



# LaserLink

## Beam Dynamics CAD/CAM program

Instructions, Hints and Sample Jobs





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## About LaserLink CAD/CAM

The LaserLink program runs on an external PC or Laser Machining Centers (LMCs) configured with the “Pro-Panel” touch screen Human Machine Interface (HMI) option. LaserLink licenses are sold by Beam Dynamics and require a special code to unlock for use on PCs. The program allows the user to import CAD files, view and manipulate the geometry and assign settings to each layer using an editable database of material settings.

When LaserLink creates an output file (file extension .lmc) it is saved in a specified directory on the host PC or Network. When the user enters the File Menu on the control panel of the LMC (or load tab with touch screen HMIs) a list of available files is displayed for loading on the machine.

All Beam Dynamics software (internal and external to the LMC System) is copyrighted and is protected by U.S. Copyright laws and applicable international treaties.

This software may only be used under the following license agreement. The LaserLink software may be used by any number of people and it may be freely moved from one computer to another computer as long as there is NO POSSIBILITY of it being used on more than one computer at a time. It is a violation of the license agreement to use this software on two computers at the same time. If individual(s) want to use LaserLink™ with two or more computers at the same time, YOU MUST PURCHASE A SEPARATE COPY of LaserLink™ for each computer.

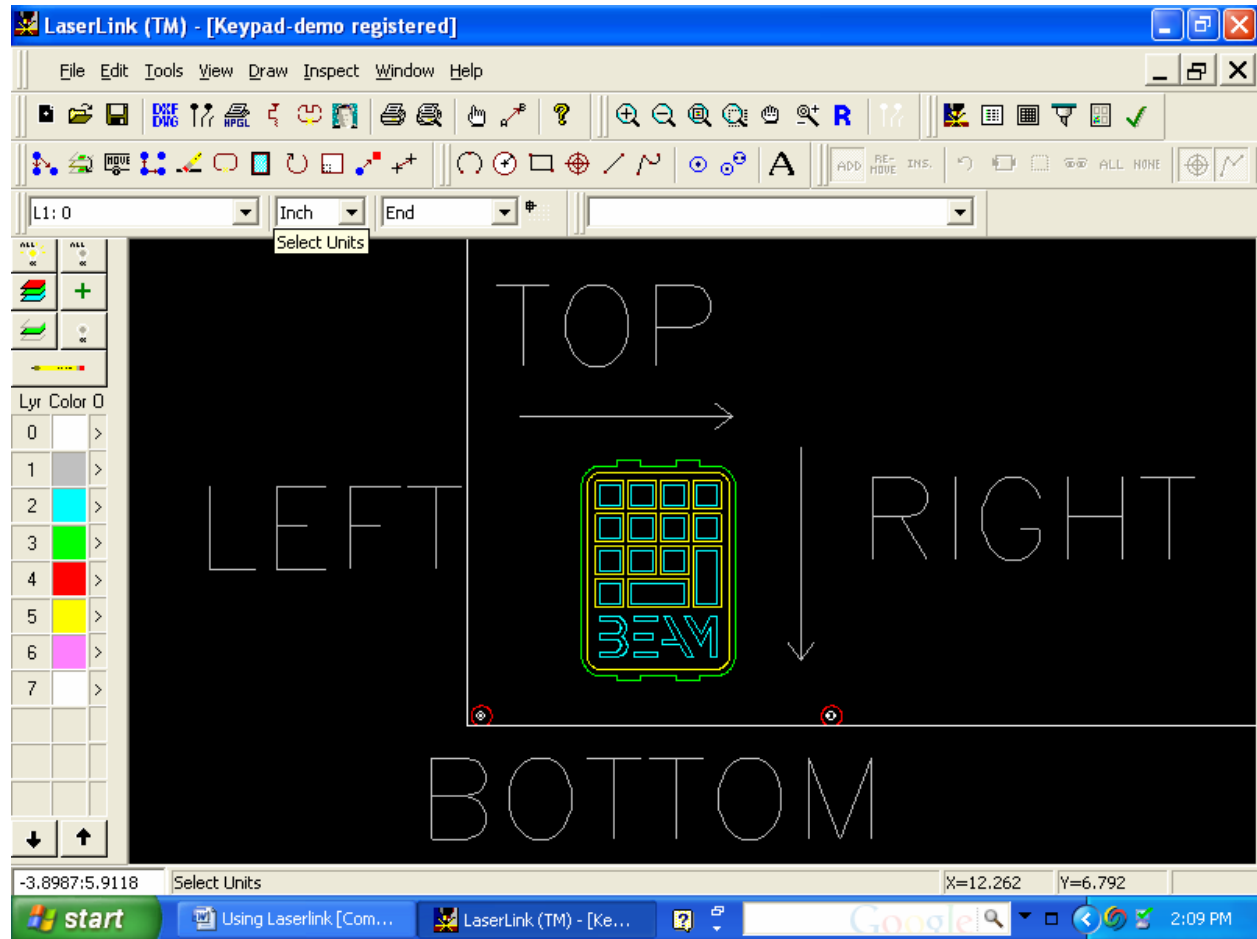
Beam Dynamics Inc. will seek maximum compensation and damages should we become aware of a copyright violation.

This software contains trade secrets and you may not de-compile, reverse engineer, disassemble or otherwise reduce the software to human-perceivable form. You may not modify, adapt, translate, rent, lease or create derivative works based upon the software or any part thereof.



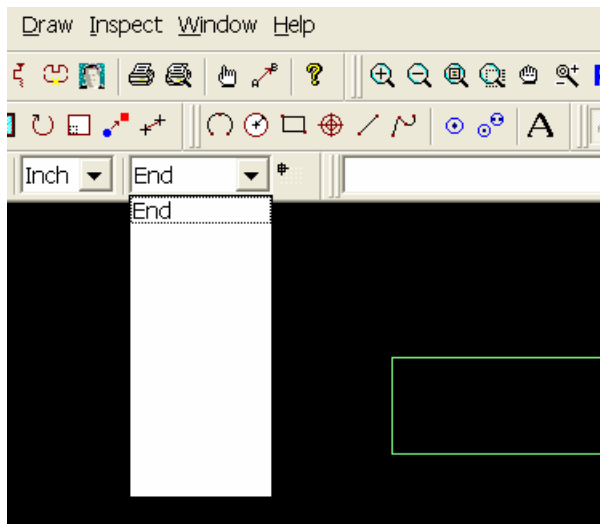
### Hint. Selection Tools in LaserLink

LaserLink allows you to select features individually or by boxing them. For example, if you want to erase something on the image below you can select “ERASE” and use the selection tool to left click on individual items to pick them. You then right click to erase. You can also click the left mouse button and drag from the TOP LEFT towards the BOTTOM RIGHT then left click again to select features. This selection method will only select those items you completely box. If you click the left mouse button and drag from the BOTTOM RIGHT towards the TOP LEFT you will select any feature that is touched by the selection box.

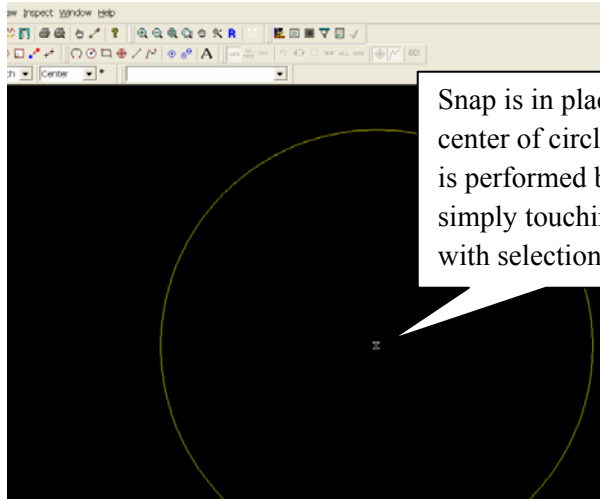


## Hint. Snaps in LaserLink

Snaps allow you to snap to a specific location on a drawn feature like the end of a line or center of a circle. Snaps work with all selection tools in LaserLink allowing you to simply touch a line and snap to a desired location. A snap symbol appears when the snap is in place. Typically left clicking will cause the Snap to take effect.



