer and Warranty Information

### Limits of Liability / Disclaimer of Warranty

The information contained within this manual has been carefully checked and is believed to be accurate, however, Vision makes no representations or warranties for this manual, and assumes no responsibility for inaccuracies, errors, or omissions that may be contained within this manual. In no event shall Vision be liable for any loss of profit including (but not limited to) direct, indirect, special, incidental, consequential, or other damages resulting from any defect or omission in this manual, even if previously advised of the possibility of such damages.

In the interest of continued product development, Vision reserves the right to make improvements to this manual and the products it describes at any time, without notice or obligation.

### Limited Warranty:

#### Vision Computerized Engraving and Routing Systems (and Retrofit Tables)

Vision Computerized Engraving and Routing Systems (Vision) warrants that for a period of two (2) years from the date of shipment to the original purchaser of either a Series 4 Controller, Phoenix, Vision or Table Retrofit (the System), that the System will be free from defects in material and workmanship under normal use and service. Upon written notification, we will transfer the remaining warranty to a new customer. *This warranty shall cover all elements except for items covered by separate manufacturer's warranties and consumable items.* "Consumable" items include, but shall not be limited to, belts, brushes, lubricants, and cutters furnished with the System, for which no warranty is provided.

In the event a defect is discovered during the warranty period, within thirty days of discovery, but no later than the last day of the warranty period as described above, the user shall contact Vision for instructions regarding disposition of the problem. Vision shall, at its option, either (1) repair the affected product with new or refurbished parts, or (2) provide a replacement. Any incidental costs, including the cost of shipment from the user's location to the point of repair and return, and any installation performed by the user, shall be at the expense of the user.

This warranty covers normal use only and shall be void in the event that the System is altered or modified without authorization by Vision, or is subject to abuse, neglect, or other misuse by the user.

The warranties for Third-Party Hardware and Third-Party Software shall run directly from the manufacturers of such hardware and software to the user. Vision makes no warranties, expressed or implied, with regard to Third-Party Hardware or Third-Party Software.

Vision does not warrant any product, component, or part not manufactured by Vision that was not supplied by Vision. (Third-party items, including but not limited to software, are subject to their own manufacturer's warranties.) Vision does not warrant defects caused by a failure to provide a suitable environment for the system, by unauthorized attachments, by modifications or repairs other than by Vision, by use of the System for other than its original intention, or by other misuse or abuse of the System.

### **Extended Warranty**

An Extended Warranty may be purchased which extends the terms of the original equipment Warranty in 1 year increments for a period of up to 30 days after the original equipment Warranty expires. An Extended Warranty may also be purchased for a period of up to 30 days after an existing Extended Warranty expires. Extended Warranties cannot be purchased on any equipment that is 7 or more years old, or if there is a Lapse of Warranty. Age of equipment is determined from the date of shipment to the original buyer.

### **Lapse of Warranty**

If an Extended Warranty is not purchased within 30 days of the expiration of the original equipment Warranty, or within 30 days of the expiration of an existing Extended Warranty, the equipment will be in Lapse of Warranty. An Extended Warranty can never again be purchased for any equipment that is in Lapse of Warranty. It is the responsibility of the purchaser of the equipment to maintain accurate records and to know the expiration date of any Warranty.

The above and foregoing is the only warranty of any kind, either expressed or implied, by statute or otherwise, regarding the System, its fitness, quality, merchantability, or otherwise. Any warranties implied by law are hereby expressly disclaimed. No oral or written information or advice given by Vision, its Dealers, Distributors, Agents, or Employees shall create a warranty or in any way increase the scope of this warranty. Neither Vision, nor anyone else who has been involved in the creation, production, or delivery of the System shall be liable for any direct, indirect, consequential, or incidental damages (including damages for loss of business profits, business interruption, loss of business information, and the like) arising out of the use of, or inability to use, the product.

Any software supplied by Vision in conjunction with the purchase of the System for use therewith shall be governed by its own separate software license and warranty agreement.

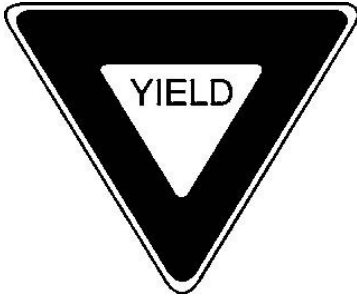
Terms and Conditions are subject to change

**For Warranty Service Call: (602) 439-0700**

**Please have your machine serial number ready before calling.**

Vision Engraving & Routing Systems is owned and operated by Western Engraver's Supply, Inc.  
Phoenix, Arizona, USA

## 1.2 Safety Precautions



- Keep hands clear of the bottom of the spindle during operation.
- There are no user serviceable parts inside the machine. Please contact qualified service personnel for service issues.
- Openings are provided in the machine's base for ventilation. Do not cover the openings or place the machine in an environment where the openings may become blocked.
- Never insert anything into the ventilation openings. Doing so may create a danger of electric shock.
- Do not expose the equipment to rain or use it near water. You can clean the machine with a damp cloth, but be sure to disconnect the power cord.
- Always stop the machine before making any adjustments.
- Do not operate the equipment with any covers removed.
- Wear safety glasses when cutting any materials that emit chips.
- Use extreme caution when inserting or removing cutters.
- Before any servicing, disconnect the power cord.
- To avoid electric shock or equipment damage, ensure that the equipment is connected to the appropriate electrical source as noted in the installation procedures.
- Never operate the equipment with damaged or frayed power cords, loose connections, or exposed extension cords where the cord could create a tripping hazard.
- Be sure to hold the plug, not the cord, when disconnecting the equipment from an electrical socket or power source.
- Place the equipment in a location with low humidity and a minimum of dust. Avoid placing the equipment in direct sunlight or in locations with excessive heat. Follow the maintenance instructions for proper cleaning of the controller air filter.
- If your equipment does not operate properly; in particular, if there are any unusual sounds or smells coming from it, immediately unplug it and contact a service technician or your local distributor.
- Unplug the machine when it is going to be left unused for an extended period of time.



## 2 Software Installation and Connections

In the following sections, equipment and Vision software installation will be outlined. There are three connection configurations possible to Vision Max.

The first is a direct cable connection to your computer via the network port. There is a special "crossover" cable supplied with the machine for this connection type. This configuration is for a stand alone computer that is NOT connected to a WIRED network or internet. The machine can be connected to a computer that is connected to a wireless network in this manner.

The second configuration is for connection to a wired network using a standard network cable (DO NOT use the crossover cable when connecting to a network). In this configuration, the machine will be recognized as a network device. Connection to the machine in this manner is the easier of the two connection types. If there are no network connections available, a network hub can be added to allow connection of the machine to your network.

The third configuration is for a connection from the computer to a hub (or router) and then to the machine. This is WITHOUT a computer network. Standard Ethernet cables are used in this configuration.

Please call your distributor or the service department at Vision for assistance if you are having problems making these connections.

**IT IS HIGHLY RECOMMENDED THAT THE COMPUTER USED TO OPERATE THE VISION ENGRAVER OR ROUTER BE CONNECTED TO THE INTERNET. THIS ALLOWS THE USER TO ALLOW VISION'S TECHNICAL SUPPORT TO ACCESS THE MACHINE AND TROUBLESHOOT IF NECESSARY.**

## 2.1 Computer Requirements

### Minimum System Requirements

CPU:	Dual Core (2.0GHz or higher)
Hard Drive:	120 GB
RAM:	1GB + OS Requirements
Operating System:	Windows 8 32/64 Bit Windows 7 32/64 Bit Windows Vista 32/64 Bit Windows XP 32 Bit
Ports:	USB port for security dongle Local or network Ethernet port to connect machine

### Suggested System Requirements

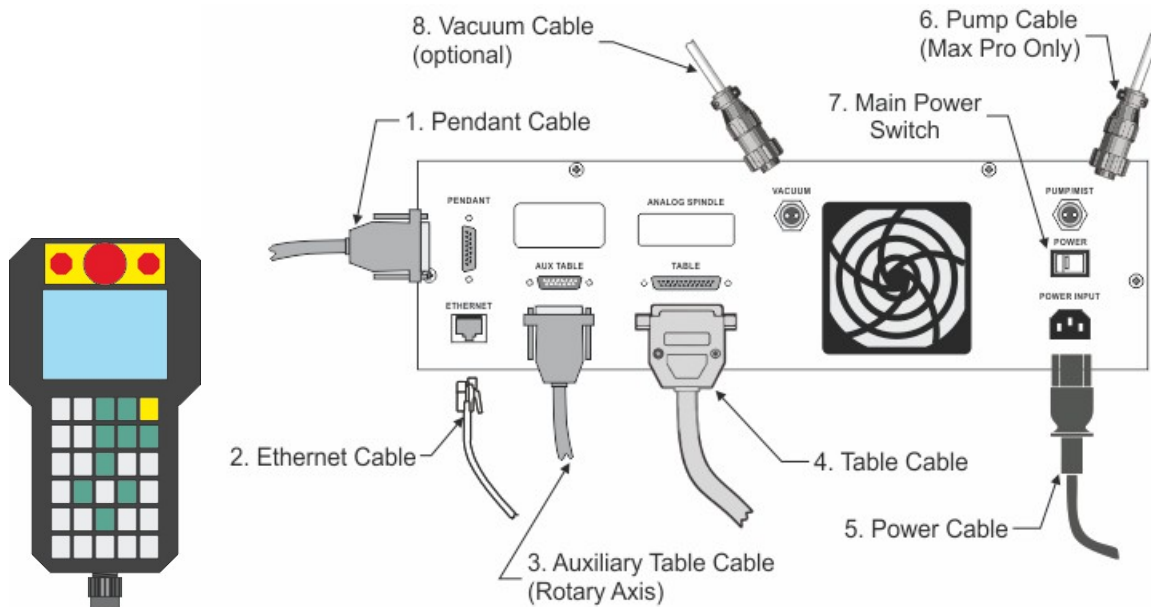
CPU:	Quad Core (3.0 GHz or higher)
Hard Drive:	250 GB (or more)
RAM:	4GB + OS Requirements
Operating System:	Windows 8 32/64 Bit Windows 7 32/64 Bit
Ports:	USB port for security dongle Local or network Ethernet port to connect machine

## 2.2 Max Connections

The Vision Max machine has an integrated controller inside the base of the machine. The machine needs to have the following cables connected to the controller.

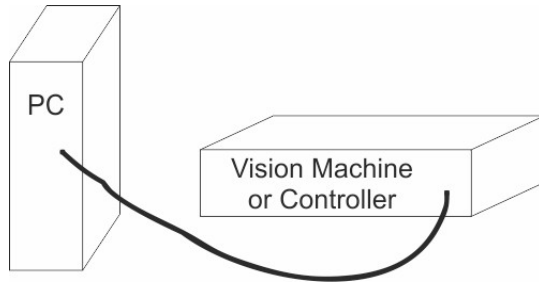
1. The engraver's Pendant is connected to the Pendant cable port.
2. The Ethernet Cable from your computer, hub or network is connected to the Ethernet port.
3. The Auxiliary Table Cable is connected to the Aux Table port and powers the machine's rotary axis.
4. The Table Cable connects from 25 pin connector on the engraver to the Table port.
5. The Power Cable connects a 110 - 220 VAC electrical source to the controller and powers the controller, table and spindle.
6. The Pump Cable (Max Pro only) connects to the Pump/Mist port and powers the machine's water pump for glass engraving.
7. Main Power switch (for reference only)
8. If you machine was equipped with the optional Vacuum Chip Removal System, the Vacuum Cable from the vacuum pump will connect to the Vacuum port.

### Series 4 Pendant and Integrated Controller Connections



## 2.2.1 Direct Connection to Computer

### Direct Connection to Computer Using Crossover Cable



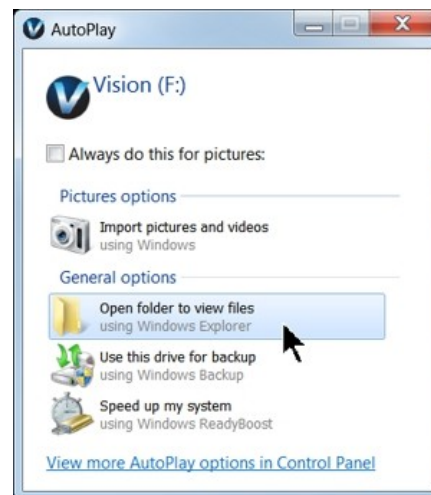
Once the machine is connected directly to your computer's network port with the crossover cable (the gray colored cable), turn the machine on. The power switch for the Max is located on the left rear of the machine's base. Once the machine has initialized, plug the supplied Vision USB drive into an available USB port on your computer.

NOTE - This installation is performed on a Windows 7 PC. For Windows Vista or Windows XP, the screens are slightly different.

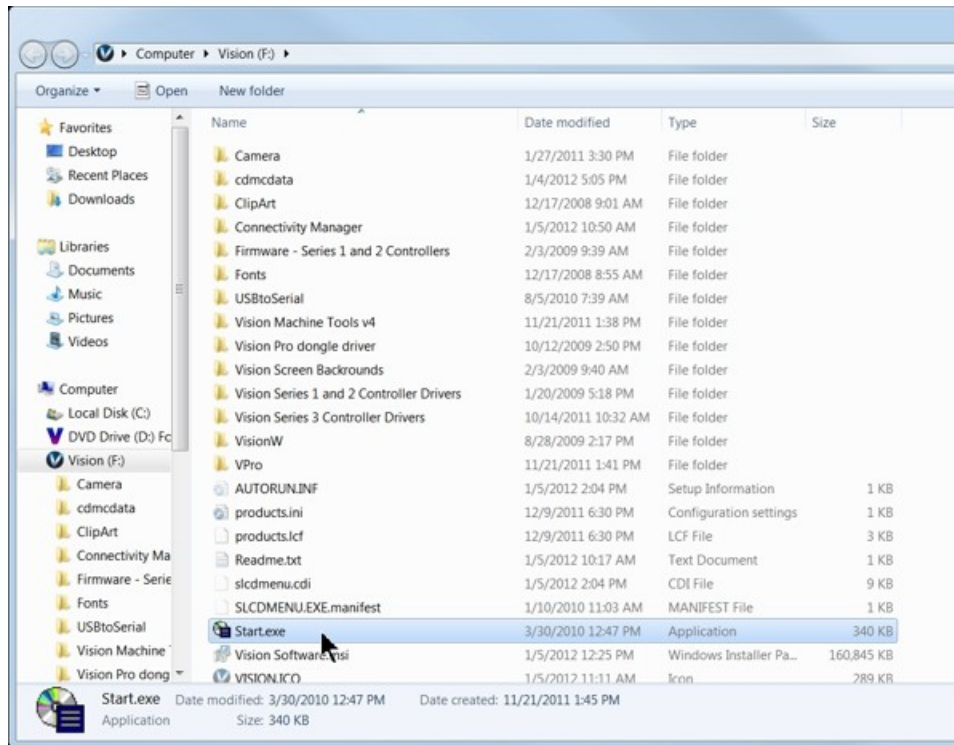
The computer will recognize the USB drive and the following screen will appear. Select Continue without scanning.



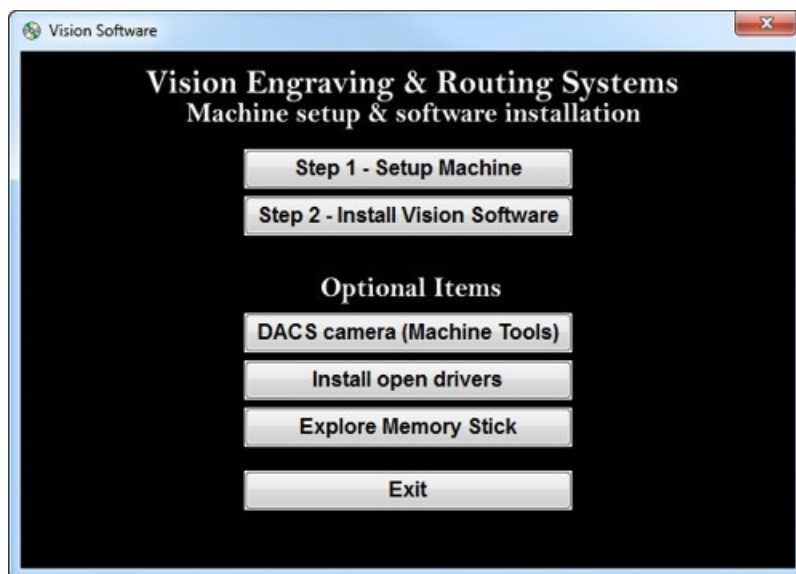
Select Open folder to view files.



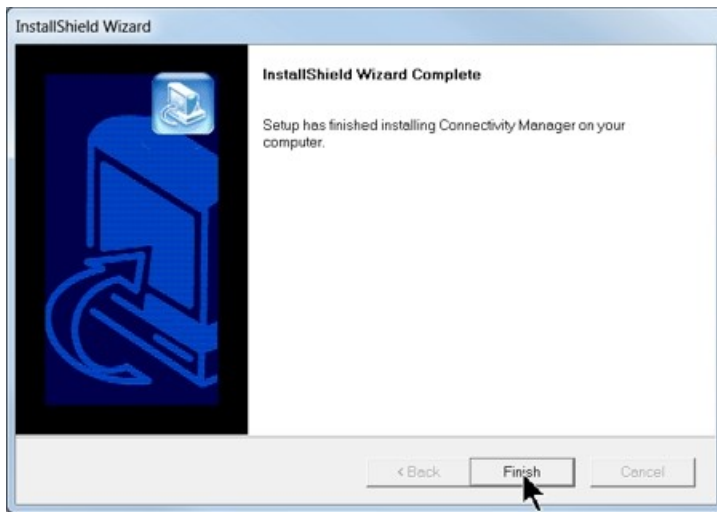
Locate the file named Start and double click on the file to start the installation. The screen below shows Start.exe, but your computer might not show the .exe portion.



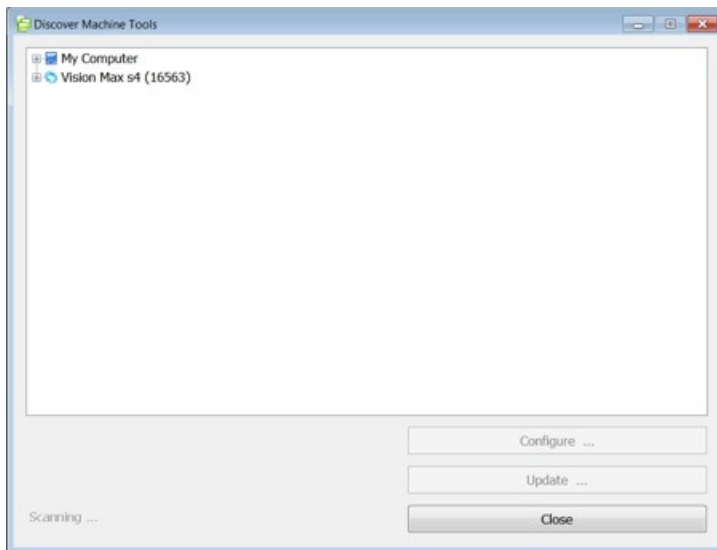
Select Step 1 - Setup Machine. This installs the Vision Connectivity Manager software.



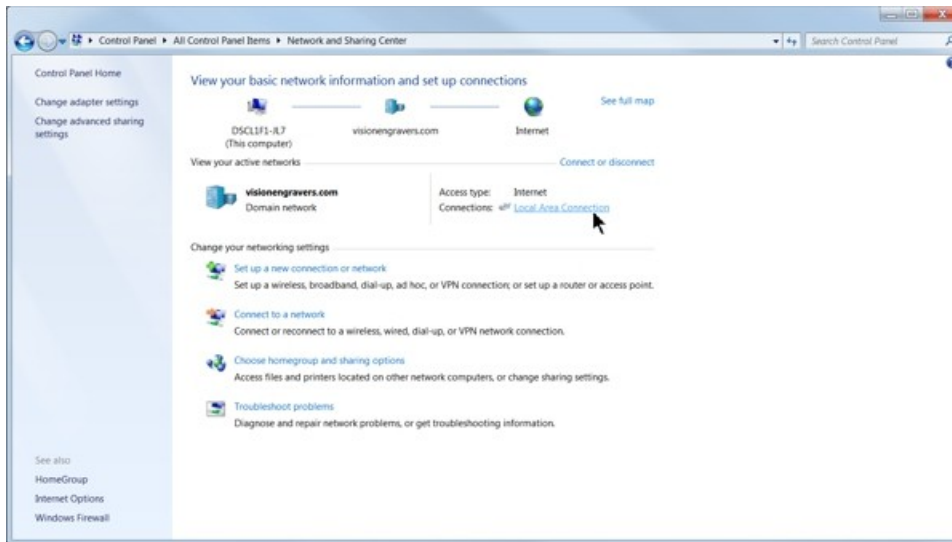
When the software is installed, select Finish.



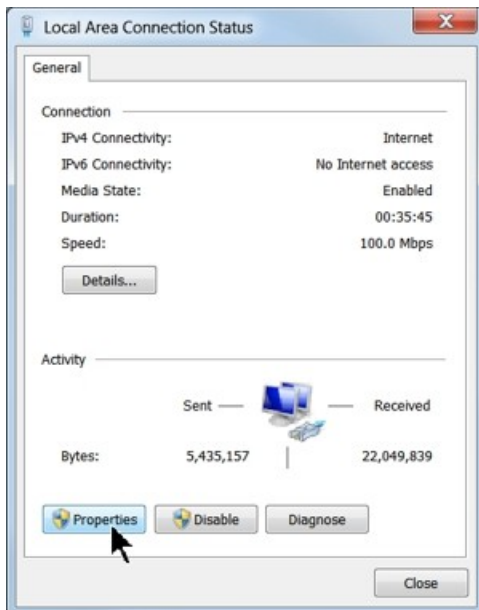
The Connectivity Manager will search for available Vision devices.



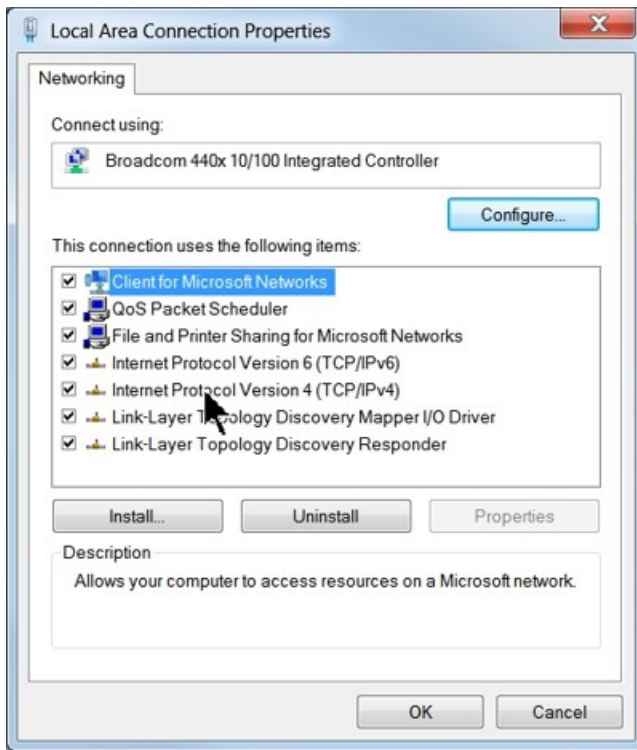
The computer's IP address will need to be set. NOTE - this should not cause any conflicts with your computer's wireless IP address, which is determined by the computer's wireless network card. To set the computer's IP address, open the Windows Control Panel. Depending on how you have this folder set, you will either see Network and Internet, or you will see the Network and Sharing Center immediately. If you see Network and Internet, select View Network Status and Tasks (which opens the Network and Sharing Center). If you see the Network and Sharing Center, open it. Then select Local Area Connection (as shown below).



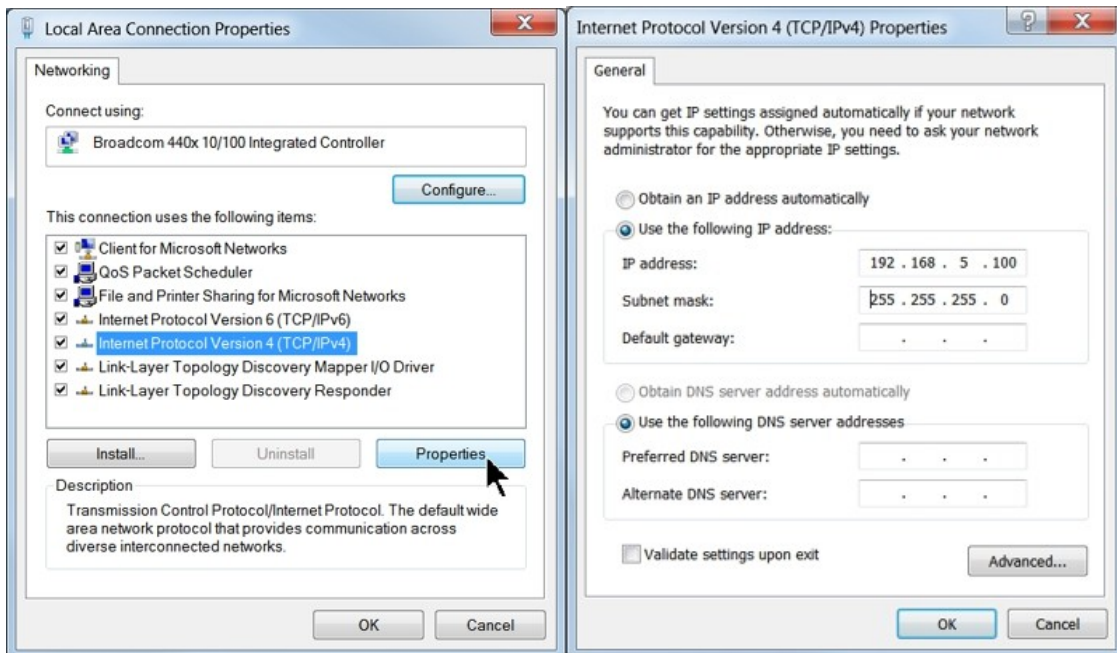
Select Properties.



Then, select Internet Protocol Version 4 (TCP/IPv4).

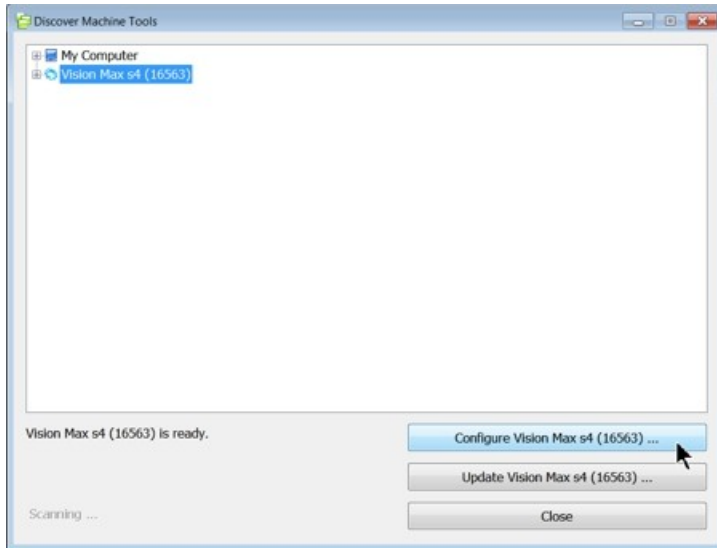


Then select Properties. Select Use the following IP address: and enter 192.168.5.100 and set the Subnet mask to 255.255.255.0 as shown. Then select OK and close any other network configuration windows.

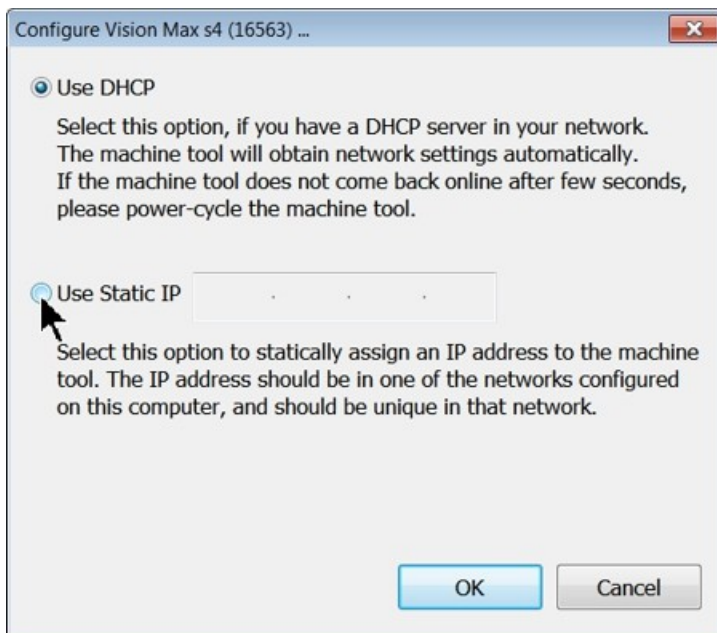




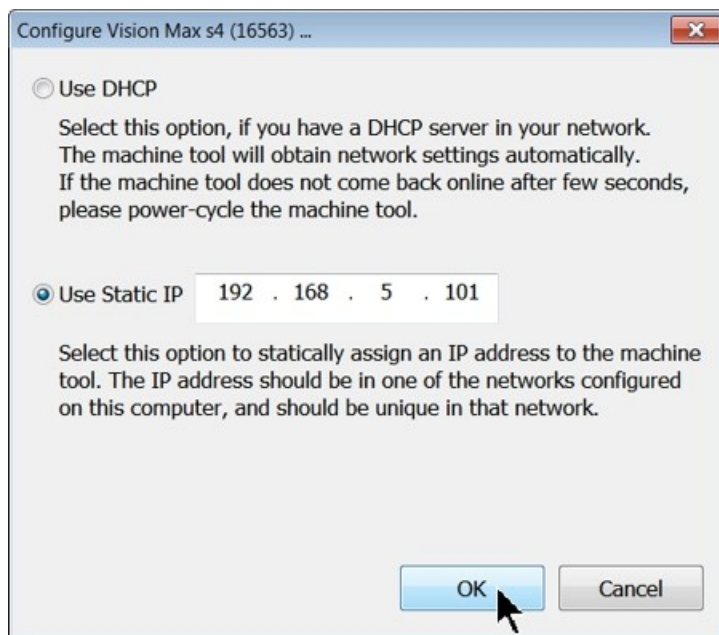
The IP address of the machine will need to be set to set up the connections properly. Select the + box next to the machine now listed in the Discover Machine Tools window to expand the information. Then select Configure (Your Machine) at the bottom of the screen.



Select Use Static IP.



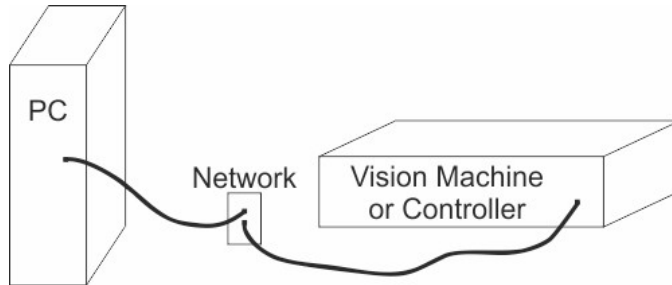
Set the IP address (as shown) to 192.168.5.101, then select OK. This sets the machine's IP address.



The configuration is complete at this point. Close the Discover Machine Tools window and return to the Main Installation Screen to proceed with the Vision software installation in the next section.

## 2.2.2 Network Connection

### Connecting via Standard Network Cable to Network

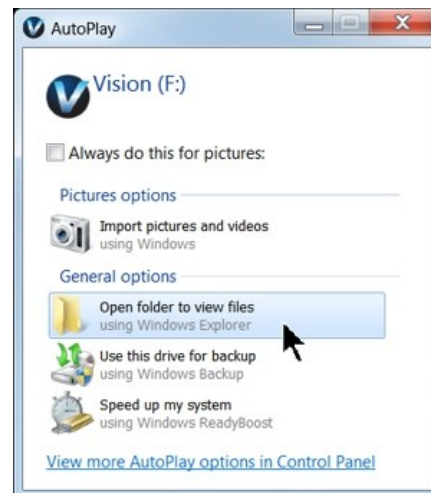


Once the machine is connected to your network, turn the machine on. The power switch for the Max is located on the left rear of the machine's base. Once the machine has initialized, plug the supplied Vision USB drive into an available USB port on your computer.

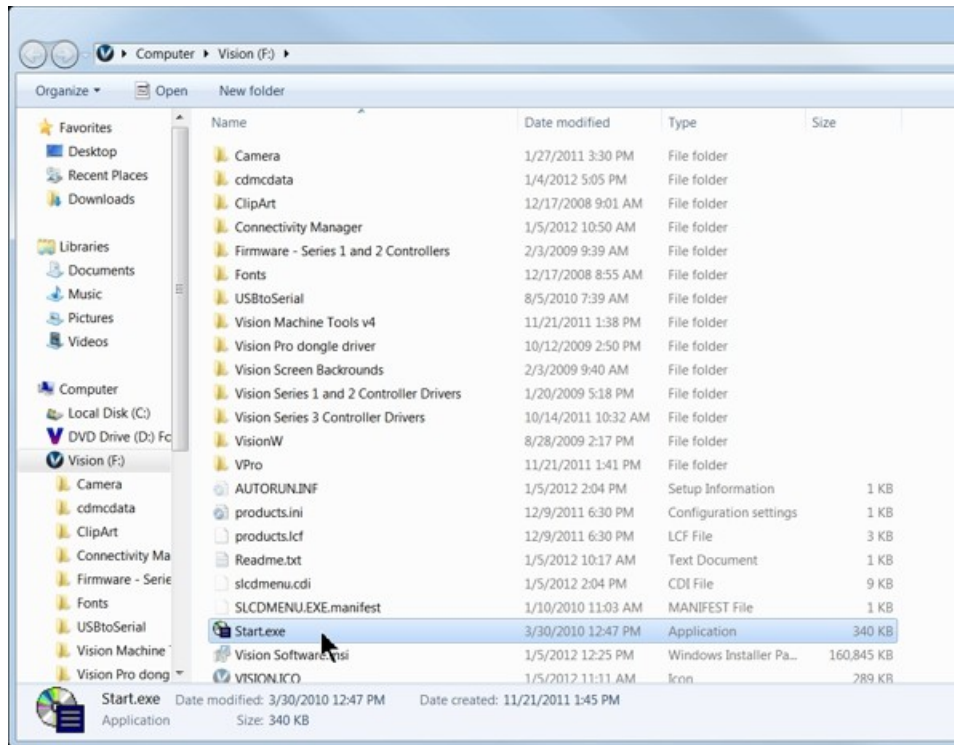
NOTE - This installation is performed on a Windows 7 PC. For Windows Vista or Windows XP, the screens are slightly different.

The computer will recognize the USB drive and the following screen will appear. Select Continue without scanning.

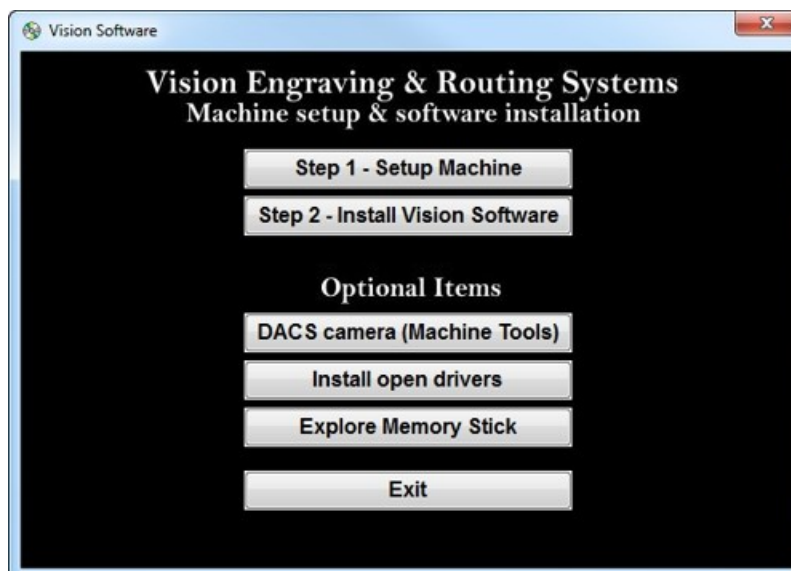
Select Open folder to view files.



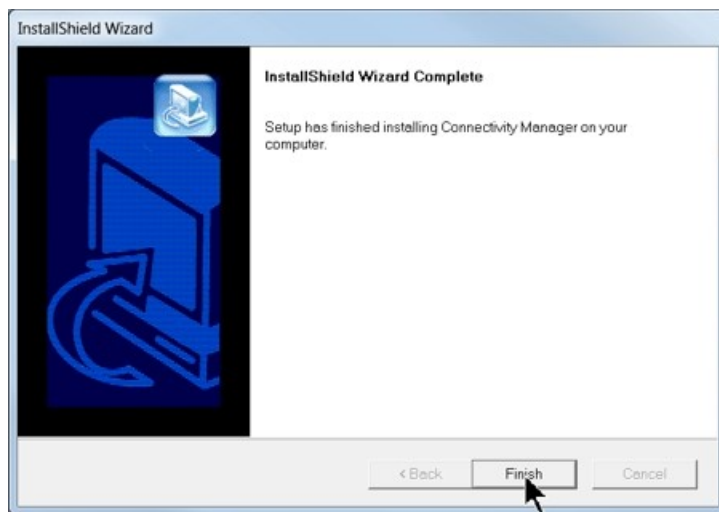
Locate the file named Start and double click on the file to start the installation. The screen below shows Start.exe, but your computer might not show the .exe portion.



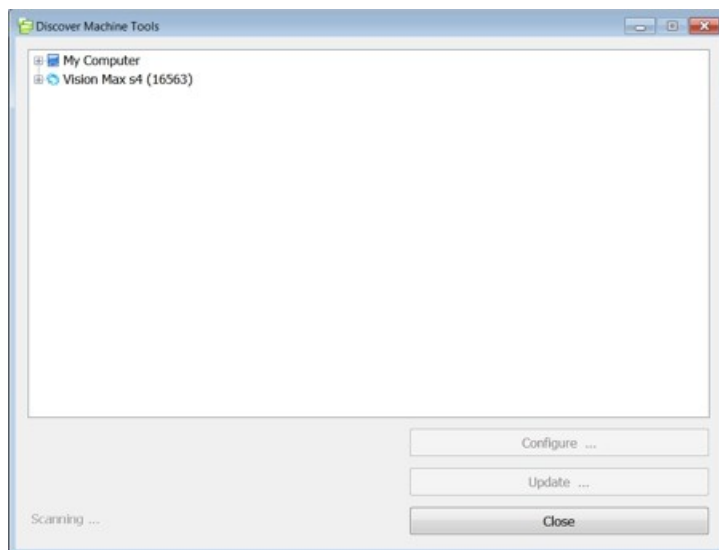
Select Step 1 - Setup Machine. This installs the Vision Connectivity Manager software.



When the software is installed, select Finish.



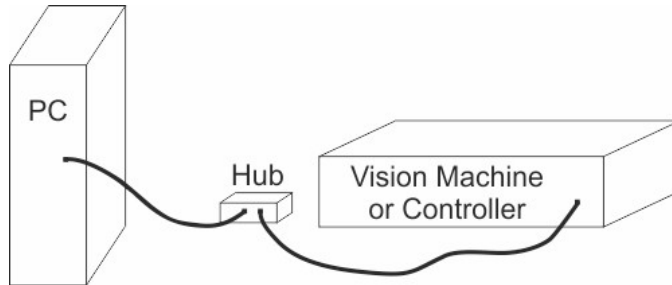
The Connectivity Manager will search for available Vision devices.



The configuration is complete at this point. Close the Machine Tools Discovery window and return to the Main Installation Screen to proceed with the Vision software installation in the next section.

### 2.2.3 Using a Network Hub - ONLY

#### Connection from PC to Hub or Router to Machine or Controller

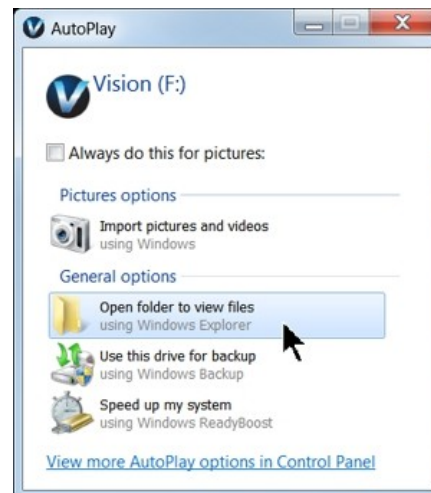
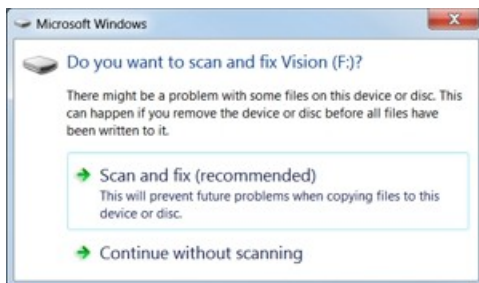


Once the machine is connected to a hub or router, and the hub or router is connected to your computer's network port, turn the machine on. The power switch for the Max is located on the left rear of the machine's base. Once the machine has initialized, plug the supplied Vision USB drive into an available USB port on your computer.

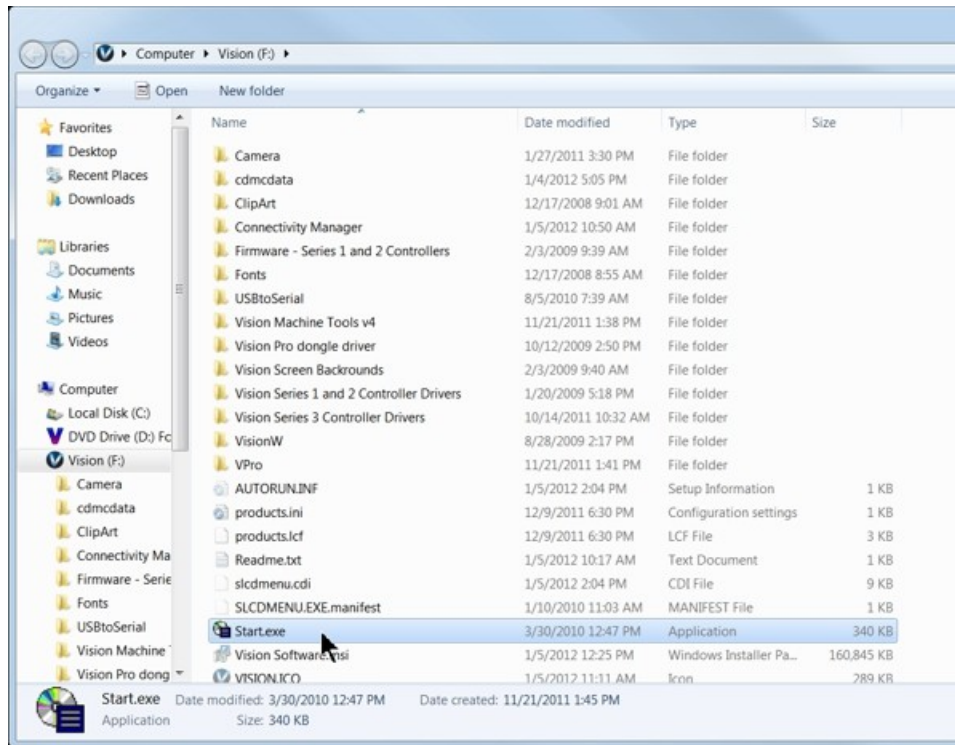
NOTE - This installation is performed on a Windows 7 PC. For Windows Vista or Windows XP, the screens are slightly different.

The computer will recognize the USB drive and the following screen will appear. Select Continue without scanning.

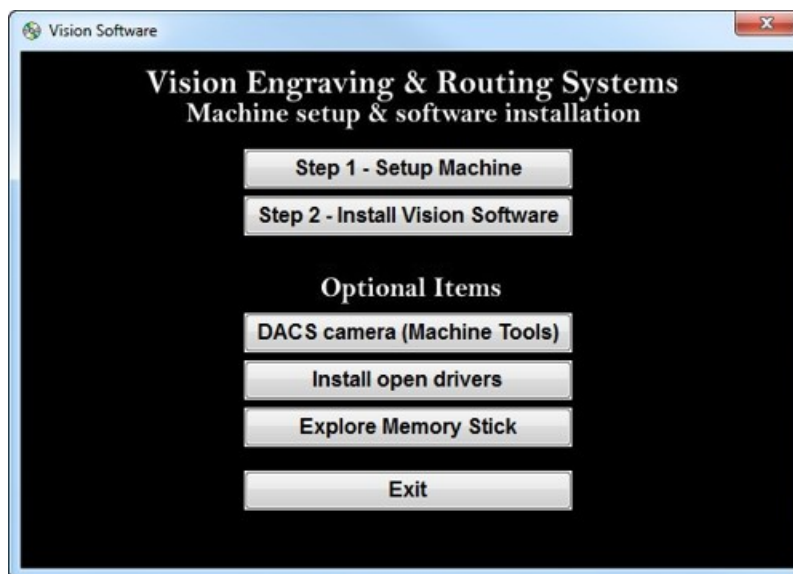
Select Open folder to view files.



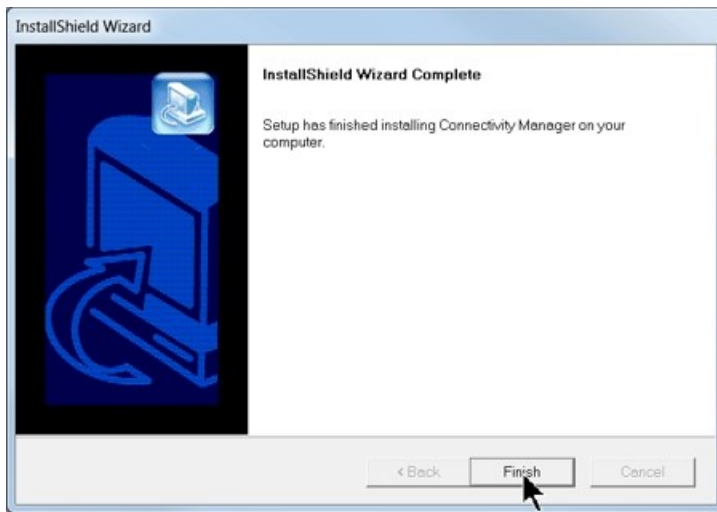
Locate the file named Start and double click on the file to start the installation. The screen below shows Start.exe, but your computer might not show the .exe portion.



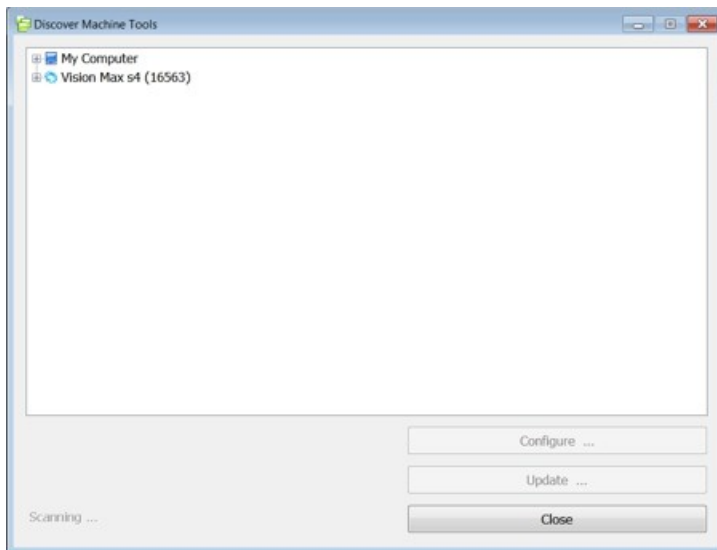
Select Step 1 - Setup Machine. This installs the Vision Connectivity Manager software.



When the software is installed, select Finish.

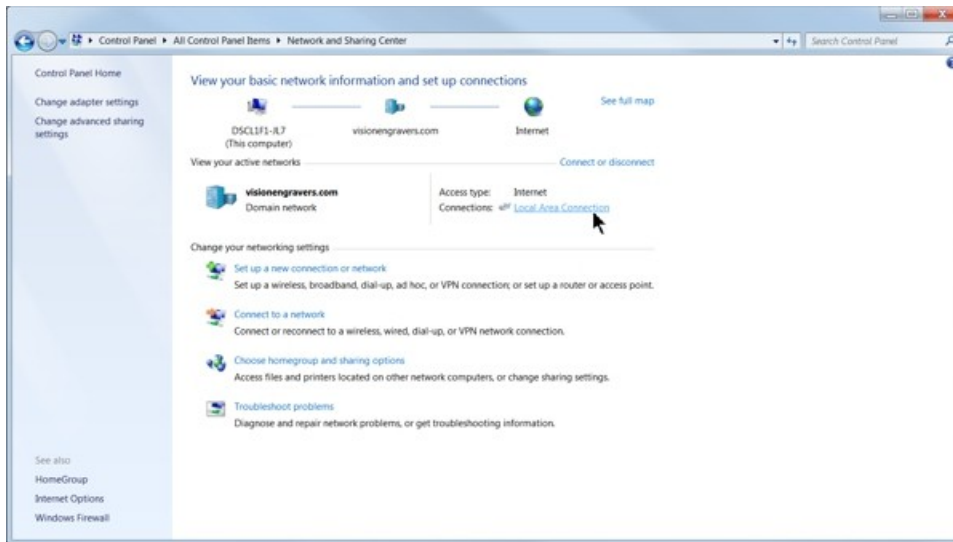


The Connectivity Manager will search for available Vision devices.

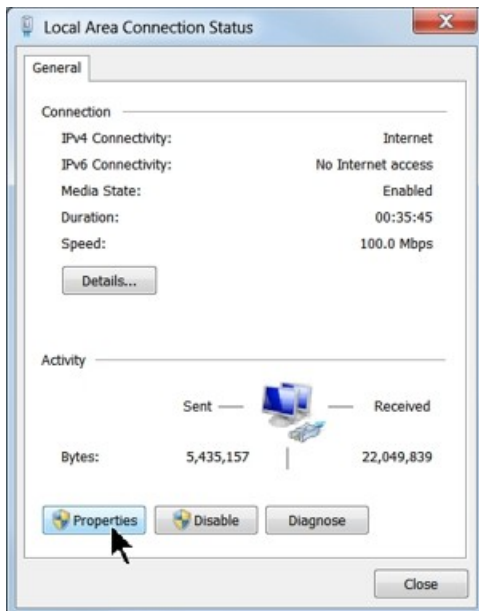




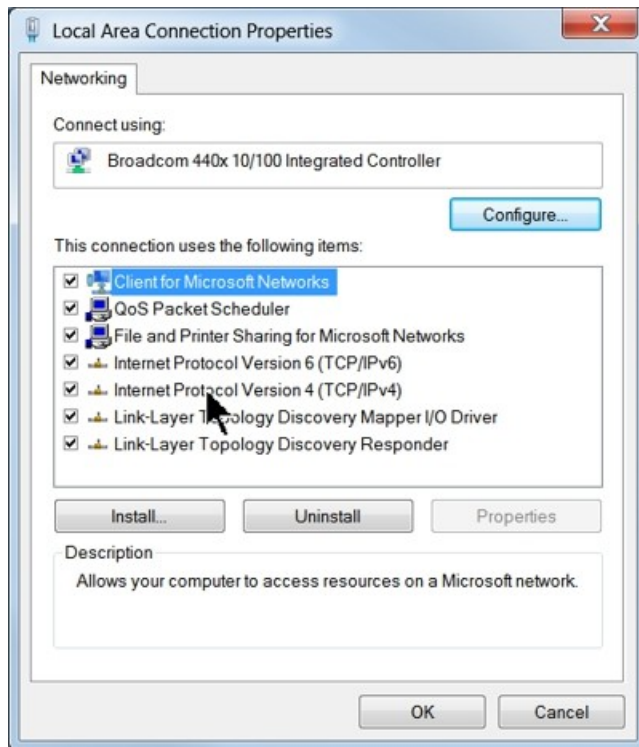
The computer's IP address will need to be set. To set the computer's IP address, open the Windows Control Panel. Depending on how you have this folder set, you will either see Network and Internet, or you will see the Network and Sharing Center immediately. If you see Network and Internet, select View Network Status and Tasks (which opens the Network and Sharing Center). If you see the Network and Sharing Center, open it. Then select Local Area Connection (as shown below).



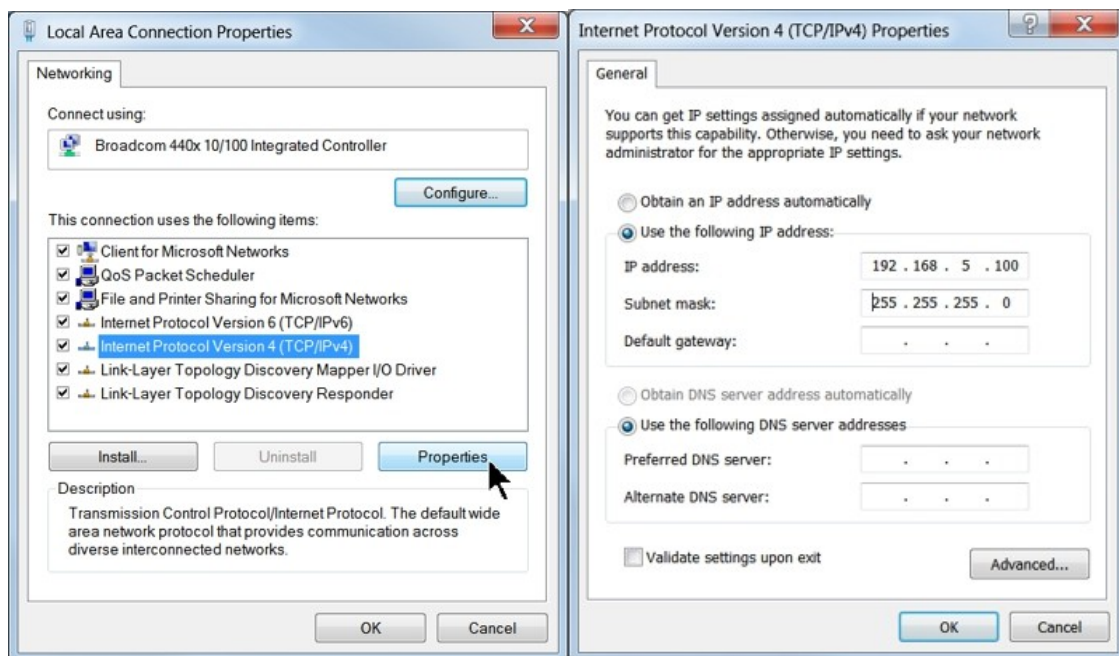
Select Properties.



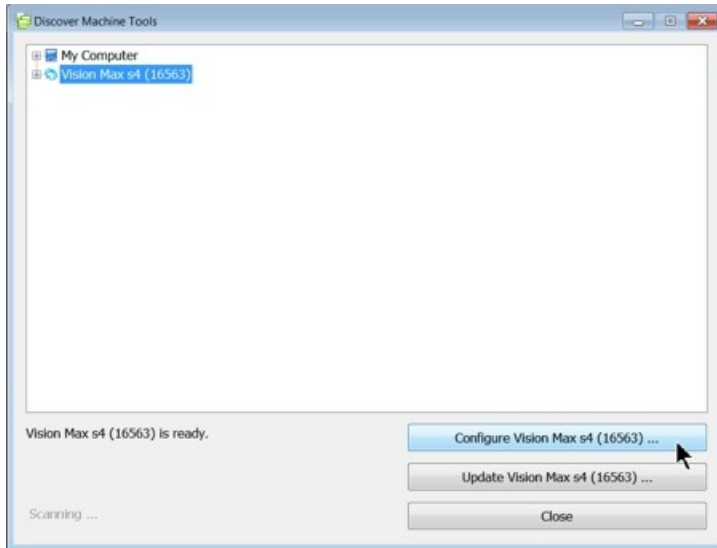
Then, select Internet Protocol Version 4 (TCP/IPv4).



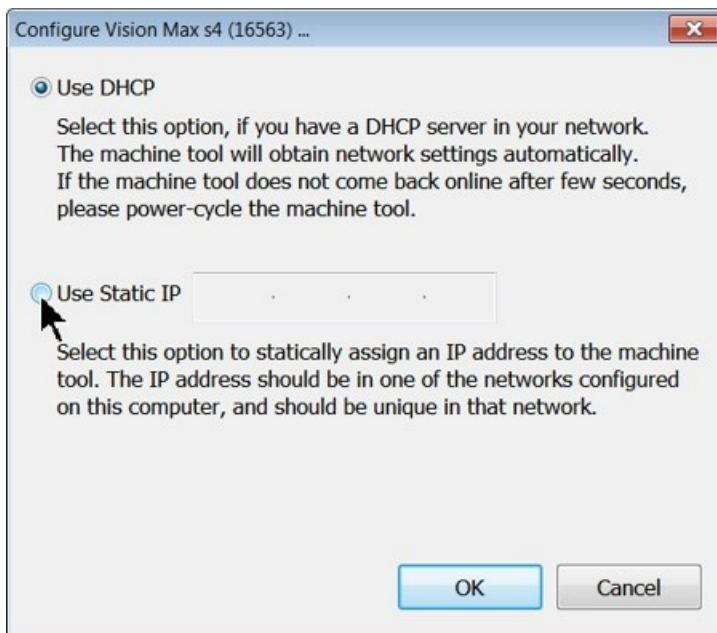
Then select Properties. Select Use the following IP address: and enter 192.168.5.100 and set the Subnet mask to 255.255.255.0 as shown. Then select OK and close any other network configuration windows.



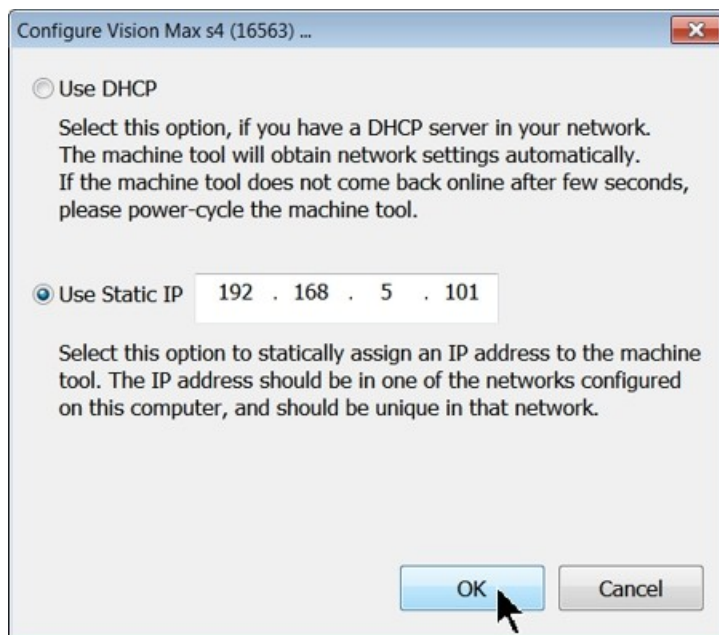
The IP address of the machine will need to be set to set up the connections properly. Select the + box next to the machine now listed in the Discover Machine Tools window to expand the information. Then select Configure (Your Machine) at the bottom of the screen.



Select Use Static IP.



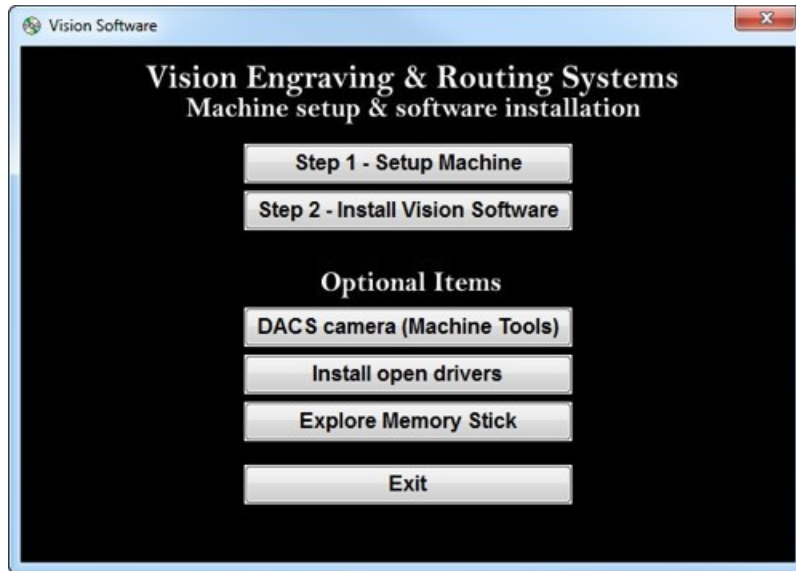
Set the IP address (as shown) to 192.168.5.101, then select OK. This sets the machine's IP address.



The configuration is complete at this point. The new IP address should appear in a few seconds in the Discover Machine Tools window. Close the Discover Machine Tools window and return to the Main Installation Screen to proceed with the Vision software installation in the next section.

## 2.3 Vision Software Installation

From the Main Installation Screen, Select Step 2 - Install Vision Software.



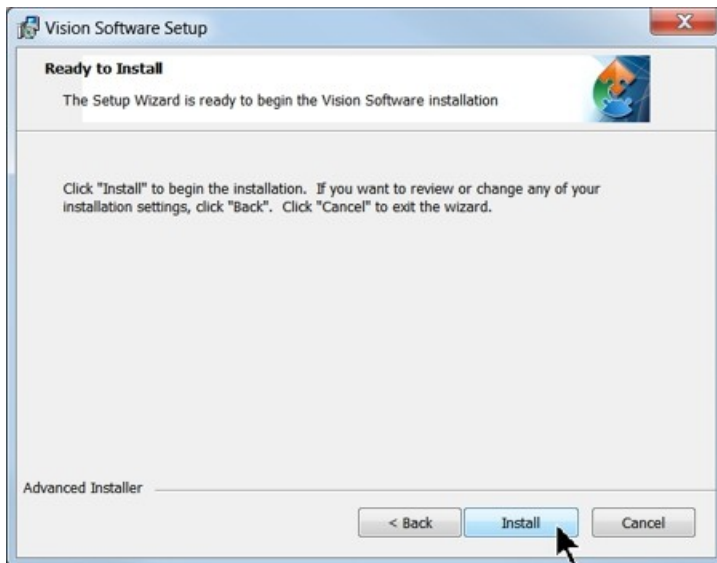
The Windows Installer will prepare the installation.



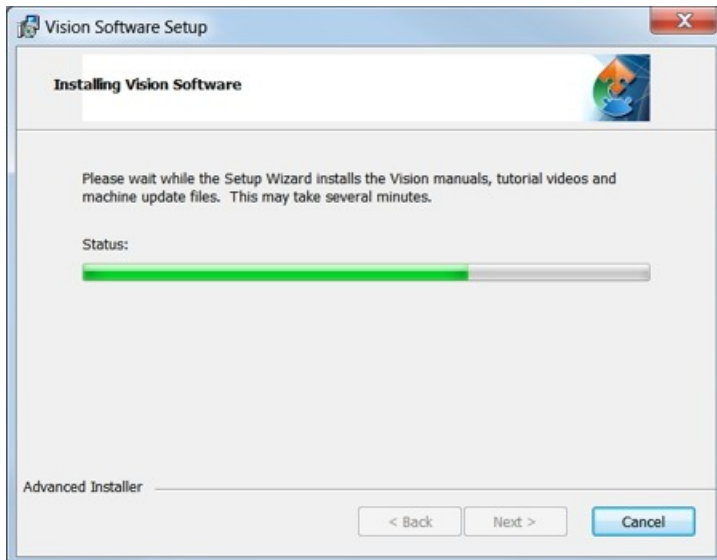
Select Next.



Select Install.



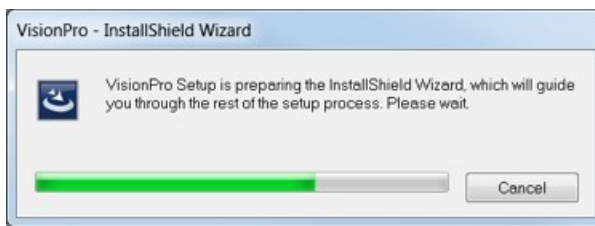
The installation will proceed.



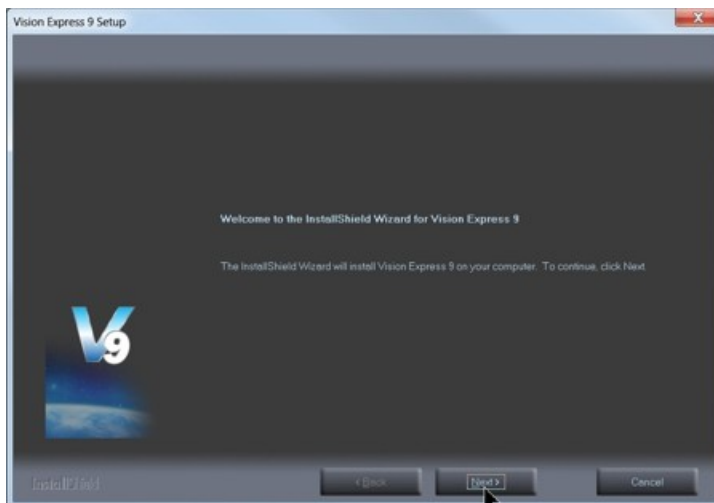
Select the appropriate language and select OK.



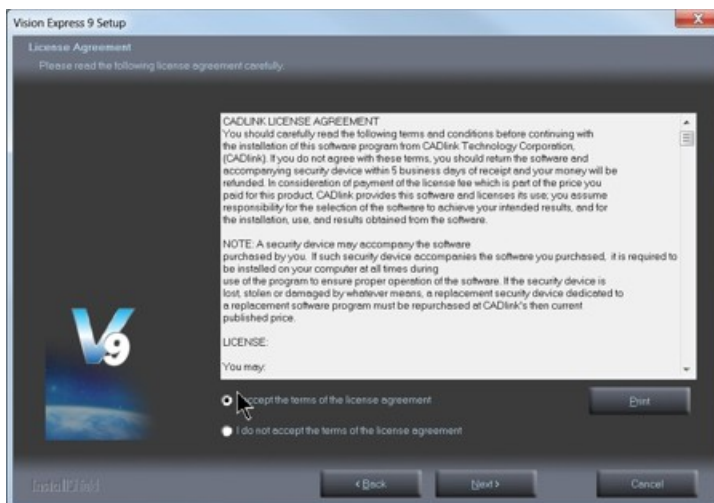
Installation will proceed.



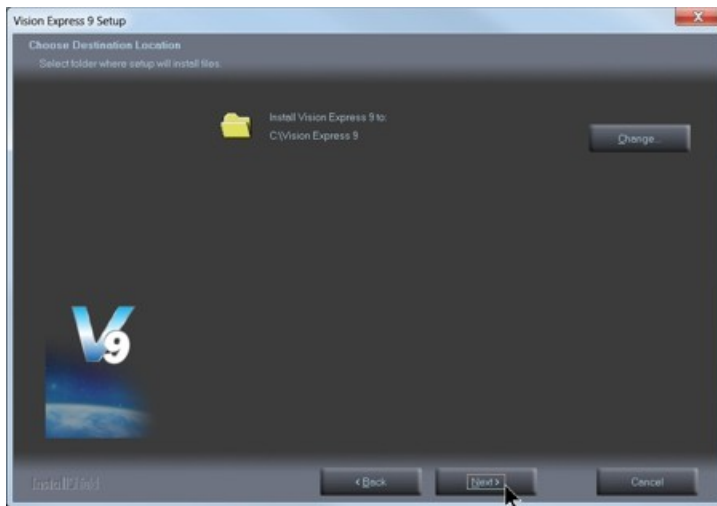
Select Next to begin the installer.



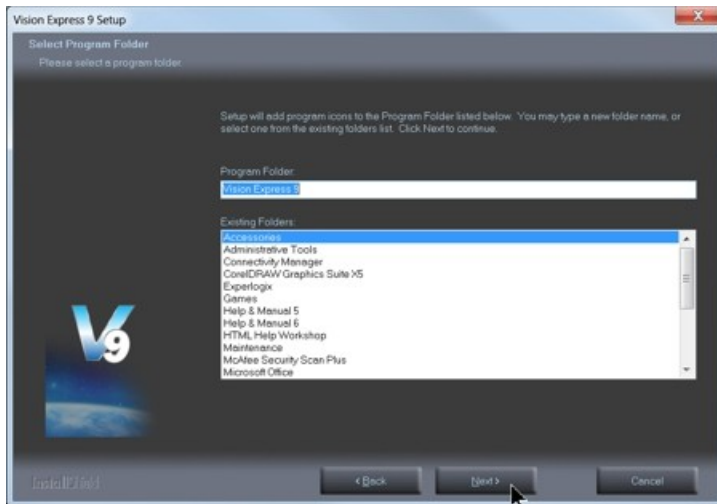
Select Accept the license agreement, then select Next.



Select Next (or change the destination folder - not recommended).

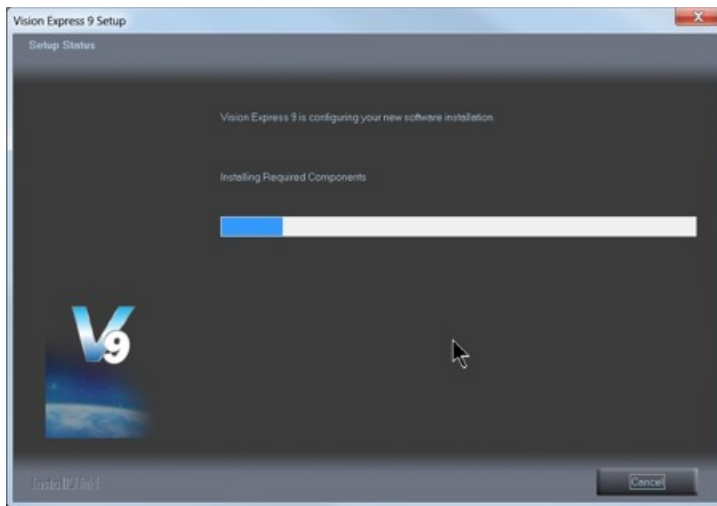


Select Next to create the folder.

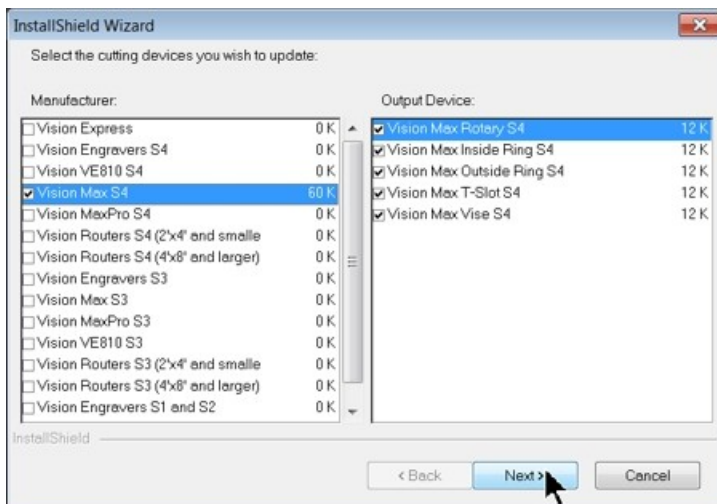




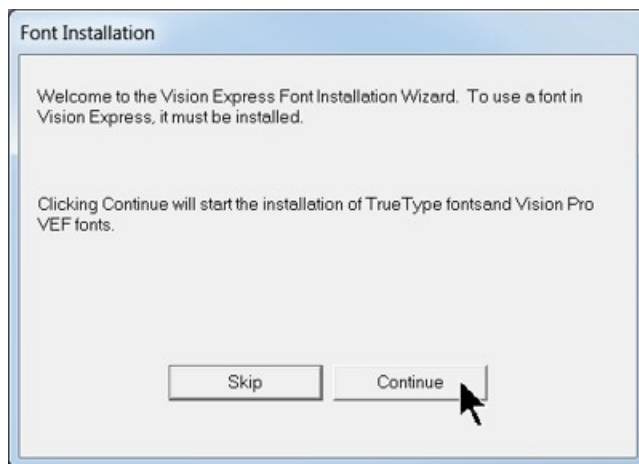
The installation will continue.



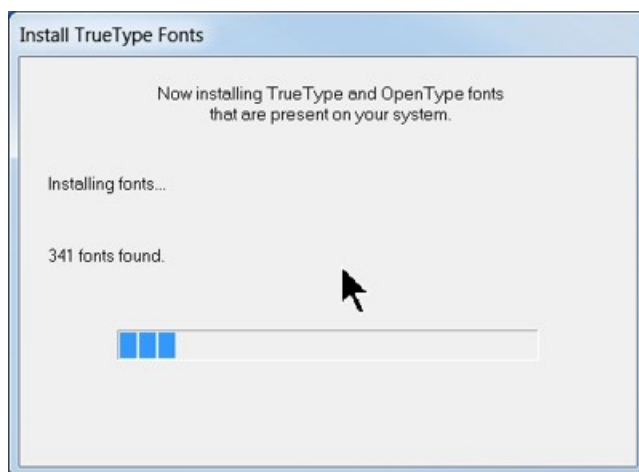
Select your machine from the Manufacturer list on the left side of this window by clicking in the box to the left of the machine (or machine series) you own. The right side of the window will list a selection of Output Devices. Only put a check mark in the box(es) to the left of the Output Device(s) you own. Then select Next. If you purchase another engraving system from Vision, it can be added to the machine list at a later date from within the Vision software.



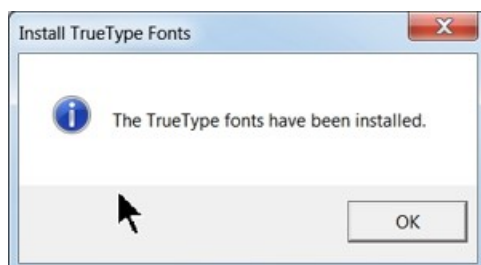
Select Continue to install True Type fonts and Vision Engraving Fonts on your computer.



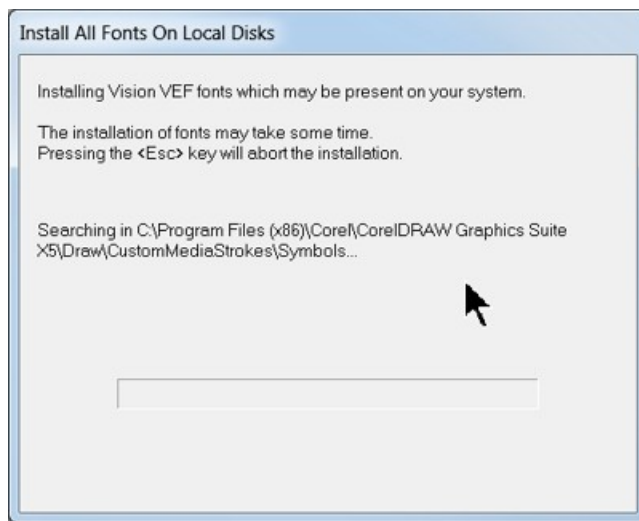
The software will look for True Type fonts on your computer and allow the Vision software to use them.



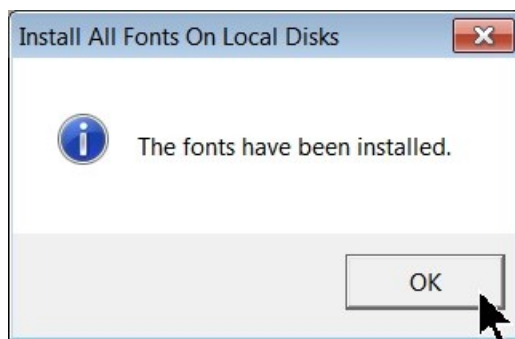
Once the True Type fonts are installed, select OK.



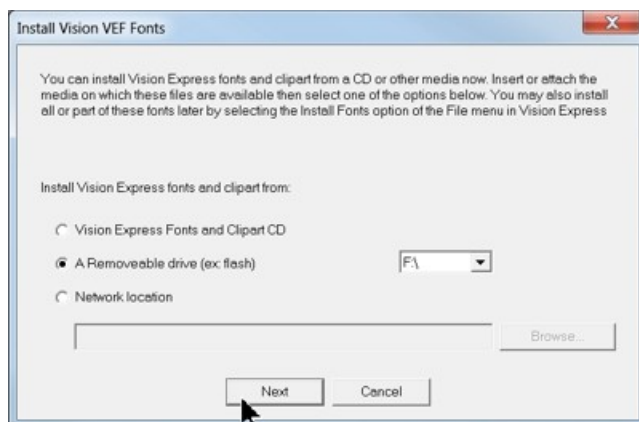
In this step, the software will install any Engraving fonts on your computer.



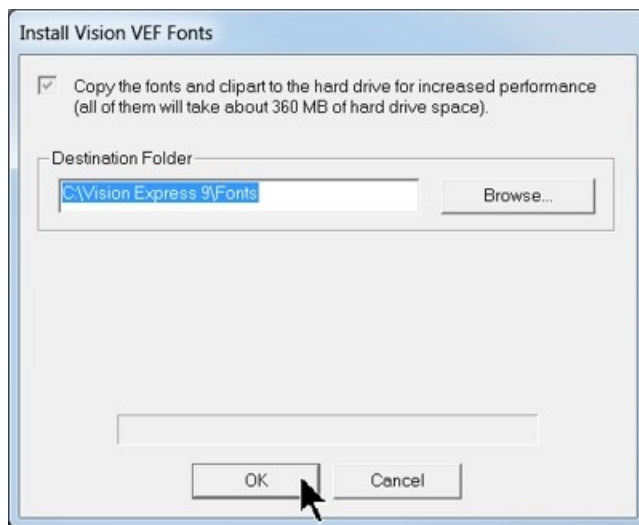
When complete, click on OK.



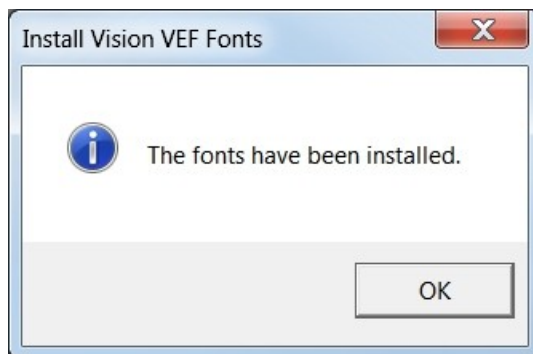
In order to install the fonts on the USB drive, select A Removable drive and from the drop down list, select the drive letter for the Vision USB drive plugged into your computer.



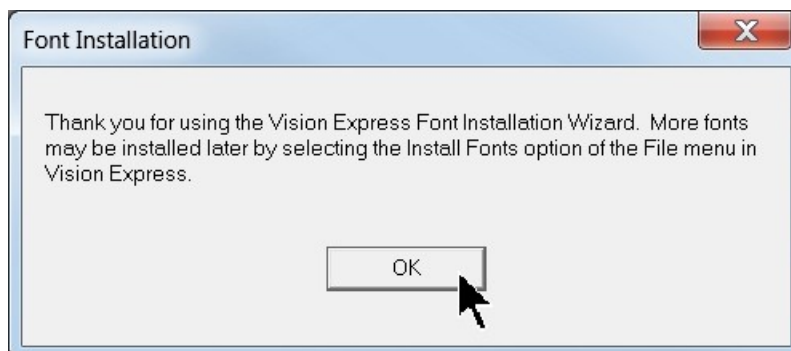
Select OK to install to the default folder.



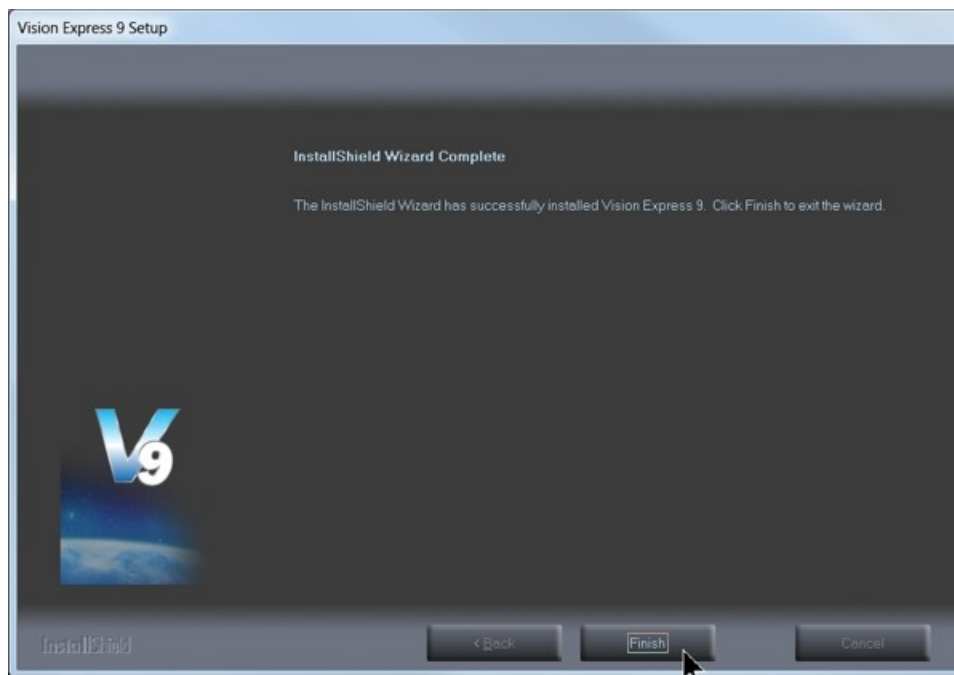
Select OK. All fonts and clipart have been installed from the USB drive at this time.



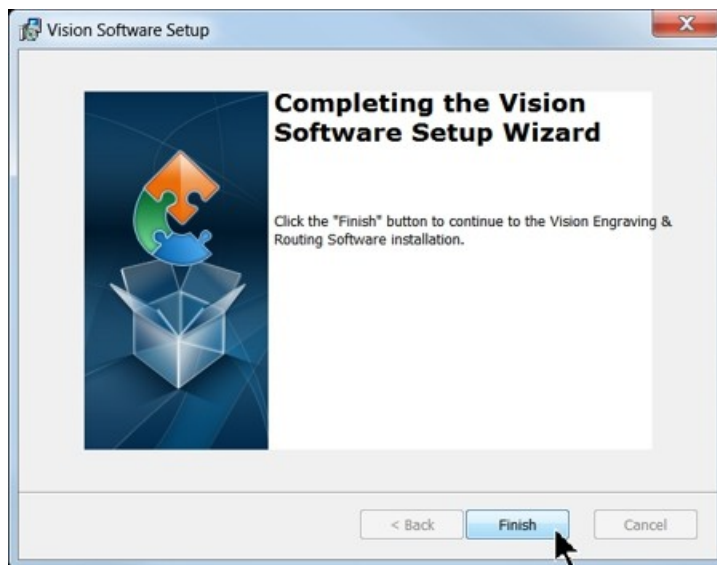
Select OK to return to the main installation screen.



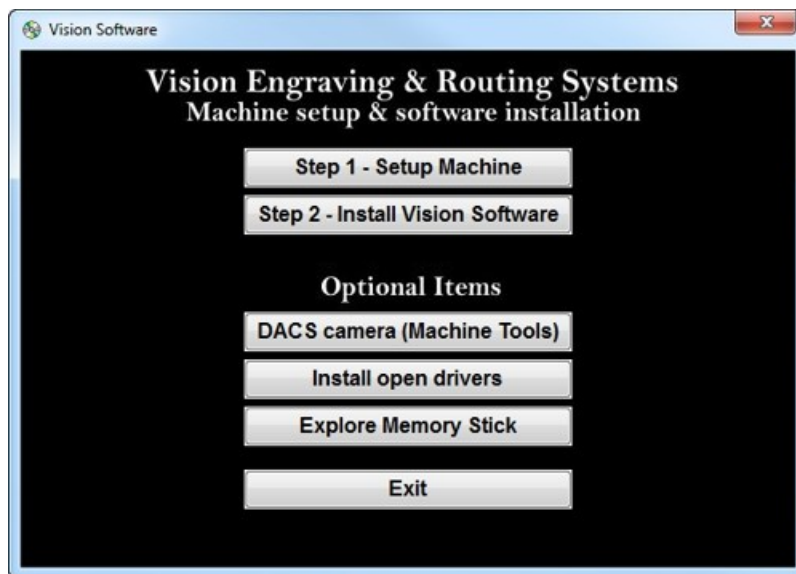
To complete the installation, select Finish.



To close the Software Setup window, select Finish.



Select Exit to close the installer.



The Vision manuals icon should now appear on your computer's desktop along with an icon for your version of Vision 9 software.



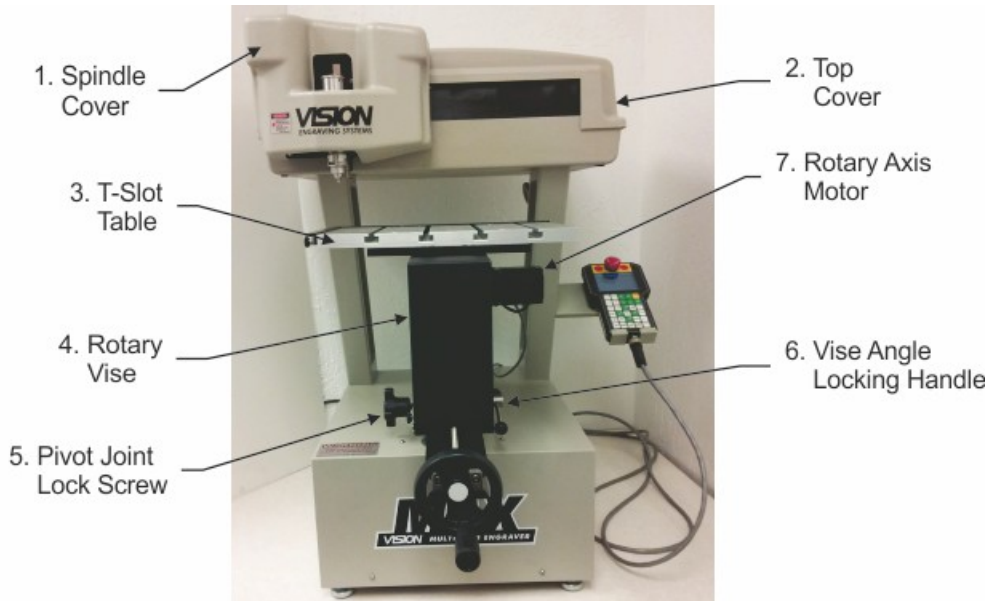
Clicking on the Vision manuals link will give the user access to User Manuals, Installation Guides, Accessories and Training Videos.

If you were supplied with an Orange Dongle (orange USB stick), keep it installed in your computer's USB port in order to use the Vision software. If you were supplied with another color USB stick with your machine, it can be removed at this time from your computer. Installation is now complete.

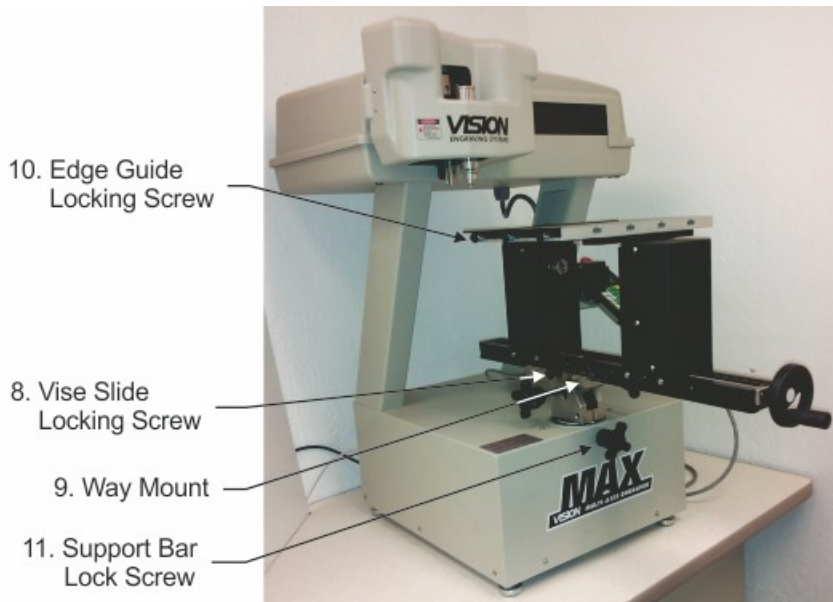
## 3 Operation

### 3.1 General Description and Terminology

The following is a list of features and a description of the components for the Vision Max Engraver.



1. Spindle Cover - This cover has a magnetic latch and opens from the left side. Pull the cover to access the spindle area.
2. Top Cover - This cover is secured by 4 screws and can be removed to access the X and Y axis motors, bearings and leadscrews for maintenance.
3. T-Slot Table - The table is secured to the Rotary Vise via 4 screws. It is used to when engraving most flat items.
4. Rotary Vise - The Rotary Vise can be used bot to rotate cylindrical items as well as hold, or clamp, odd shaped items. The rear side of the vise is the drive side, powered by the rotary axis motor. The front side is "free-wheeling". Adjustment of the vise can be performed by manually rotating the adjustment wheel.
5. Pivot Joint Lock Screw - This lock screw secures the vise and T-Slot table in a flat position, relative to the motion system. In order to angle the vise or table, this screw must be removed.
6. Vise Angle Locking Handle - The rotary vise can be tilted in its pivot joint to accommodate tapered items. Turning the handle counter-clockwise unlocks the vise. Turning the handle clock-wise locks the vise.
7. Rotary Axis Motor - This motor rotates the rotary axis.



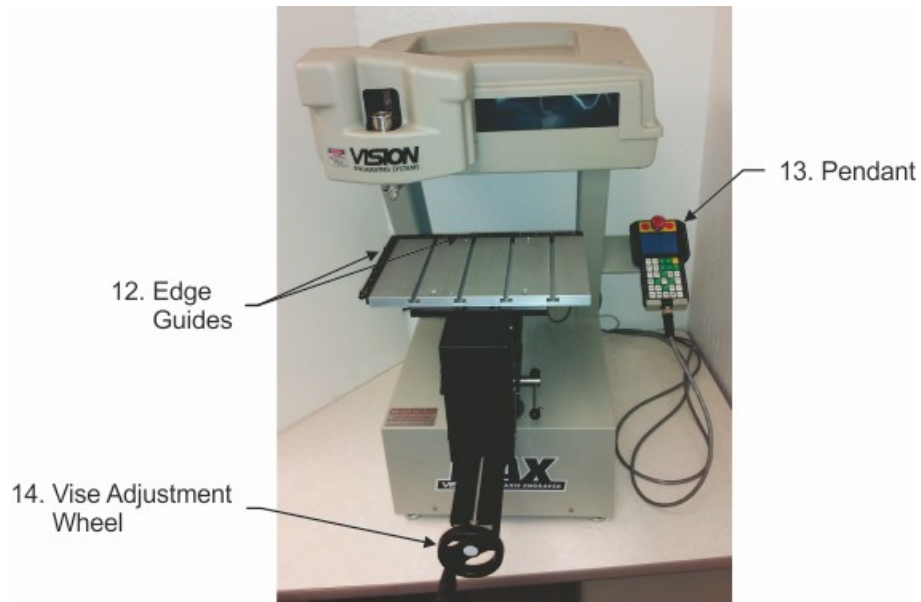
8. Vise Slide Locking Screw - This screw normally secures the position of the vise in the Way Mount. After loosening this set screw, the entire vise assembly can be slid forward or backward depending on the item to be engraved. Secure this screw before engraving by turning the screw clock-wise.

9. Way Mount - The Way Mount supports the vise and allows it to slide forward and backward when positioning items.

10. Edge Guide Locking Screw - There are 3 locking screws on each edge guide to allow the guides to be raised or lowered depending on the thickness of the material to be engraved on the T-Slot table.

11. Support Bar Lock Screw - This screw secures the support bar, which holds the entire vise assembly in place. The vise can be rotated, raised or lowered after turning this screw counter-clockwise. Once the vise has been positioned, secure this screw by turn it clock-wise tightly.