Snap symbol

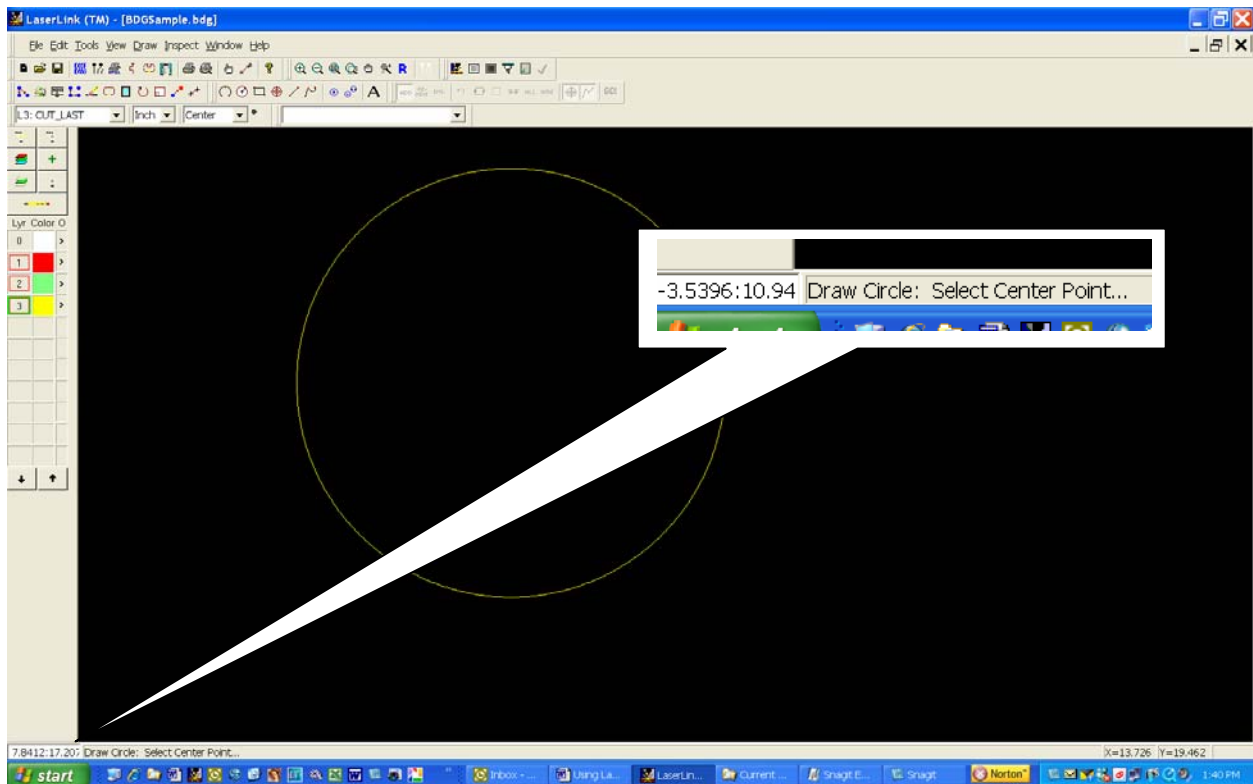


Snap is in place to center of circle. Snap is performed by simply touching circle with selection tool.



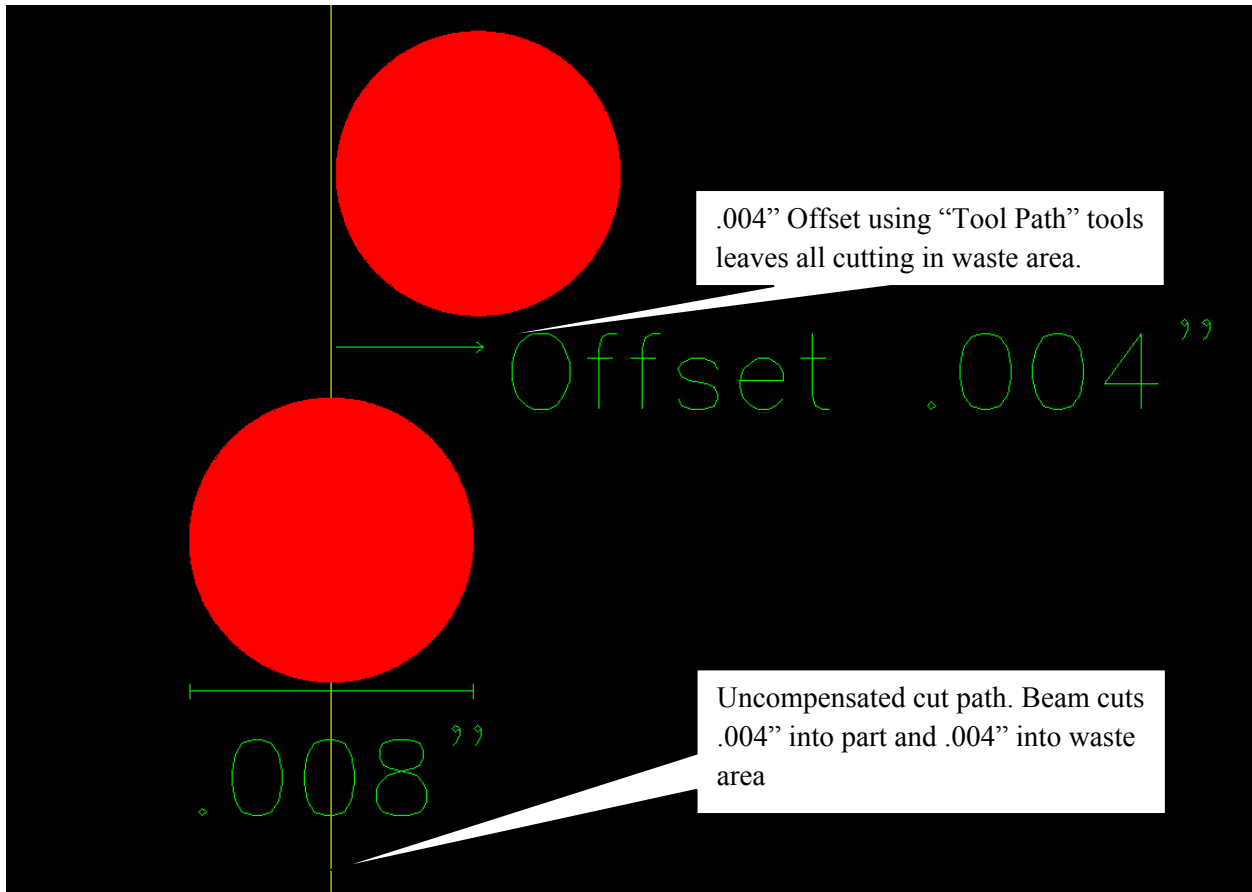
## Hint. Entering absolute coordinates in LaserLink

LaserLink allows you to do limited Computer Aided Design (CAD) work. One valuable tool to create exact sized parts is the coordinate box. For example, if you create a rectangle you can highlight the coordinate box and enter 0,0 as the first corner and 4,6 as the second corner. This will give you a 4" x 6" part.