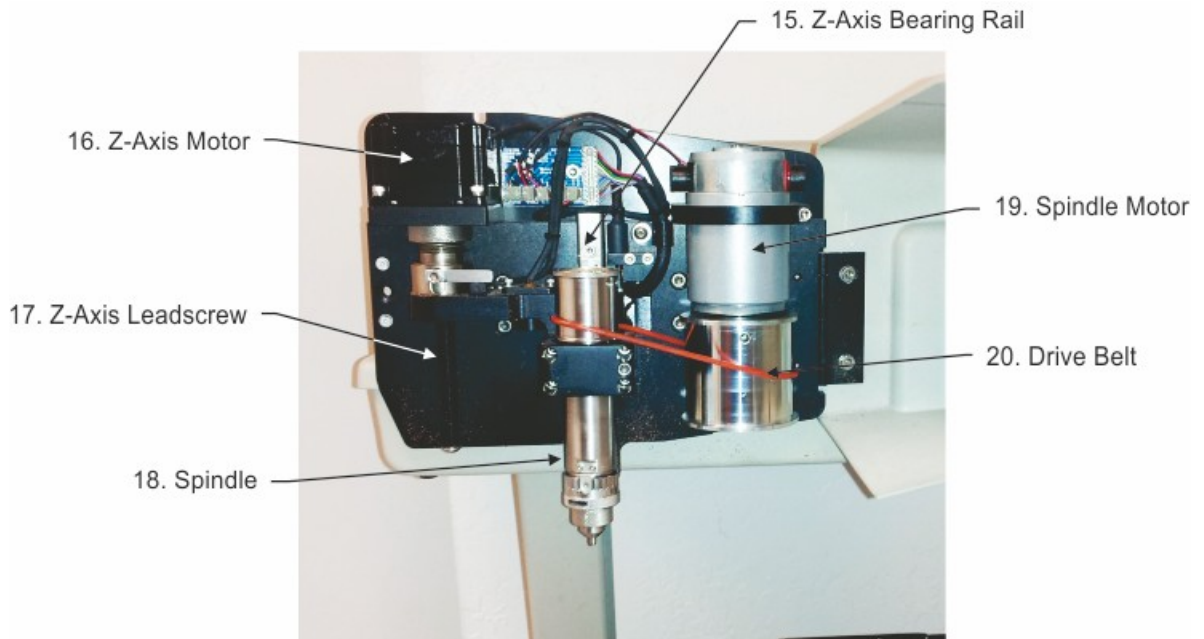


12. Edge Guides - These guides can be used to position items on the T-Slot table. They can be raised or lowered depending on the thickness of the material being engraved.

13. Pendant - The Pendant is the main control key pad for the machine. It allows the user to change machine parameters and run jobs sent to the machine.

14. Vise Adjustment Wheel - Turning this wheel opens or closes the rotary vise.

(Spindle Cover Shown Opened)



15. Z-Axis Bearing Rail - This rail locates the spindle in the Z-Axis.

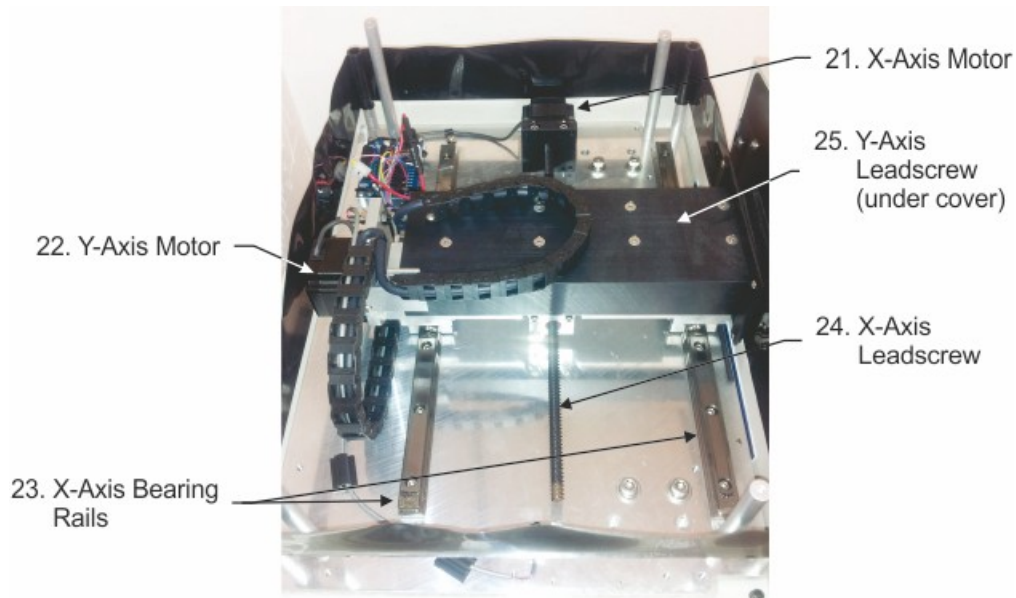
16. Z-Axis Motor - This motor raises and lowers the spindle.

17. Z-Axis Leadscrew - The Z-Axis motor turns the Z-Axis Leadscrew in order to raise and lower the spindle.

18. Spindle - The spindle holds the cutting tool and can rotate cutting tools when applicable.

19. Spindle Motor - This motor drives the drive belt, which in turn drives the spindle.

20. Drive Belt - This belt connects the spindle motor to the spindle.



(Top Cover Removed)

21. X-Axis Motor - This motor turns the X-Axis Leadscrew which moves the motion system and spindle in the X-Axis.
22. Y-Axis Motor - This motor turns the Y-Axis Leadscrew which moves the motion system and spindle in the X-Axis.
23. X-Axis Bearing Rails - These bearings allow movement and rigidly hold the position of the motion system in the X-Axis direction.
24. X-Axis Leadscrew - This leadscrew is rotated by the X-Axis motor and drives the motion system and spindle in the X-Axis.
25. Y-Axis Leadscrew and Bearing Rail - These components provide identical function as the X-Axis counterparts, except in the Y-Axis direction.

## 3.2 The Pendant Controls

The Pendant controls all of the movement and speeds of your Vision engraver or router. Below is a picture of the Pendant. The function of each button is explained below.

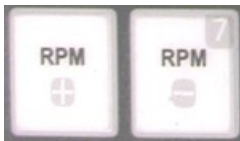


**XY Speed + and - Buttons** - These buttons control the engraving speed of the machine. You can change the engraving speed depending on the type of material you are engraving

and the type of cutter you are using. If you are using a diamond drag cutter (non-rotating), you can generally run the machine at higher speeds. If you are using a rotary cutter, you will need to adjust the speed depending on what type of material you are cutting. Harder materials, such as acrylic and engraver's brass, will need to be engraved at slower speeds. Softer materials such as engraver's plastic can be engraved at higher speeds. A rule of thumb for setting the engraving speed is to start off engraving at a slow speed, then gradually increase the engraving speed while the machine is engraving. Increase the speed until you get to a speed where it sounds like the machine is working freely. If your speed is too fast, the machine will sound like it is working very hard, or putting a heavy load on the engraving spindle. If this happens, you can possibly dull the engraving cutter or the engraving quality will not be very good. Fortunately, engraving speeds presets for most materials are sent to the engraver with the job file. There is much less trial and error as a result.



**Z Speed + and - Buttons** - These buttons control how fast the spindle will move down into the material. Typically, you can leave the speed at it's maximum setting, unless you are engraving into hard materials such as acrylic or deep engraving into metals. In cases such as these, slow the speed down using the Z SPD - button. Again, this is part of the presets sent to the engraver after a material is selected in the Vision software.



**RPM (Spindle Speed) + and - Buttons** - These buttons control the rotational speed (RPM) of the engraving spindle. You would change the RPM of the engraving spindle depending on the type of material you are engraving or for different sizes of engraving cutters. The harder the material you are using, the higher the RPM you would use. Also, the larger the cutter you are using, the higher the RPM you would use. A rule of thumb for setting the spindle speed is to start out at a higher RPM. You can gradually lower the RPM while the machine is working. Keep lowering the spindle speed until the spindle sounds like there is a load (or drag) on the spindle. When you reach that point, you should turn the spindle speed knob up a little bit. The spindle speed also has presets based on the material selected in the Vision software.



**Start Button**- The Start button is used to start the engraving machine. When there is a job in the machine, the Pendant Screen will display the message "Press START to Go; EXIT to Abort. Z-up to Prox Restart, Shift/Start - Dryrun". Also, if you have pressed the Pause button to stop the engraving, pressing the Start button will resume the job.



If a job has been sent to the machine and has been run, the Start button has another feature. If you are using the Connectivity Manager (not Machine Tools), pressing the Start button after the job has been run, will recall the job. Pressing the Start button once more will run the same job.



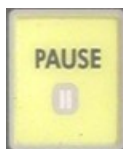
, then



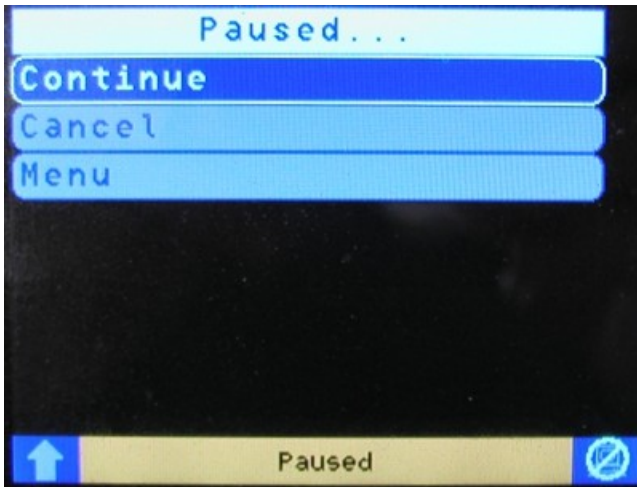
**Shift, then Start Button**

When connected via Connectivity Manager - Pressing Shift, then Start with a job in the machine will perform a dry run of the job with the red pointer on the machine. The red pointer will outline the job to be engraved. If there is no job in the machine, this function will attempt to connect to your computer and you will receive the messages "Connecting to host...", then, "Host not responding!" This is normal, as this button combination is not meant to be used with the connectivity manager.

When connected to Vision Machine Tools - If there is no job in the machine, pressing Shift, then Start will display a list of jobs that are stored on the computer's hard drive. Use the Y up and down jog buttons to move the cursor on the Pendant screen to the job to be engraved and then press Enter to select the job. Pressing Start will run the job. If a job is in the machine and ready to be engraved, pressing Shift, then Start will perform a dry run of the job with the red pointer on the machine. The red pointer will outline the job to be engraved.



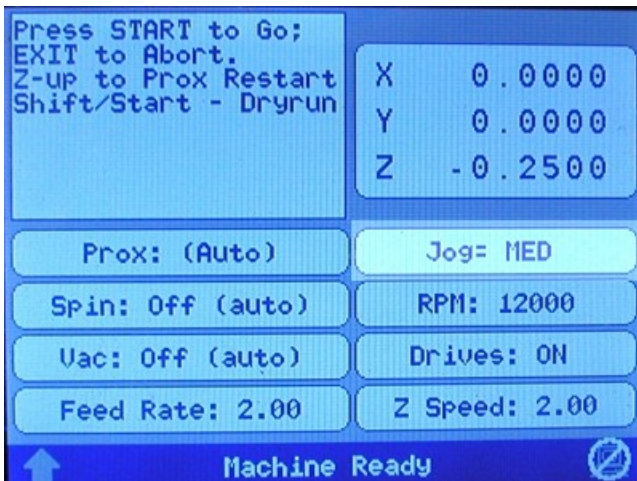
**Pause Button** - The Pause button is used to momentarily stop the machine from engraving. If you press the Pause button while the machine is engraving, the machine will lift the cutter up from the material and stop engraving. The spindle motor and vacuum will power off while in Pause mode. Pressing the Start (or Enter) button will resume (Continue) the engraving where it left off. To Cancel the job, use the Y Up or Down buttons to select Cancel, then press the Enter button. When in Pause mode, the Pendant screen will display:



**Emergency Stop Button** - This button will stop engraving immediately, leaving the cutter in the down position and will power off the X, Y and Z stepper motors and also shut off the spindle motor and auxiliary. Once you have pushed the Emergency Stop Button, you must twist the knob clockwise to release it. Press the Goto Home button to power up the machine and move the spindle back to the home position. The job you were running will be canceled. To run a job, send it to the machine again.

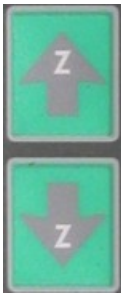
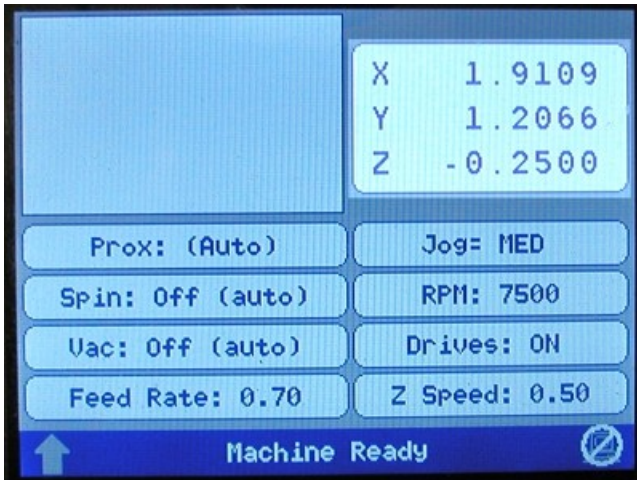


**Jog Speed Button** - The Jog Speed button will toggle the machine's jog speed between Fast, Medium and Slow. The current jog speed can be seen on the Pendant screen as highlighted below.





**X & Y Jog Buttons** - The X & Y jog buttons are used to move the position of the spindle on the T-Slot table work area. This is used to position graphics, or to locate an area for engraving. The X jog buttons will move the spindle left and right. The Y jog buttons will move the spindle front to back. As you use the X & Y jog buttons, the Jog speed will determine how fast the spindle will move and the spindle position will be displayed on the Pendant screen as highlighted below.



**Z Jog Buttons** - These will move the spindle up and down. These buttons are commonly used for setting the surface of your material when you are not using the proximity sensor. The spindle will jog up and down at the Jog speed displayed on the Pendant screen (medium, slow or fast). As you use the Z jog buttons, the spindle position will be displayed on the Pendant screen as shown above.



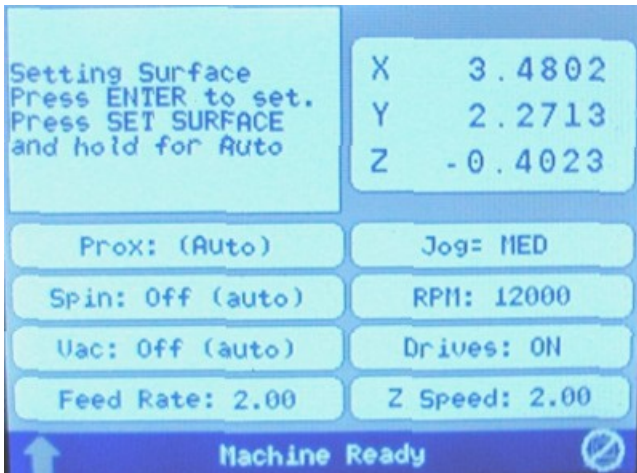


**Shift button** - The Shift button is used to access different functions. Pressing the Shift button will highlight the up arrow in the bottom left corner of the Pendant screen.



**Set Surface Button** - The set surface button is used to set the surface point of the material you are engraving. The procedure for setting the surface is as follows:

- a) Use the X & Y jog buttons to move the spindle over the material to be engraved.
- b) Press the Set Surface button. The Pendant screen will display the message below



- c) Lower the spindle with the Z down jog button until you reach the desired position.
- d) Press the Enter button to set this as the surface position. The spindle will then move up to its lift position.

*HINT:* It is sometimes easier to set the surface right before engraving the job. To do this, send a job to the machine to be engraved. Press Pause. Press Start. The spindle will move to the first point to be engraved and pause. You can then jog the Z down until you reach the desired Z position, then press Set Surface, then press Enter to set the surface. Pressing Start will then begin the engraving process..



**Shift, then Set Surface Button** - When you first press the Shift button, then press the Set Surface button, the red dot laser pointer will power on. Repeating Shift, then Set Surface will turn the red dot laser point off.



**Goto Home Button** - When you press the Goto Home button, the engraver will return to its home position, which is either the default location in the upper left corner of the T-Slot table, or a user defined home position. Pressing this while a job is running will lift the spindle up, move to the home position and cancel the job from the machine.

**IMPORTANT:** When the machine is first powered on, the Goto Home button must be pressed in order to set the home position of the machine before running any jobs.



**Shift, then Goto Home Button** - When you press the Shift button, then press the Goto Home button, the engraver will return to the top left corner of the T-Slot table and "re-home". This is used if the machine has lost position for some reason.



**Set Home Button** - The Set Home button is used to set a user defined home position. To define a home position, use the X & Y jog buttons to move the spindle to a point you want to set as the home position. Press the Set Home button. The message "Home Set." will briefly appear on the Pendant screen. This position is now set as the home (0,0) position. To reset this home back to the machine's home position at the upper left corner of the T-Slot table, press Shift, then press Goto Home, then press the Set Home button.

**Setting a Home Using the Red Dot Laser Pointer** - The red dot laser pointer can be used to set the machine's home position. Turn on the red dot laser pointer by pressing the Shift button, then pressing the Set Surface button. Jog the motion system to the desired location using the X & Y jog buttons and the red dot laser pointer for positioning. Press Set Home to save the home position in the machine. If you want to save a new home position, move the spindle to the desired position and press Set Home as described above.



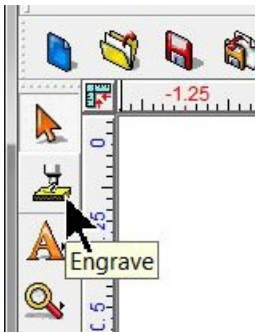
**Shift, then Set Home** - If the machine is turned off, the user defined home position will be replaced with the factory home position. To reset the machine to the user defined home position, Press Shift, then Set Home. The machine will now use the user defined home position.





**Goto Limits Button** - The Goto Limits button is used to send the motion system to its upper left corner limits. This button is typically used for troubleshooting purposes only.



**Prox On/Off Button** - This button allows you to turn the Proximity Sensor on and off. The Prox sensor enables the machine to determine the Z position of the material. This feature works when engraving with a nose cone or diamond drag only; it is not designed for non-nose cone engraving or burnishing. The Pendant screen displays the status of the proximity sensor as (Auto) or Off.  
**Note:** The proximity sensor can be turned on or off from within the Vision Pro software. When the Engrave icon is selected, the proximity icon can be selected or deselected to automatically turn the proximity sensor on or off when the job is running.





Proximity sensor on icon:   
 Proximity sensor off icon: 



**Spindle On/Off Button** - The spindle motor can be either in automatic mode or off. You can toggle between these two modes by pressing the Spindle On/Off button. When set to (Auto), the spindle will automatically turn on and off at the beginning and end of the engraving job. If you press the PAUSE or STOP button, the spindle will turn off for safety reasons. Always make sure you have the spindle turned on when appropriate, otherwise you may run the risk of breaking your cutter. When pressing the Spindle On/Off button, the Pendant screen will display the status as (Auto), or Off.  
**Note:** The spindle can be changed to on or off from within the Vision Pro software. When the Engrave icon is selected, the spindle icon can be selected or deselected to automatically turn the spindle on or off when the job is running.



Spindle on icon:   
 Spindle off icon: 




, then **Shift, then Spindle On/Off Button** - When you press the Shift button, then press the Spindle On/Off button, the spindle motor will start. Pressing Shift, then the Spindle On/Off button again will shut the spindle motor off. The Pendant screen will display On (Auto) when the spindle is turned on.




**Aux On/Off Button** - The auxiliary for an optional vacuum system motor can be either in automatic mode or off. You can toggle between these two modes by pressing the Aux On/Off button. The Pendant screen will display either Vac: Off (Auto), or Vac: Off. When set to Auto, it will automatically turn on and off at the beginning and end of the engraving job. If you press the PAUSE or STOP button, the vacuum will turn off for safety reasons. Always make sure you have the vacuum turned on when appropriate to remove chips that will be created during engraving.

**Note:** The auxiliary can be changed to on or off from within the Vision Pro software. When the Engrave icon is selected, the auxiliary icon can be selected or deselected to automatically turn the vacuum on or off when the job is running.



Auxiliary on icon: 

Auxiliary off icon: 



, then **Shift, then Aux On/Off Button** - When you press the Shift button and then press the Aux On/Off button, the optional vacuum pump will start. Pressing the Aux On/Off button again will shut the vacuum pump off.



**Numeric Buttons** - The Numeric buttons are used when entering numbers. The Pendant will automatically switch to numeric mode when accessing menu items that require numerical input. The numbers 0 - 9, as well as the forward slash "/" and period "." are available.



**Move XY Button** - The Move XY button allows the user to move the spindle to an exact location. Press the Move XY button, then using the Numeric buttons, enter the X coordinate and press the Enter button. Enter the Y coordinate using the Numeric buttons, then press the Enter button. Press the Enter button one more time to jog the spindle to these coordinates, or press Exit to cancel this operation.



**Access Jobs Button** - When connected to Vision Machine Tools - If there is no job in the machine, pressing Access Jobs will display a list of jobs that are stored on the computer's hard drive. Use the Y up and down jog buttons to move the cursor on the Pendant screen to the job to be engraved and then press Enter to select the job. Pressing Start will run the job.



**Enter Button** - The Enter button is used to confirm an operation or to select a highlighted item in the menu system.



**Exit Button** - The Exit button is used to either cancel an operation, or to exit a menu.



**Job Time Button** - The Job Time button shows the time required to complete the last job.



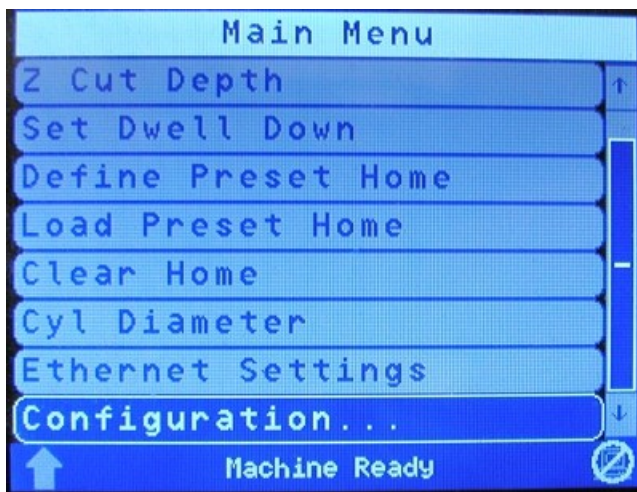
**Rotary Axis Button** - The Rotary Axis button allows for the rotary axis to be used. When this button is pressed, the Pendant screen will display a field to enter the diameter of your item to be engraved. Enter the diameter of the item using the Numeric buttons and press ENTER. Note: This button only works when a rotary axis is present on your machine.



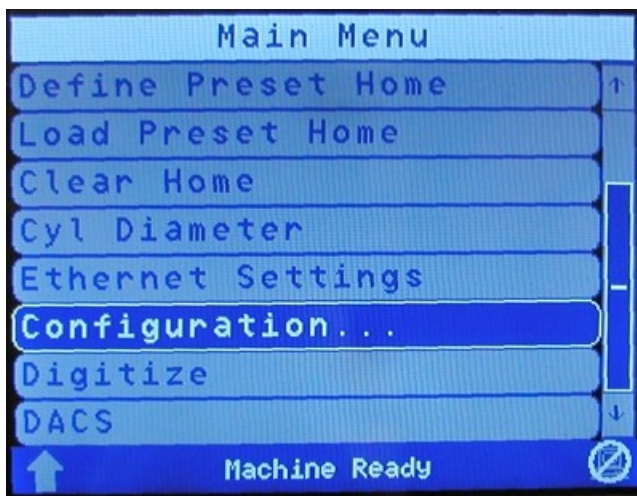
**Menu Button** - The Menu button allows access to various options within the Vision Controller. Pressing the Menu button will display the following Pendant screen. There are controls for Z Lift Height, Z Cut Depth, Defining a Preset Home Position, Loading a Preset Home Position, Clear Preset Home, Cylinder Diameter (when using a rotary axis), and Ethernet Connection Settings.



Pressing the Y down button will access the last menu item: Configuration.



On certain Vision machines, the second menu page adds options for Digitize and DACS. Those features are discussed in separate sections.

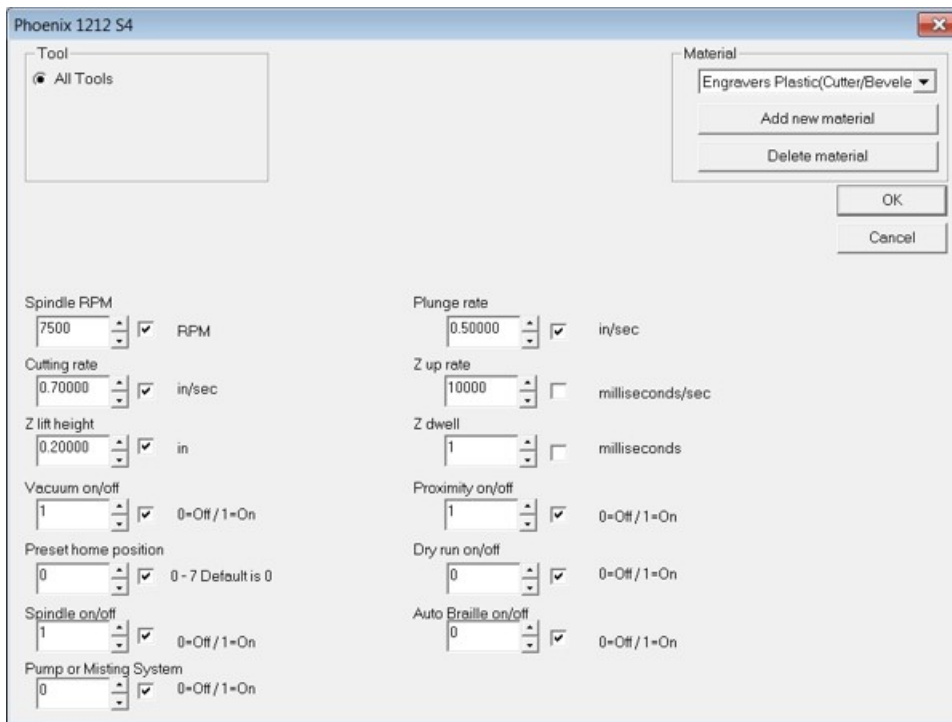
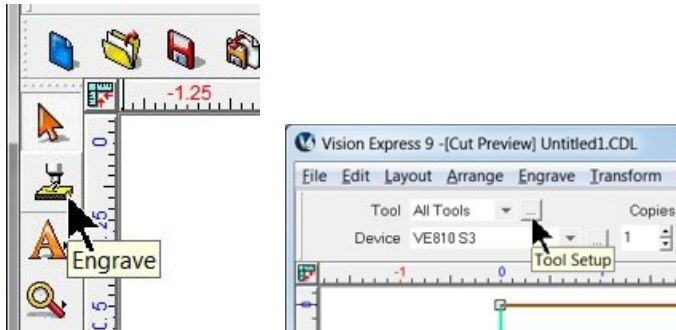


To access any of these menu items, use the Y up or down arrows to highlight the menu item, then press the Enter button. Each of these menu items are described later in this section.

*Hint - To quickly scroll to the next menu page, use the Z up or down buttons.*

*Note: Many of the following features can be set from the Vision Pro software. When the Engrave icon is selected, select the icon with three dots to the right of All Tools as shown below. Settings can be changed for the following items:*

*Spindle RPM, Cutting Rate, Z-Lift Height, Vacuum (or Aux) On/Off, Preset Home Position number, Spindle On/Off, Pump (or Misting System) On/Off, Plunge Rate, Z Up Rate, Z Dwell, Proximity Sensor On/Off, Dry Run On/Off, and Auto Braille On/Off.*



**Z Lift Height** - This will adjust the distance that the cutter lifts between characters while engraving. Move the cursor to the Z Lift Height using the Y up and down jog buttons and press Enter. Using the numeric buttons, enter the distance you would like the cutter to lift between characters. This number will be in inches or in millimeters, depending on how the controller is configured. It will show the units that are being used on the Pendant screen. After the lift distance is entered, press the Enter button to set this value. Press the Exit button to return to the main screen when finished.

**Z Cut Depth** - This will adjust the depth of engraving or routing. It is the distance from the position that you set as the surface, to the final depth you would like to cut. Move the cursor to the Z Cut Depth using the Y up and down jog buttons



and press Enter. Using the numeric buttons, enter the depth you would like to engrave or rout. This number will be in inches or millimeters, depending on how the controller is configured. It will show the units that are being used on the Pendant screen. After the Z Cut Depth is entered, press the Enter button on the controller to set this value. Press the Exit button to return to the main screen when finished. Note: The Z Cut Depth is only used if you are not setting the depth of cut in the Vision software.

**Set Dwell Down** - This controls how long the spindle will dwell, or wait after initially dropping the cutter down into the material before moving in an X/Y direction. This is typically used when engraving into harder materials, allowing the cutter to plunge to the correct depth before starting to engrave or rout. This number is in milliseconds, so entering a number of 1000 will allow for a 1 second delay. After the dwell time is entered using the numeric buttons, press the Enter button. Press the Exit button to return to the main screen when finished.

**Define Preset Home** - The user can store up to 9 preset home positions. Move the cursor to the Define Preset Home menu using the Y up and down jog buttons and press Enter. The Pendant screen will show the current number (#) as "Select Pre Home #". Numbers 1 through 9 can be user defined. Use the Z speed + and Z speed - buttons to select the home position you would like to save. Next, use the X and Y jog buttons to move the spindle to the position that you would like to use as the home position. Once the spindle is at the desired location, press the Enter button to store the home position. Press Exit to return to the main screen. *Note: Preset home positions are stored even after the controller has been powered off.*

**Load Preset Home** - To load a preset home, move the cursor to the Load Preset Home menu using the Y up and down jog buttons and press Enter. Use the Z speed + and Z speed - buttons to select the home position you would like to load. Once the desired position is shown on the Pendant screen, press the Enter button to load the home position. The machine will now use this position as the home position. Press the Exit button to return to the main screen when finished.

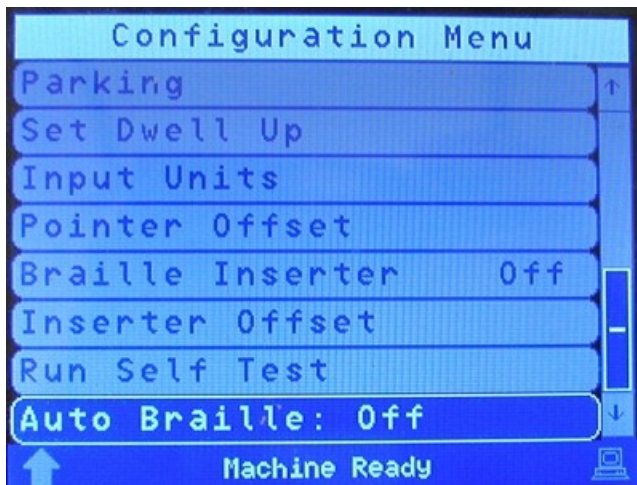
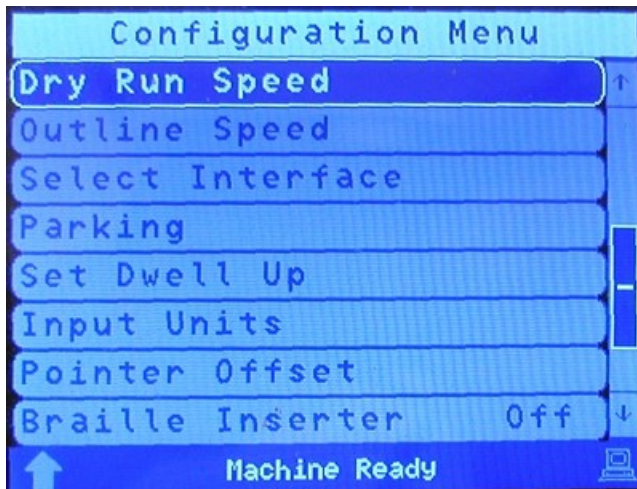
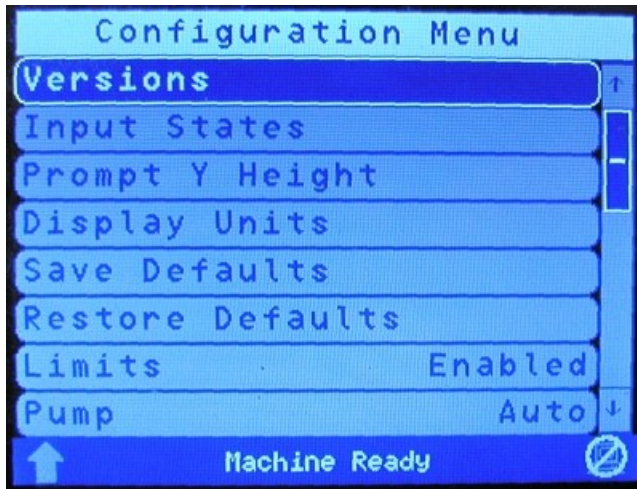
**Clear Home** - To clear the home position that has been loaded, move the cursor to the Clear Home menu using the Y up and down jog buttons and press Enter. The home position is now defaulted back to the upper left corner of the table. Press the Exit button to return to the main screen when finished. *Note: This does not apply to Preset Home Positions, only to the user defined home position set with the Set Home button.*

**Cyl Diameter** - This menu item is only used when engraving round objects on a machine that supports the rotary axis. Move the cursor to the Cyl Diameter using the Y up and down jog buttons and press Enter. Using the numeric buttons, enter the diameter of the item to be engraved. This number will be in inches or millimeters, depending on how the controller is configured. Once the diameter has been entered, press the Enter button on the controller to set this value. Press the Exit button to return to the main screen when finished.

**Ethernet Settings** - This menu is used to setup the network settings in the Vision controller. There are two options in the Ethernet Settings menu available after pressing Enter, which are:

1. Specify IP - Pressing the Enter button from this screen will set the Vision controller to DHCP, which automatically retrieves an IP address from the network server it is connected to. Pressing the Exit button from this screen will allow you to enter an IP address manually. Pressing Exit again allows the user to set the sub Net Mask. Please refer to the Machine Connections section for details on network configuration settings
2. Display IP - This menu is used to show the IP address that the Vision controller is set to. It also shows the IP address of the PC that is connected to the Vision controller.

**The Configuration Menu** - There are three screens to the configuration menu as shown below.



**Configuration** - This menu accesses various additional settings, as well as information about the machine in use. To change of view any of these settings, highlight the Configuration menu and press Enter. Each of these sub menus are described below:

**Versions** - Pressing Enter with this item highlighted will display hardware and software versions of the controller, as well as display the machine serial number.

**Input States** - Pressing Enter with this item highlighted will display information about the status of the motors and sensors on the machine.

**Prompt Y Height** - Pressing Enter with this item highlighted will allow the user to specify whether to ask the user for the Y height before running a job. When engraving jobs from programs such as CorelDraw®, jobs may engrave upside down on an engraving machine. This is because the program typically is referencing the home position from the lower left corner of the plate, and the engraver or router is referencing the home position from the upper left corner of the plate. To correct this, the Vision Job Server will flip the job automatically so that the engraving will be oriented properly. However, when doing this, the Vision controller needs to know the page size that is set up in programs such as CorelDraw®. To accomplish this, the Prompt Y Height configuration setting must be turned on. Move the cursor to the Prompt Y Height menu item using the Y up and down jog buttons and press Enter. Press the Y up or down jog buttons to select Yes or No. Press the Enter button on the controller. Press the Exit button two times to return to the main screen when finished.

**Display Units** - Pressing Enter with this item highlighted will allow the user to set the display units to either inches or millimeters. To change units, move the cursor to the Display Units menu item using the Y up and down jog buttons and press Enter. Press the Y up or down jog buttons to select imperial or metric units. Press the Enter button to save this setting. Press the Exit button two times to return to the main screen when finished.

**Save Defaults** - Pressing Enter with this item highlighted will allow the user to save various settings, even when the machine is turned off. The user can save settings such as the Spindle On/Off, Aux On/Off, Prox On/Off, Z lift, Z depth, RPM and surface location. To save the controller defaults, change the settings above to the way that you would like them. Move the cursor to the Save Defaults menu item using the Y up and down jog buttons and press Enter. The Pendant screen will show "Save as Defaults?". Highlight Yes or No using the X left or right jog buttons, then press Enter. The settings are now saved. Press the Exit button two times to return to the main screen when finished. The next time the Vision controller is turned on, the defaults will be as you set them.

**Restore Defaults** - Pressing Enter with this item highlighted will restore the defaults in the controller to the original factory set defaults. To restore the controller defaults, move the cursor to the Restore Defaults menu item using the Y up and down jog buttons and press Enter. The Pendant screen will show the main screen with "Restore to Factory Defaults?" shown in the upper left corner of the screen. Press Enter to restore the defaults. The Pendant screen will display "Loading Defaults...", then display "Reboot Now?". Press Enter to reboot the controller. The factory settings will then be restored.

**Limits** - Pressing Enter with this item highlighted will prevent the controller from reading the limit switches on the machine. This is typically used only in diagnosing problems that may occur with the machine's limit switches. To disable the limit switches, move the cursor to the Limits Enabled menu item using the Y up and down jog buttons and press Enter, which toggles the limit switches from Enabled to Disabled. Pressing Enter again will Enable the limit switches. Press the Exit button two times to return to the main screen when finished.

**Pump** - Pressing Enter with this item highlighted will activate the (optional) external misting system used for lubrication during specific material cutting. It is also used for the Max-Pro machines. This is a manual control and the Vision Pro software allows for automatic operation of the misting pump, so this feature is not often used. To turn this feature to Off or Auto, highlight the item in the menu and press Enter. To turn this feature to On or Auto, press the Shift button, then press Enter. Both Enter and Shift/

Enter are toggles. To return to the main Pendant screen, press the Exit button two times.

**Dry Run Speed** - Pressing Enter with this item highlighted will allow the user to set the dry run XY speed of the motion system. To set the speed, use the Y up or down buttons to highlight the menu item and press Enter. Use the numeric buttons to enter the desired speed, then press Enter to save this speed. To return to the main Pendant screen, press the Exit button two times.

**Outline Speed** - Pressing Enter with this item highlighted will allow the user to set the outline speed which used by the measure feature in the Vision Pro software. To set the speed, use the Y up or down buttons to highlight the menu item and press Enter. Use the numeric buttons to enter the desired speed, then press Enter to save this speed. To return to the main Pendant screen, press the Exit button two times.

**Select Interface** - Pressing Enter with this item highlighted will allow the user to select HPGL or GCode interface language. The Vision controller can run from both HPGL and GCode machine language. By default the controller uses the HPGL language which is what is used by Vision and Vision Pro software. If you would like to run GCode, move the cursor to the Select Interface menu item using the Y up and down jog buttons and press Enter. Use the Y up or down buttons to select the language you would like to use, then press Enter. Press the Exit button two times to return to the main screen when finished.

**Parking** - Pressing Enter with this item highlighted will allow the user to set the position the spindle will return to after a job has finished. To set this position, move the cursor to the Parking menu item using the Y up and down jog buttons and press Enter. There are four positions that you can set the spindle to move to at the end of the job. Datum: The spindle will move back to the limit switch position on the table. None: The spindle will remain at its last location when the job is finished. Z-Up: The spindle will remain at its last location at the end of the file and lift the spindle off the material. Home: The spindle will move to the current home position that is set in the controller. Use the Y up and down job buttons to select which parking position you would like to use, then press Enter to select it. Press the Exit button two times to return to the main screen when finished.

**Set Dwell Up** - *This is used only with tables that are using an air actuated Z axis. None of the current Vision systems use an air actuated Z axis.* This will allow the Z axis to release the air pressure so that the spindle moves up before moving to the next item to be engraved. Move the cursor to the Set Dwell Up menu item using the Y up and down jog buttons and press Enter. Enter the length of time required for the Z dwell up and then press Enter. This number is in milliseconds so entering a number of 1000 will allow for a 1 second delay. Press the Exit button two times to return to the main screen when finished.

**Input Units** - Pressing Enter with this item highlighted will allow the user to set the units used by the machine to either Imperial or Metric units. This differs from the Display Units menu item in that the input units are what the machine recognizes from the job sent to the machine, while the display units simply show the file on the Pendant screen as Imperial or Metric. The input units MUST match the units used to create the job, or improper scaling of the job will result. To select the input units, use the Y up or down buttons to highlight the menu item and press Enter. Use the Y up or down buttons to select either Imperial or Metric units, then press Enter to save this setting. To return to the main Pendant screen, press the Exit button two times.

**Pointer Offset** - Pressing Enter with this item highlighted will allow the user to modify the factory settings used in the machine to compensate for the offset between the spindle centerline and the red dot laser pointer location. Modification of this setting may be necessary if the location of the red dot laser pointer does not accurately represent the location of the spindle during engraving. To modify this setting, use the Y up or down buttons to highlight the menu item and press Enter. Use the numeric buttons to enter the X offset, then press Enter. Use the numeric buttons to enter the Y offset, then press Enter. The settings are now saved. To return to the main Pendant screen, press the Exit button two times.

**Braille Inserter** - Pressing Enter with this item highlighted will toggle the Braille Inserter function to On or Off. The Vision Pro software automatically turns this function on or off with the job. This function is used only when the machine is being run from software other than Vision Pro.

**Inserter Offset** - Pressing Enter with this item highlighted will allow the user to modify the factory set offset used with the Braille Inserter tool. The offset is from the spindle centerline to the Braille Inserter centerline. The X and Y offsets are set for each machine if the Braille Inserter option was ordered from the factory. If the user restores factory defaults, the X and Y offsets will need to be reset. To modify the offsets, highlight the menu item and press Enter. Using the numeric buttons, enter the desired X offset, then press Enter. Enter the Y offset using the numeric buttons, then press Enter. Enter the Z-lift setting with the numeric buttons, then press Enter to save these settings. To return to the main Pendant screen, press the Exit button two times.

**Run Self Test** - Pressing Enter with this item highlighted will allow the user to engrave a self test job that is programmed into the controller. Move the cursor to the Run Self Test menu item using the Y up and down jog buttons and press Enter. The Pendant screen will display "Run Self-Test". Use the Y up or down buttons to select Yes or No, then press Enter. The Pendant screen will now show "Press Start to Go". Press the Start button to begin engraving the test job.

**Auto Braille** - Pressing Enter with this item highlighted will allow the controller to turn the automatic braille detection On or Off. A reboot will be required to retain this setting. If using the Vision Pro software, this setting is normally left as On. If the user sends files from another software program, turn this feature off and using the Braille Inserter feature described above, turn On the Braille Inserter feature.

### 3.3 Set Home Procedure

To set a user defined home position, use the X & Y jog buttons to move the spindle to a point you want to set as the home position. Press the Set Home button. The message "Home Set." will briefly appear on the Pendant screen. This position is now set as the temporary home (0,0) position. To reset the temporary origin back to the machine's home position at the upper left corner of the T-Slot table, press Shift, then press Goto Home, then press the Set Home button.

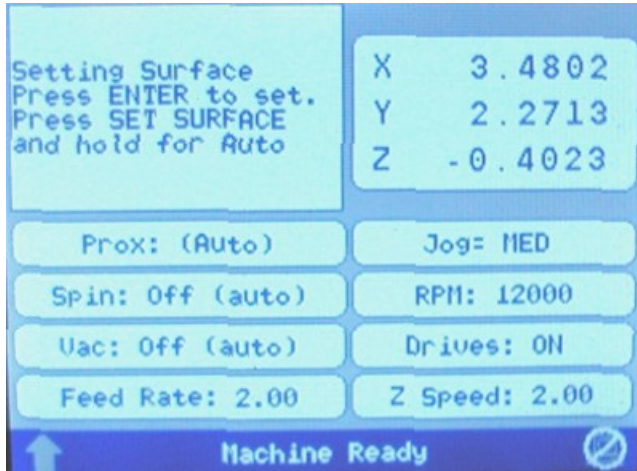
The red dot laser pointer can be used to set the machine's home position. Turn on the red dot laser pointer by pressing the Shift button, then pressing the Set Surface button. Jog the motion system to the desired location using the X & Y jog buttons and the red dot laser pointer for positioning. Press Set Home to save the home position in the machine. If you want to save a new home position, move the spindle to the desired position and press Set Home as described above.

If the machine is turned off, the user defined home position will be replaced with the factory home position. To reset the machine to the user defined home position, Press Shift, then Set Home. The machine will now use the user defined home position.

### 3.4 Set Surface Procedures

The procedure for setting the surface is as follows:

1. Use the X & Y jog buttons to move the spindle over the material to be engraved.
2. Press the Set Surface button. The Pendant screen will display the message below



3. Lower the spindle with the Z down jog button until you reach the desired position.
4. Press the Enter button to set this as the surface position. The spindle will then move up to its lift position.

*HINT:* It is sometimes easier to set the surface right before engraving the job. To do this, send a job to the machine to be engraved. Press Pause. Press Start. The spindle will move to the first point to be engraved and pause. You can then jog the Z down until it touches the surface and press Set Surface, then Press Enter to set the surface. Pressing Start will then begin the engraving process.

**NOTE:** There are different procedures for different types of engraving - see below.

#### Diamond drag engraving with a proximity sensor

Make sure that the proximity sensor is turned on. When you run the job, the spindle will go down until it touches the material and finds the surface automatically. If you want to change the lift amount of the cutter between characters, you will need to do the following steps:

1. Press the menu button on the controller. Note: If you are in the middle of engraving a job, press the pause button before pressing the menu button.
2. Use the Y jog up and down buttons to select Z Lift Height and press Enter.
3. Enter the lift height using the numeric buttons on the Vision controller and press Enter.
4. Press Exit to return to the main screen.
5. The Z lift height is now set. Press Start to run the job or resume engraving.

#### Diamond Drag and nose cone engraving without a proximity sensor

1. Send a job to the Vision controller.
2. With the prox off, press the Pause button and then press Start.
3. The machine will move to the start of the engraving and pause.
4. Use the Z jog down button to lower the spindle to material.
5. Press the Set Surface button.
6. Press the Enter button.
7. Press the Start button. The machine will start to engrave using the surface point that was just set.

**Non-nose cone engraving (depth control)**

1. Send a job to the Vision controller.
2. Make sure that the spindle is locked by tightening the spring adjustment knob all the way down.
3. Make sure that you have entered a depth of cut in the Vision or Vision Pro software. If you are using a different program than Vision or Vision Pro, use the Menu button on the controller to select and enter the Z Cut Depth.
4. With the prox off, press the Pause button and then press Start.
5. The machine will move to the start of the engraving and pause.
6. Use the Z jog down button to lower the spindle to material. Make sure that the cutter is just barely touching the surface.
7. Press the Set Surface button.
8. Press the Enter button.
9. Press the Start button. The machine will start to engrave using the depth that was entered in the software or the controller.

**Burnishing**

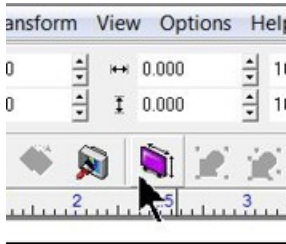
1. Send a job to the Vision controller.
2. Make sure you are using a burnishing adapter on the burnishing cutter.
3. With the prox off, press the Pause button and then press Start.
4. The machine will move to the start of the engraving and pause.
5. Use the Z jog down button to lower the spindle to material. Once the cutter reaches the material, press the Z jog down button a small amount more (typically about 0.03 - 0.05 inches).
6. Press the Set Surface button.
7. Press the Enter button.
8. Press the Start button. The machine will start to engrave using the depth that was entered in the software or the controller.



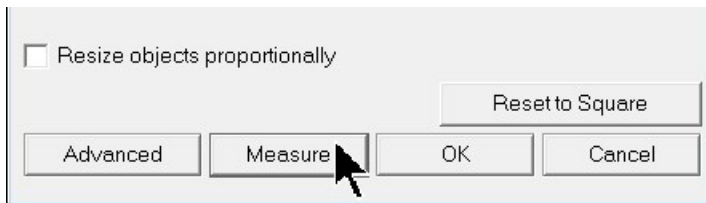
### 3.5 Using the Measure Feature

The Measure Feature is a very useful tool that can be used to set up both the machine's home position and the plate size in the Vision 9 software.

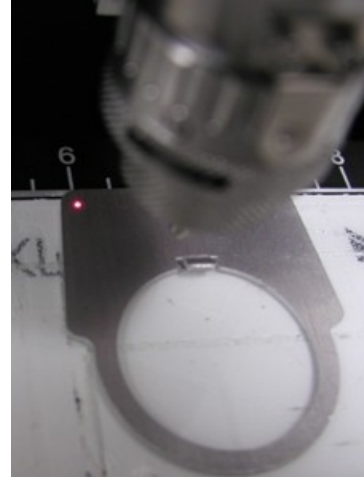
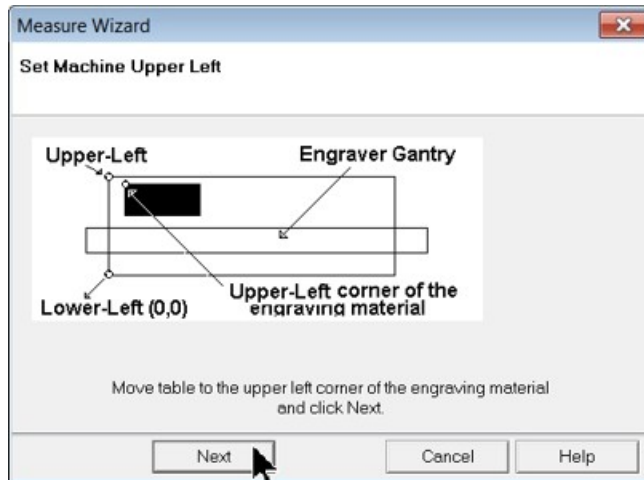
To use this feature, turn on the engraver and press the Go to Home button. Open the Vision 9 software with a new drawing and select the Plate Size icon on the top toolbar.



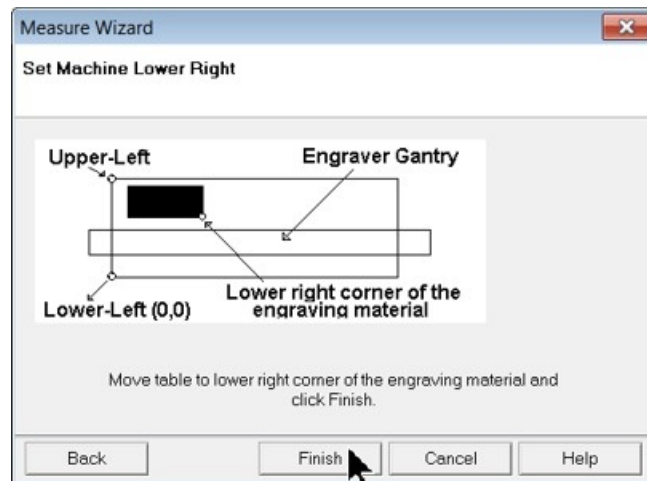
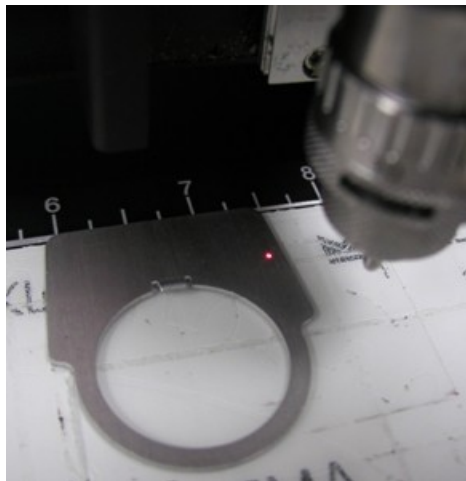
At the bottom of the plate size window, click on the Measure icon.



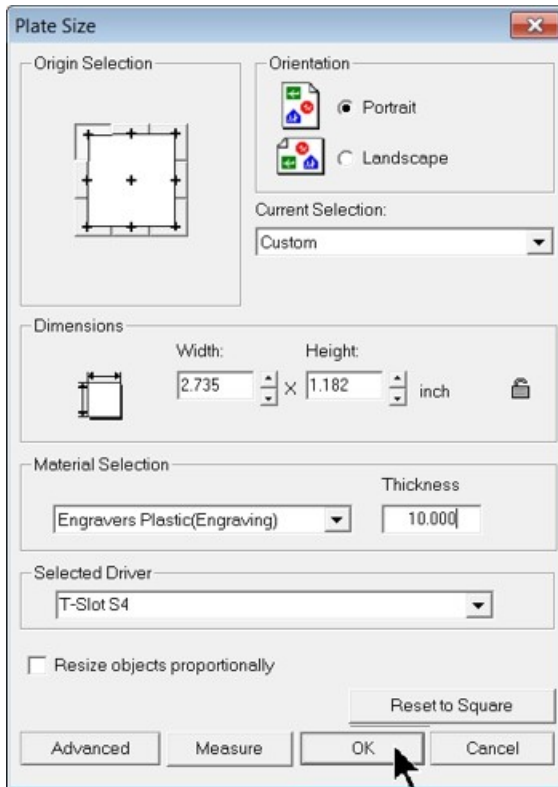
The Measure Wizard window will open. The engraver will turn on its red dot laser pointer. Move the spindle over the material using the X and Y Move buttons on the Pendant and position the laser pointer so that it is in the upper left hand corner of the engraving area you wish to define. Then, click on Next in the Measure Wizard window.



Move the laser pointer to the lower right corner of the engraving area you wish to define, then click on Finish in the Measure Wizard window.



The dimensions of the plate size shown in the Plate Size window will now reflect the engraving area you have defined on the machine. The Home Position of the machine has also been set to the upper left corner of this area.



The machine will also allow you to outline the engraving area you just defined. Follow the instructions on your machine or controller to have the machine outline this engraving area with the red dot laser pointer. If the area appears to be correct, click on OK in the Plate Size window. The plate size in the Vision 9 software now shows the area defined with the measure feature. Design your job and send the job to the engraver.

Note that when using the measure feature, the machine will have its home position changed. You will need to reset the home position to the upper left hand corner of the engraving table in order to use the machine normally.

## 3.6 Holding Down Material

There are many ways to hold material down on the T-Slot table. One of the major things to remember is that the material must be placed in the upper left corner of the T-Slot table. This will ensure that the engraving is in the correct position on your material.

You can use double-sided tape, Multi Mat hold down material, the quick lock vise, or optional clamps and fixtures (see the Optional Accessories section of this manual for more details) to hold down material to the T-Slot table. Double-sided tape or Multi Mat material are available from your Vision Distributor or directly from Vision.

### Hold Down Techniques

Holding material in place is critical for engraving and cutting applications. The Multi Mat material is useful for both applications, but using double-sided tape or a spray adhesive can be a better choice for some applications. For most materials and engraving applications, the Multi Mat material is the easiest to use. Simply place it on the table and place the material to be engraved on top of it. When cutting completely through, or kiss-cutting materials, care must be taken to not cut too far through the material, or the Multi Mat will be slightly cut in the process. The most common approach to cutting when using the Multi Mat is to set the cut depth using the machine's micrometer or the "stacked material method" as described below and in the section on Profile Cutting. When using the micrometer, the material thickness should be measured with calipers. Keep in mind that some materials can vary in thickness and there may be areas that remain uncut. For a detailed explanation on the use of the micrometer for setting cutting depth, see Level 1 Example Job 4 in the Profile Cutting section.

### Stacked Material Method

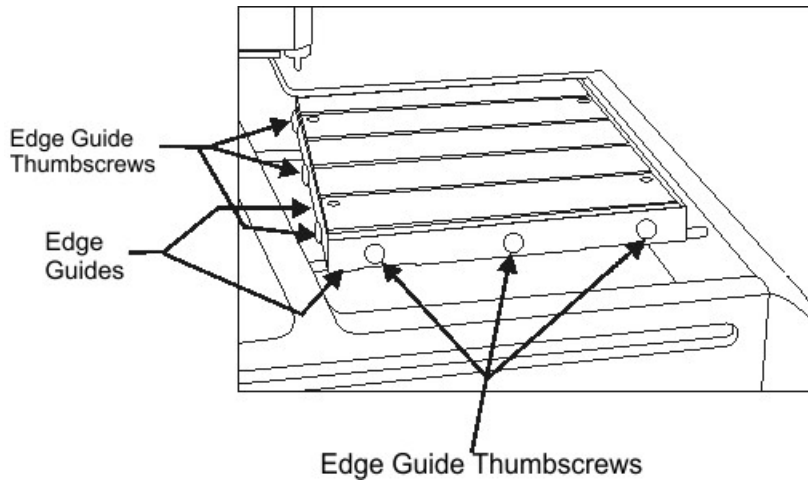
Many times, double sided tape can be a quick and very secure way to hold material down to the T-Slot table. The downside to using tape is that it will remain on the table and can be a problem to remove. A better solution is to place Multi Mat material on the T-Slot table, then place a piece of sacrificial material (of the same type as being cut) on top of the Multi Mat. Then apply double-sided tape to the sacrificial material and place the material to be cut on top of the sacrificial material. In this manner, while the machine is engraving or cutting other jobs, the sacrificial material/cut material can be removed and separated by the user, making better use of machine time and allowing for easier clean up. Note - if double-sided tape is used, be careful to cover a sufficient area to keep the material in place and also to hold smaller pieces in place so they do not move when the last section of the small piece is cut.

### Spray Adhesives

Using a spray adhesive, in conjunction with "transfer tape" or "application tape" is yet another method often used. As with the other methods, place Multi Mat on the T-Slot table, a piece of sacrificial material is then covered with transfer tape on its top surface and a spray adhesive is applied on top of the tape. Place the sacrificial material with the tape/adhesive side facing up on the Multi Mat material. Then, the material to be cut should have transfer tape applied to its back side and adhesive is sprayed on to the transfer tape. Place the material to be cut, tape/adhesive side down, on to the sacrificial material. This is a very secure way to cut through materials and once cutting is finished, the tape/adhesive can be easily removed from the back sides of cut pieces.

**Edge Guides:** The T-Slot table edge guides need to be adjusted to the thickness of material that you are engraving. If they are higher than the material's surface, the nose cone may ride on top of the edge guides and the machine may not engrave characters completely.

#### Edge Guides (Side View)



To adjust the edge guides, loosen the edge guide thumbscrews and raise the edge guides above the surface of the T-Slot table, then tighten the thumbscrews. Place the material on the table, then loosen the edge guide thumbscrews and lower the edge guides until they are even with (or just below) the material surface. Tighten the edge guide thumbscrews. This process should be repeated any time materials of different thicknesses are to be engraved.

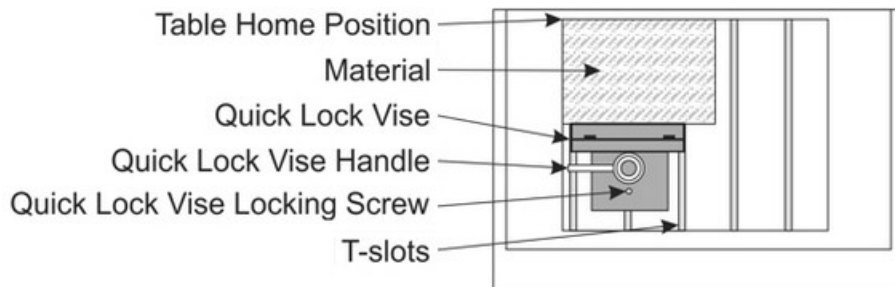
### Quick Lock Vice

The Quick Lock Vice is used to clamp rigid materials against the top Edge Guide in order to prevent movement.

Put the material you would like to engrave on the T-Slot table and push it to the home position corner. Next, loosen the quick lock vise locking screw and slide the quick lock vise so that there is about 1/16th inch gap between the edge of the vise and the material. Tighten the quick lock vise locking screw. Once this is done, the material can easily be secured by turning the quick lock vise handle. When changing the engraving material, simply loosen the quick lock vise handle, remove the engraved material, put the new material in and tighten up the quick lock handle.

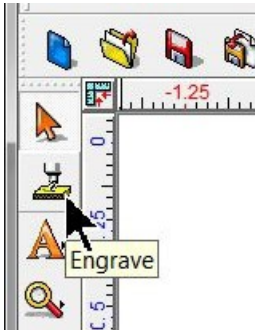
**Note:** For larger pieces of material, you may need to put a small piece of double-sided tape on the T-Slot table in the middle of the engraving material. This will keep the material from bowing in the center.

The quick lock vise will only work on square or rectangular materials. To hold down irregular shaped objects, you must use some other method. Ask your Vision Distributor or Vision if you need more information on this feature.

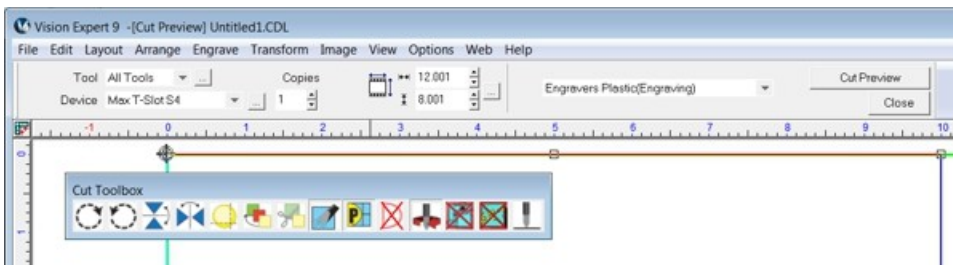


### 3.7 Sending Jobs to Your Machine

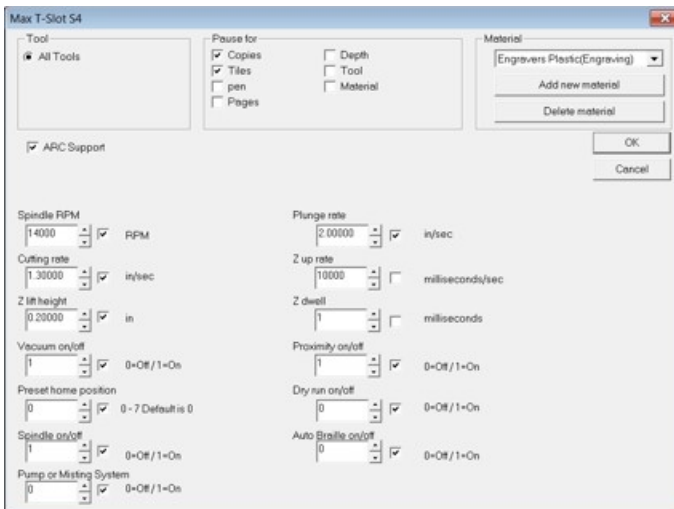
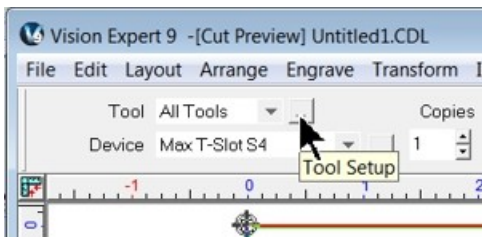
Once a job has been set up in the Vision 9 software, select the Engrave icon from the left toolbar.



The Cut Toolbox window will appear and the top toolbar will change to the Engrave toolbar.



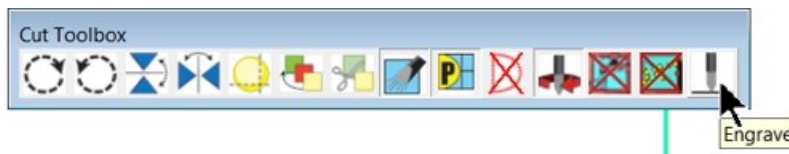
Make sure the Device is set to the machine you wish to send the files to, then select the Tool Setup icon to open the Tool Setup window.



Select the appropriate material from the Material Selection drop down list, then select OK.



Verify the Cut Toolbox settings (settings available will depend on device selected and version of Vision 9 software), and click on the Engrave icon.



The job will be sent to the machine.



## 4 Example Jobs

In the following sections, there are 9 example jobs which can be used to learn the different ways to operate the Vision engraver or router. The jobs are separated into three levels; Level 1, Level 2 and Level 3. Level 1 contains files that provide instructions on the most common uses of the engraver or router, and utilizes Vision 9 Express software for job creation. Level 2 includes more advanced applications and may require features only available in Vision 9 Expert or Pro software. Level 3 uses Vision 9 Expert or Pro software and provides examples of advanced jobs.

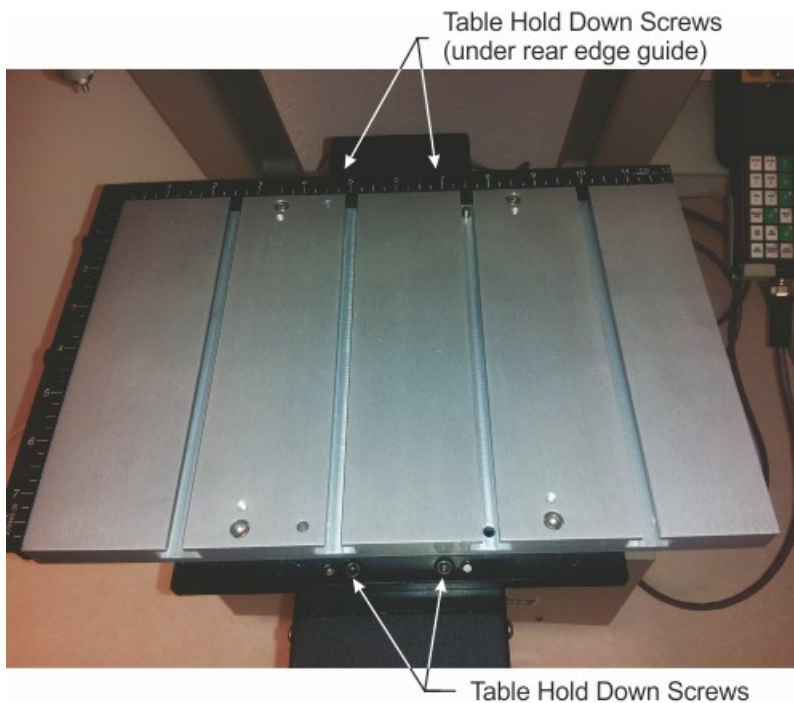
The sections and example jobs are designed to incrementally teach the user how to operate their machine, as well as utilize some of the common functions within the Vision software. It is recommended that the first time user read through these sections and practice the techniques discussed in the order they are presented.

### 4.1 Level 1 Jobs - Using the T-Slot Table

These first set of example jobs cover the basics of engraving and cutting. The basic machine functions and software setup are discussed. By the last of these examples, the user should be well acquainted with the machine and Vision software.

In these first set of jobs, the T-Slot Table is installed on the machine. Removal of the T-Slot Table is shown. Reverse this procedure to install the T-Slot Table.

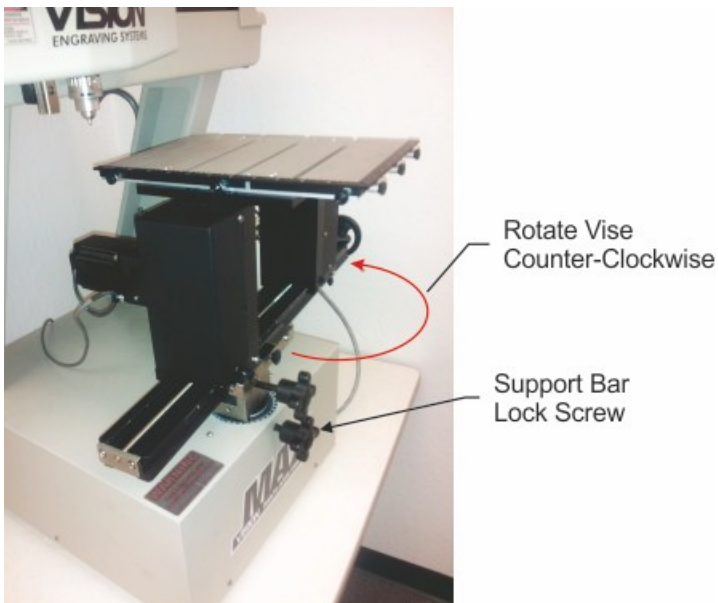
The table is held to the vise via 4 allen screws.



Remove the two front screws.



Loosen the Support Bar Lock Screw by turning it counter-clockwise, then rotate the entire vise/table assembly to the right in order to access the rear edge guise easily.



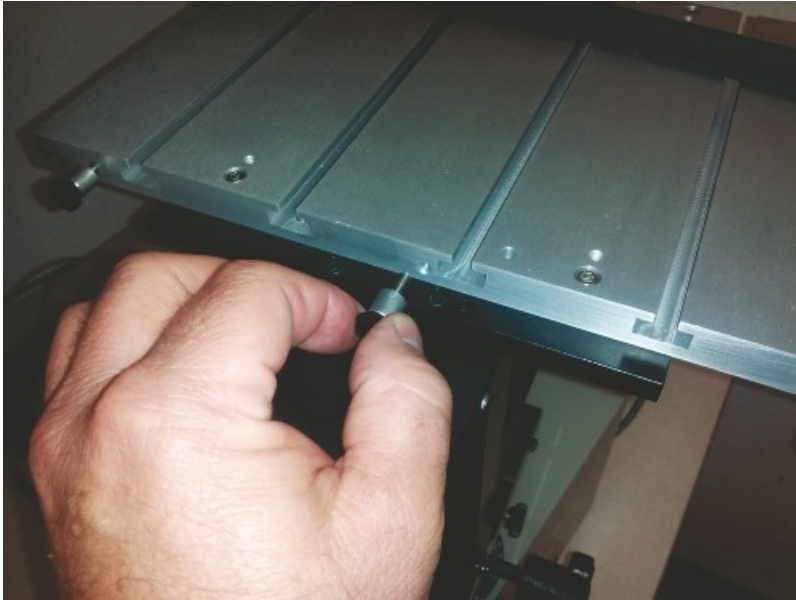
Loosen the three rear edge guide screws.



Lift the edge guide up to remove.



Completely remove the center edge guide screw.



Remove the two rear screws.



Lift the T-Slot table off the vise. It may be necessary to turn the vise adjustment wheel in either direction to unload the locating pins that fit into the bottom of the bracket holding the T-Slot table to the vise.



The 4 locating pins must be installed to position the T-Slot table or of using other attachments that fit the vise.

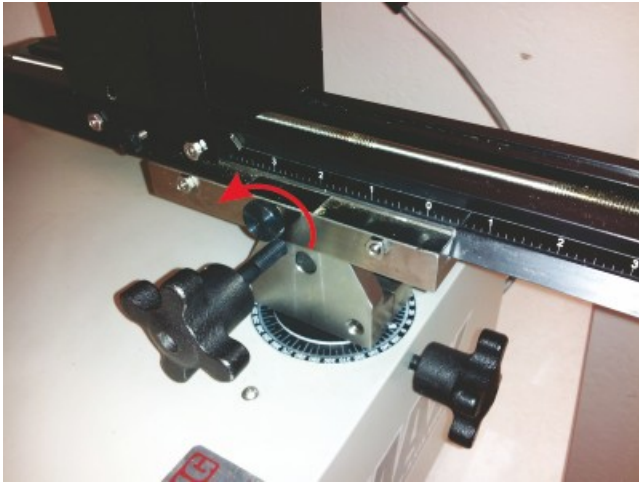


### 4.1.1 Positioning the T-Slot Table

The Vision Max allows the user to change the position of the vise and/or T-Slot table relative to the motion system. The vise/table can be rotated, raised, tilted and moved in the vise's way bracket. Adjustments can change the position of the vise/table to the machine's home position. Since the vise/table can be adjusted to accommodate many different objects and may have been adjusted so that the upper left corner of the T-Slot table is not located in the same position as the machine's home position, the user should properly position the vise/table before running a job.

Below are examples of how the vise/table can be adjusted.

To adjust the fore and aft position of the vise/table, loosed the Vise Slide Locking Screw.



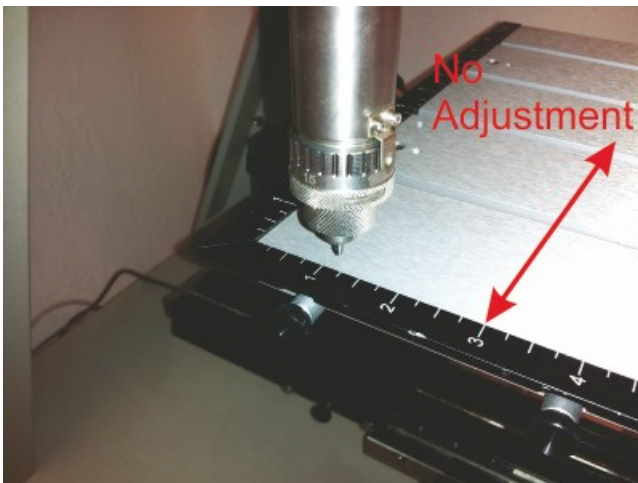
The vise/table can be moved toward the rear,



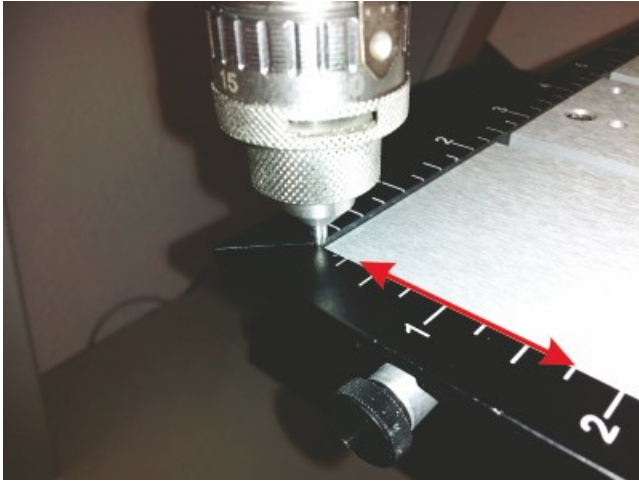
or toward the front of the machine.



If the vise/table was moved, note that there is no side-to-side (X-Axis) adjustment.



If the table is to be returned to the machine's home position, with the machine turned on and after pressing the Go to Limits key on the Pendant, lower the spindle with the Z Down button until the tip of a tool almost touches the edge guides. Adjust (slide) the vise/table until the tool tip is in the upper left corner of the table (where the edge guides meet). Note that if any other tilt or rotation has been applied to the table, those adjustments must be returned to 0 degrees first (see below). Tighten the Vise Slide Locking Screw after resetting the table position.

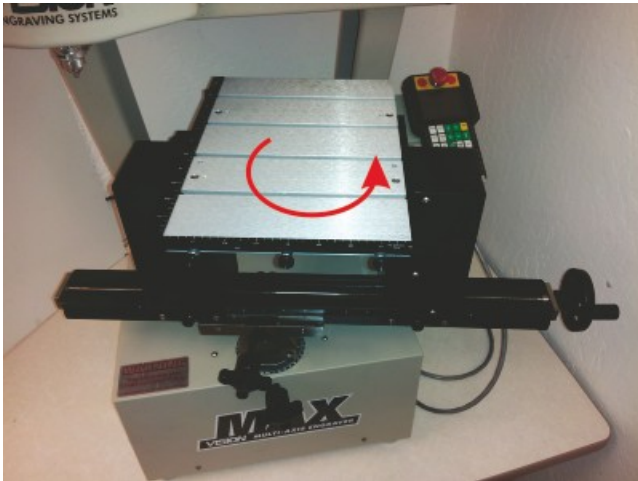


To adjust the vise/table rotation and height, loosen the Support Bar Lock Screw.





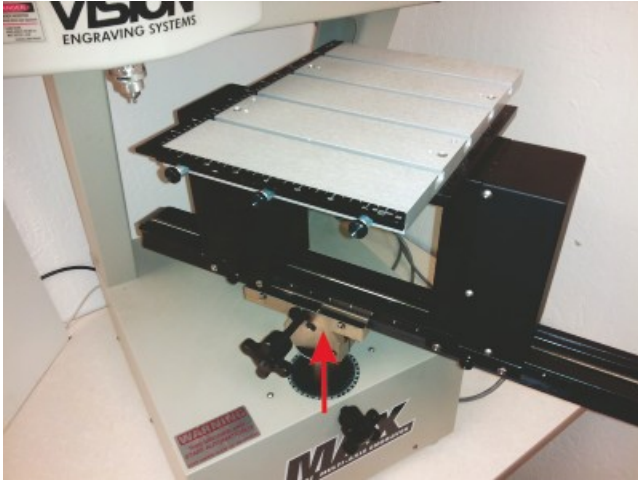
The vise/table can be rotated to the right,



or to the left. After adjusting rotation, tighten the Support Bar Lock Screw.



The vise/table height can also be adjusted after loosening the Support Bar Lock Screw.



Lift or lower the vise table as needed, then tighten the Support Bar Lock Screw to secure its position.



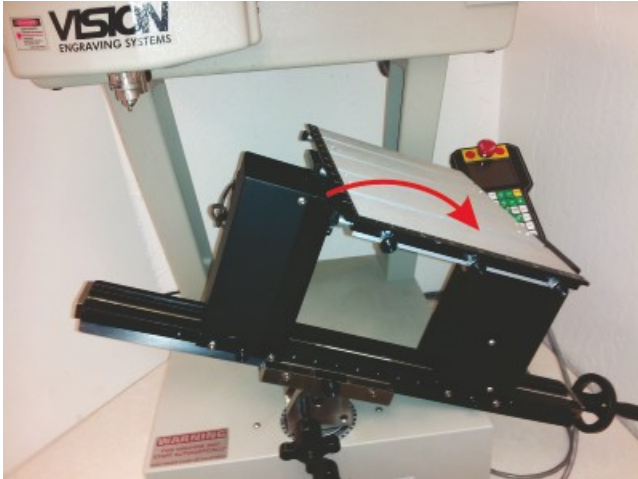
To adjust the vise/table tilt, loosen the Pivot Joint Lock Screw and



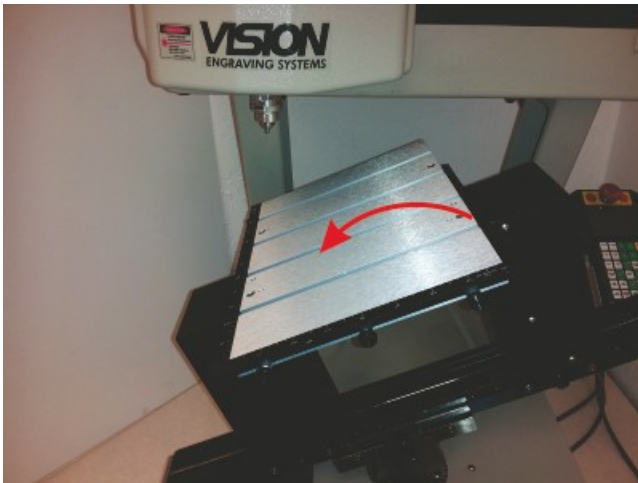
the Vise Angle Locking Handle.



Tilt the vise/table as needed, then tighten both the locking handle and lock screw firmly.



The limitation for tilt is usually when the bottom of the vise contacts the base of the machine.



Note that any combination of rotation, tilt and slide position can be utilized.

To return the machine to 0 degrees rotation, loosen the Support Bar Lock Screw, rotate the table until the pointer at the bottom of the support bar is near 0 degrees and tighten the lock screw. The end of the lock screw has a point that fits into a machined groove in the support bar for accurate and repeatable positioning back to 0.

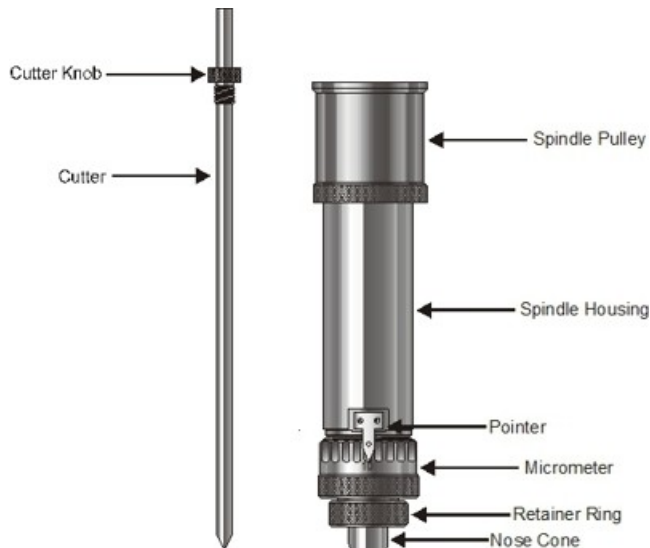
To return the vise/table to 0 degrees tilt, loosen the Vise Angle Locking Handle and Pivot Joint Lock Screw, adjust the vise/table tilt, then **FIRST**, tighten the Pivot Joint Lock Screw. The end of this screw fits into a hole machined into the pivot joint to accurately return the vise/table to 0 degrees tilt (flat relative to the motion system X and Y axes). Tighten the Vise Angle Locking Handle to additionally secure the vise/table position.

## 4.1.2 Diamond Drag Engraving

### Engraving - Non Rotating

In this section, we will set up to engrave with a non-rotating cutter, such as a diamond drag cutter. The figure below shows a spindle with a diamond drag cutter.

#### Spindle with Diamond Drag Cutter



To install the diamond drag cutter, loosen the set screw on the cutter knob with the supplied cutter wrench and move the cutter knob to about the mid-point of the cutter tool, then lightly tighten the set screw. Note that the set screw on the cutter knob is NOT a standard Allen screw. It is a Spline Wrench. DO NOT attempt to turn the set screw with any tool other than the cutter wrench. Insert the cutter into the top of spindle and lower it until the cutter knob can be screwed into the spindle. The cutter knob is REVERSE threaded, so in order to tighten the cutter knob, turn the knob COUNTER-CLOCKWISE (when viewed from the top of the spindle) until it is hand tight.

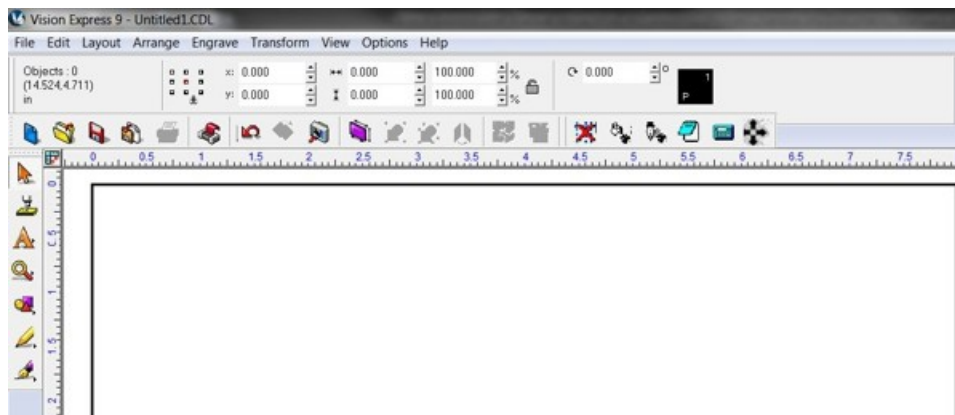
With your finger at the bottom of the nose cone, loosen the cutter knob set screw and lower the cutter so that the cutting tip extends below the bottom of the nose cone by approximately 1/4 inch (6 mm). Then tighten the cutter knob set screw.

Turn the machine's power switch on. Set up the job you would like to engrave in the Vision Software (for an example job, please refer to the following section). Place the material on the T-Slot table. In this type of engraving, the Proximity Sensor is used and will sense when the cutter tip contacts the material and automatically adjust the Z-Axis height and cutting pressure. Also, the spindle does not need to rotate. The Vision software material selection (shown in the next section) will preset the engraver to turn the spindle rotation off and turn the proximity sensor on.

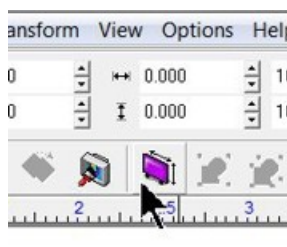
#### 4.1.2.1 Example Job 1 - Diamond Drag

In this first example, Diamond Drag engraving will be performed on a 3" x 2" plate. The material used for this example application is black painted aluminum. Make sure the T-Slot table has been positioned so that the machine's home position is in the upper-left corner of the T-Slot table, as described in the section - Positioning the T-Slot Table.

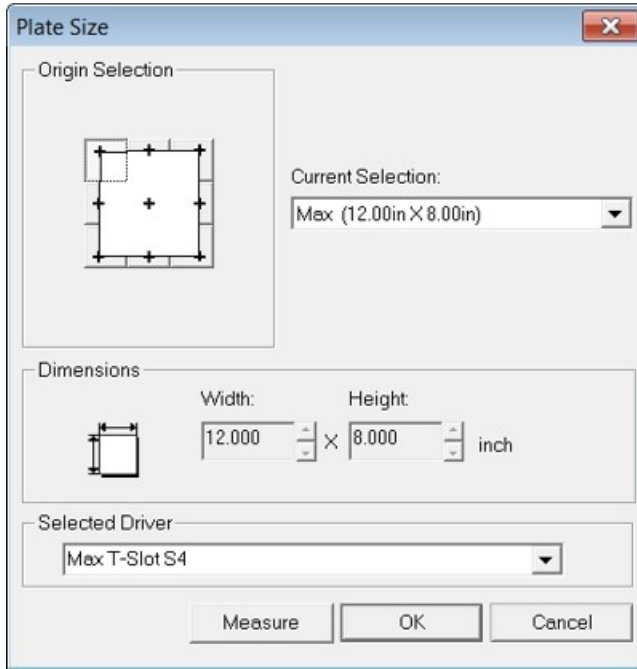
Starting with a new file in Vision 9 software, the first step is to adjust the plate size to match the plate to be engraved.



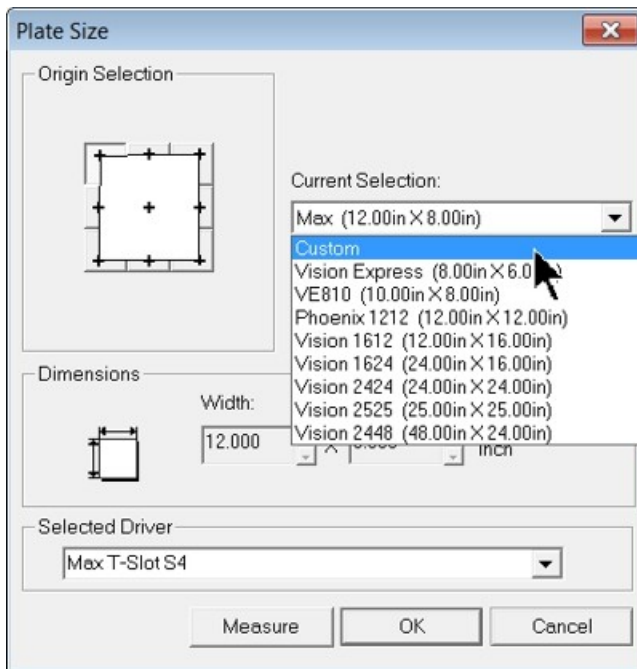
Click on the Plate Size icon.



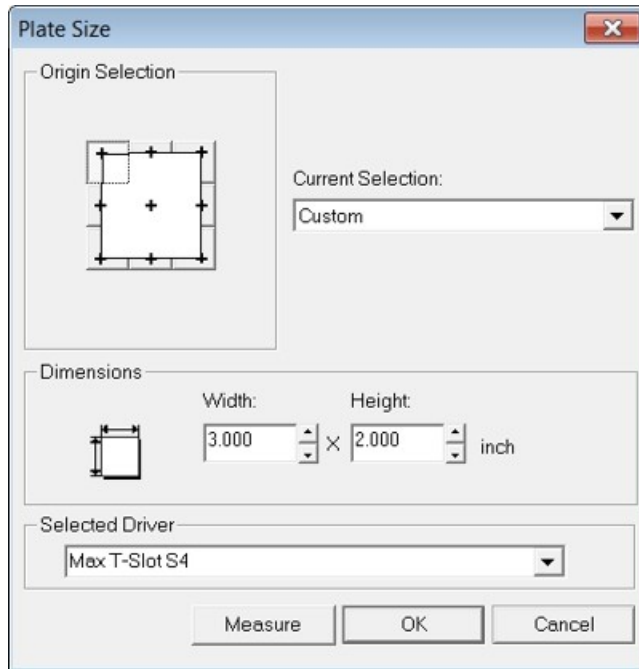
The Plate Size window will appear.



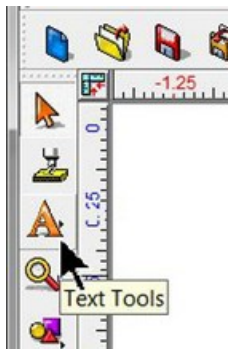
Click on the Current Selection drop down list and select Custom.



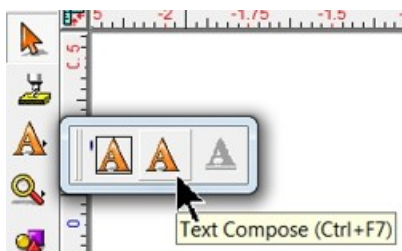
Enter the plate size to be engraved - for this example 3" x 2", and **select the appropriate driver for your machine in the Selected Driver drop down list.** (Max T-Slot S4 shown), then select OK..



To add text, click on the Text Tools icon.

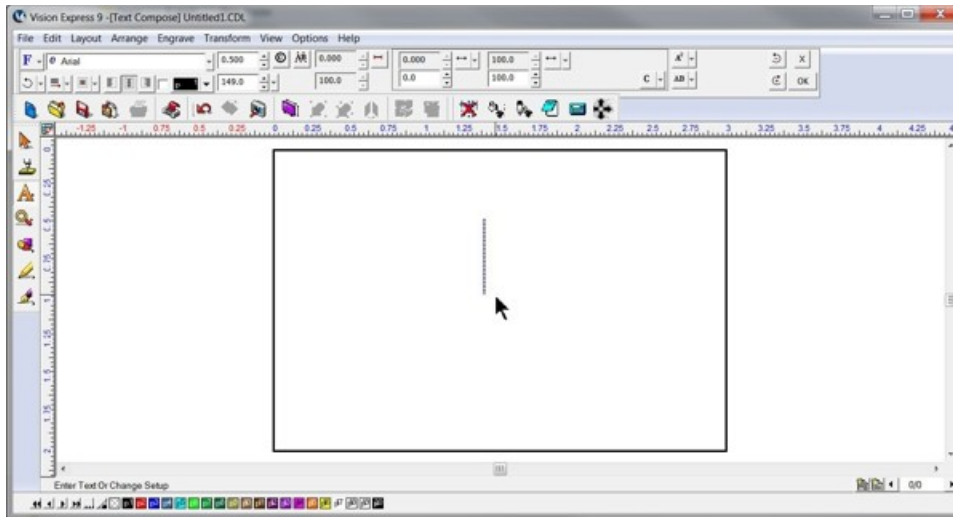


The flyout icons will appear, then select the Text Compose icon.

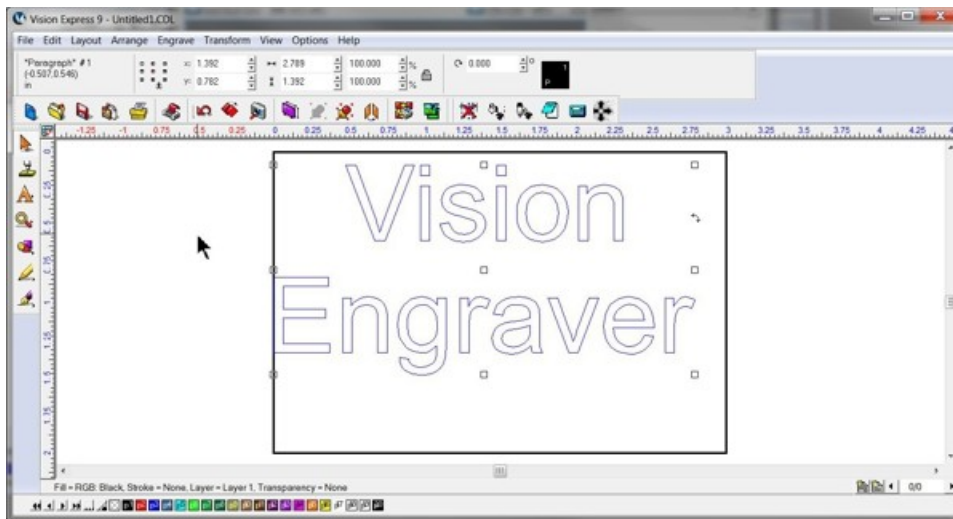




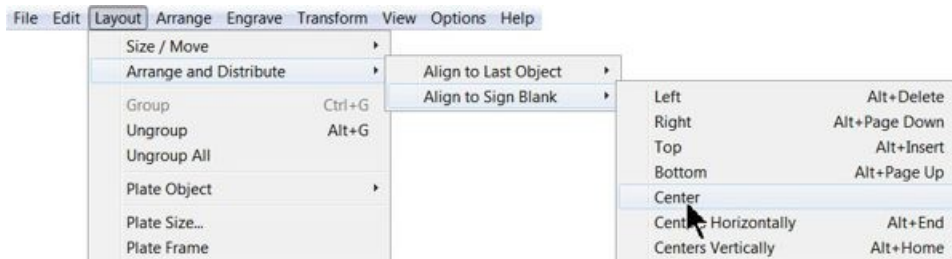
Click somewhere in the drawing to begin typing text. Note that on the top toolbar, the various font editing fields have appeared. The user should become familiar with the various ways fonts can be formatted with the toolbar options. For this example, the font height was set to 0.500" and the Arial font was selected.