**Hint. Remember the “kerf” of the laser beam.**

Woodworkers consider the width of their cutting blade when making furniture. When precision laser cutting it is equally important to consider the width (kerf) of the material vaporized by the laser. While a saw blade can be 1/8” thick the LMC beam is typically .006” to .008”. A mechanically precise part can be obtained by taking this kerf into consideration and compensating for it with tool LaserLink tool pathing tools.

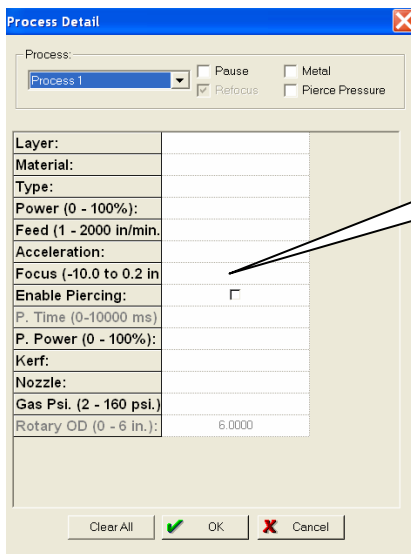




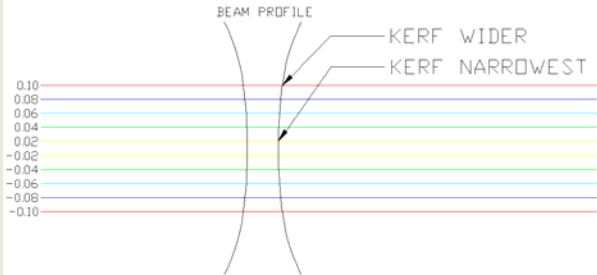


**Hint. Focus height. Over and under focusing.**

The laser beam is blown up and projected around the cutting area of the Laser Machining Center in a beam about 1/2" around. The beam is focused by a lens in the gantry or cutting nozzle to a "in-focus" spot of .004" to .008". It is possible to de-focus or over-focus the beam to hit the material being processed at a wider point in the focus plane to achieve a variety of effects. For example, you can just heat and weld a plastic part with a 1/8" wide beam path by de-focusing by two inches or so. Keep in mind that every time the spot size is doubled the energy density delivered to any specific surface feature is only one quarter.



Set Focus Height in process table. Use caution to prevent head crashes!



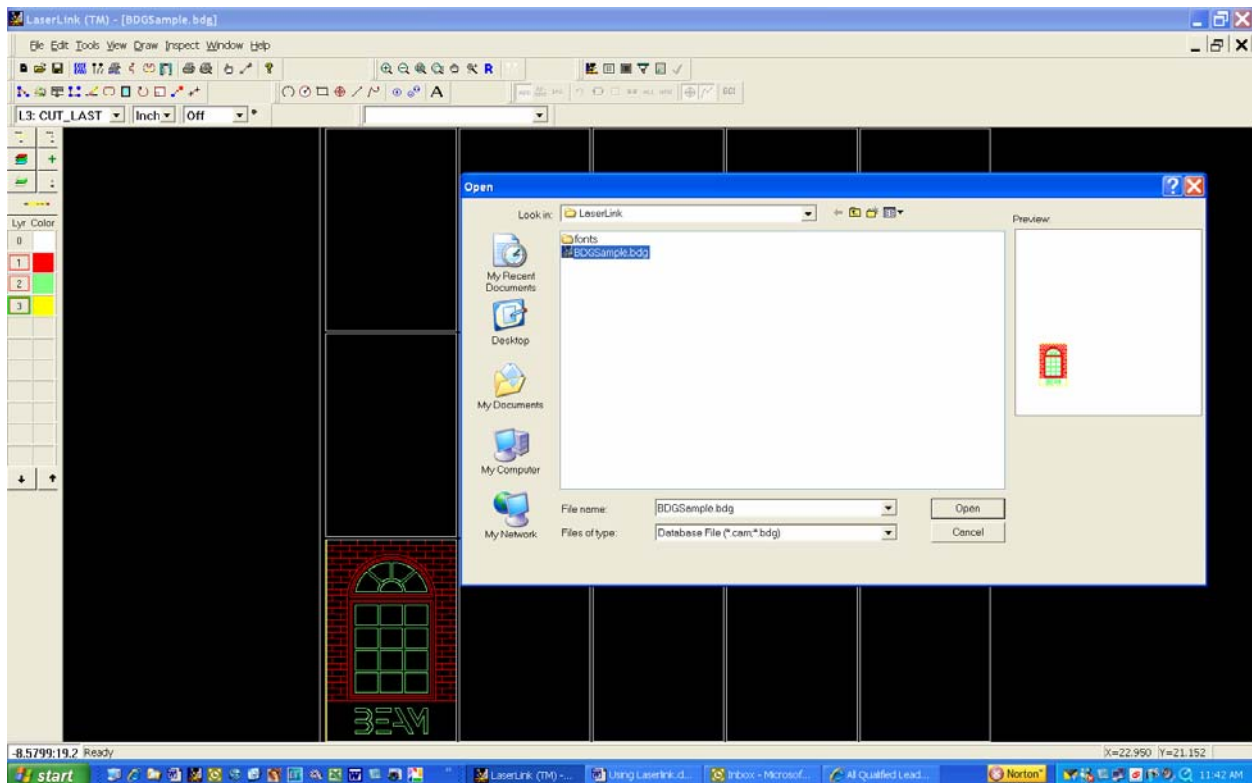


## Tour of LaserLink

File Menu  (Open .BDG File Shortcut Key)

**“File - Open”:** Left click “File” then “Open” to see the file menu. Select an existing Beam Dynamics Graphics File (file extension .bdg) file to open.

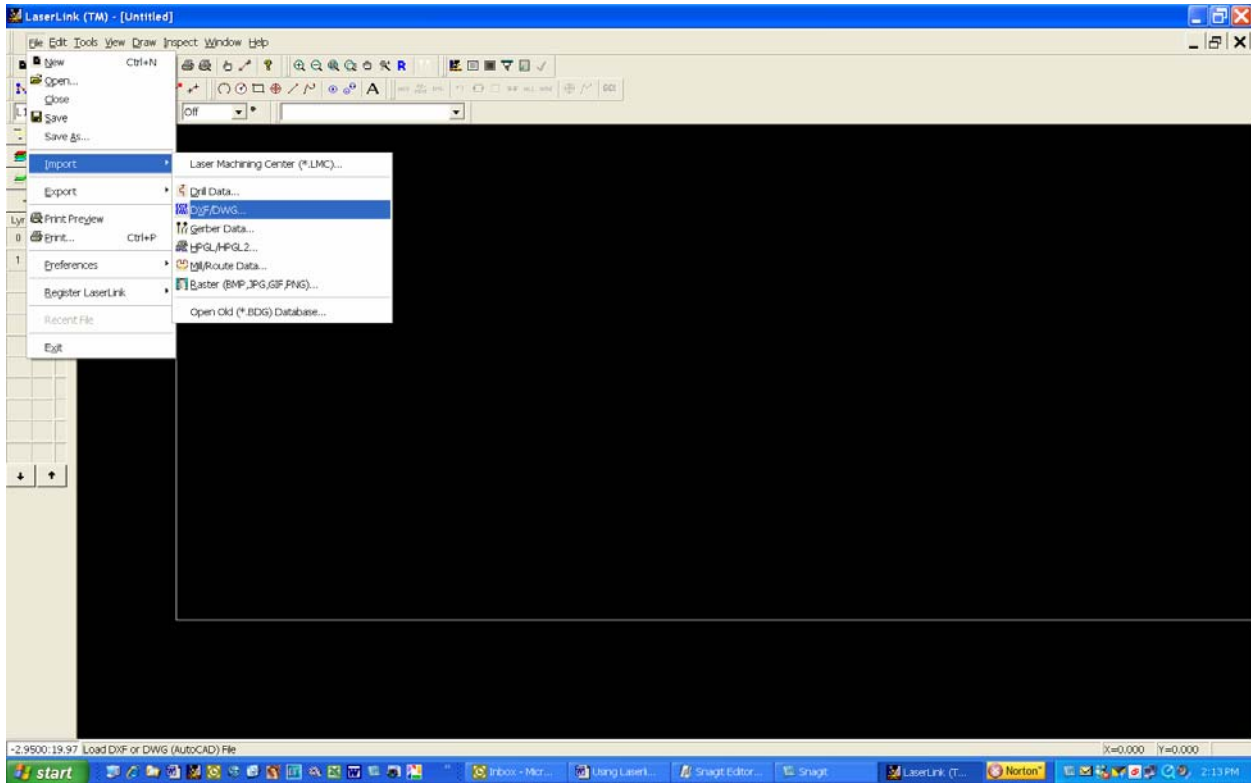
The .bdg is the LaserLink native file format. All of the drawing information is stored in the .bdg. You can re-open an existing .bdg in order to make changes or re-process a Laser Machining Center .lmc file. The .lmc file is output by the .bdg and contains only the cut information the machine tool requires to run. The .lmc is the actual machine language.