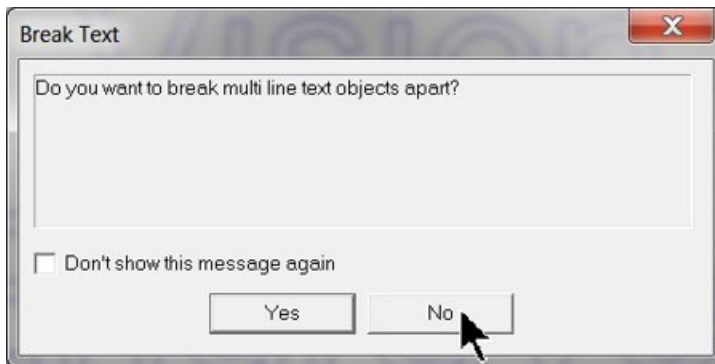
Begin typing text to be engraved.



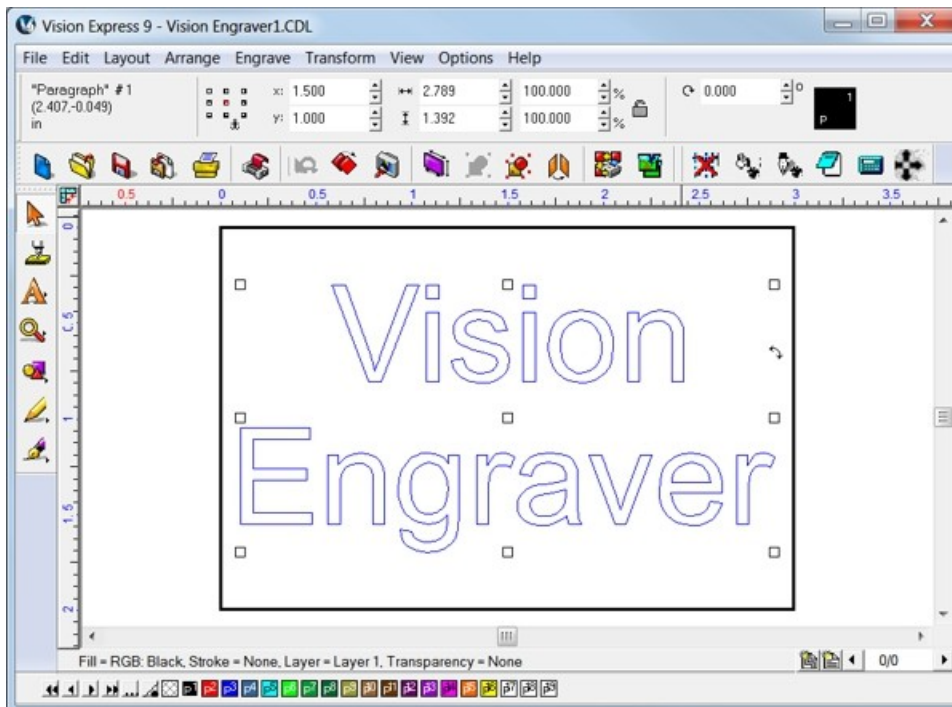
In order to align the text to the center of the plate, select **Layout** → **Arrange and Distribute** → **Align to Sign Blank** → **Center** (as shown below) from the top toolbar. Note that there are several ways to align objects within the Vision software.



The Break Text warning may appear. If so, select No. If Yes is chosen, and more than one line of text has been entered, each line will align on top of one another in the center of the plate.



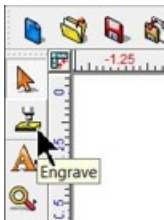
At this point, the screen should appear as below.



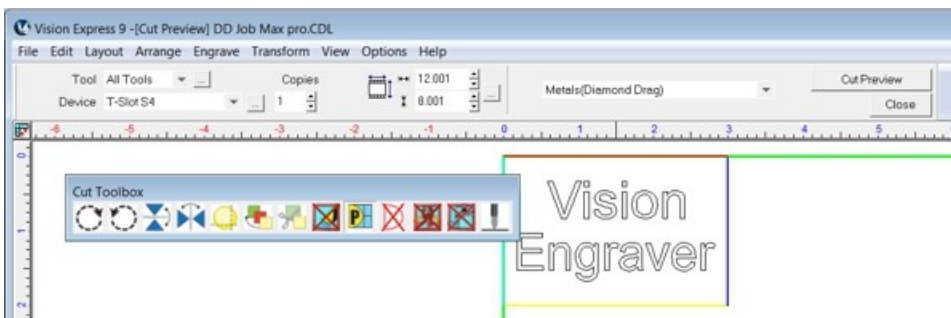
Next, the material should be placed on the engraving table, with the upper left corner of the material positioned in the home position (upper left corner of the engraving table). Note that the Multi Mat material has been placed on the T-Slot table in order to hold the engraving material in place.



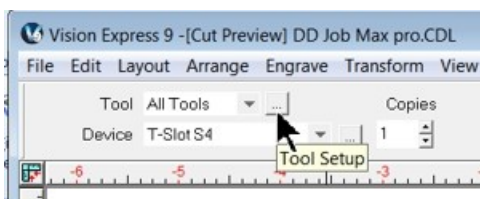
Select the Engrave icon from the left toolbar.



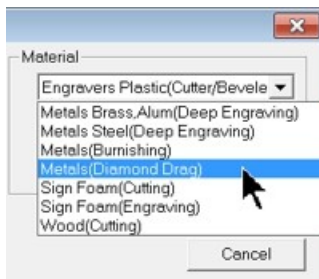
The Cut Toolbox will appear and the options for engraving will appear on the top toolbar.



Verify the Device chosen is for your machine, then open the Tool Setup window by clicking on the icon shown below (which is to the right of the Tools drop down list).



Select the appropriate material from the Material Selection drop down list. In this example, the material - Metals(Diamond Drag) is selected, then select OK.



Since we are running a file for the first time, we will select the Dry Run option from the Cut Toolbox.



Make sure the "D" appears by selecting it. The default is "Off" for the Dry Run, which will engrave the plate. We want to make sure our file has been set up properly in this example and that the material is positioned correctly.

**NOTE - Dry Run Operation** - There is an offset between the spindle and the red laser pointer of approximately 1.25 inches (31.8 mm) in the X and 1.50 inches (38.1 mm) in the Y directions. If the characters to be engraved extend beyond the machine's table size, the file will not run because the motion system would have to move beyond its limits.

When ready to send the file to the engraver, make sure the power switch is turned on and the machine has initialized (the Goto Home message has appeared on the Pendant and you've pressed Goto Home), then select the Engrave icon from the Cut Toolbox.



**Note - keeps hands and other loose objects away from the engraver during operation.**

Press the Start Button on the Pendant to begin the Dry Run. The Dry Run feature will automatically activate the red dot laser pointer and show the user where the machine will engrave.

**Note - If the spindle turns, or begins to drop toward the material, either press the Pause Button or the Stop Button on the Pendant. If either of these occur, make sure that Dry Run was selected in the Cut Toolbox (shown as the letter "D") and that the spindle has not been turned on. The Spindle icon on the Cut Toolbox is shown below for reference.**

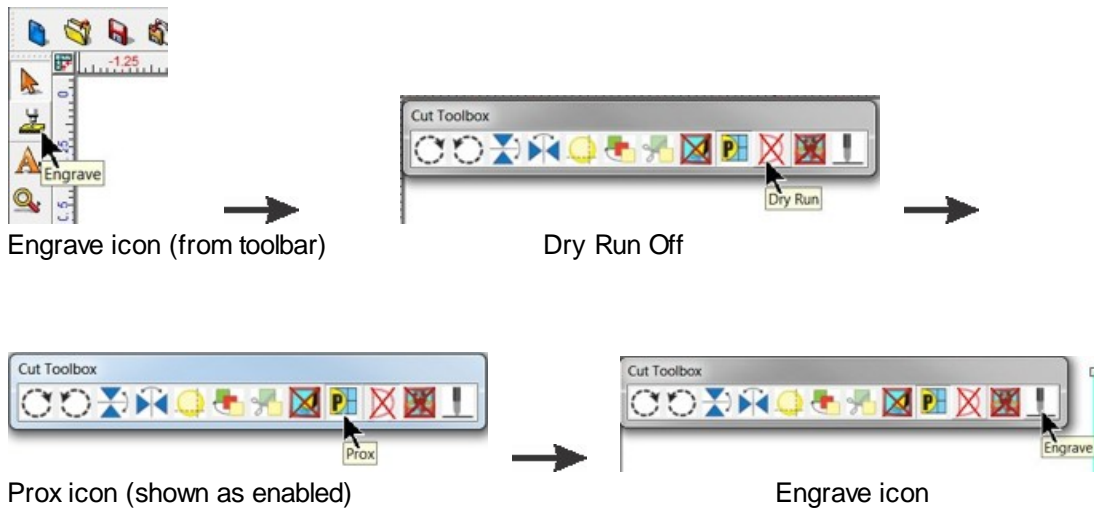
Spindle icon (shown as disabled)



Red Laser Pointer



If the file and material appear to be positioned properly and you are ready to engrave, select the Engrave icon from the left toolbar, turn off the Dry Run option and check to make sure the Proximity Sensor (see the Prox icon below) is enabled, then select the Engrave icon on the Cut Toolbox to send the file to the engraver.



Make sure the material is positioned properly and secured on the engraving table, then press the Start Button on the Pendant to begin engraving.

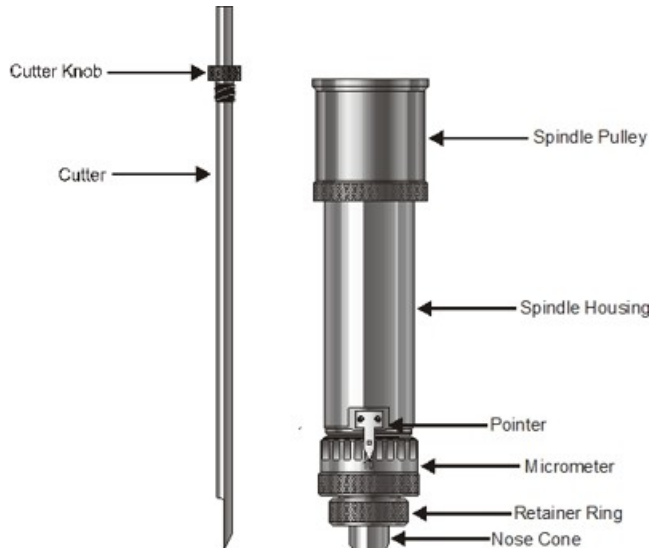
The finished piece should appear as shown below.



### 4.1.3 Rotary Engraving

In this section, we will set up to engrave with a rotating cutter. The figure below shows a spindle with a rotary cutter.

#### Spindle with Rotary Cutter



To install the rotating cutter, loosen the set screw on the cutter knob with the supplied cutter wrench and move the cutter knob to about the mid-point of the cutter tool, then lightly tighten the set screw. Note that the set screw on the cutter knob is NOT a standard Allen screw. It is a Spline Wrench. DO NOT attempt to turn the set screw with any tool other than the cutter wrench. Insert the cutter into the top of spindle and lower it until the cutter knob can be screwed into the spindle. The cutter knob is REVERSE threaded, so in order to tighten the cutter knob, turn the knob COUNTER-CLOCKWISE (when viewed from the top of the spindle) until it is hand tight. Then, you must zero the cutter. To do this, you must first turn the micrometer so that the pointer points to 0. Note - it is helpful to first turn the micrometer to the left (clockwise) until threads just start to appear on the spindle. This will be about 3 - 4 full turns of the micrometer from its uppermost position. This allows for sufficient depth adjustment when turning the micrometer to the right.

With the machine powered off, take a scrap piece of material and push it up underneath the nose cone and hold it there. As an option to this method, jog the spindle over your material and lower the spindle until the nose cone come in contact with your material by using the Z Down button. Loosen the cutter knob set screw and push the cutter down until it just touches the material. Tighten the cutter knob set screw. The cutter is now zeroed.

To run a job, turn the machine on, then set up the job in the Vision Software. (For more information on this, see the example job file in the next section). Put the material on the T-Slot table as described in the previous section.

#### Adjusting Depth of Cut

Cutting depth depends on the type of material being engraved. Generally, manufacturer's of engraving plastic provide recommendations for cut depth. If a recommended depth is unavailable, trial and error can be used to find the appropriate cut depth. Since the depth is set to zero at this time, in order to increase cut depth, the micrometer at the bottom of the spindle should be rotated to the right (counter-clockwise when viewing from the top of the spindle). To set a depth of 0.010 inches (0.25 mm) turn the micrometer to the right 10 clicks. Each "click" of the micrometer is 0.001 inches (0.025 mm). Run a

job with an initial setting of 0.005 - 0.010 inches (0.12 - 0.25 mm). After the job has run for a short time, press the Pause Button on the front panel, then adjust the micrometer for more or less depth, depending on whether the engraving is acceptable. Note - be careful not to set the depth of cut greater than the material thickness. This will cut completely through the material and potentially cut into the T-Slot table. Press Start to resume engraving and to determine if the depth is appropriate.

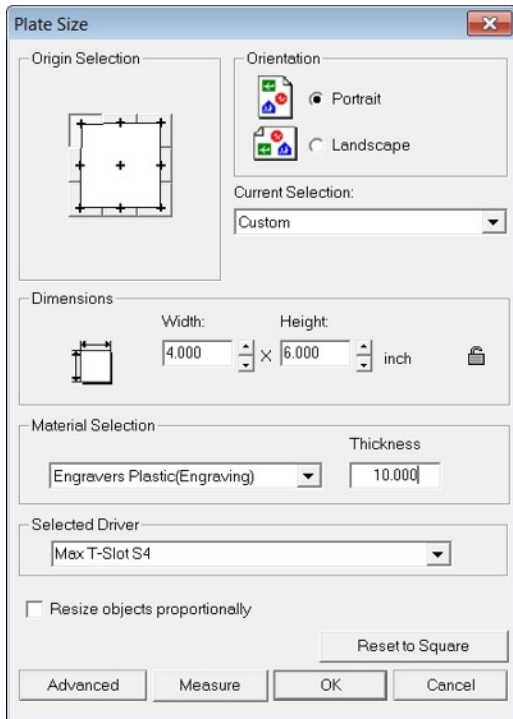


### 4.1.3.1 Example Job 2 - Rotary Engraving

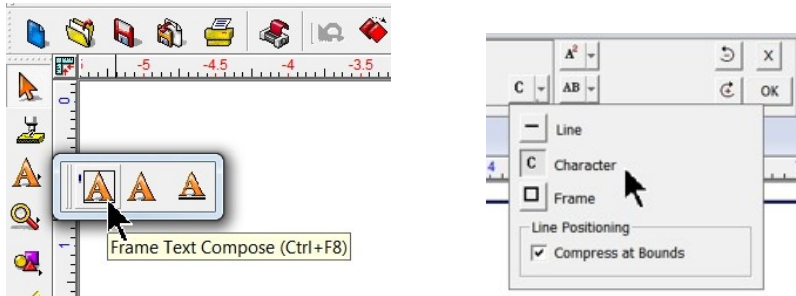
In this example, a sign will be made using engraver's plastic. The piece is pre-cut and measures 4 inches x 6 inches (100 x 150 mm). Make sure the T-Slot table has been positioned so that the machine's home position is in the upper-left corner of the T-Slot table, as described in the section - Positioning the T-Slot Table.

Note - In this application, it is highly recommended to use the Vacuum Chip Removal System as described in the Optional Accessories section. The process of engraving or cutting plastics, acrylics, sign foam and wood, produces a significant amount of debris that can clog the nose cone and/or get trapped between the nose cone and the material, which will cause engraving/cutting depth inconsistencies as well as potentially scratch the surface of the material. The Vacuum Chip Removal System significantly reduces these problems and provides for a cleaner work area.

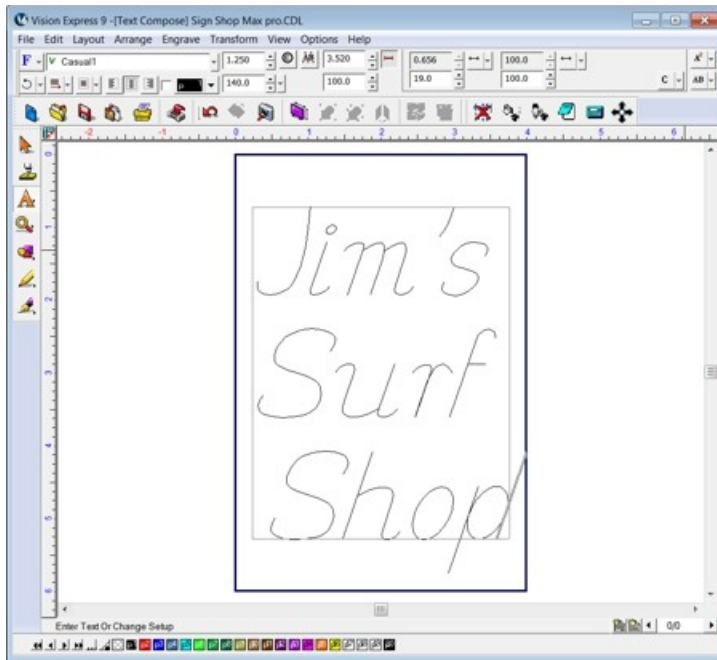
As with Example Job 1, the first step is to set the plate size in the Vision 9 software. Create a plate that is 4 inches wide x 6 inches high and make sure that the driver selected is for your machine.



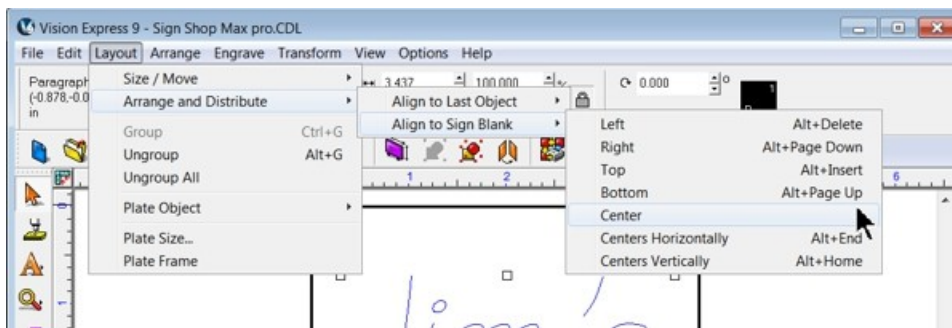
Enter text using the Frame Text Compose tool as shown below. Character Mode was selected from the top toolbar.



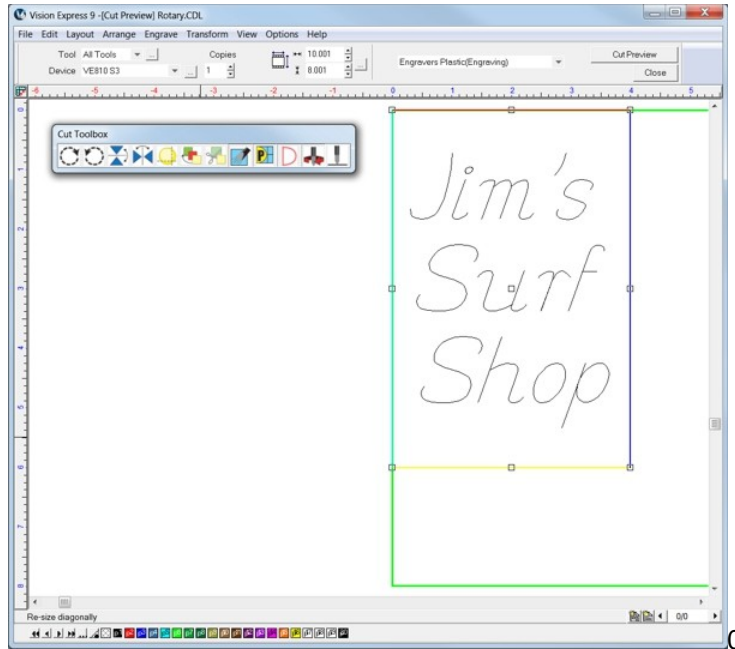
The font was changed to Casual1, with a height of 1.250 inches and a slant of 19 degrees. The top and center lines are left justified and the bottom is center justified in order to produce a sloping look to the sign.



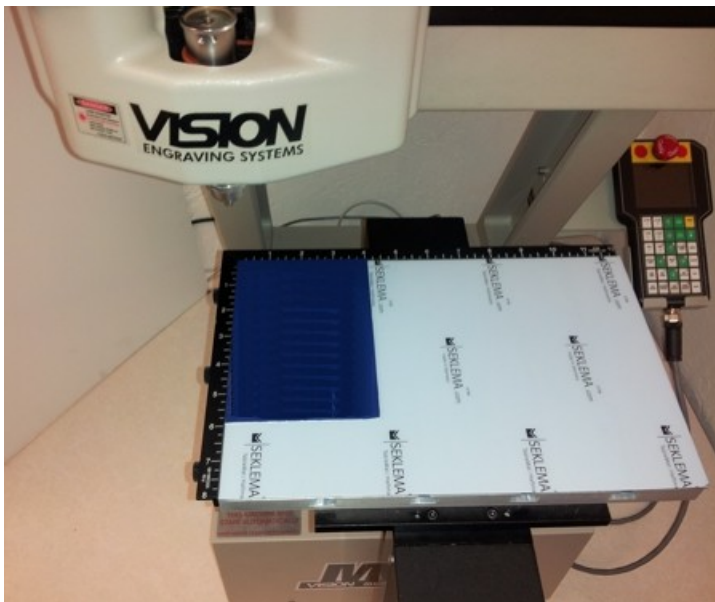
The text was then centered on the plate by selecting **Layout** → **Arrange and Distribute** → **Align to Sign Blank** → **Center**.



Once the file has been set up, select the Engrave Icon, open the Tool Options window and select Engravers Plastic(Engraving) from the Materials drop down menu. In the picture below, the Cut Toolbox shows that the Vacuum, Prox, Dry Run, and Spindle are all enabled. Since this is the second example job, sending a Dry Run job to the engraver is suggested. Select the Engrave Icon to send the file to the engraver.



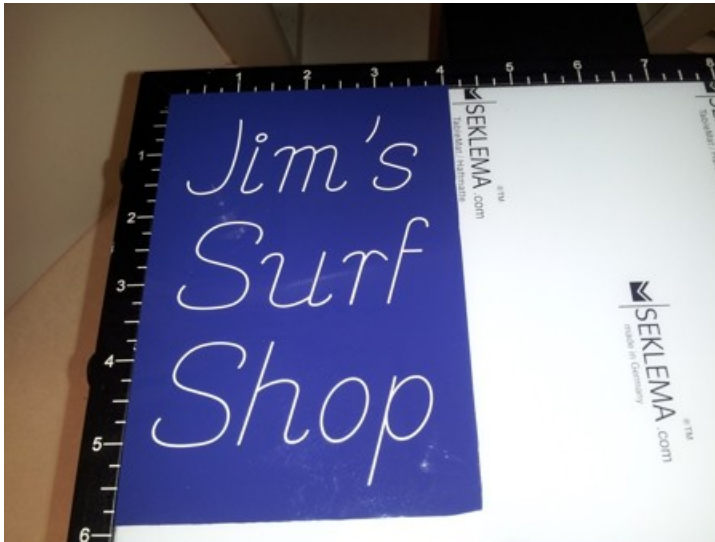
Place the material on the table (shown with Multi Mat on the T-Slot table to hold the engraving material in place), and press the start button on the machine to begin engraving.



If the Dry Run showed no set up errors, the job can be re-sent to the engraver with the Dry Run disabled.

NOTE - It is recommended to use the Vacuum Chip Removal System in this application. The design of the Vacuum Chip Removal System is to clear the debris away from the engraved material and prevent the chips from scratching the surface of the material during operation, and/or getting trapped between the nose cone and the material (when using the proximity sensor function) and causing the engraver to not engrave to the proper depth.

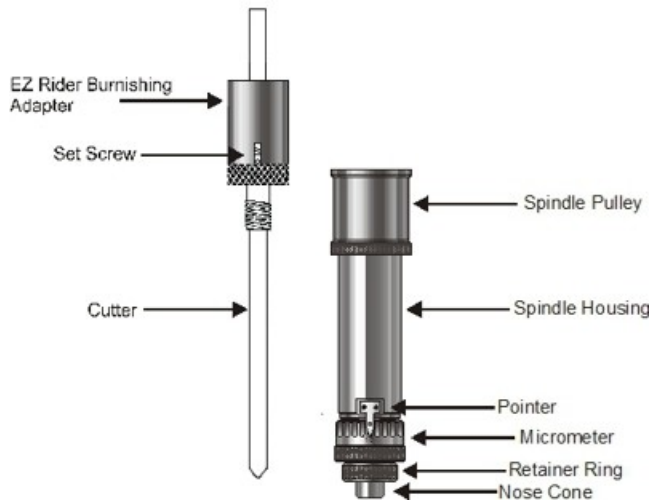
When the file is complete, remove the material from the table. HINT - Use a light bristle brush to clean out any debris that may remain in the engraved characters.



#### 4.1.4 Burnishing

In this section, we will set up to engrave with a burnishing cutter. The figure below shows a spindle with a burnishing cutter and an optional EZ Rider burnishing adapter.

##### Spindle with Burnishing Cutter and EZ Rider Burnishing Adapter

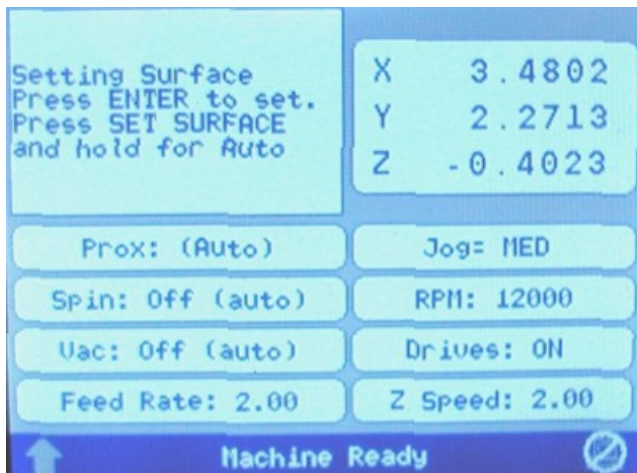


Burnishing is different than standard rotary engraving mainly because the nose cone is not used to set the depth of cut. Burnishing does not actually cut deep into metals, rather it cuts the painted surface off of metals. To effectively burnish, it is recommended to use an optional EZ Rider burnishing adapter. This helps to control the pressure of the cutter applied to the material. Burnishing requires less pressure than other types of engraving and the EZ Rider attachment applies the proper amount of pressure for burnishing.

Installing the EZ Rider is similar to using a cutter knob. First, screw the EZ Rider into the top of the spindle hand tight. Next, insert the cutter through the EZ Rider and spindle so that the cutter sticks out below the nose cone approximately 1/8 inch (3 mm). Tighten the set screw in the EZ Rider to hold the cutter in place.

In order to set the engraver up for burnishing, we will need to perform a "Set Surface" function. Turn the machine on and place the material on the table. Follow the steps below to perform the Set Surface procedure.

- a) Use the X & Y jog buttons to move the spindle over the material to be engraved.
- b) Press the Set Surface button. The Pendant screen will display the message below



c) Lower the spindle with the Z down jog button until the cutter tip touches the engraving material, then continue moving the spindle down for another 0.030 - 0.050 inches (0.75 - 1.25 mm). This is called "pre-loading" the adapter. Pre-loading the EZ Rider Burnishing Adapter sets the pressure applied by the cutter on to the material. More or less pre-load can be used, depending on the material to be engraved. The Z position shown on the Pendant screen can be used to view the Z position, and assist in the pre-loading procedure.

d) Press the Enter button to set this as the surface position. The spindle will then move up to its lift position.

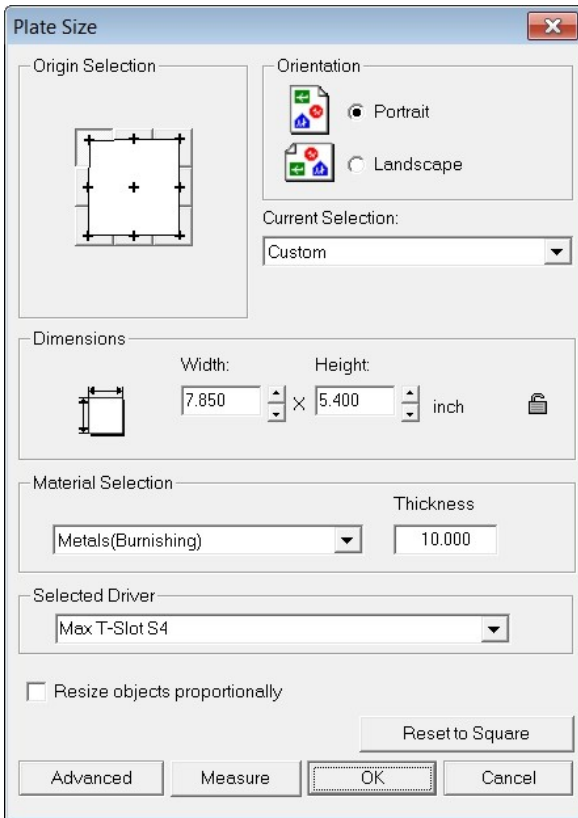
*HINT:* It is sometimes easier to set the surface right before engraving the job. To do this, send a job to the machine to be engraved. Press Pause. Press Start. The spindle will move to the first point to be engraved and pause. You can then jog the Z down until it touches the surface and press Enter to set the surface. Pressing Start will then begin the engraving process.

In the following example job, a burnishing file will be set up and run on coated brass material.

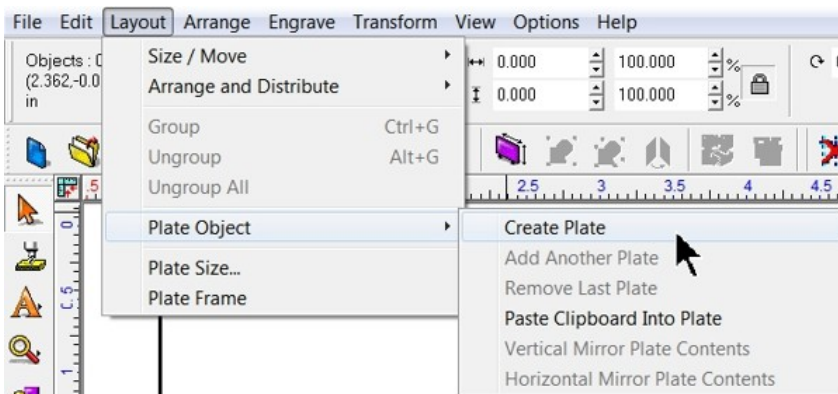
### 4.1.4.1 Example Job 3 - Burnishing

In this example, another feature in the Vision Software will be introduced. We will create a Plate Object in order to create multiple items with different text engraved on a single 7.85 x 5.4 inch (199.4 x 137.2 mm) piece of coated aluminum. The plate will use a text import function from an external text file that will be copied into a plate template and the Vision software will automatically format the imported text. Make sure the T-Slot table has been positioned so that the machine's home position is in the upper-left corner of the T-Slot table, as described in the section - Positioning the T-Slot Table.

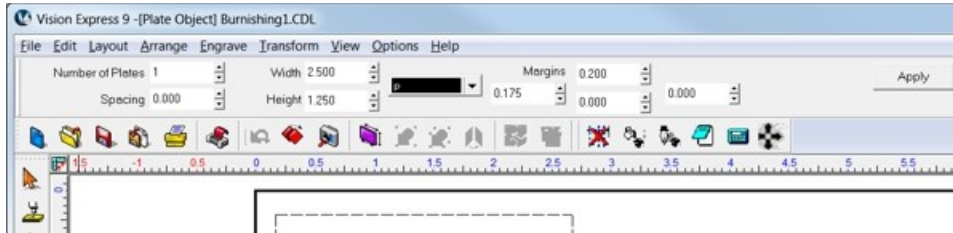
Begin by selecting the Plate Size Icon and setting the engraving area to a custom plate size with a 7.85 x 5.4 inch area.



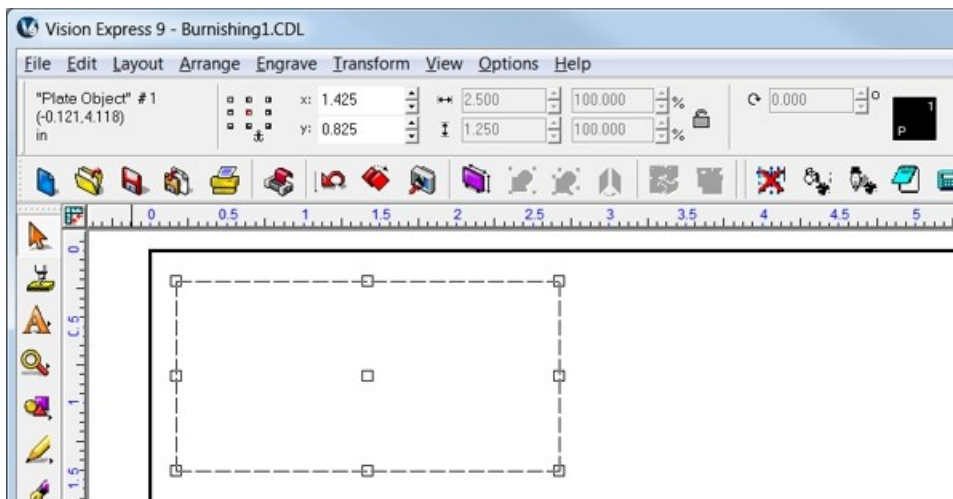
To create the Plate Object, select Layout → Plate Object → Create Plate from the top toolbar menu.



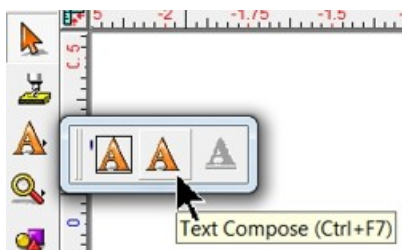
Adjust the number of plates to 1, leave spacing at 0.000 inches, width and height to 2.500 and 1.25 inches, set the left margin to 0.175 inches and the top margin to 0.200 inches as shown, then click on Apply. Note that the page margins on the toolbar are located such that the top field is for the top margin, the left field is the left margin, etc.



The screen should then appear as below.

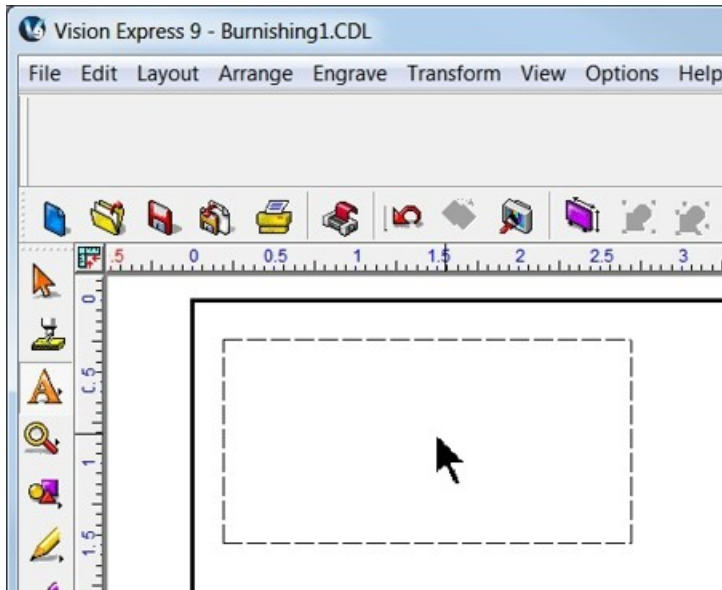


Select the Text Compose Icon.

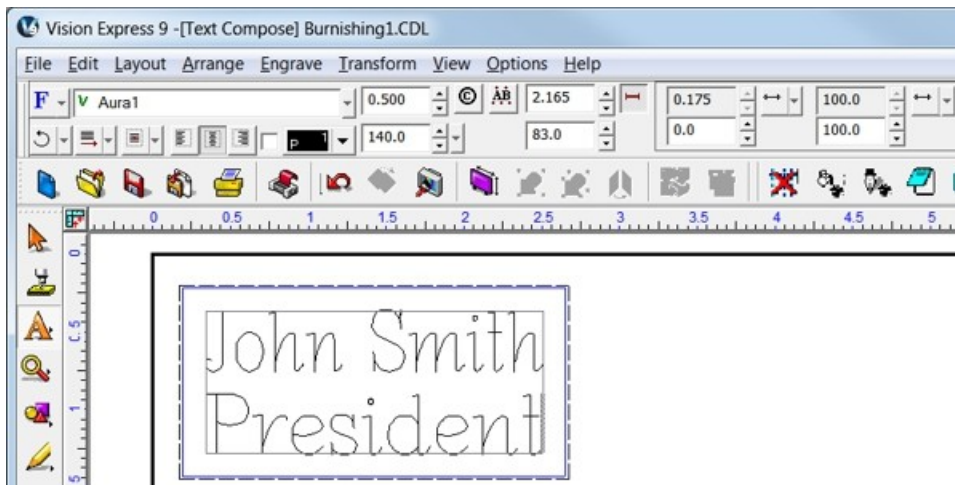




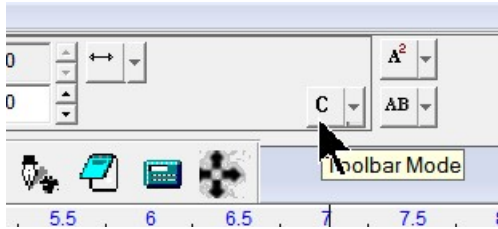
Click in the middle of the Plate Object.



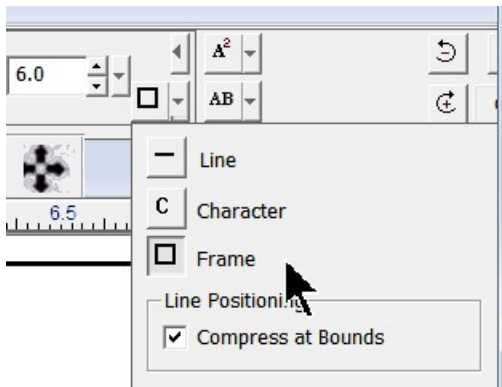
Enter any text in the format you wish to use. In this example, two lines of text are entered as variables (it does not matter what you type. The text entered is only for formatting and will be replaced with the text imported from the .txt file).



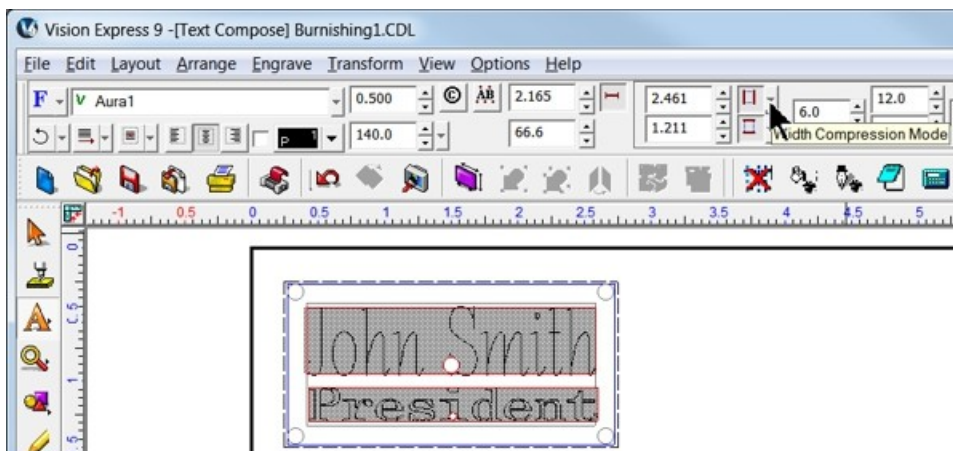
Each line of text can be independently set for font and size. Highlight the text to be changed, then from the font list on the top toolbar, choose the font to be used for the selected text and double click on the font name. If the size or other parameters need to be revised, use the toolbar fields to modify the font style. Please note that in this example, the Width Compression for the text was adjusted. In order to adjust the Width Compression, select the text, then click on the Toolbar Mode icon (shown below).



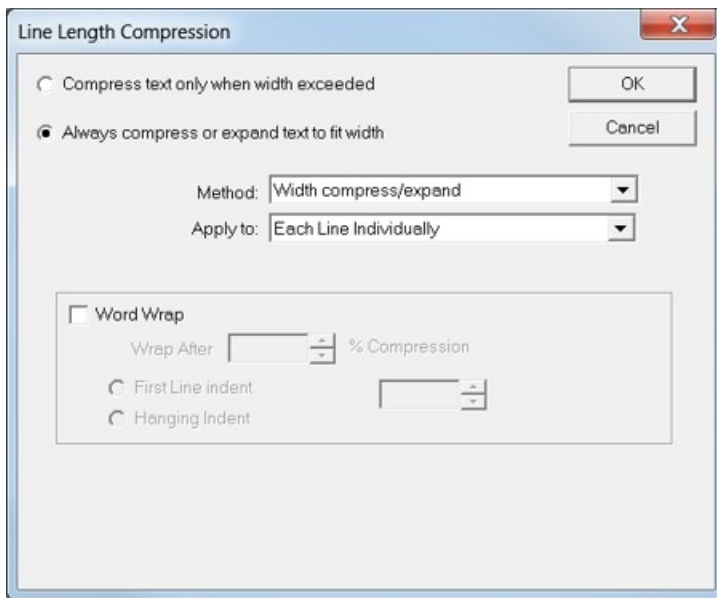
Select Frame mode.



Select all text and select the Width Compression Mode by clicking on the drop down list (as shown).

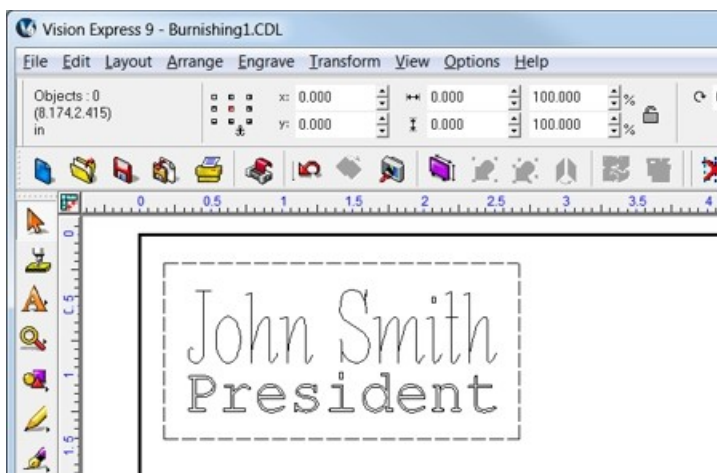


Change the settings to Always compress or expand text to fit width, Method: Width compress/expand, and Apply to: Each Line Individually. Deselect Word Wrap, then select OK.

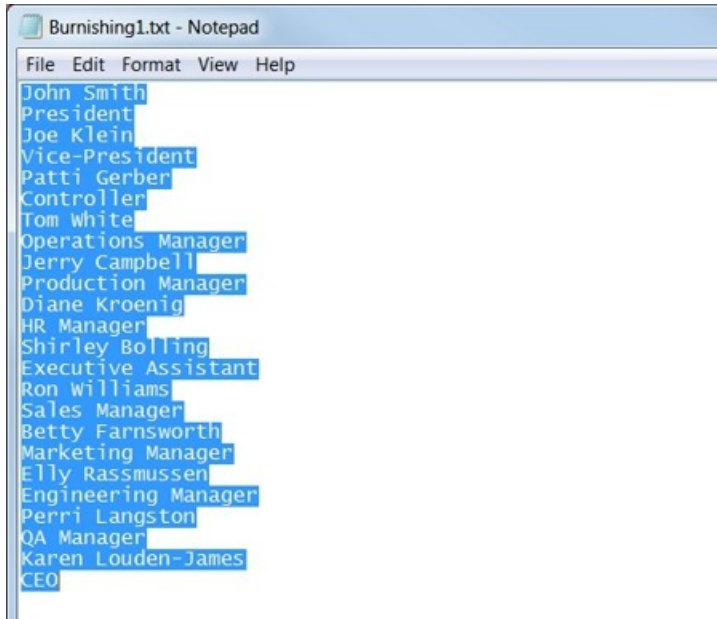


For a detailed description of all the font modifications possible, refer to the Vision software help or user manual.