File Menu (File Formats Import Shortcut Keys)

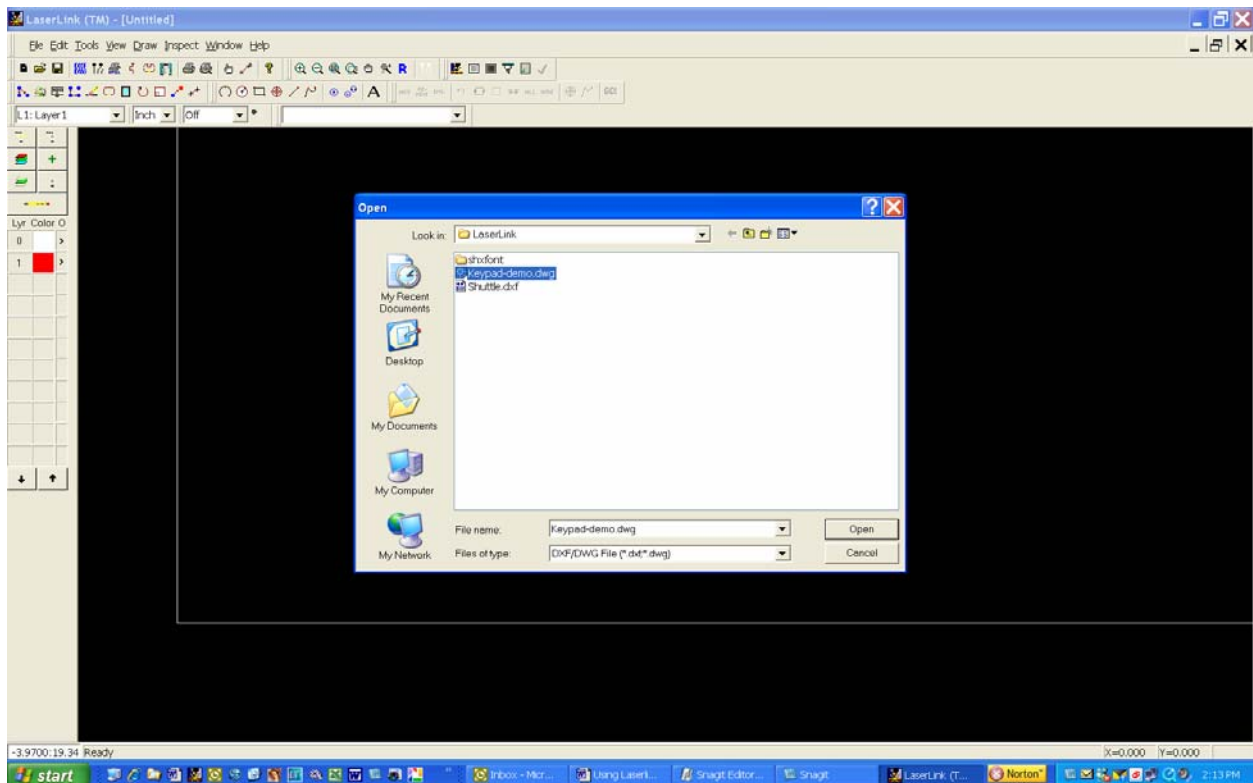
**“File - Import”:** Left click “File” navigate to “Import File” and left click on the type of file you wish to import. (See next page)





File Menu -

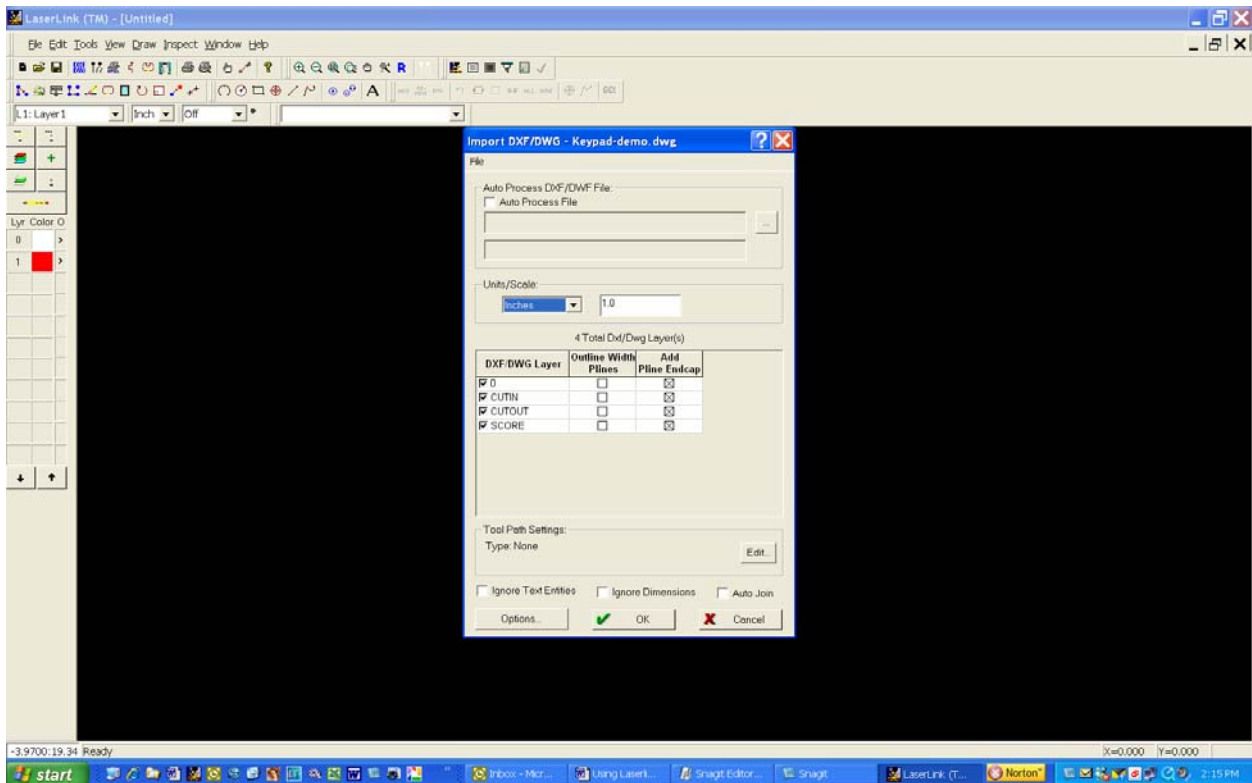
“File - Import”: continued. Find the file you wish to import into LaserLink and left click Open. The Import DXF/DWG dialogue box will now appear. (See next page)





File Menu

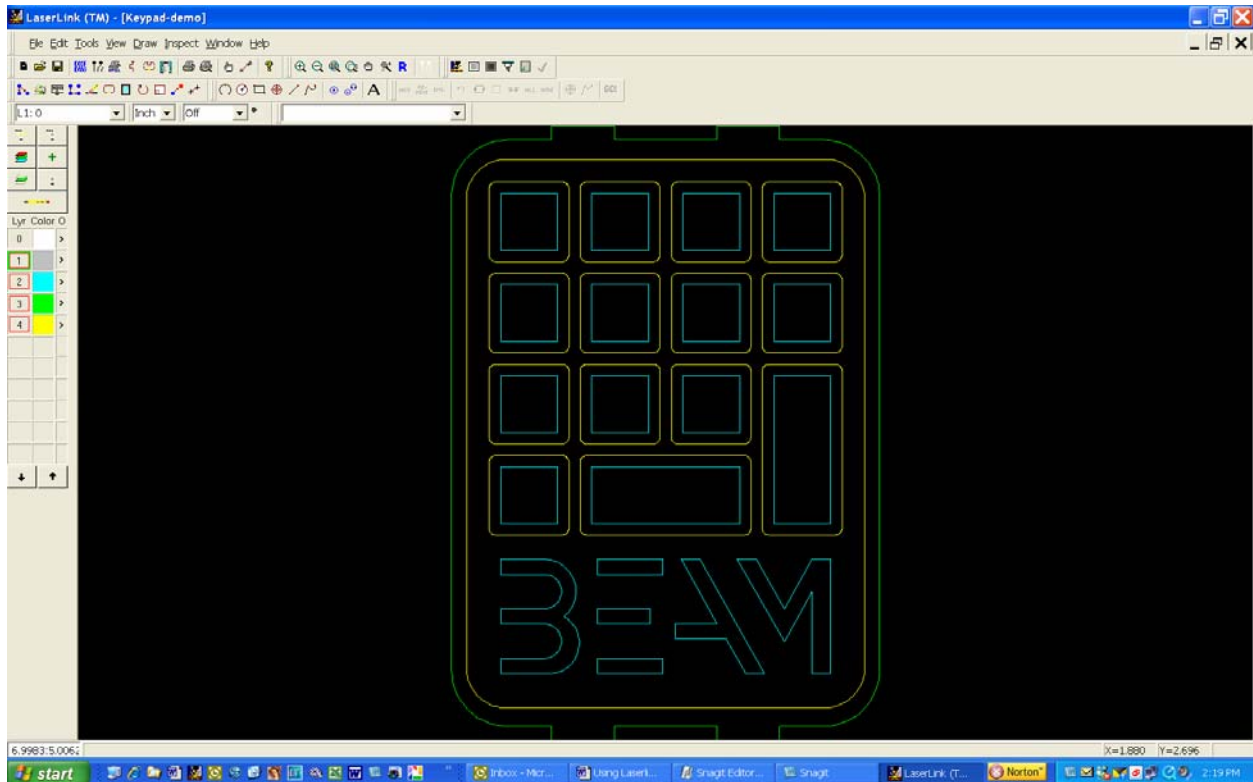
**“File - Import”**: continued. Import DXF/DWG dialogue box allows you to select an existing Auto Process File (layer names must match exactly), select Units/Scale in which drawing was created and perform Auto Tool Path on import. No Auto-Process on import options are selected in this case. (See next page)





File Menu

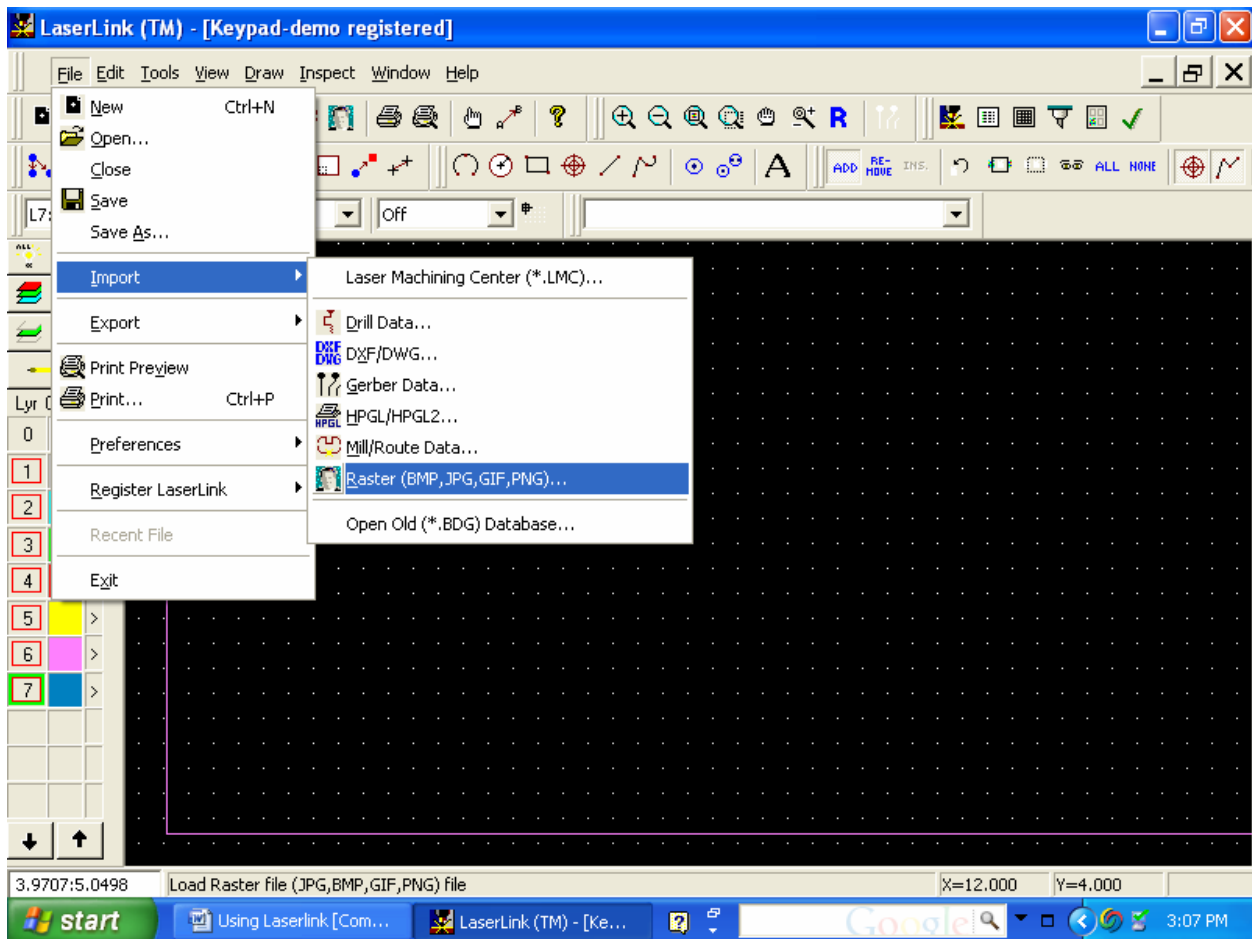
“File - Import”: continued. File following import.