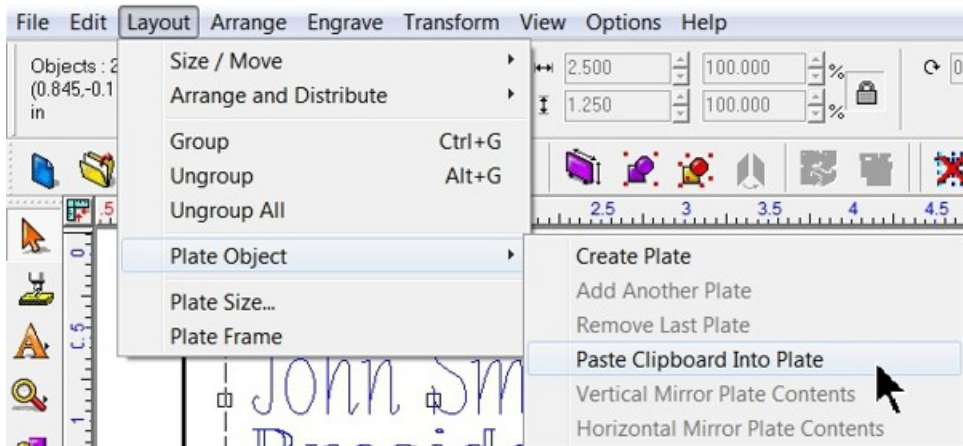
Once changes have been made, deselect text mode by clicking in any open area of the screen, away from the plate object.



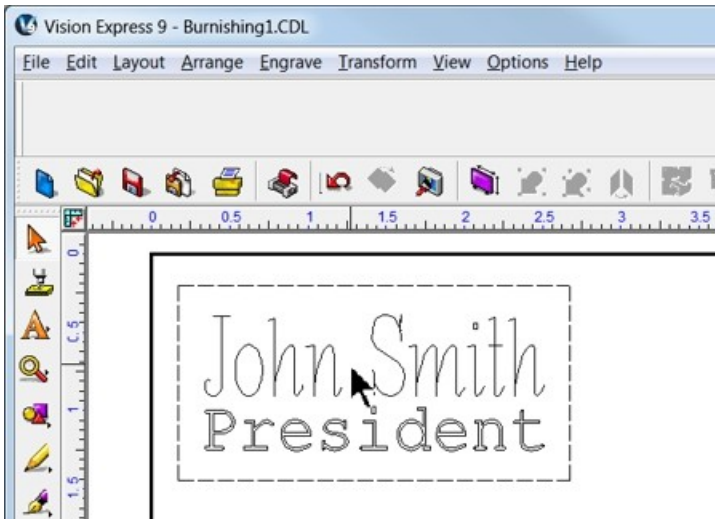
In this example, a text file was created in order to copy and paste the variables into the Vision software. Highlight the text and select copy from the edit menu (or right click and select copy). Note that in this example, the two variables are entered as subsequent lines in the text file and that there may be difficulties when importing from other file formats. A simple text file created in Windows Notepad is suggested.



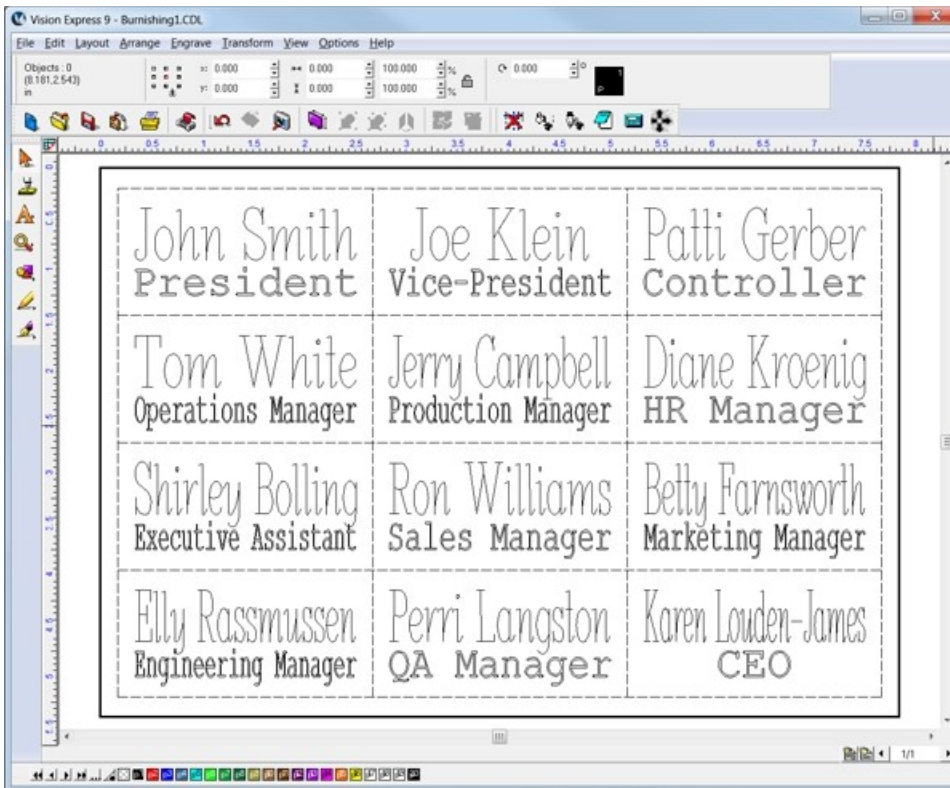
To insert the copied text, select Layout → Plate Object → Paste Clipboard Into Plate.



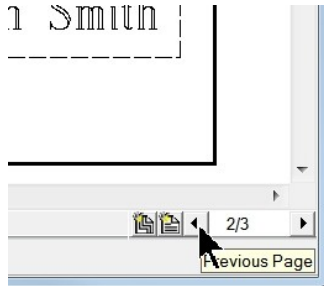
Click in the center of the plate.



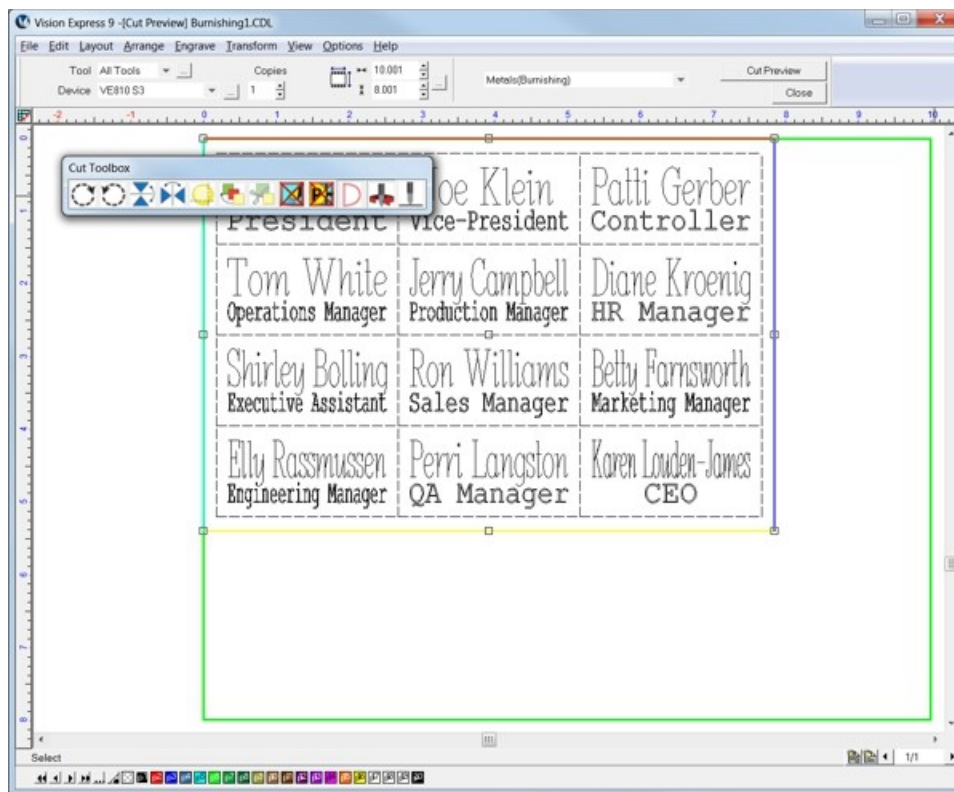
After clicking in the center of the plate, all fields are merged and multiple plate objects will be created based on the number of text variables selected.



Also, if there are more variables than can be fit into one plate in the Vision software, multiple plates (or pages) are automatically generated for individual output to the engraver. The lower right corner of the Vision software screen allows the user to view the individual pages. During the Engrave operation, the user will select the page to be sent to the engraver.



To finish this example job, set up the engraver for a metal burnishing application as described in the previous section and select the Engrave icon from the left toolbar. If you choose to run a Dry Run (as shown) to make sure the setup is correct, proceed as in prior sections to send the file to the engraver. Make sure you have performed the set surface procedure as well.



Note that if the plate objects are left as part of the file sent to the engraver, they will engrave as well. If this is not desirable, simply select the plate object within the Vision software and delete it prior to sending the file to the engraver. Alternatively, the plate object may be changed to a different color than the text to be engraved, or you can print selected objects by changing a setting in the Engrave → Engraving Default screen from the top menu bar. The Engrave by Color option is discussed in the next example job.

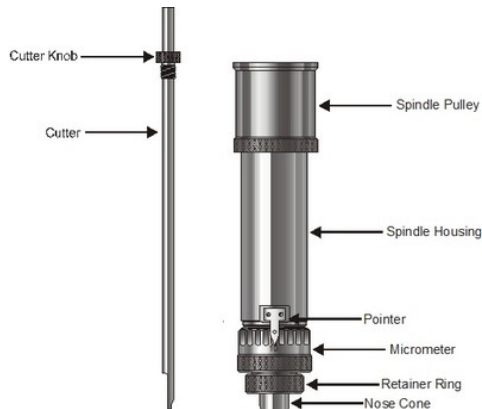
In this example, the plate object lines were engraved.



### 4.1.5 Profile Cutting

In this section, we will set up to engrave with a standard engraving cutter and cut completely through engraver's plastic with a cutter/beveler. The cutter/beveler is used to create a contrast on the edge of the cut material. The figure below shows the spindle with a rotary cutter/beveler.

#### Spindle with Rotary Cutter/Beveler



To install the rotating cutter, loosen the set screw on the cutter knob with the supplied cutter wrench and move the cutter knob to about the mid-point of the cutter tool, then lightly tighten the set screw. Insert the cutter into the top of spindle and lower it until the cutter knob can be screwed into the spindle. Tighten the knob COUNTER-CLOCKWISE (when viewed from the top of the spindle) until it is hand tight. Then, you must zero the cutter. To do this, you must first turn the micrometer so that the pointer points to 0. Note - it is helpful to first turn the micrometer to the left (clockwise) until threads just start to appear on the spindle. This allows for sufficient depth adjustment when turning the micrometer to the right. Zero the cutter, then set the engraving depth as described in the Rotary Engraving section. You will then need to set the cutting depth of the cutter/beveler tool.

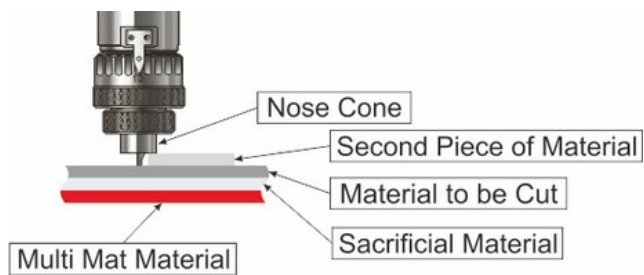
#### Setting Cut Depth for Cutter/Beveler Tool - Standard Method

If you have measured the thickness of the material to be cut, you can adjust the micrometer in two ways - 1) adjust the cutter to cut through the material PLUS 0.001 - 0.003 inches (0.0250 - 0.075 mm). This method will produce a clean cut of the parts and lightly cut into the sacrificial material underneath, or 2) adjust the cutter depth to cut through the material MINUS 0.001 - 0.003 inches (0.0250 - 0.075 mm). This will create a "kiss cut" that will leave a very thin amount of material which holds all of the parts together, then the parts can be snapped apart after removal from the engraver. This second method is ideal in production environments where part handling is an issue.

#### Alternate Method For Setting Cut Depth for Cutter/Beveler Tool - "Stacked Material Method"

As an alternate to dialing the micrometer 50 or 60 clicks to set the cut depth on 1/16th inch plastics (or up to 130 clicks for 1/8th inch material), this second method utilizes a second piece of the same kind and thickness of material to be cut to set the cut depth. Refer to the below diagram - the material to be cut is placed on top of the sacrificial material/Multi Mat materials. The material to be cut is held in place either with double sided tape or by the spray adhesive/transfer tape method detailed in the Holding Down Materials section. Then a second piece of material is placed on top of the material to be cut. The nose cone is lowered on top of the second piece of material (near its edge) and the cutter is adjusted downward until it touches the top of the material to be cut. This, in effect, sets the cut depth to match the material thickness. The cutter knob set screw is tightened, then the micrometer is adjusted, either for a through cut (turning clockwise) or a kiss cut (turning counter-clockwise), 1 - 3 clicks.





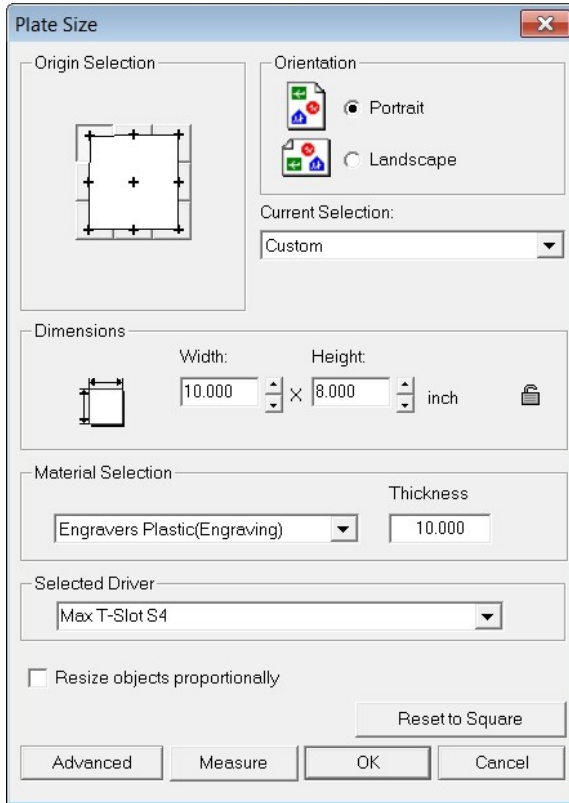
### Holding Down Material

Secure the material on the T-Slot table. It is best to use Multi Mat to hold the material in place, but keep in mind that since we are cutting completely through, there will likely be cut marks into the Multi Mat when the job is complete. A better procedure is to use a piece of sacrificial material on top of the Multi Mat. DO NOT place the material to be cut directly on the T-Slot table. If you do, then the cutter will cut into the T-Slot table and permanently damage the surface. Other methods for holding material down are in the section Holding Down Material.

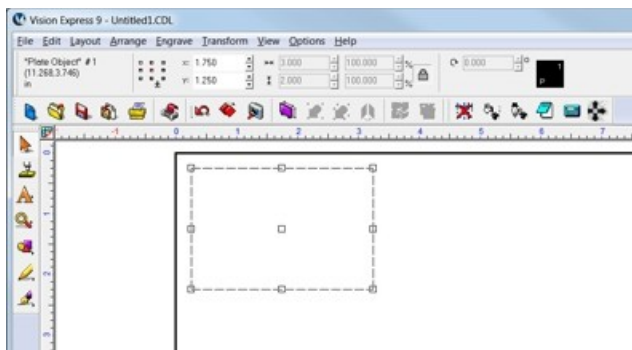
#### 4.1.5.1 Example Job 4 - Profile Cutting

In this example job, engravers plastic will be set up to engrave several name badges, then the badges will be cut out. 1/16th inch standard engravers plastic is used. Two different tools will be used - one to engrave, and one to cut/bevel the edges. Make sure the T-Slot table has been positioned so that the machine's home position is in the upper-left corner of the T-Slot table, as described in the section - Positioning the T-Slot Table. The Vacuum Chip Removal System is highly recommended for this application and is shown in this example.

First, the plate size will be adjusted to a 10 x 8 inch size.

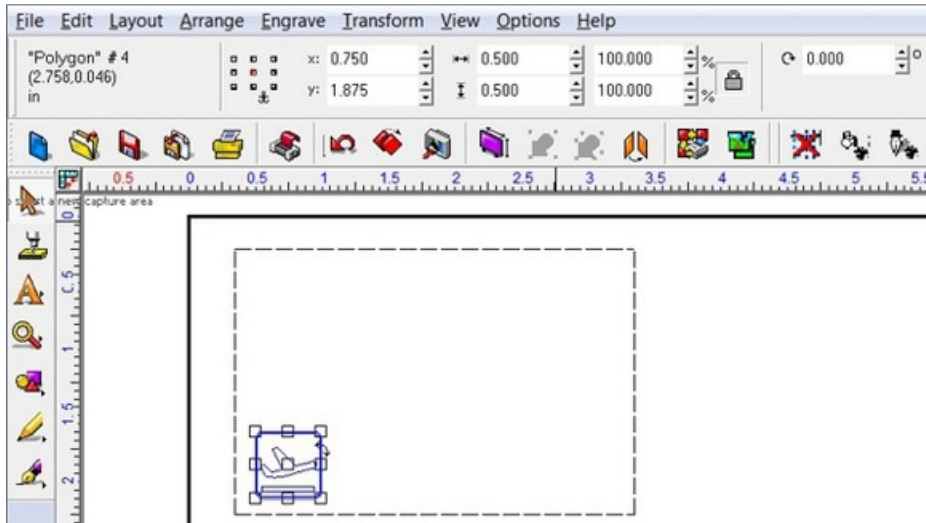


A single Plate Object will be created (from the top toolbar menu - Layout → Plate Object → Create Plate) with a size of 3 x 2 inches (75 x 50 mm) and margins on the top and left side will be set to 0.25 inches (6.4 mm). The margins are necessary so that during the cutting operation, the cutter will not cut right on the edge of the material, or on the edge guides.

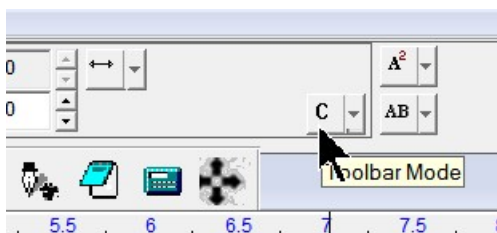


A Clip Art image will be added to the badge. The image is GENE0038.CDL from the Vision software clip art in the General folder (installed as C:\Vision Express 9\ClipArt\GENERAL. If you are using Vision Expert or Vision Pro, the folder name will reflect your particular version). To import the clip art, simply browse the folder in Windows Explorer and drag the file to the engraving area on the plate within the Vision software. the image will be quite large, so it must be re-sized to fit, either by changing the size manually on the toolbar, or by selecting the object and clicking on a corner node (holding down the left mouse button) and dragging the corner to make the image smaller.

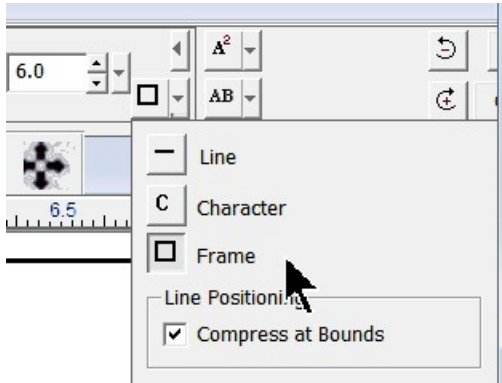
For this example, the image was re-sized to 0.5 x 0.5 inches (12.7 x 12.7 mm) and located at X 0.75, Y 1.875 as shown below.



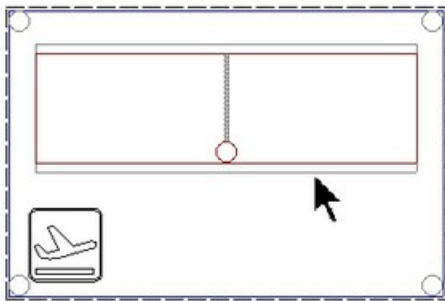
Next, three text fields are entered with the Text Compose tool. At first, when clicking in the middle of the Plate Object, the text field is set to centered within the plate and auto sized. We will adjust the text frame size and location using text Frame mode. To enable, select the Toolbar Mode Icon on the toolbar (only visible after selecting text, or after clicking on the Text Compose icon, then clicking within the plate object), then select the Frame mode. This will allow sizing and placement of the text field.



Select Frame mode.



Next, we will re-size the text area and type in some text (it does not matter what text is entered here. It is just entered to create the text object). To re-size the text frame, click and hold with the left mouse button on the black edge of the text frame and drag the frame to the appropriate size.



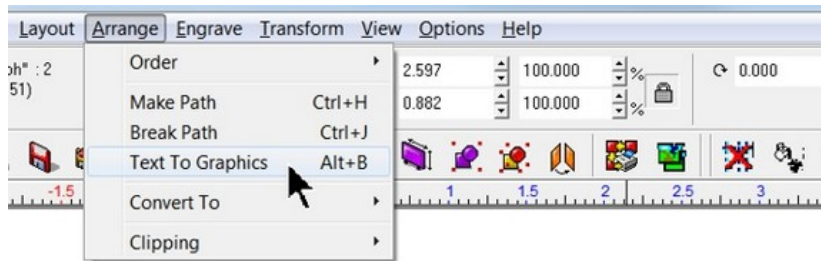
then,



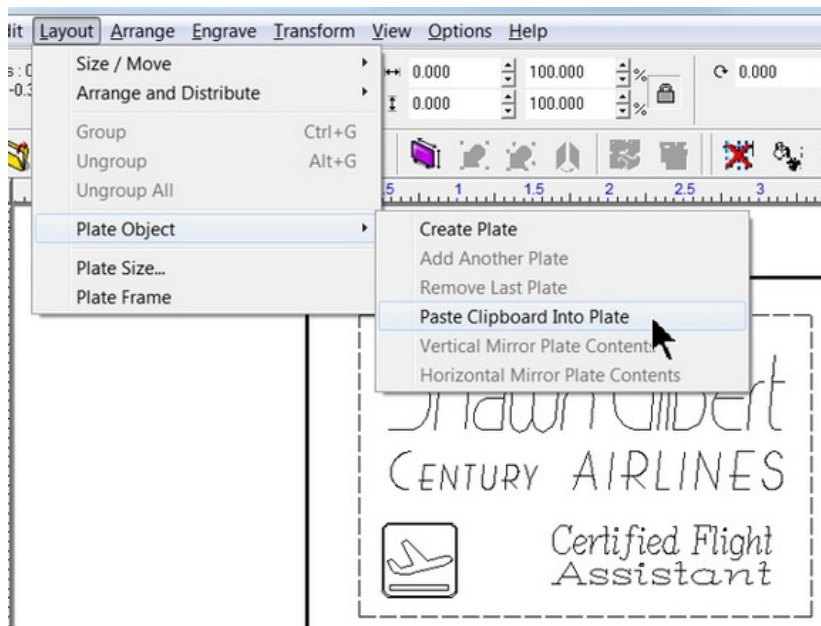
Two more text fields are entered in the same manner, re-sized, and fonts are changed.



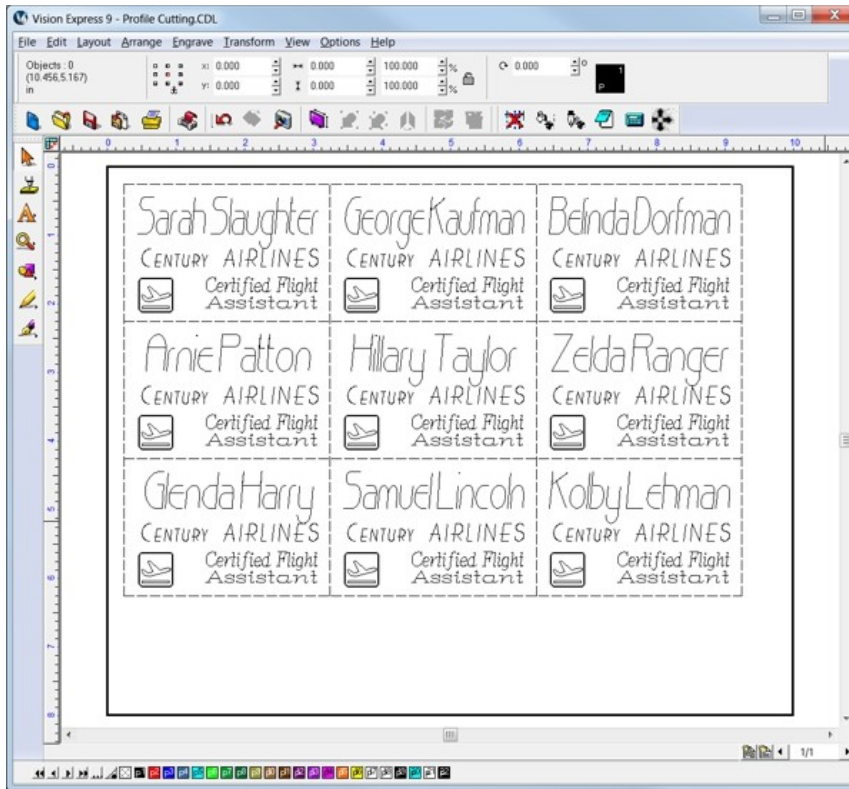
At this point, we need to change the two fixed text fields to graphics, so that when we import the text file for multiple badges, the correct text is replaced. Select the two text fields shown and from the toolbar, select Arrange → Text To Graphics. HINT - to select more than one object, click on the first object, hold down the Shift Key, then click on additional objects.



The two text fields are now non-editable graphics and will not be replaced when importing a text file with variable text. Next, copy the list of text variables from a Notepad text file and select Paste Clipboard Into Plate, then click in the middle of the Plate Object.

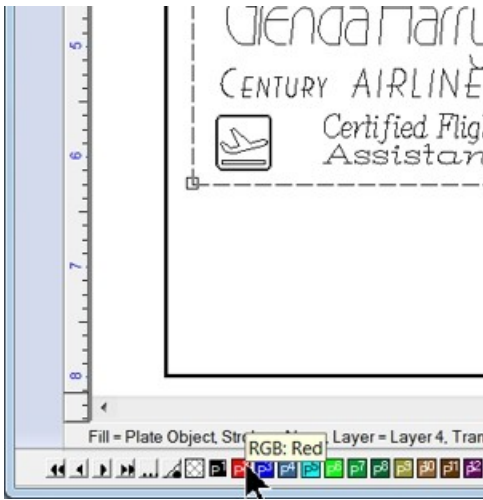


The screen should appear as below after pasting the names into the plate.



Lastly, before we send the file to the engraver, we will separate the graphics into two different colors, one for engraving and one for cutting. This is necessary so that two files can be sent to the engraver independently and a cutting tool change can be performed after engraving. To change the Plate Object frames to another color (red in this example), select the Plate Object frame, then click on the Red color icon on the bottom toolbar of the Vision software. It is also a good idea to verify the color of the other objects on the screen. If all other objects are to be Black, then select everything except for the Plate Object frame and click on the Black color icon at the bottom of the screen. Many times, when importing graphics, the color is unknown, so making sure the graphics are the correct color is good practice.

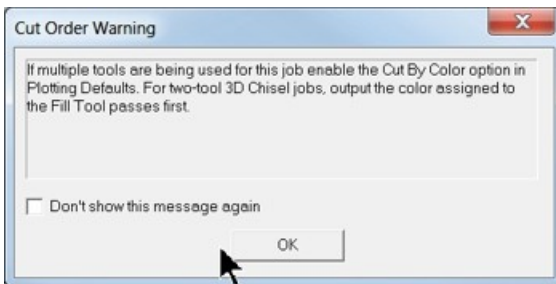
Note that if there is more than one page of names, each page of the file will need to have the plate frame color changed.



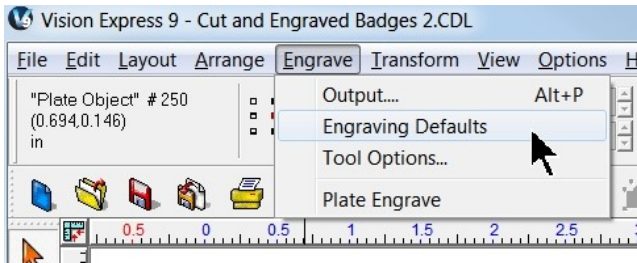
After changing the plate frame color.



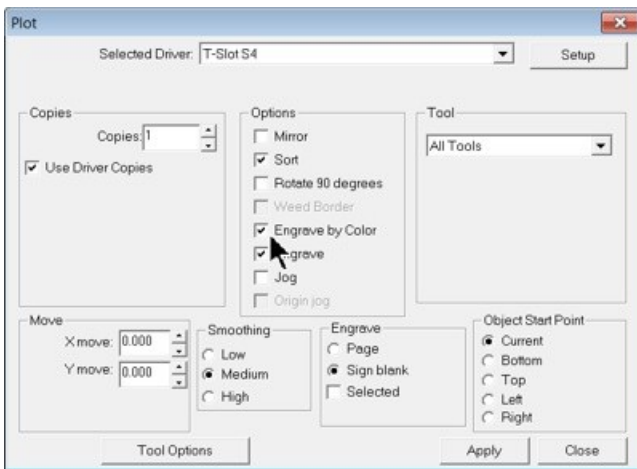
If you try to send this file to the engraver at this point (by clicking on the Engrave icon), a warning screen may appear as below.



In order to engrave by color, from the toolbar menu select Engrave → Engraving Defaults (Note that the Cut Order Warning screen refers to the "Plotting Defaults", but the menu item is "Engraving Defaults"),



then make sure Engrave by Color checkbox is selected, then Apply and Close.

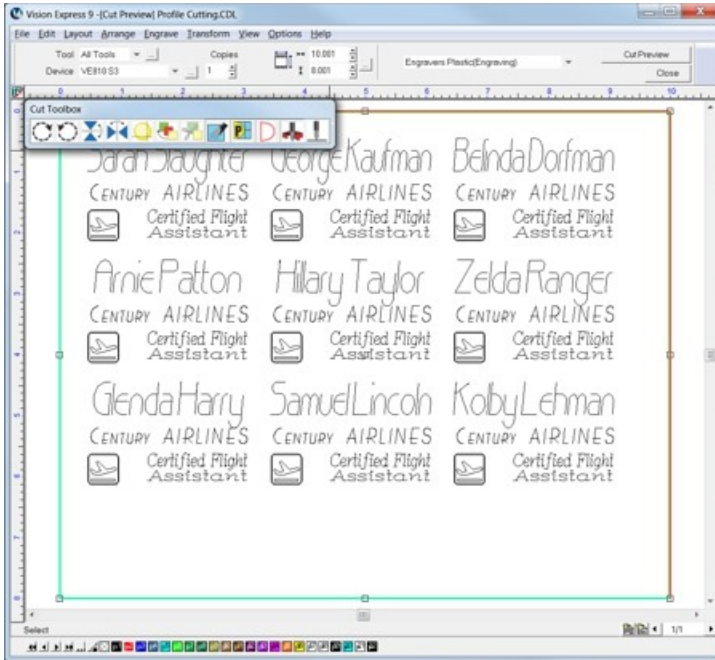


In order to send the engrave file to the engraver, select the Engrave icon from the left toolbar, at which time the Filter by Color window will appear. Select the color to send to the engraver in the Filter Layer drop down box. In this example, all text and graphics are Black, so the color Black (P1) was selected from the drop down menu in the Filter by Color window.

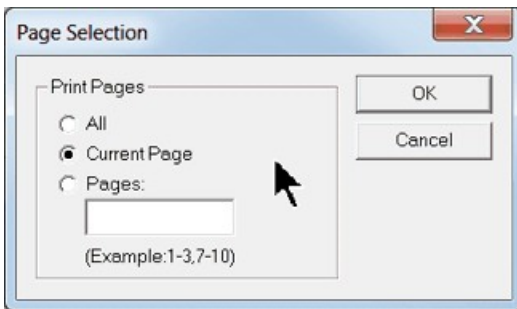




After clicking on Select, the Vision software window will show only the color being sent to the engraver, in this case, black. Make sure that Engravers Plastic(Engraving) is the material selected, and all options are turned on in the Cut Toolbox, including Dry Run for this example file. Select the Engrave icon from the Cut Toolbox to send the file to the engraver.



If there are multiple pages, the Page Selection screen will appear for you to choose which page(s) to send to the engraver. In this example, the Current page will be sent by itself so that the cut file can be sent afterward.



After selecting OK, the engraving file is sent to the machine. Place the material on the table and make sure the engraver is set up as in Rotary Engraving section before running the file. Use the proper cutting tool for the engraving application. Note that the nose cone for the vacuum chip removal system has been installed in this picture.

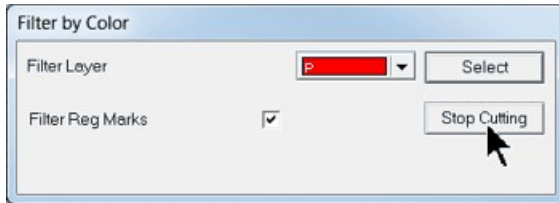


After pressing Start and finishing the job, the engraved portion of the file should appear as shown.

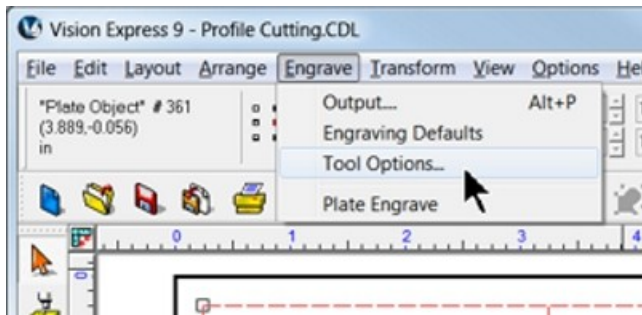


### Cutting

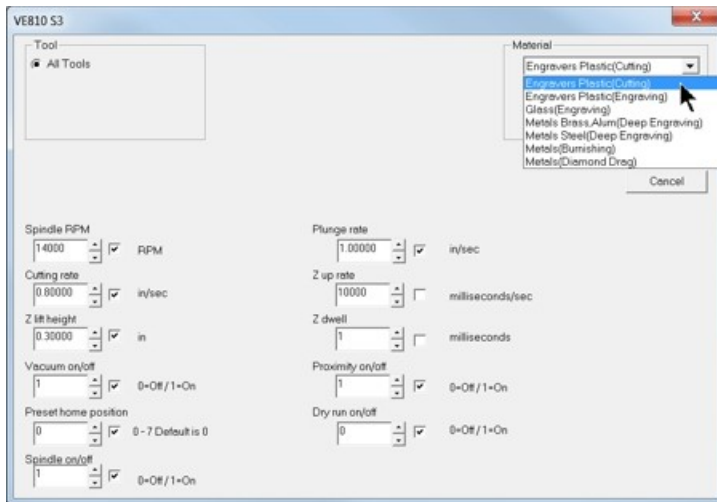
After sending the engrave file to the machine, the Filter by Color window will re-appear, signaling that the software is ready for you to send another file to the engraver. Since we need to change the material setting, select Stop Cutting.



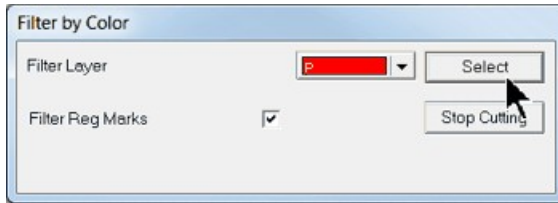
To change to the material setting for cutting, select Engrave from the top toolbar menu, then Tool Options.



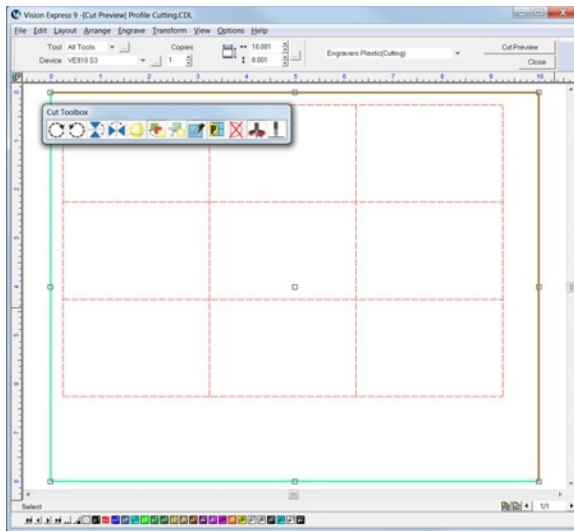
Select Engravers Plastic(Cutting) from the Material drop down list, then select OK.



Select the Engrave icon from the left side toolbar, then select the color for cutting in the Filter Layer drop down box in the Filter by Color window (select Red for this example),



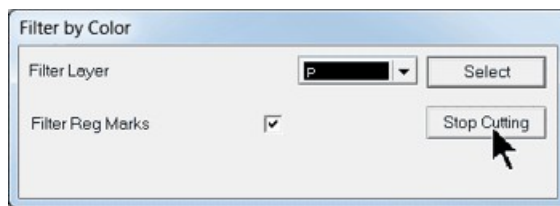
then select Engrave from the Cut Toolbox. The screen will show only objects in the color selected in the Filter by Color window.



The page selection screen will re-appear, for this example, choose Current Page and select OK. The file will be sent to the engraver. Make sure you have installed the cutter/beveler tool for this process and set up the cutting depth as described in the previous section. When the file is complete, it should appear as shown. (The outside/excess material was removed in the picture below for clarity)



Note - The Filter by Color screen will once again appear. Since we have no further colors to send to the engraver, select Stop Cutting.



## 4.1.6 Reverse Engraving/Color Filling

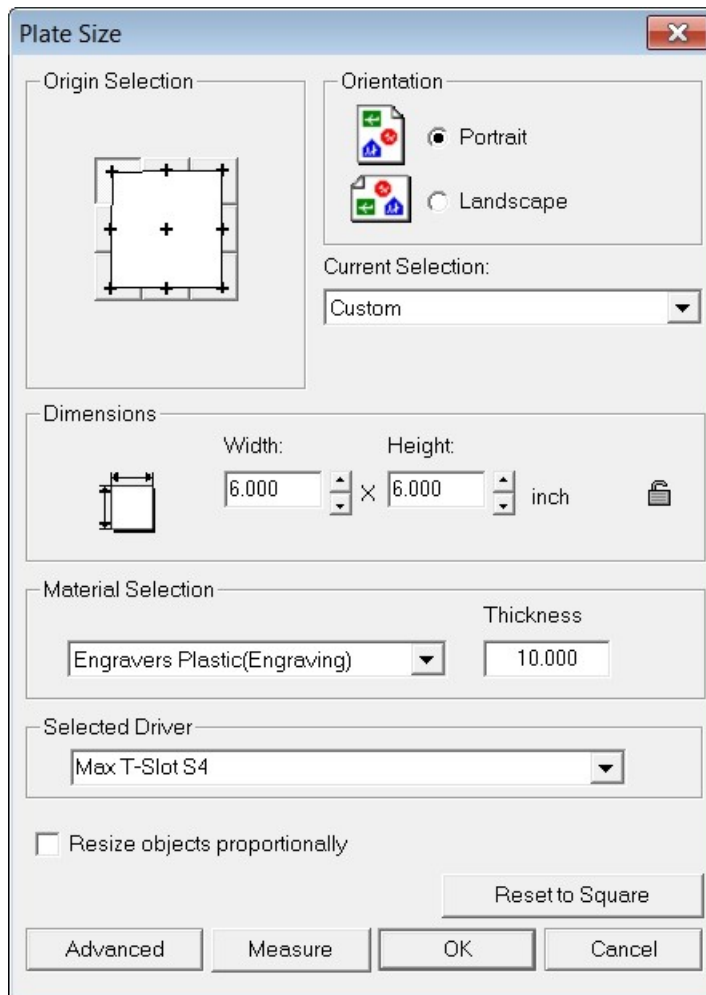
In this example, a reverse engraved sign will be created from reverse engraver's plastic. The techniques used with this application are: text layout and positioning, importing clipart, drawing simple graphics, adding fills, mirroring the graphics for reverse engraving and color filling. The basic setup is similar to that performed in the Rotary Engraving section in Level 1 Job Examples.

### 4.1.6.1 Example Job 5 - Reverse Engraving

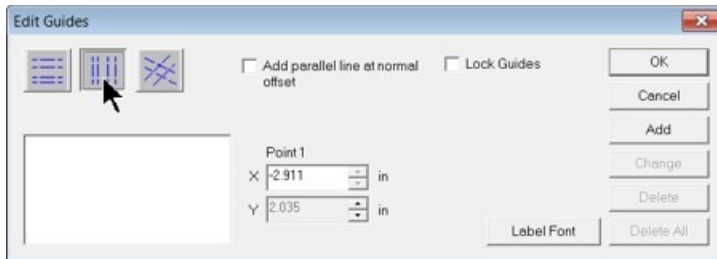
In this example, a sign will be made using reverse engraver's plastic. The piece is pre-cut and measures 6 inches x 6 inches (150 x 150 mm). Make sure the T-Slot table has been positioned so that the machine's home position is in the upper-left corner of the T-Slot table, as described in the section - Positioning the T-Slot Table.

Note - In this application, it is highly recommended to use the Vacuum Chip Removal System as described in the Optional Accessories section. The process of engraving or cutting plastics, acrylics, sign foam and wood, produces a significant amount of debris that can clog the nose cone and/or get trapped between the nose cone and the material, which will cause engraving/cutting depth inconsistencies as well as potentially scratch the surface of the material. The Vacuum Chip Removal System significantly reduces these problems and provides for a cleaner work area.

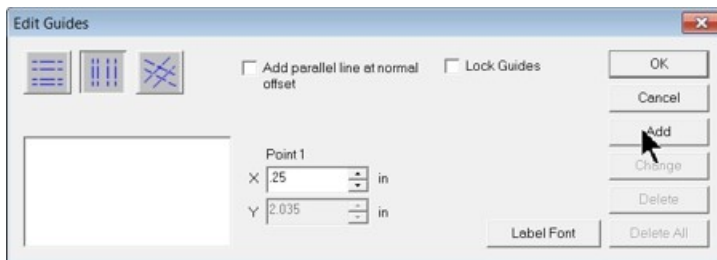
Set the plate size to 6 x 6 inches and select the driver for your machine.



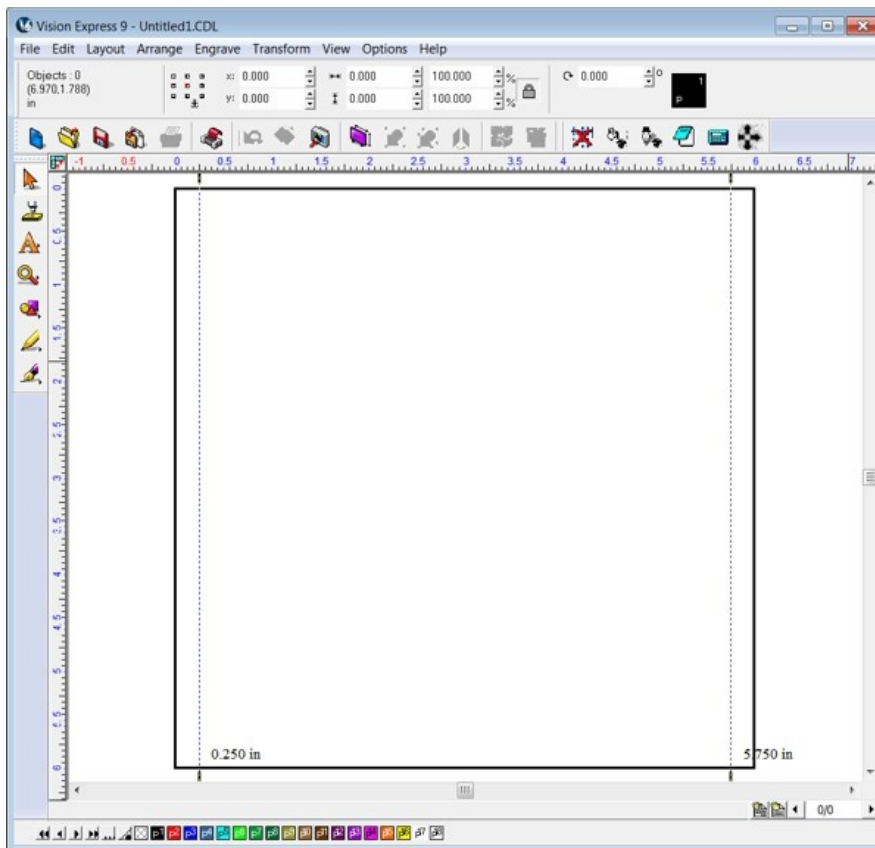
To make this job setup a little easier, we will add guidelines to the plate. Right click outside the plate area to show the Edit Guides window. Then select the vertical guides as shown.



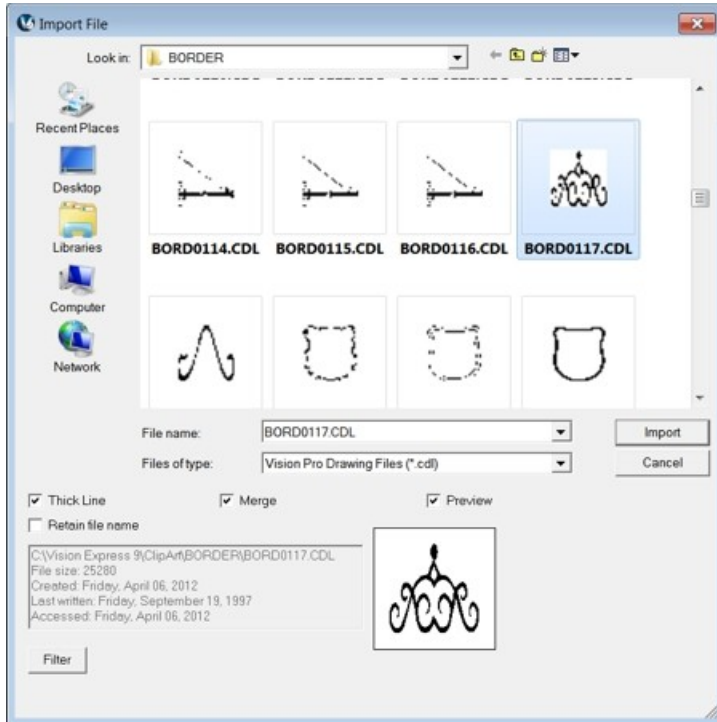
Enter 0.25 in the X entry field, then click on Add. Type in 5.75 in the X entry field, then click on Add, then click on OK.