File Menu

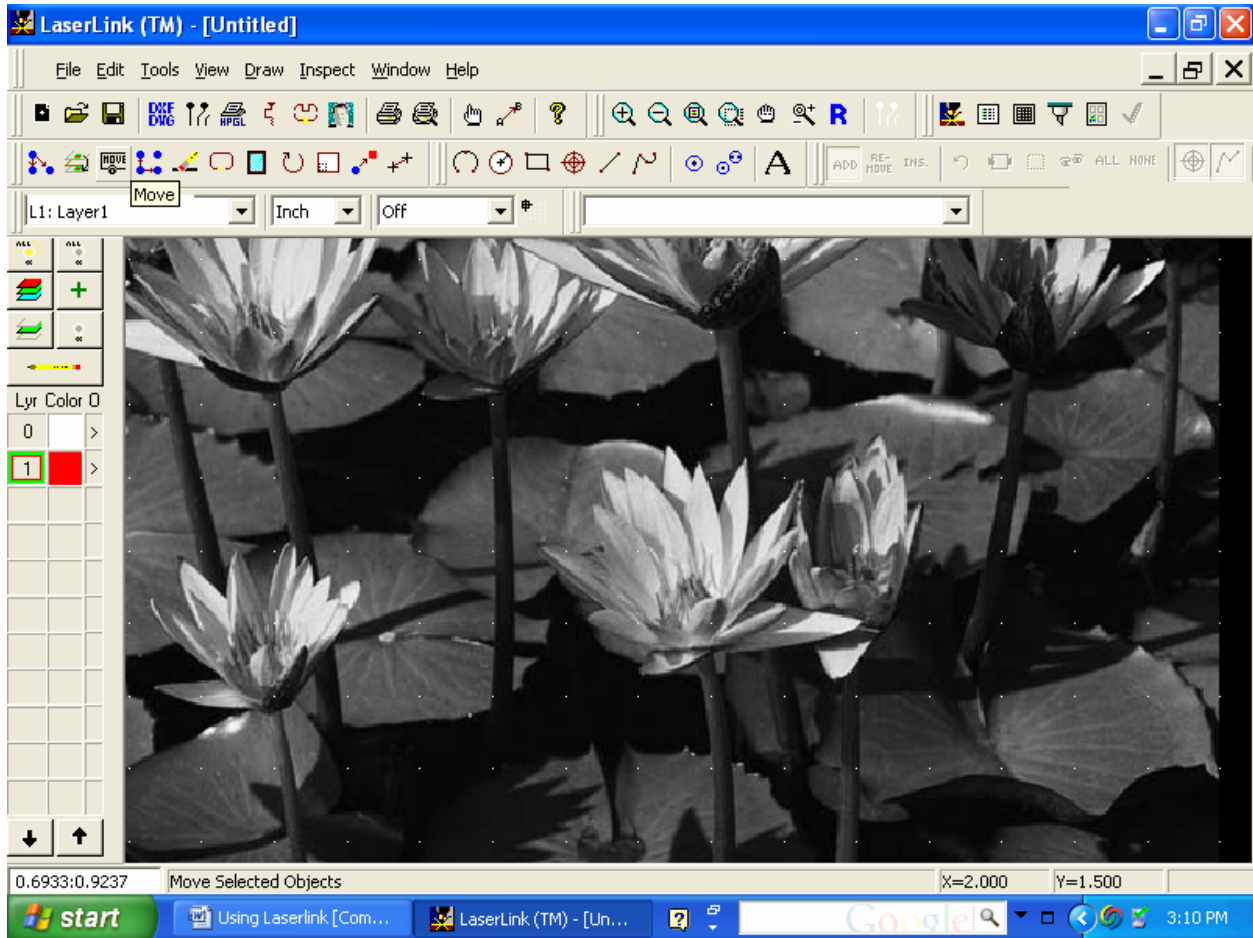
**“File – Import - Raster”**: LaserLink can engrave a photo image. To get correct grey scale balances you will need to use a program like Adobe Photoshop or a specific program for laser like PhotoGrav. (See next page)





File Menu -

“File – Import - Raster”: continued. You can now either directly engrave the photo image or use the drawing tools to outline particular features you wish to cut in conjunction with the engraved image.

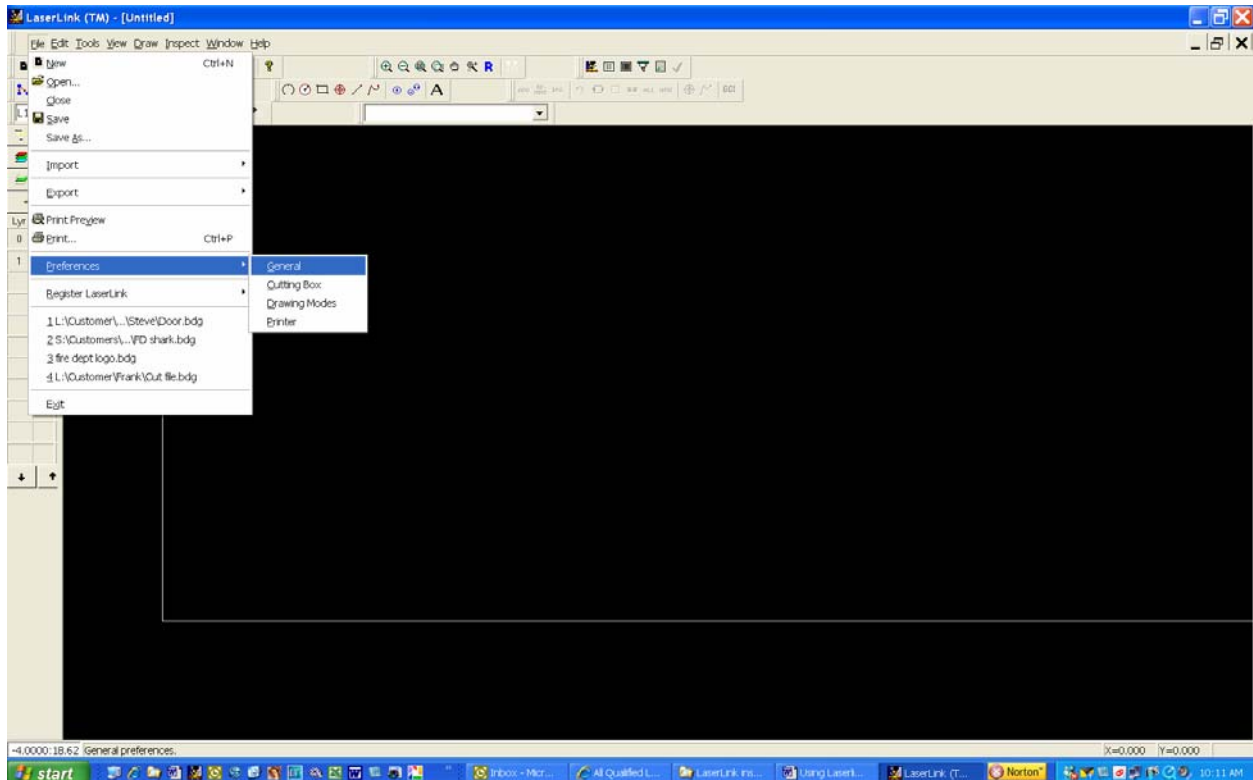






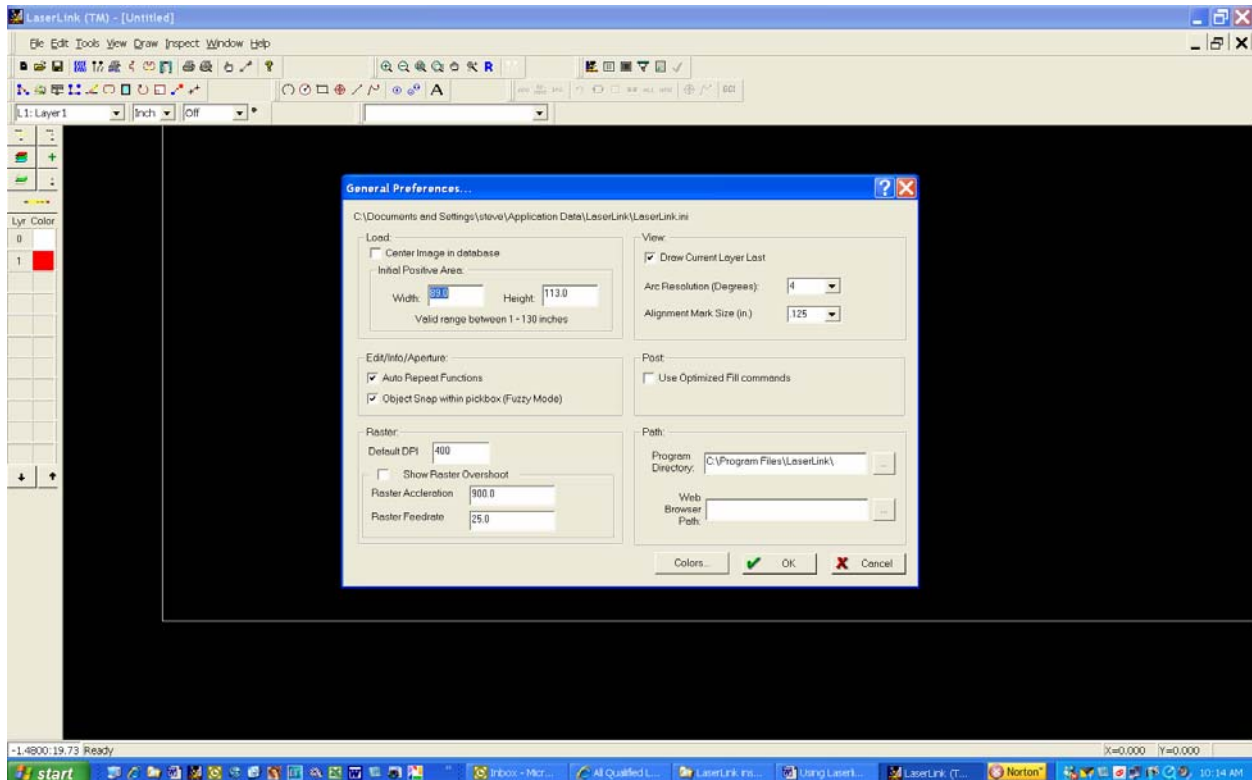
## File Menu

**“Preferences - General”**: Left click “File” navigate to “Preferences” and “General” then release left click to be presented with the preferences general dialogue box. *(see next page)*



## File Menu

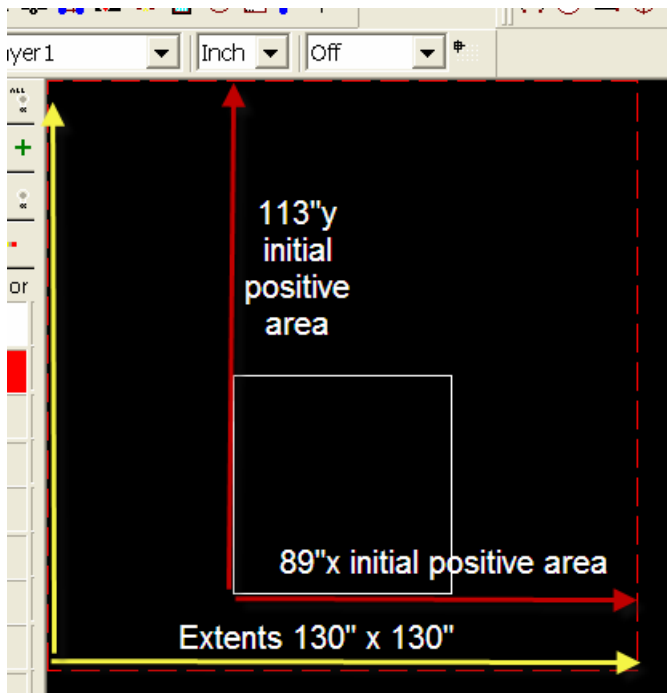
**“Preferences – General”**: continued. General Preferences Dialogue box. Settings created in this dialogue box will take effect each time LaserLink is opened. (see next page)





## File Menu

**“Preferences – General – Load Field”**: “initial positive area” – default width is set at 89” and height 113”. This is the area in which the “cutting box” displayed here at 48”x48” will be represented with 0,0 as the bottom left corner of the cutting box. The default numbers are used in order to comfortably fit a 48”x96” cutting box within the Extents limits of the working area. The extents limits of the working area can be viewed by checking the “Extents” box (red dashed box) in the view menu. Images cannot be manipulated outside the Extents limits.





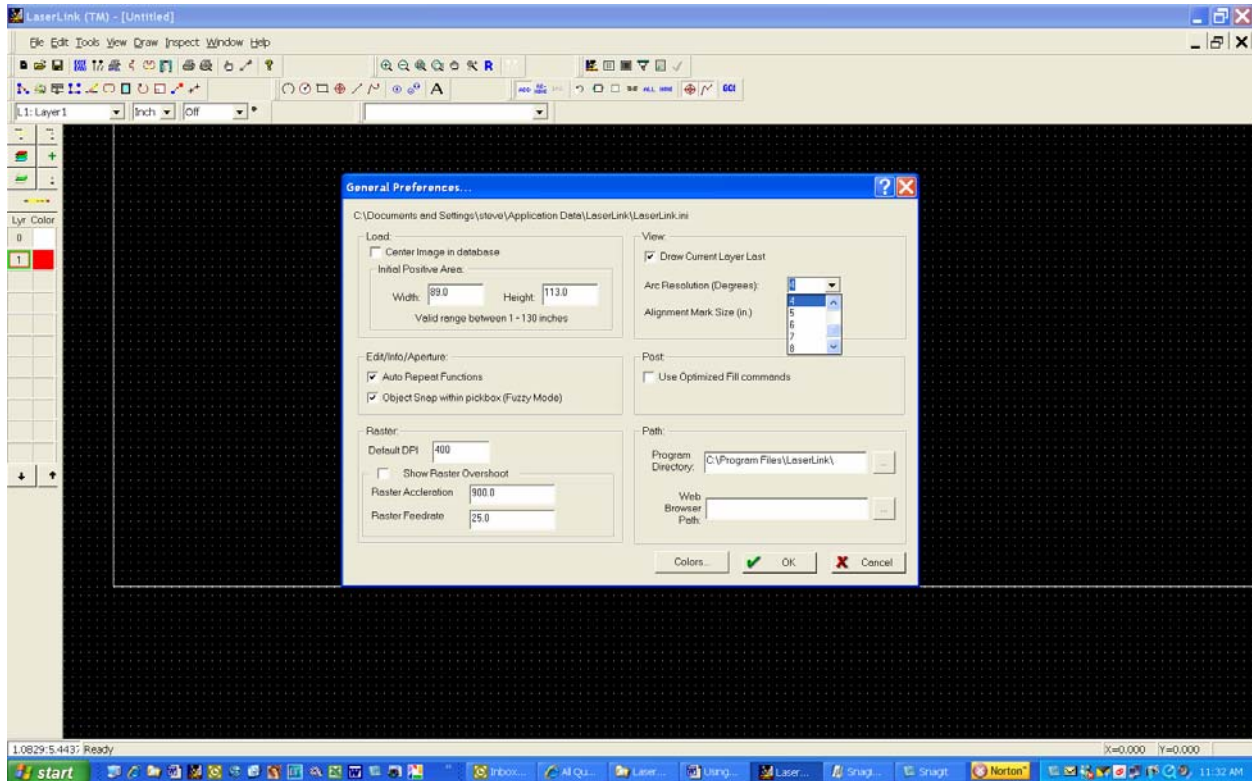
## File Menu

### “*Preferences - General - View Field*”:

 Arc Resolution and Alignment Mark Size

These are display preferences where you can select how an arc will display in LaserLink. If you select the default 4 degrees any arc less than 4 degrees will display as a straight line. If a very small arc resolution is used the program can get bogged down generating a display for features with a lot of arcs.