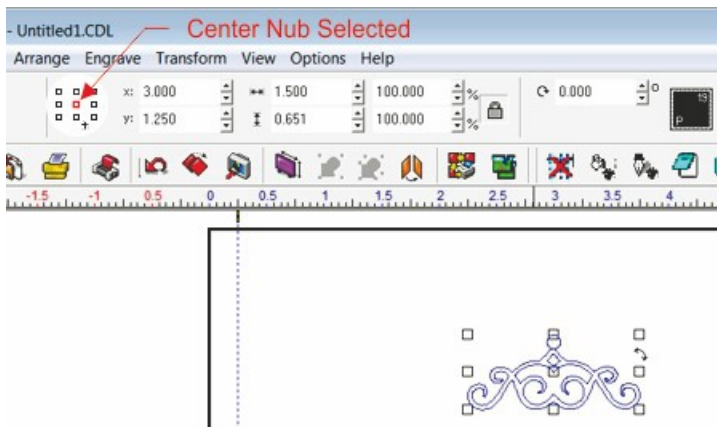
The plate area should now show the two guides you just added.



We now import clipart to add style to the sign. To import the file, select File → Import from the top menu bar. This will open the Import File window. The file we are importing is BORD0117 and is located in the C:\Vision Express 9\ClipArt\BORDER folder. Select the file, then click on Import. Click inside the plate area to finish importing the file.

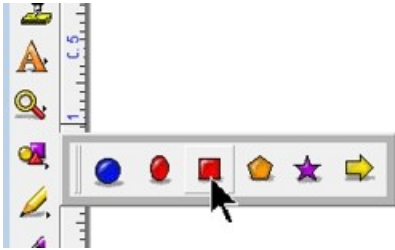


Change the size to 1.5 inches wide by 0.651 high and change the position to 3.00 inches X and 1.25 inches Y as shown, using the top toolbar fields. Make sure the center "Nub" is selected when positioning graphics using center coordinates.

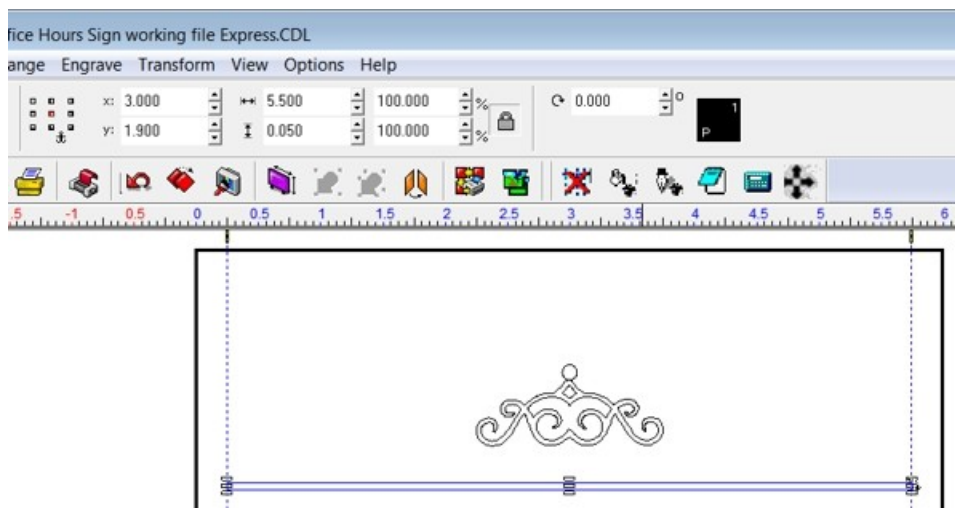




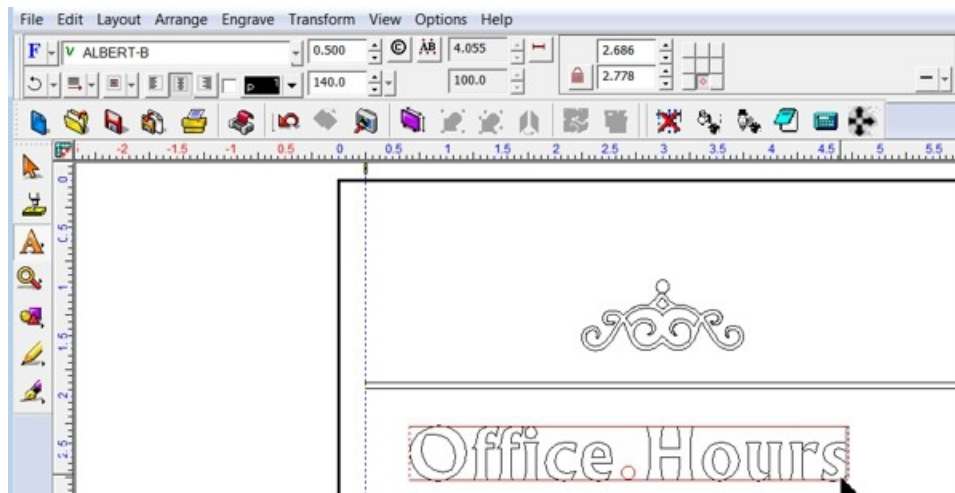
To add a rectangle that will separate the sign, select the Shape Tools icon from the left toolbar, then select the Rectangle tool.



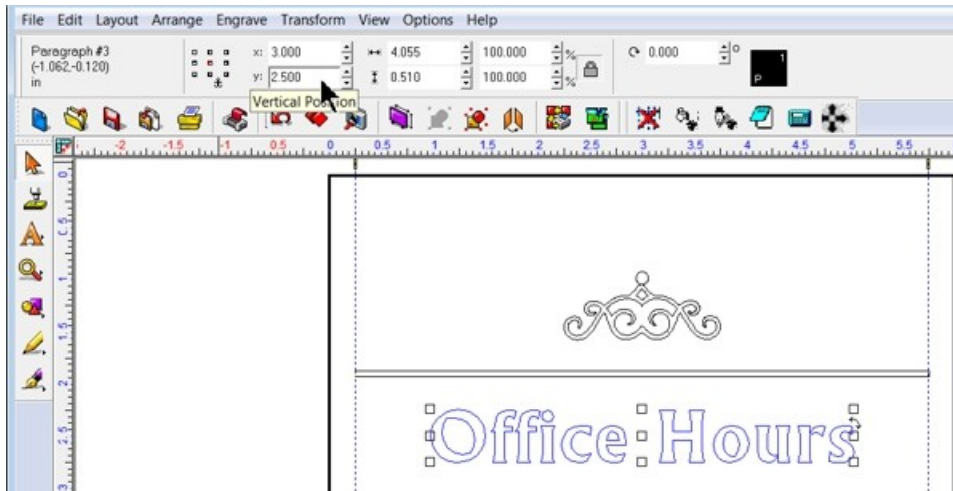
Draw a rectangle 5.5 inches wide x 0.05 inches high and position it to 3.00 inches X and 1.90 inches Y, as shown below.



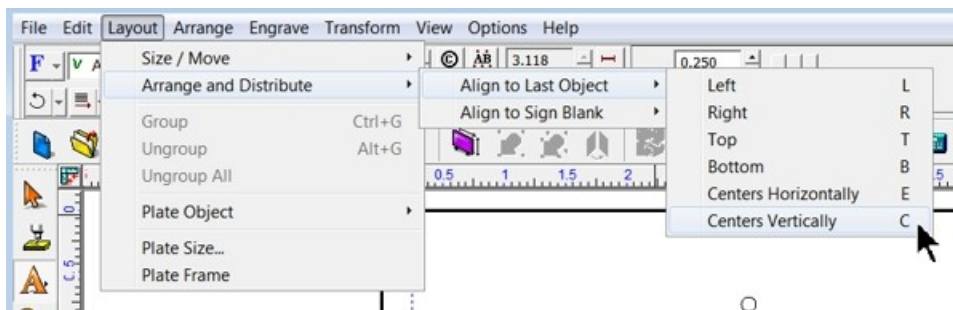
Enter the text shown with the Frame Text tool. The font is Albert-B, 0.500 inches high.



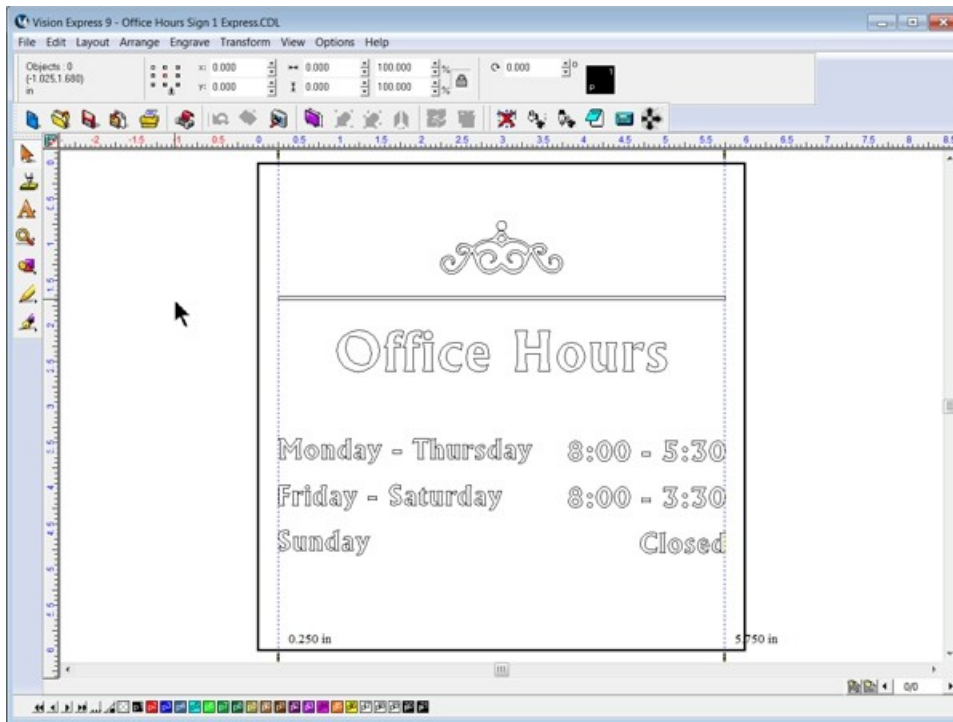
Using the position entry fields on the top toolbar, which will only show if you exit text mode after entering the text, then select the text as shown, change the position to 3.00 inches X and 2.5 inches Y. In a later step, the Y position will be changed slightly once all the text has been entered.



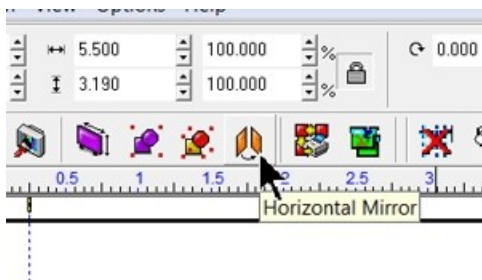
Add the additional text as shown. Each text is entered separately. (Monday - Thursday is one line, 8:00 - 5:30 is another line, etc.) The guides we added can be used to "snap" the text into position and align the left and right edges of these lines of text. To align each line of text, select the text along one line (such as Monday - Thursday and 8:00 - 5:30), then use the Align tool by selecting **Layout** → **Arrange and Distribute** → **Align to Last Object** → **Centers Vertically**.



Align each line of text. The spacing between text lines was equalized by moving each line of text with the up or down arrow keys on the computer's keyboard.



Since we are engraving the back side of the plastic, we need to mirror all objects about the center of the plate. Select all objects and click on the Horizontal Mirror icon on the top toolbar.



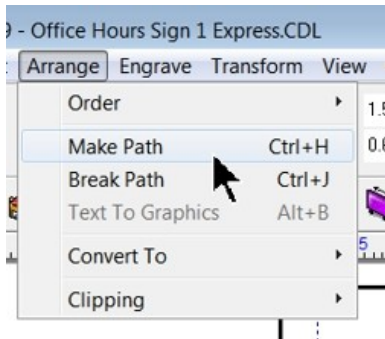
The plate should now appear as below.



Next, since we are going to use a Hatch Fill to engrave the inside of all of the characters and clipart on screen, we first make sure all objects have the same outline color. Select all objects, then click on the Black color swatch on the bottom toolbar (shown below) with the left, then the right mouse buttons. This should be done any time clipart is imported. Many times, clipart is drawn in colors that may look similar to the color of other objects, but if they are different. The software will interpret them as different tools, and they may be engraved out of sequence or with different parameters.

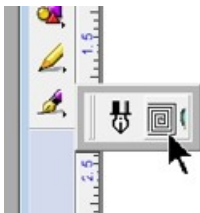


Once the color of all objects is the same, select only the clipart, then select Arrange → Break Path, then select Arrange → Make Path. This resets the fill path so that when we use the Hatch Fill tool, the correct parts of our clipart object will be filled.

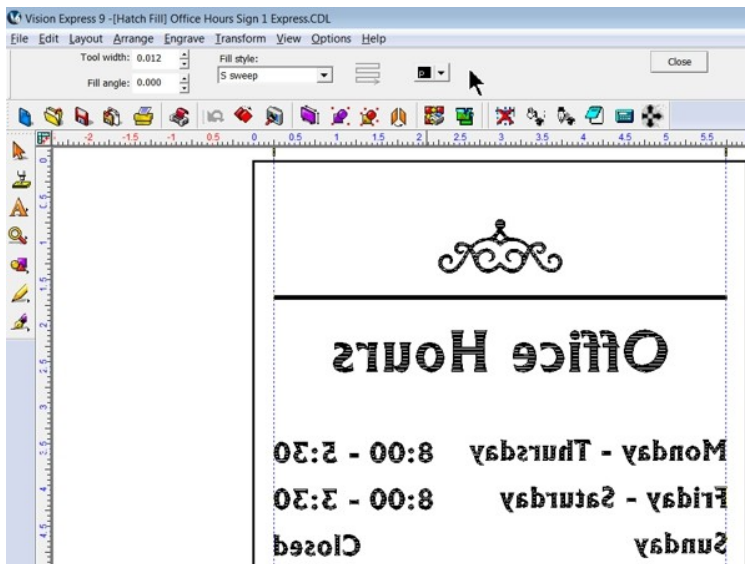


**Hatch Fills**

For Vision Express, select the Stroke and Fill Tools (or ) icon from the left toolbar, and click on the Hatch Fill (or Fill tool) tool.



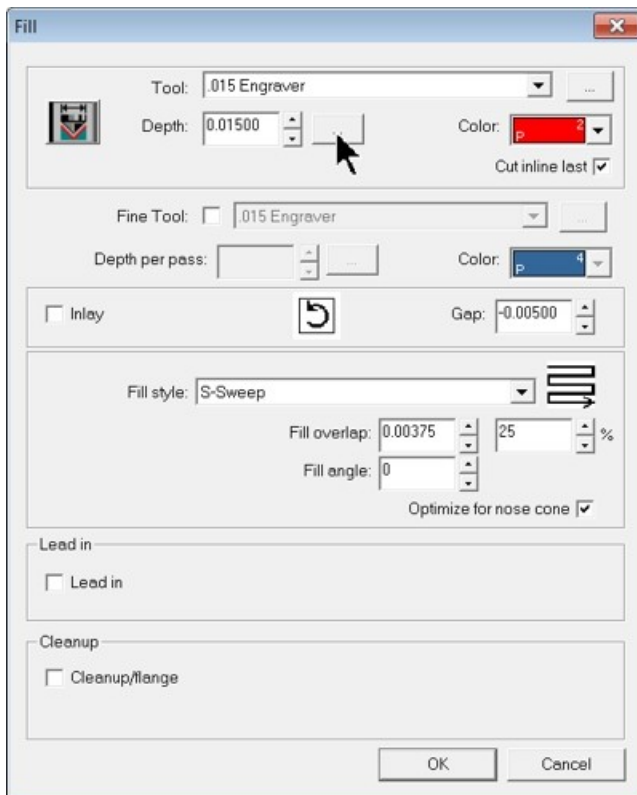
The top menu bar will change to the Hatch Fill toolbar in Vision Express only. (For Vision Expert or Pro, see below). Since we are using a 0.015 Flex Cutter for this example, we need to change the Tool width setting to about 25% less than the cutter tip width. In this case, the Tool Width was set to 0.012 inches, the Fill angle was left as 0 degrees, the S sweep pattern was used (it is faster than the line sweep pattern) and the color was set to black. Once these settings have been changed, click on Close to exit the Hatch Fill toolbar.



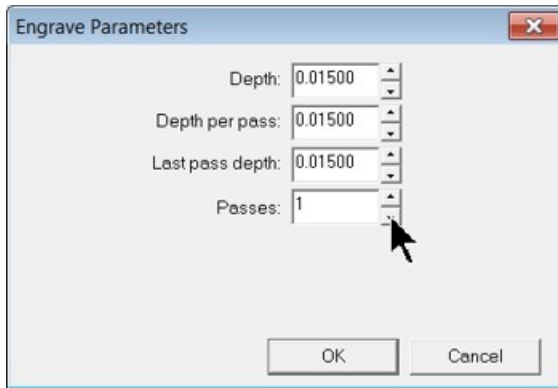
For Vision Expert or Pro, select the Tool Path Tools, then select the Fill icon.



The Fill window will appear. Select the .015 Engraver as the Tool. Set the Depth to 0.015 inches (or whatever the cap layer thickness is for the material you're using). The Color can be any one you choose, in this case, Red was chosen. For this graphic, the Gap was set to -0.005 inches to increase detail slightly. Choose the Fill style, such as S-Sweep and set the Fill overlap to about 25% for plastics. More overlap will make for a cleaner engraving, but take more time. In this example, the Fill angle was set to 0. There are many parameters to modify in this Fill dialogue. The user should get familiar with these parameters and experiment to determine which settings are preferred for the job being performed. Once these settings have been entered, select the icon to the right of the depth text entry field.



The Engrave Parameters window will appear. Generally, the number of passes will depend on the desired total depth, cutting tool used and material. In this example, a single pass will be used. A rule of thumb is to not engrave any individual pass deeper than the cutting tool tip diameter - although this varies with each tool type. To make sure only one pass is run, select the "down" arrow next to the Passes field until the number of passes equals 1. Select OK to close this window.



Select OK to close the Fill window and create the fill pattern.

At this point, the file is ready to be sent to the engraver. Place the reverse engraver's plastic material (clear side down) on the T-Slot table on top of Multi Mat. Set the engraving depth to slightly more than the cap layer for your material. In this case, the engraving depth was set to 0.015 inches (15 clicks). Send the job to the engraver using the Engravers Plastic material setting, hook up your vacuum chip removal system and start the job. In the picture below, the material was flipped over to view from the front side.



When the engraving is complete. Brush of any excess plastic chips from the engraved areas and color fill these areas with an acrylic based paint. It is recommended to mask the edges of the piece before painting. In this example, two colors were used to fill the engraved areas.

(Back of plate shown for reference)





## 4.2 Level 2 Job Example - Using the Vise

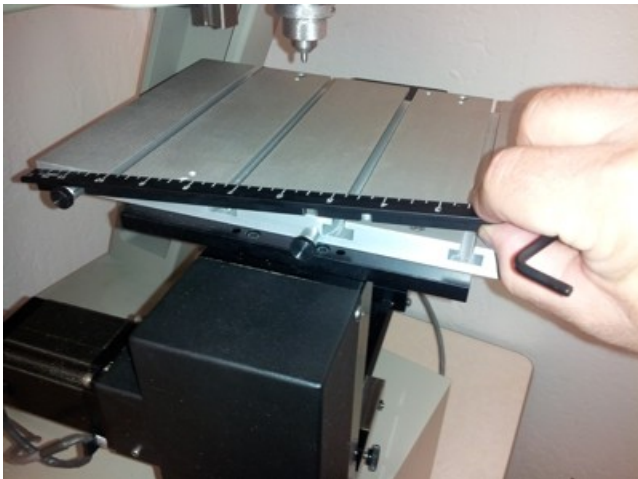
The Adjustable Pen Fixture is used in this example job. If you do not have this fixture, please contact technical support at Vision - 602-439-0700.

### 4.2.1 Example Job 6 - Engraving Pens

In this example job, a pen will be engraved using the adjustable pen fixture. Remove the T-Slot table by first removing the 2 screws in the front of the table as shown.



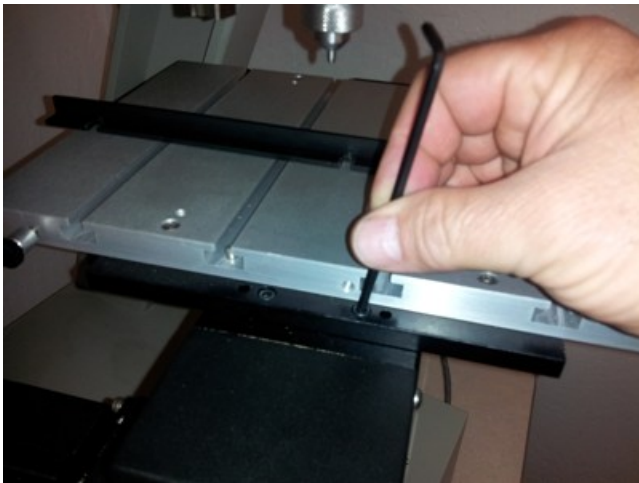
Rotate the table by loosening the Support Bar Lock Screw, then loosen the screws holding the rear edge guide in place and remove the edge guide by lifting it up.



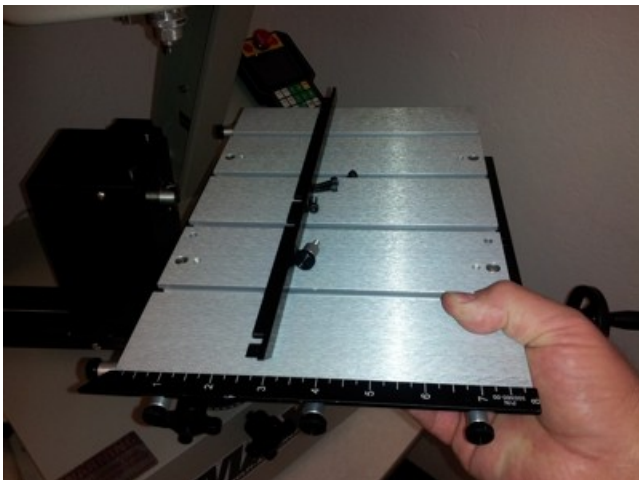
Completely remove the center edge guide screw.



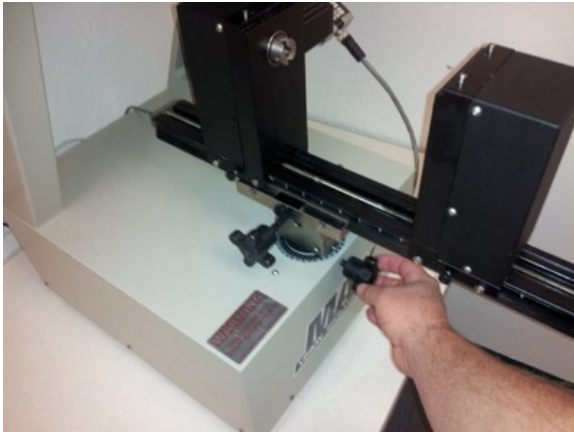
Remove the 2 screws on the rear of the table.



Lift the table off of the vise.



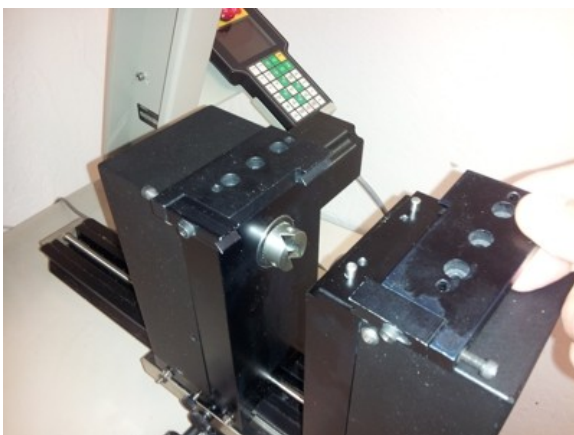
Make sure the locating pins are installed into the holes on top of the rotary vise and rotate the vise back to 0 degrees, then tighten the Support Bar Lock Screw.



Close the vise until there's a gap between the locating pins of about 3 inches.



Place the adjustable pen fixture on the locating pins, making note that the "adjustable" side (where the adjustment screws are located) is on the left.



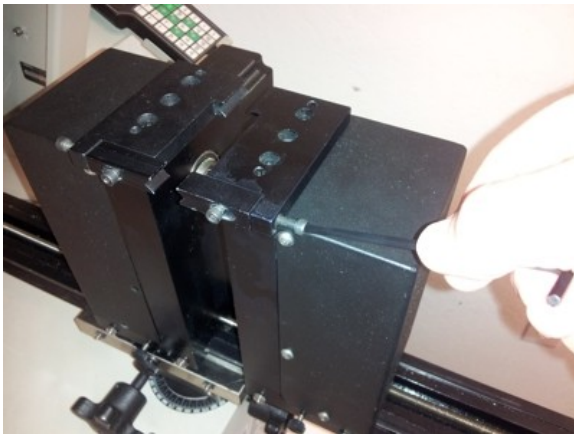
Secure the fixture to the vise with 4 screws



Loosen the locking screws on the adjustment slides of the fixture.



Back out the adjustment screws to provide the widest gap between the adjustment slides.



Place the pen in the fixture as shown, then tighten the vise by using the vise wheel.



Once contact has been made on the fixed part of the pen fixture, adjust the adjustment slides to do two things: center the barrel of the pen in the fixture and firmly clamp the barrel. Tighten the lock screws on the adjustable portion of the fixture when finished.



**NOTE:** The pen fixture can be installed in two directions, with the adjustment slides either placed towards the left or right of the vise..

Once the fixture has been adjusted for the style of pen being engraved, the vise wheel can be used to open and close the vise when making pen changes. Make sure each pen is located at the same left-right position so the engraving area is consistent.

With the vise at its lowest position, there will not be enough down travel in the spindle to reach the pen.



Loosen the Support Bar Lock Screw and raise the vise.



The spindle (Z-Axis) travel is approximately 3 inches. Raise the vise until the pen is roughly 1.5 - 2 inches below the spindle, then firmly tighten the Support Bar Lock Screw.



Turn the machine on and after homing the machine, move the tip of the cutter (in this case, the diamond drag adapter tool) so that it is positioned as close as possible to the center of the area to be engraved. Press the Set Home button on the Pendant. (If using a standard non-rotating diamond drag tool, install it into the machine's spindle and adjust the cutter so that the tip extends below the bottom of the spindle approximately 1/4" before setting the machine's home).



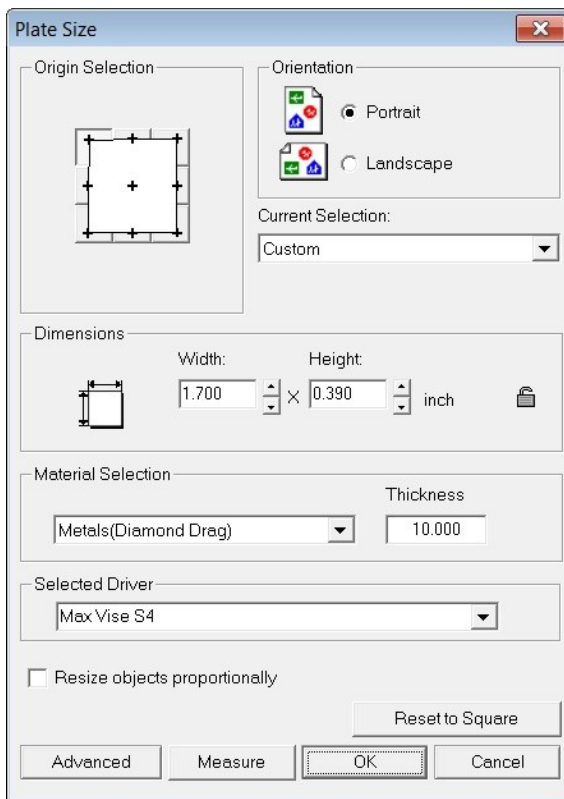
Using calipers, measure the width of the engraving area,



and the height of the engraving area. As a general rule, the maximum engraving height on a round object should be roughly 1/2 the object's diameter. Attempting to engrave beyond this limitation will typically result in the cutter tip losing contact with the pen, skewed graphics, or poor quality at the top and bottom of the graphics being engraved.

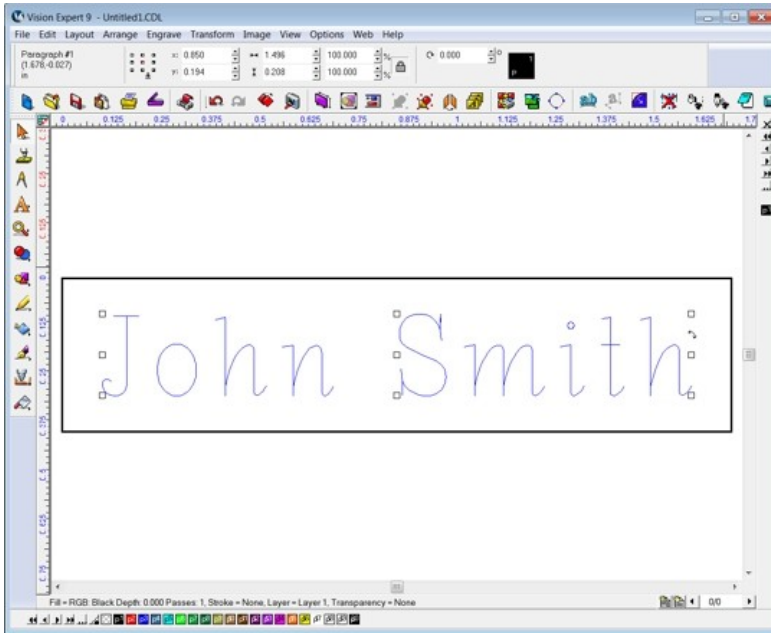
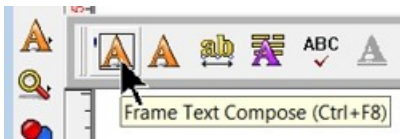


In the Vision software, set the height and width you measured as the Plate Size.

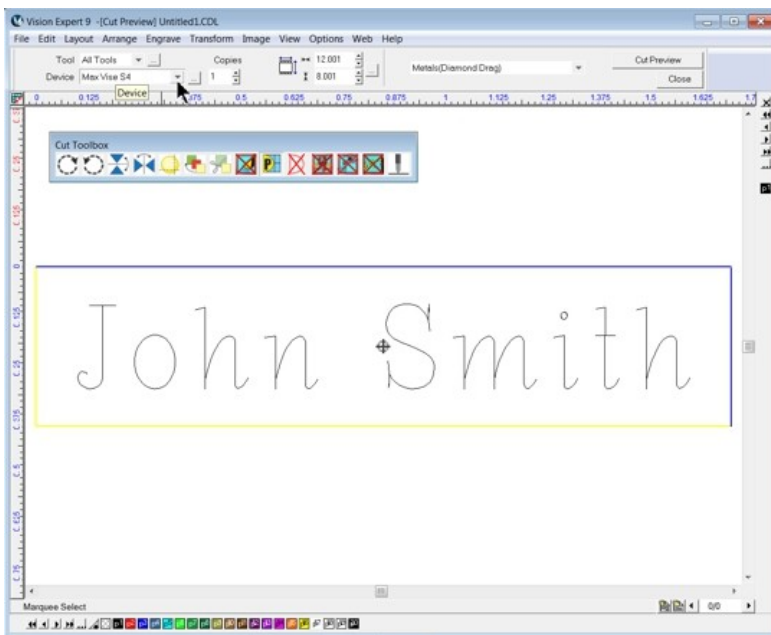




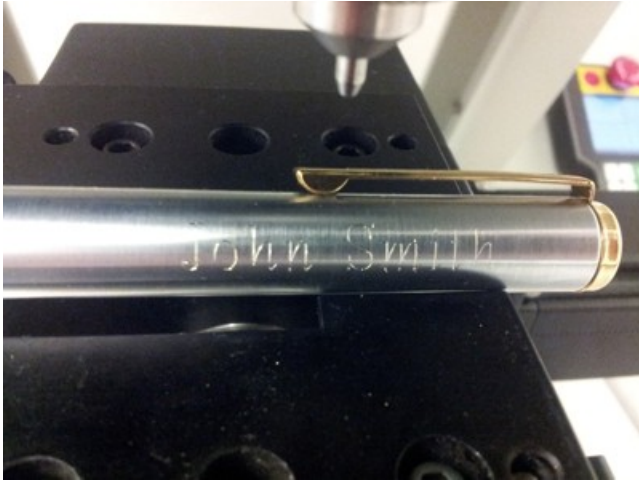
Enter the text or graphics within the plate area. In this example, a name was entered using the Frame Text Compose tool, in order to center the text within the plate area.



Select the Engrave icon from the left toolbar. Select the Device as Max Vise S4.



Select Metals - Diamond Drag in the Tool Setup window. To verify that the graphics are located properly, turn the Dry Run ON in the Cut Toolbox and send the job to the machine. Start the job and check to make sure the graphics you are engraving are positioned properly with the Red Dot Laser Pointer. Adjust either the machine's Home Position or the position of the graphics within the Plate Area to correct the positioning. Resend the job to the engraver with the Dry Run turned OFF to engrave the item.



## 4.3 Level 3 Job Examples - Using the Rotary Axis

These last 2 example jobs use the Rotary Axis on the Max Engraver. The T-Slot Table will need to be removed. Refer to Level 1 Jobs - Using the T-Slot Table for removal instructions. Several different types of tools are used to hold items in the rotary vise. These include; cones, flat surfaces, chucks and related pins. If you do not have certain tools for the rotary fixture, contact technical support at Vision - 602-439-0700.

### 4.3.1 Example Job 7 - Diamond Drag Engraving Round Objects

In this example job, a metal mug will be engraved using the rotary axis.

To prepare the machine for use of the rotary axis, remove the T-Slot table as described in the Level 1 Jobs - Using the T-Slot Table section.

Measure the diameter of the item to be engraved with calipers in the area where the engraving will be positioned. In this example, a mug was used and the diameter was 3.454 inches.



Install the appropriate cones or holding chucks for the item being engraved. The drive side of the rotary axis is the rear of the rotary vise. This is where the cones or chucks are installed. A flat fixture is commonly used for the base of flat items and is installed on the free floating (front) side of the rotary fixture. Note that the cross pin slides into the V grooves as shown.

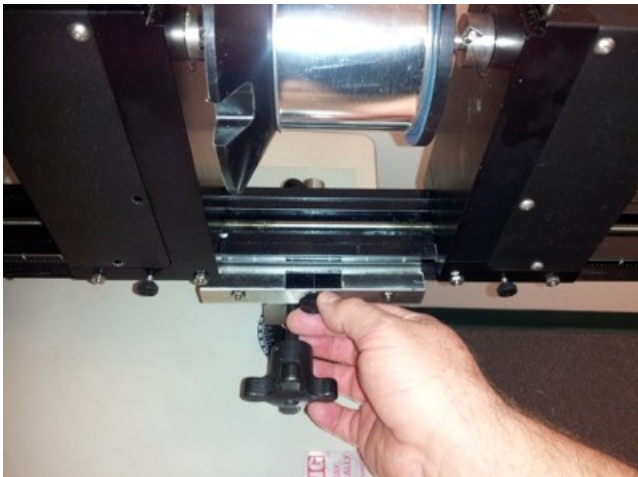


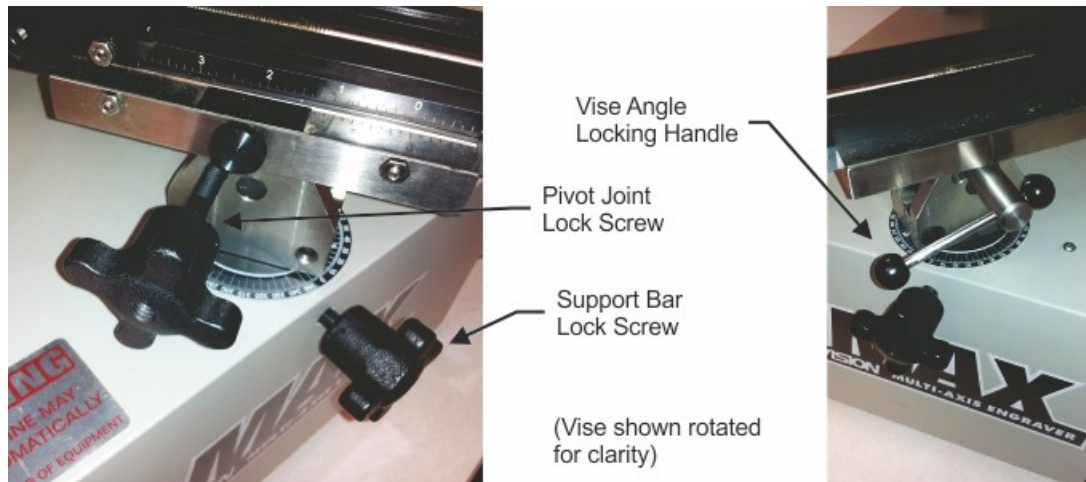
Place the item between the flat and the cone on the rotary vise and use the wheel of the vise to tighten the vise. Hold the item in-line with the cone and held flat against the front side of the rotary, then close the vise. Once the item is held lightly between the cone and the flat fixture, rotate the item by hand to see it is centered on the flat fixture side (the cone side will inherently be centered). If the item is not centered, manually open the vise slightly by rotating the wheel, center the item, then close the vise using the wheel. Items should be firmly secured by turning the wheel by hand, or they may slip during engraving.

In this example, the item has a handle. Locate the handle so that the graphics face outward when holding the mug in either your left or right hand. In the picture below, the mug is positioned so that the graphics face outward when holding the mug in your left hand - the handle is 90 degrees to the right of straight up.



To locate the item under the spindle properly, turn the machine on and Press Go to Home on the Pendant, then loosen the Vise Slide Locking Screw and move the vise so that the centerline of the spindle is at the top edge of the item held in the vise.





Also, raise the vise so that the bottom of the engraving tool (the diamond drag adapter in this example) is approximately 1 - 2 inches above the surface of the item. The vise height can be adjusted by loosening the Support Bar Lock Screw, lifting the vise (or lowering it), then securely tightening the lock screw. In addition, if the item is tapered, adjust the angle of the vise by loosening the Pivot Joint Lock Screw and Vise Angle Locking Handle, then tilt the vise so that the area to be engraved is perpendicular to the spindle axis as shown below. Tighten the lock screw and handle firmly after adjustment.



Using the Pendant, press the Rotary Axis button and select 1, which enables the rotary axis.

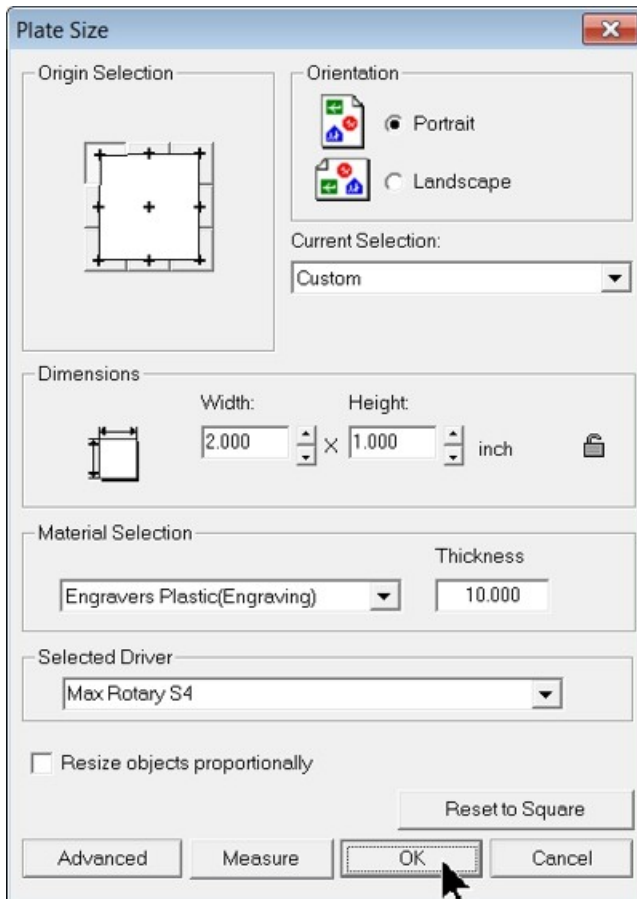
**WARNING: In the next step, the spindle will move to the center point of the X and Y-Axis. Make sure the vise, its attachments and the item to be engraved are not above the bottom of the cutting tool, or damage to the machine may occur. Keep hands and clothing away from the machine before pressing the Enter button on the Pendant.**

Enter the diameter of the item using the numbers on the Pendant's key pad, then press Enter on the Pendant.

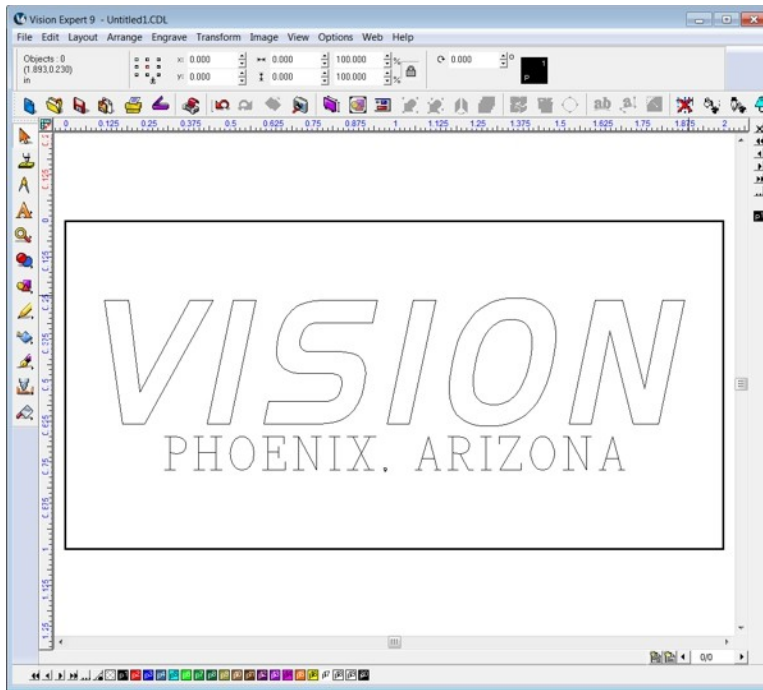
Move the spindle over to the center of the area to be engraved using the Y Down button on the Pendant, then lower the spindle using the Z Down button on the Pendant until the tool tip is slightly above the item. Adjust the Y position as necessary to locate the tool tip in the center of the engraving area. Press the Set Home button on the Pendant.



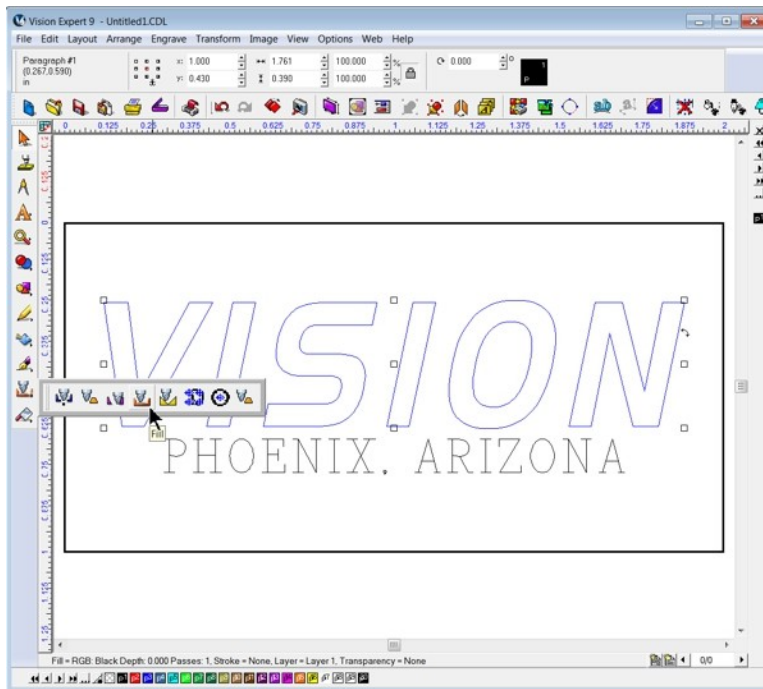
The Max Rotary S4 driver is a CENTER based driver. It will use the center of the plate size in the Vision software as the home position on the machine. For this example a plate size was set in the Vision software to be 2 inches wide and 1 inch high.



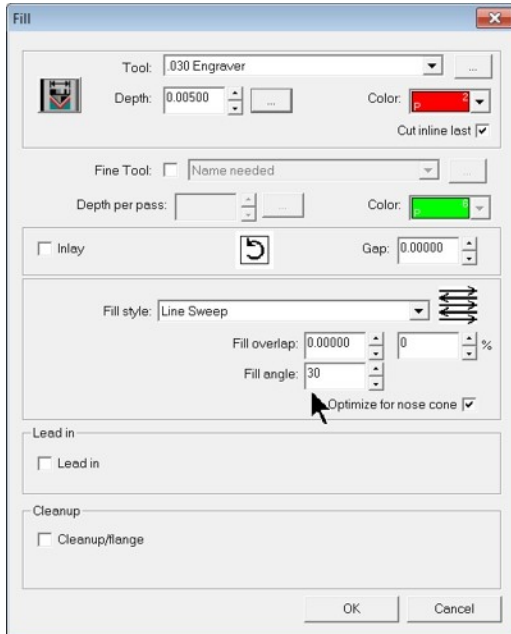
The text was added by using the Frame Text Compose tool, using Handled as the font, set to 0.375 inches high and slanted 12 degrees. A second line of text was added using Aura1 as the font set to a height of 0.1 inches.



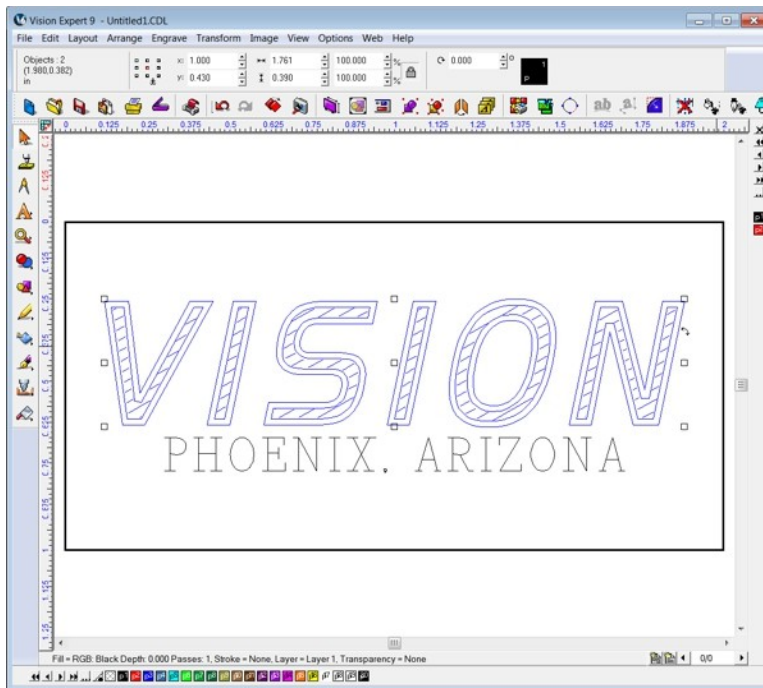
Once the text was added, it was ungrouped (select Layout, then Ungroup from the top menu bar or the Ungroup icon on the top toolbar). The top line of text was selected and the Fill Tool was selected to create a fill.



In order to apply a wide cross-hatch to the text, the Fill path was set using the following parameters: Tool - 0.030 Engraver, Depth - 0.005", Color - Red, Fill style - Line Sweep, Fill overlap - 0, Fill angle 30 degrees. Select OK to apply this tool path. HINT - experiment with different Tools, Overlap and Fill Angle to create different fill patterns.

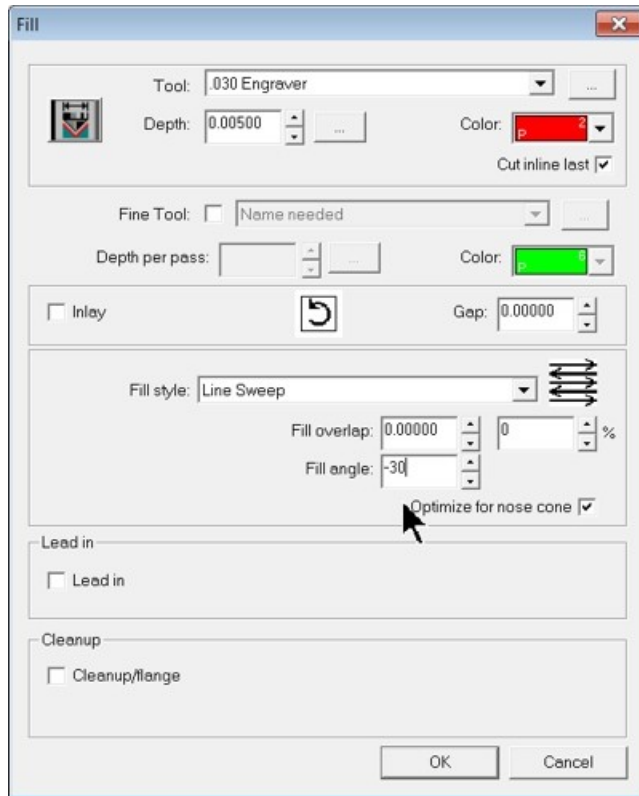


The path will be created as shown below. Select only the top line of text (do not select the tool path just created) and again select the Fill Tool.

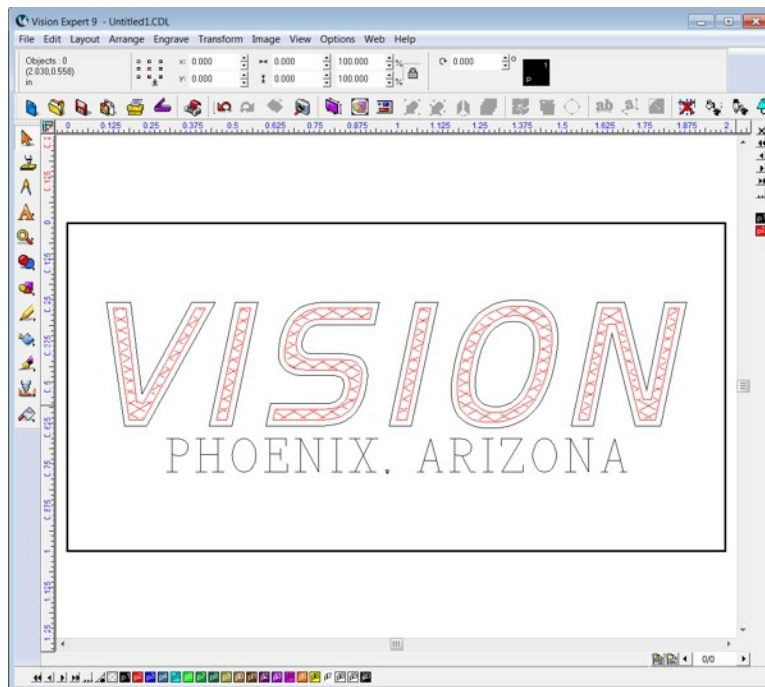




Apply the same parameters, except change the Fill angle to -30 degrees, then select OK.



This will create a cross-hatch pattern inside the text as shown.



Send the job to the engraver using the Max Rotary S4 as the device and using Metals(Diamond Drag) for the material setting. The Proximity Sensor is used and should be turned on in the Cut Toolbox since we are using Diamond Drag engraving.

The finished item should appear as shown below. If the opposite side of the mug will be engraved, loosen the vise adjustment wheel, rotate the mug 180 degrees (so that the handle is on the left side) and run the job again.



### 4.3.2 Example Job 8 - Deep Engraving Round Objects

In this example job, a metal (Aluminum) tube will be engraved using the rotary axis. To prepare the machine for use of the rotary axis, remove the T-Slot table as described in the Level 1 Jobs - Using the T-Slot Table section. Measure the diameter and length of the item to be engraved. In this example, the diameter of the tube was 2.003 inches and the length was 5.95 inches. Install the appropriate cones or holding chucks for the item being engraved.



Install the tube in between the cones and use the vise wheel to tighten the vise. Items should be firmly secured by turning the wheel by hand, or they may slip during engraving. To locate this item under the spindle properly, turn the machine on and Press Go to Home on the Pendant. Press the Rotary Axis button on the pendant and select 1 to enable the Rotary Axis.

**WARNING: In the next step, the spindle will move to the center point of the X and Y-Axis. Make sure the vise, its attachments and the item to be engraved are not above the bottom of the cutting tool, or damage to the machine may occur. Keep hands and clothing away from the machine before pressing the Enter button on the Pendant.**

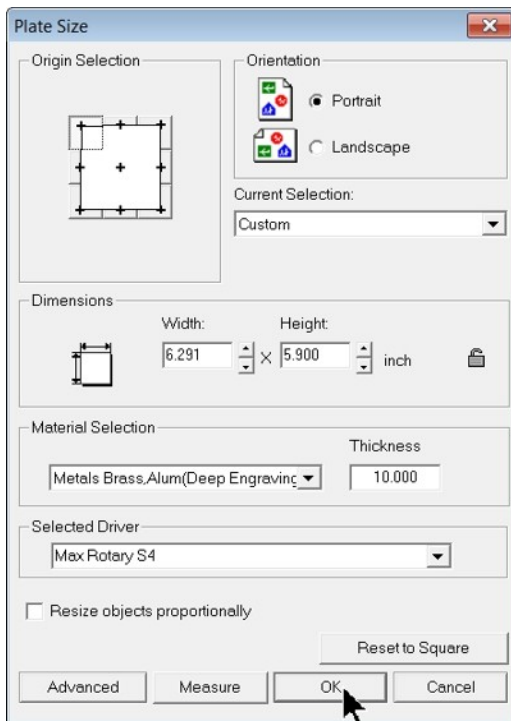
Enter the diameter of the item using the numbers on the Pendant's key pad, then press Enter on the Pendant. In this example, 2.003 was entered using the numeric keys on the Pendant. After the machine moves the spindle to the center of its engraving area, adjust the height of the vise so that the bottom of the nose cone is roughly 1 - 2 inches above the item and slide the vise forward (or towards the rear) to visually center the spindle over the center of the item.



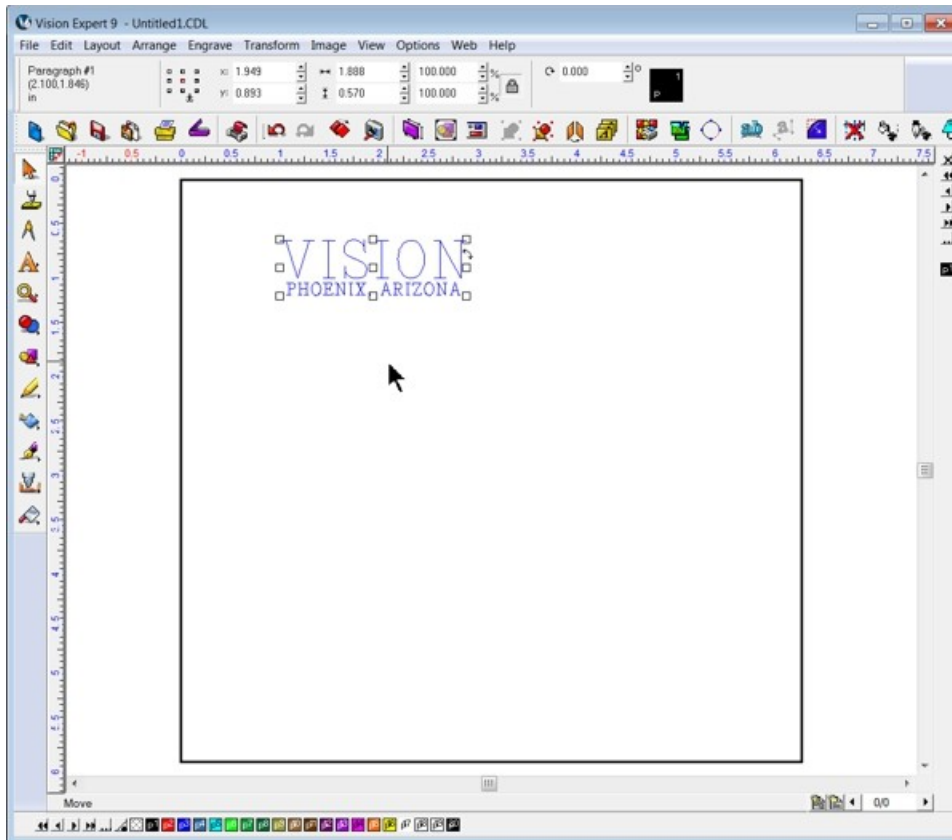
Lower the spindle using the Z Down button on the Pendant and adjust the vise as needed to position the spindle over the center of the item.



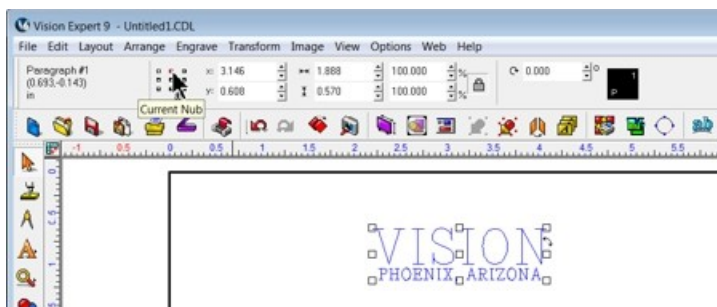
The Max Rotary S4 driver is a CENTER based driver. It will use the center of the plate size in the Vision software as the home position on the machine. For this example, the plate height is the length of the tube, which was previously measured to be 5.95 inches. The width of the plate is the circumference of the tube. Multiply the diameter of the item by Pi (3.14) to calculate the circumference. The circumference of the tube is  $2.003 \times 3.14 = 6.291$  inches. Enter the height and width into the Plate Size window and select Metals Brass\_Alum(Dep Engraving) as the material setting, then select OK.



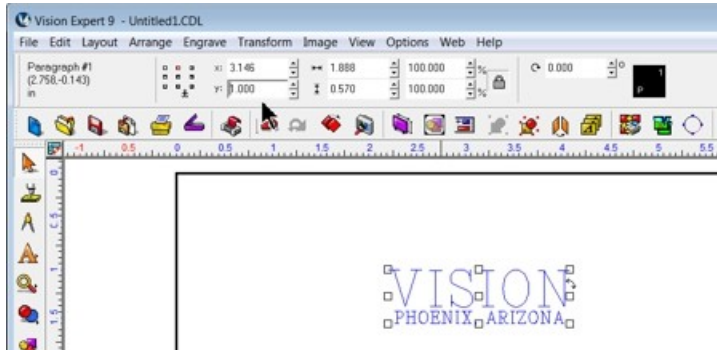
Text was added with the Text Compose tool (not the Frame Text Compose tool) and two lines of text were added in Aura1 font, with the top line being 0.375 inches high and the bottom line being 0.125 inches high.



The text was centered horizontally on the plate using the short cut keys ALT+END. (This short cut is the same as selecting Layout, Arrange and Distribute, Align to Sign Blank, Centers Horizontally). In order to place the top of the text 1 inch from the top of the tube, the Current Nub was selected as the top center nub on the top toolbar. (See mouse pointer in the picture below). The "Current Nub" is always indicated by that nub being colored red.



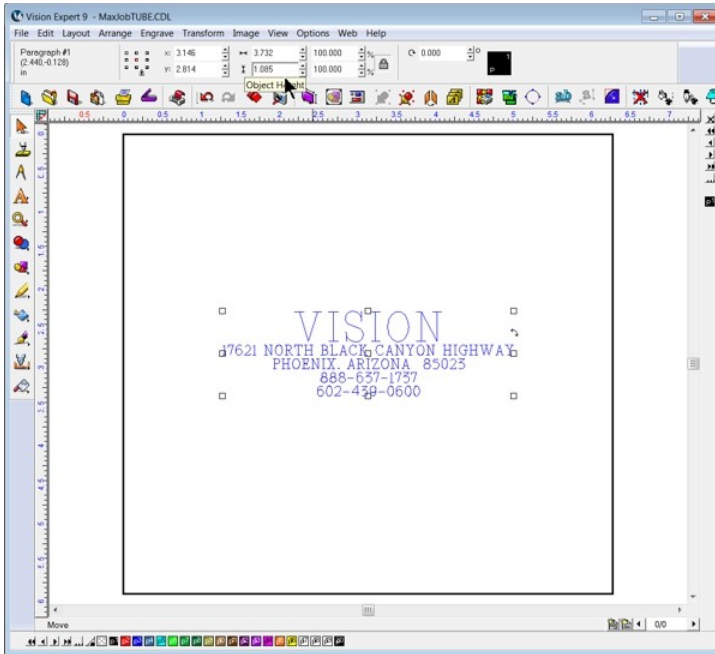
The Y-Position of this nub (the top center of the text) was then set to 1.000 inches. Enter 1.000 into the Y-Position text field (above pointer shown in the pic below), then press Enter on the computer keyboard. The top edge of the text is now 1 inch below the top of the plate, which is also the top of the tube.



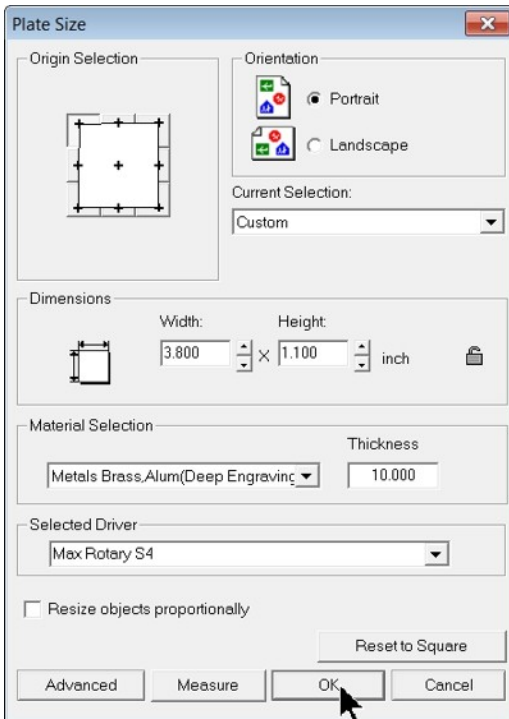
For this example, a 0.015 BAL cutter was used. The Micrometer was set to an engraving depth of 0.005 inches and the job was run using the factory material settings for Metals Brass\_Alum(Dep Engraving) with one change. The Cutting Rate was reduced to 0.40 inches per second due to the depth of engraving and the fine tip size of the cutter. The job was then run. Once the job was finished, the Micrometer was changed to 0.010 inches engraving depth and the job was run a second time to increase engraving depth. NOTE - with smooth, metallic surfaces, the metal nose cone may leave "ghost" images around the engraved graphics. This was expected in this application and when the engraving was finished, the item was lightly sanded to remove the ghost images. The sanded product is shown below.



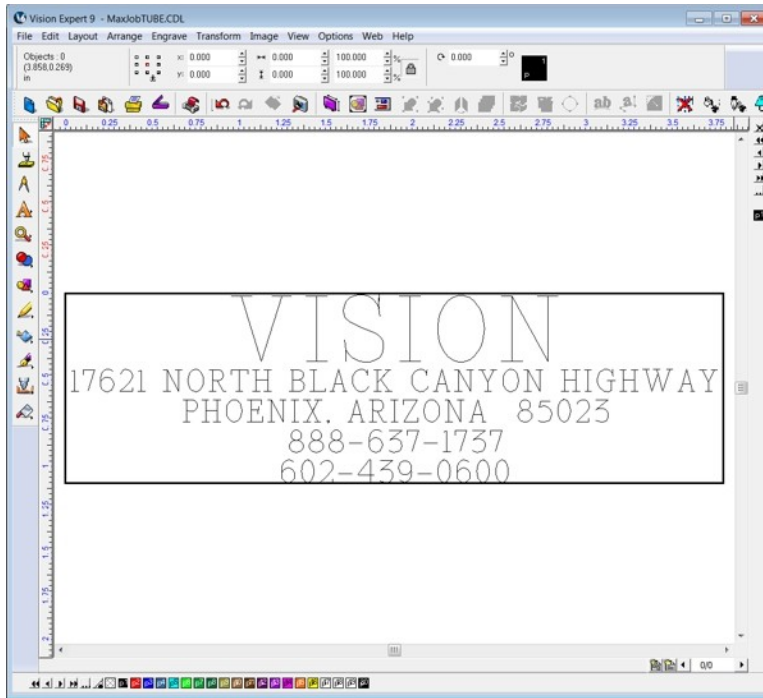
As an alternate way of engraving this tube, the text was revised as per the below picture.



Then the plate size was reduced to just slightly more than the image size. Note that in the above picture, the image size is displayed as 3.732 inches wide and 1.085 inches high. The plate size was adjusted to 3.8 inches wide and 1.1 inches high.



This text will be rotated and engraved with the text in line with the tube's centerline. It will also be positioned in a specific location.

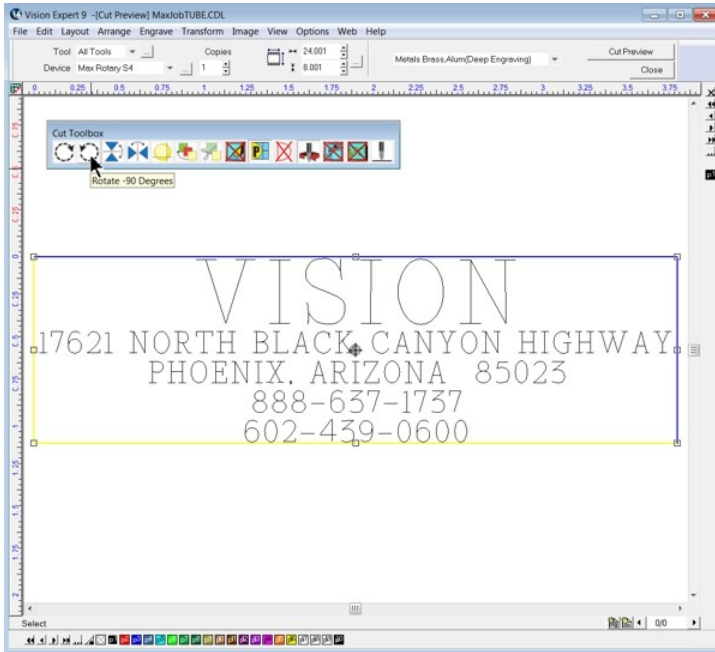


The location of the center of this text was chosen to be 2 inches from the bottom of the tube. Move the spindle using the Y Down button on the Pendant until the tip of the cutter is directly above the bottom edge of the tube. HINT - Depending on the engraving depth set with the Micrometer, it may be difficult to see the tool tip. Remove the cutting tool and install a pointed tool, such as a diamond drag cutter, and extend it below the nose cone far enough to see it easily, then adjust the Y position of the spindle over the bottom edge of the tube. Note the Y position indicated on the Pendant, then move the spindle using the Y Up button on the Pendant until the Y position on the Pendant is 2.00 inches less than indicated when the tool was positioned over the bottom of the tube. (Alternatively, the user could press the Set Home button with the tool tip aligned to the bottom of the tube, then move the spindle using the Y Up button until the Y position reads -2.000 inches). After moving the spindle, press the Set Home button on the Pendant. This will be the center of the engraving area.

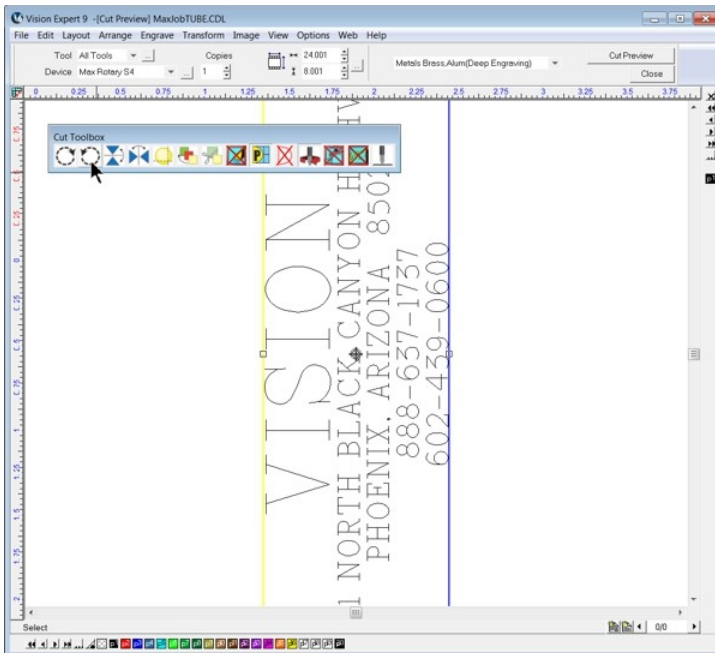




After selecting Engrave from the left toolbar, the Rotate -90 Degrees icon was selected.



This simply rotates the plate -90 degrees and changes the orientation of the graphics. Alternatively, the user could rotate the graphics in the Vision software and change the plate size, but Rotate feature allows the user to "read" the text normally, rather than having to read it sideways in the Vision software.



The job was run in the same manner as the first two lines of text in this example job. Afterwards, the tube was sanded to remove the ghost images created during the engraving process. The finished item is shown below.



## 5 Feeds and Speeds

The best way to obtain cutting speeds and feeds is by contacting the tool or material manufacturer. Otherwise, determining the optimal cutting speed and feed rate for the project at hand requires some research and experience. Researching your cutter or material will ultimately yield a chip load or a SFPM (Surface Feet per Minute) value. These tool/material specific values can then be used in the following calculations to determine the speed and feed rates for your job.

$$\text{Speed} \left( \frac{\text{rev}}{\text{min}} \right) = \frac{\text{SFPM} \left( \frac{\text{ft}}{\text{min}} \right) * 3.82}{\text{Diameter (in)}}$$
$$\text{Feed} \left( \frac{\text{in}}{\text{min}} \right) = \text{Speed} \left( \frac{\text{rev}}{\text{min}} \right) * \text{Chip Load} * \text{Number of Flutes}$$

*Speed* equals the spindle speed in revolutions per minute (RPM).

*SFPM* equals the Surface Feet per Minute and is the speed at which the cutting edge of the tool moves past the material. This value is tool and material dependent.

*Diameter* is the tool diameter.

*Feed* equals the linear feed of the tool through the material.

*Chip Load* equals the amount of material each cutting edge of the tool removes per revolution. This value is tool dependent.

Speeds and feeds are often adjusted at the machine based on chip shape and size or the cutting sound. For routing applications one should start off using the recommended chip load and RPM for the material you are cutting. Increase the feed rate until the part finish starts to deteriorate or you risk moving the part. From this point, decrease the feed rate by 10%. Next decrease your RPM until your surface finish deteriorates, then increase your RPM until the finish is acceptable. These steps will yield the optimal speed and feed rates and the largest chip possible. Take note of these values for future reference.

Factors that will affect your feed and speed values include:

- Hardness of the material - Wood is the perfect example of this variable. A hard wood such as oak will require a slower feed rate than pine.
- Chip removal efficiency – A large nose cone and high volume vacuum will remove chips more efficiently thus allowing for faster feed rates.
- Size and Type of Cutter – A fine tipped cutter is more fragile and will require conservative feed and speed rates.
- Required Accuracy and Job Detail – products requiring fine detail or accuracy will require

slower feed rates to account for tool deformation.

- Hold down method – The more securely a product is held down the more aggressive the feed and speed rates can be.
- Depth of cut - Shallow cuts can be made with faster feed rates.
- Strength/Speed of Motor – The strength and speed of the motor will limit the materials that can be cut and what feed rates you can cut at. The optional engraving and routing motors will cover most all engraving/routing needs.
  - The NSK High-Frequency 50,000 RPM Engraving Spindle is perfect for deep engraving into metals. The high RPM allows cutters to stay sharp much longer for increased production and allows for much faster speed in engraving.
  - The 3.25 HP 18,000 RPM Router Motor is perfect for routing applications in all materials.
  - The Standard Engraving Head can work at speeds up to 18,000 RPM, is driven by the Router Motor and can easily cut through plastics and woods.
  - The High Speed Engraving Head is capable of 30,000 RPM, is driven by the Router Motor and can increase feed rates when engraving many materials.

## 6 Maintenance

### How to Remove and Clean the Air Filter

Weekly preventive maintenance should be performed to ensure reliable operation of the machine's controller. It is recommended that the input fan filter be removed weekly and cleaned to ensure proper cooling of the electronics. The filter is located on the back of the machine.

- i. Remove the filter guard; this is easiest if you pull from a corner of the guard.
- ii. Remove the filter and blow out the filter with low pressure compressed air, or rinse the filter with water and dry before replacing.
- iii. Replace the filter and replace the filter guard.

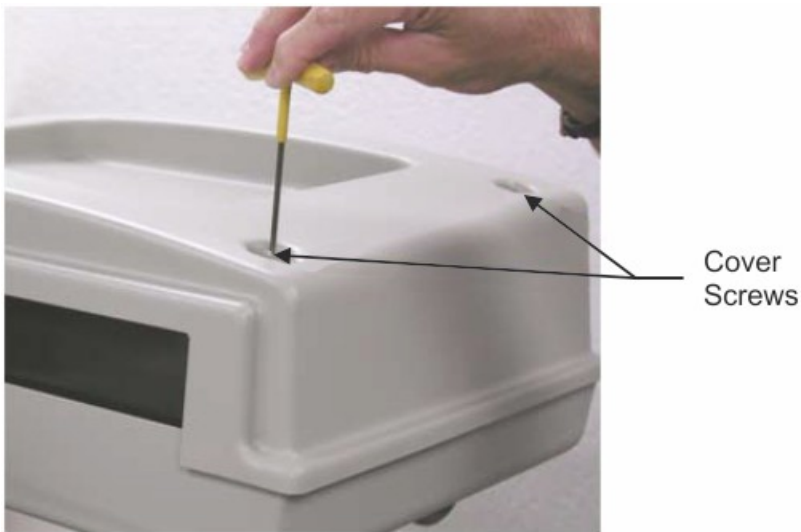


### **Cleaning and Lubrication of the Motion System**

The linear bearings and leadscrews should be cleaned and lubricated periodically. Time periods between cleaning and lubrication will depend on the materials being processed and the amount of time per day the machine is used. The Z-Axis is exposed to more debris than the X and Y-Axis. Clean the Z-Axis at least once a month and lubricate the linear bearing every 3 - 6 months when the machine is under moderate usage. The X and Y-Axis bearings and leadscrews should be cleaned and lubricated once every year.

#### **Procedure**

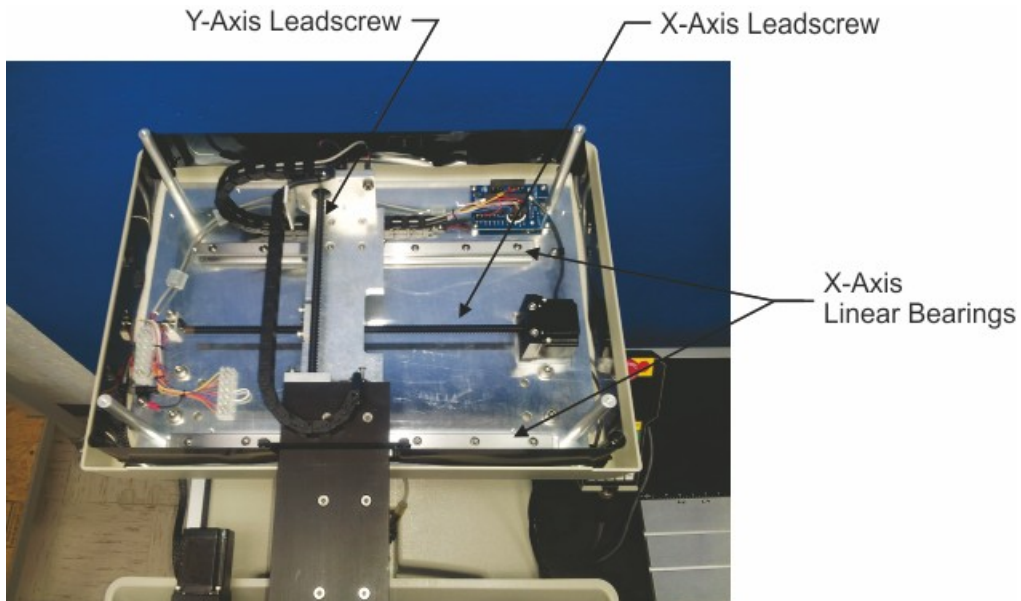
The X and Y-Axis of the motion system are under the top cover. Remove the 4 screws securing the cover.



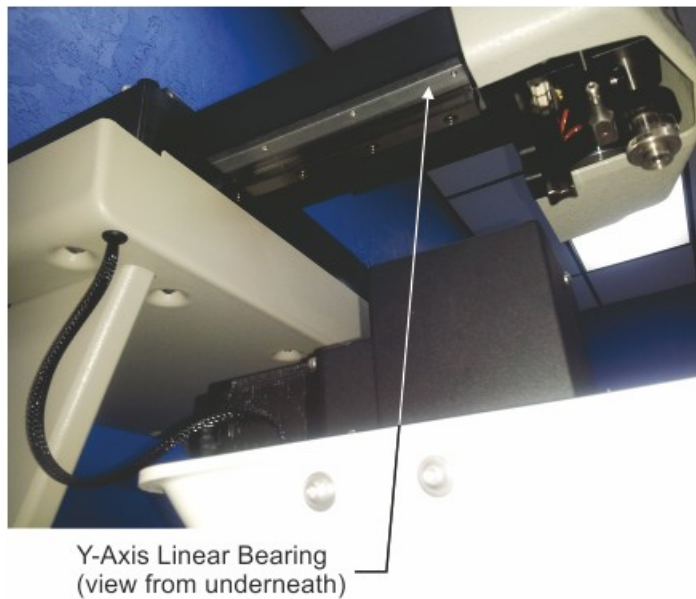
Lift the cover off the machine.



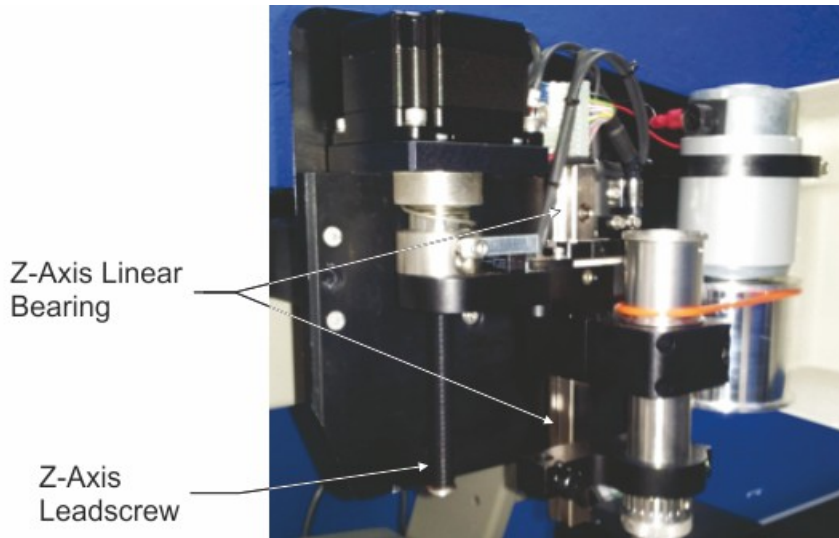
Inside the cover, the X and Y-axis Leadscrews and the X-Axis Linear Bearings are easily accessible. Clean the Linear Bearings by wiping them down with a clean cloth. The Leadscrews will likely have lubricant residue on them. Clean the Leadscrews by using a brush or a clean cloth to remove any large debris.



The Y-Axis Linear Bearing can be accessed by moving the spindle forward (in the Y-Axis). The bearing is under a cover, but accessible from underneath the cover. Clean this bearing with a cloth.

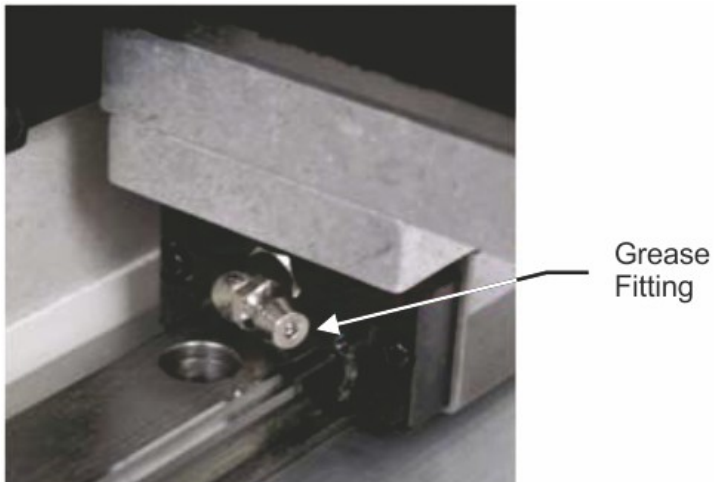


The Z-Axis Linear Bearing and Leadscrew are accessible by opening the spindle cover and should be cleaned with a clean cloth or a brush.



Lubricate the Leadscrews by using a Teflon-free Silicone Spray Lubricant. A light coating is all that is necessary. Make sure components around the leadscrews are protected from over spray. HINT: Use a paper towel and tuck it behind the leadscrew to protect surrounding areas from over spray.

All linear bearings have a grease fitting to lubricate the bearings and bearing rails. Use a hand pump style grease gun with Lithium based grease. The grease fitting for the Y-Axis is shown below. Only use on pump of grease in these bearings. Do not apply so much that the grease comes out of the bearings. This can damage the bearing seals. A grease fitting "nozzle" is best to use to grease the bearings.





### Replacing the Drive Belt

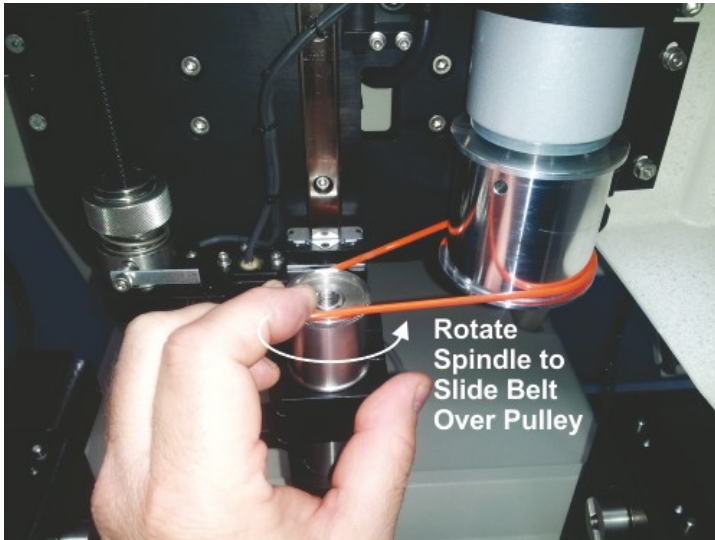
The drive belt will need replacement periodically, depending on usage. To remove the drive belt, lower the spindle and roll the front edge of the drive belt over the lip of the spindle pulley.



Remove the old belt and place the new belt on the motor pulley as shown.



Stretch the belt and rotate the spindle pulley as shown to allow it to roll over the pulley lip. Do not stretch the belt completely over the pulley. Doing so may cause the belt to stretch beyond its limits and the belt may not apply sufficient tension to drive the spindle.



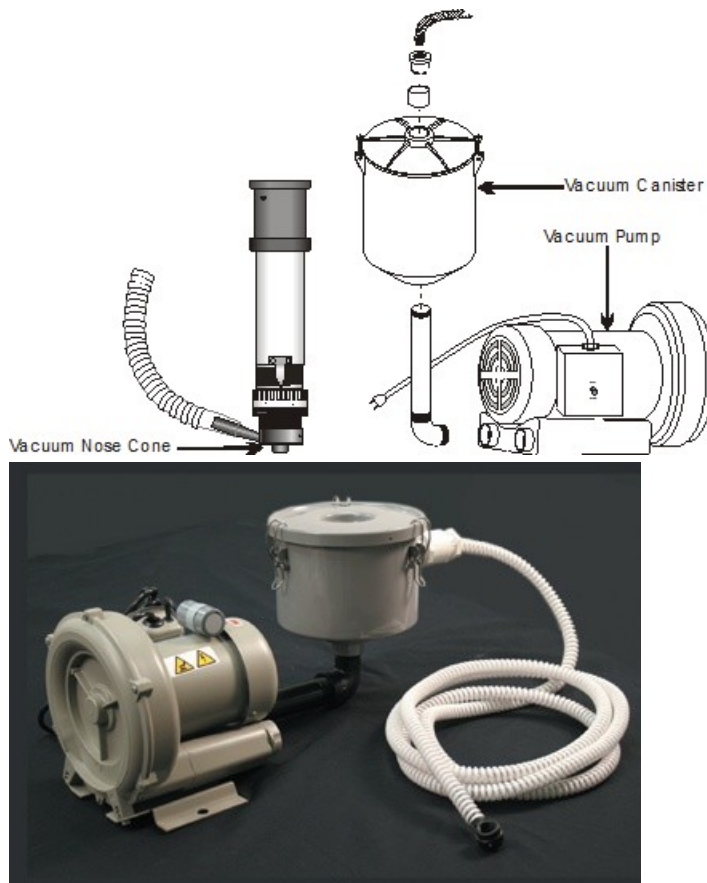
## 7 Optional Accessories

These accessories are available for purchase directly from Vision, or your local distributor, as well as through [www.visionengravers.com](http://www.visionengravers.com). If you have any questions about these accessories, please contact Vision or your distributor for advice for choosing the best accessories for your applications. Vision can also help if you have a need for special fixtures, or modifications to our standard accessories. Please call us for details.

### 7.1 Vacuum Chip Removal System

Processing plastics, acrylics, sign foam and wood, produces a significant amount of debris that can clog the nose cone and/or get trapped between the nose cone and the material, which will cause engraving/cutting depth inconsistencies, potentially scratch the surface of the material and cause overheating in the spindle area. The vacuum chip removal system is designed to simplify the engraving process and minimize wear and tear on the engraver. It uses a vacuum nose cone to remove chips created during the engraving process before they have the chance to create problems. The quiet pump, coupled with the micro-fine layered filters, assures that your unwanted chips are whisked away effortlessly. The vacuum pump canister uses replaceable/reusable filters to assure maximum efficiency and cost-effectiveness. This vacuum chip removal system is available with or without a Vision vacuum nose cone.

#### The Optional Vacuum Chip Removal System



## 7.2 Hold Down Clamps

### Wedge Clamps

Simply slide the clamp onto the T-Slot table surface and position it over the edge of the engraving stock. The downward clamping force eliminates bowing. This clamp can be used with material up to 1/4" thick.



### Push Down Clamps

This double-sided clamp secures items from the edge. It is ideal for heavy-duty items that are being cut, contoured or engraved.



### Edge Clamps

This clamp is designed to secure engraving materials from the top surface and avoids bowing in most applications. This clamp will hold material thicknesses of .020, .032, .062, and .125 by rotating the clamp and tightening a thumbscrew.



### Corner Clamps

This clamp is designed to hold down square or rectangular plates. By lining up the "V" cut-out of the clamp with the corner of the plate, the engraver is allowed maximum engraving space. It will hold material as thin as 1/32".



## 7.3 Fixtures

### Universal Pin Fixtures

Available for the Versa Vise, T-Slot table, and Self-Centering Vise. Also usable with other computerized engravers and Pantographs. These fixtures enable engraving on uniquely shaped items such as pens, lighters, knives, keychains, and more.



### Universal Clamping Bars w/Medallion Holder

These clamping bars hold 1 to 3 round objects at a time. Engrave multiple notary seals, paperweights, and a variety of other circular items. With a place for the “eye” of medallions, this clamp adapts to any vise or table that has a T-Slot system.



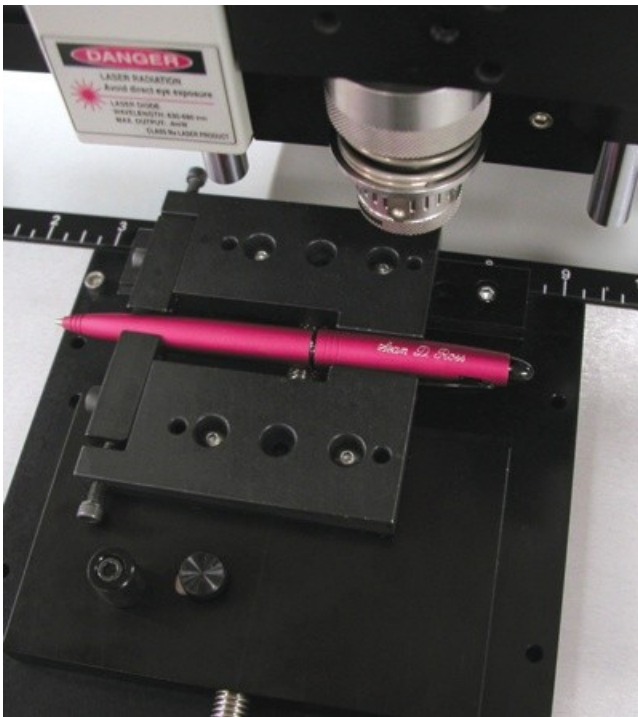
### Seal Fixture

The Seal Fixture enables engraving on notary seals, medallions, coasters, paperweights, dog tags, and other round objects. Usable with the Quick-Lock or Versa Vise.



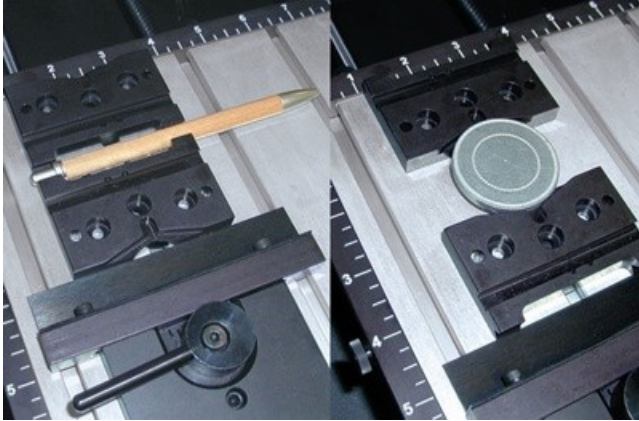
### Adjustable Pen Fixture

Enables engraving on most pens and cylindrical items that vary in diameter from end to end. Available for most computerized engravers and Pantographs. It is also usable with the Versa Vise and Self-Centering Vise.



### Pen & Medallion Fixture

This is a double-sided fixture that, when turned in one direction, accommodates a pen, and when turned in the other direction, accommodates a medallion, seal, or other circular item. With a space for the “eye” of the medallion, this fixture is usable with the Versa Vise or Quick-Lock Vise.

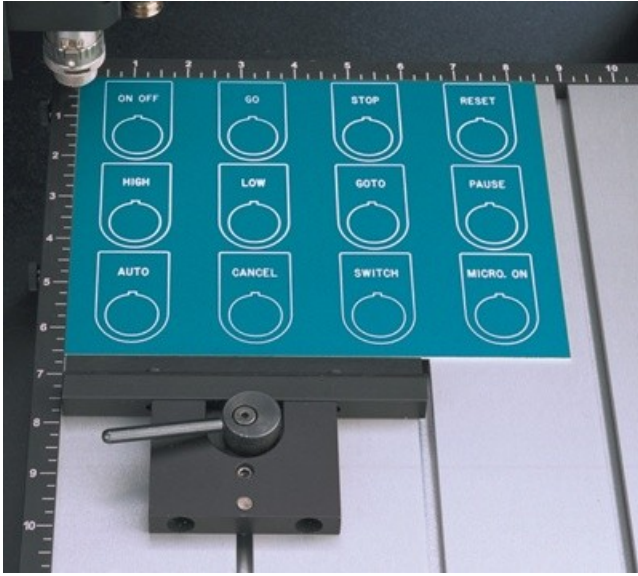




## 7.4 Clamping Vises

### Quick Lock Vise

The Quick-Lock Vise is specifically designed for T-Slot table users. The “cam” type locking device allows for quick changing of parts. This vise is supplied with a removable front clamping plate which allows for the holding of thicker items.



### Self-Centering Deep Vise

This self-centering vise allows for easy setup of odd-shaped items up to 3 1/4" deep.