“Alignment Mark Size” simply sets the display size of the alignment mark symbol used by LaserLink when you are selecting alignment features for the vision system to register to. If you find the alignment mark symbol obscures other features it can be made to display smaller.



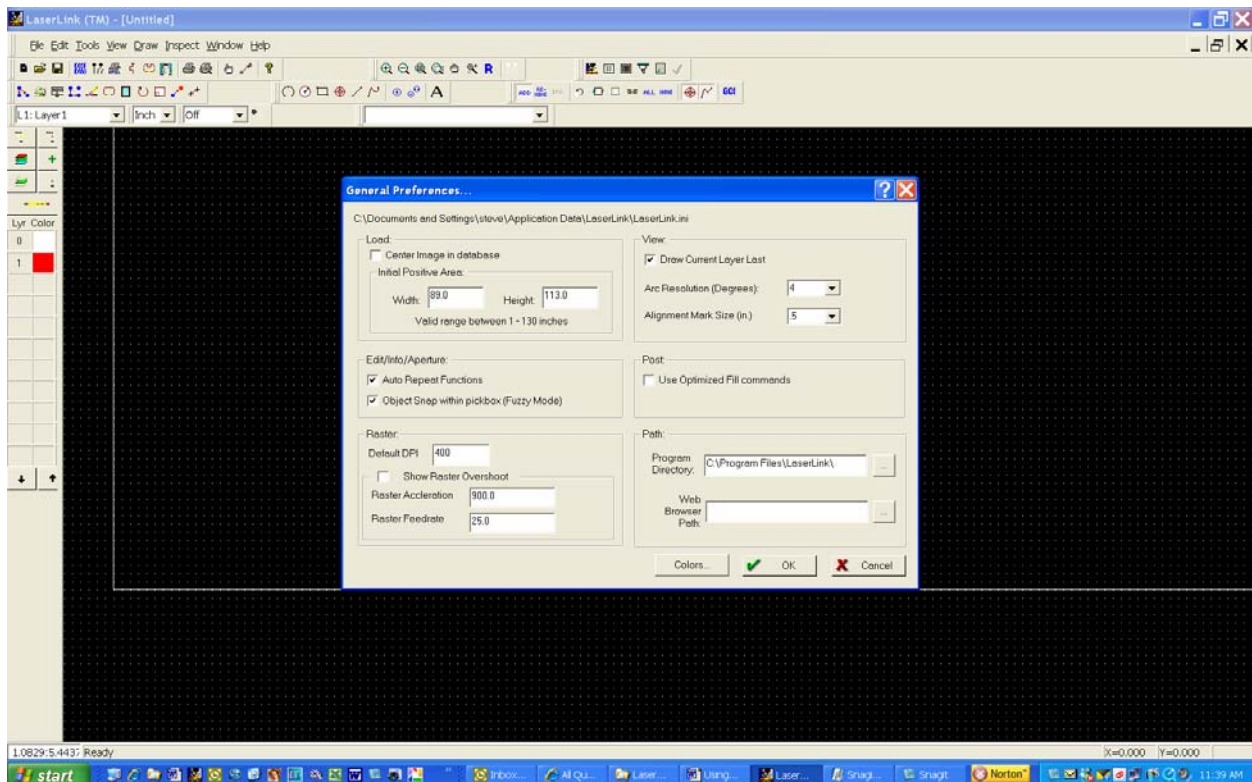


## File Menu

**“Preferences - General - Edit/Info/Aperture Field”**: Auto Repeat Functions and Object Snap within pickbox.

Leaving “Auto Repeat Functions” checked allows you to repeat functions using only the mouse. For example, if you are drawing several rectangles, you can select “draw rectangle” left click first corner, left click second corner then left click first corner of next rectangle and so on until right clicking to stop.

Leaving “Object Snap within pickbox” checked – non-functioning feature.



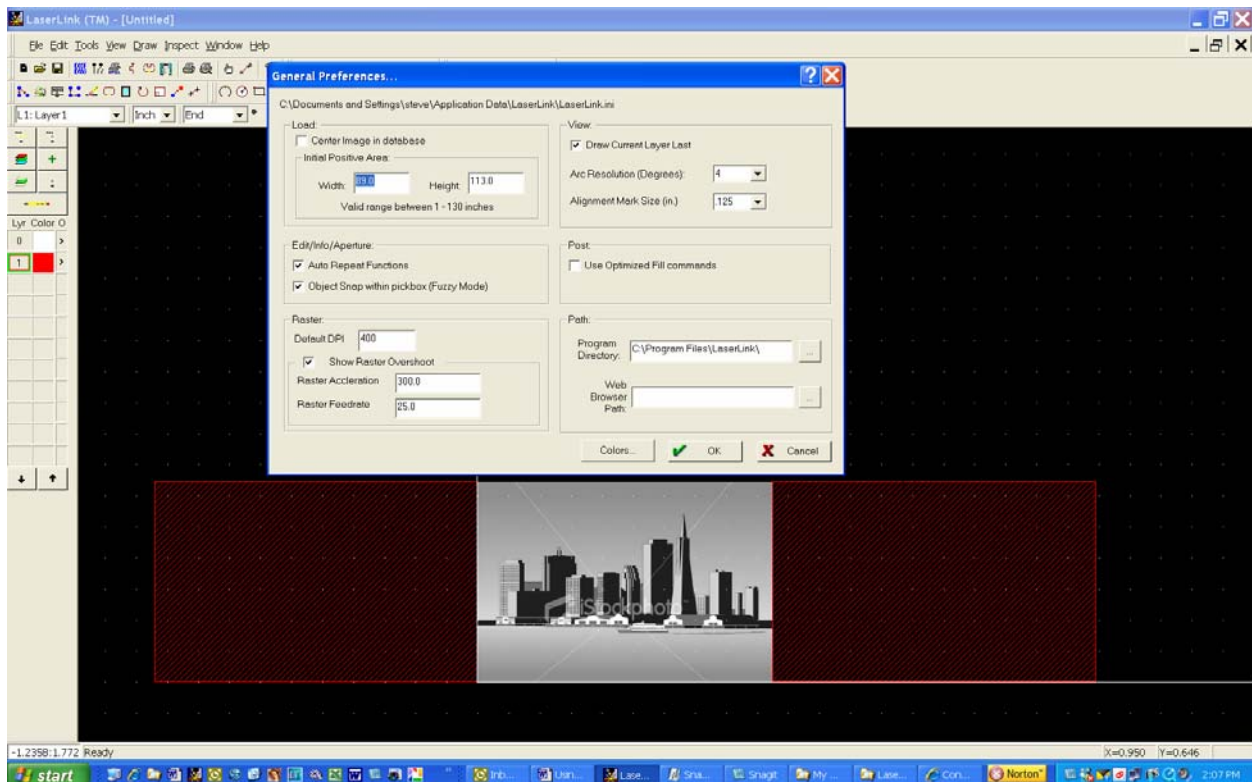


## File Menu

“**Preferences – General – Raster Field**”:  
Raster preferences.

“Default DPI” The default dots per inch setting for raster images is 400dpi. This means if you import an image created with 400dpi it will display to the correct size.

“Show Raster Overshoot” check box displays the red boxes seen below. This is the area the machine will use to accelerate up to full raster engraving speed. Increasing the “Raster Acceleration” will reduce the size of the acceleration area. Increasing the “Raster Feedrate” increases the size of the overshoot box.

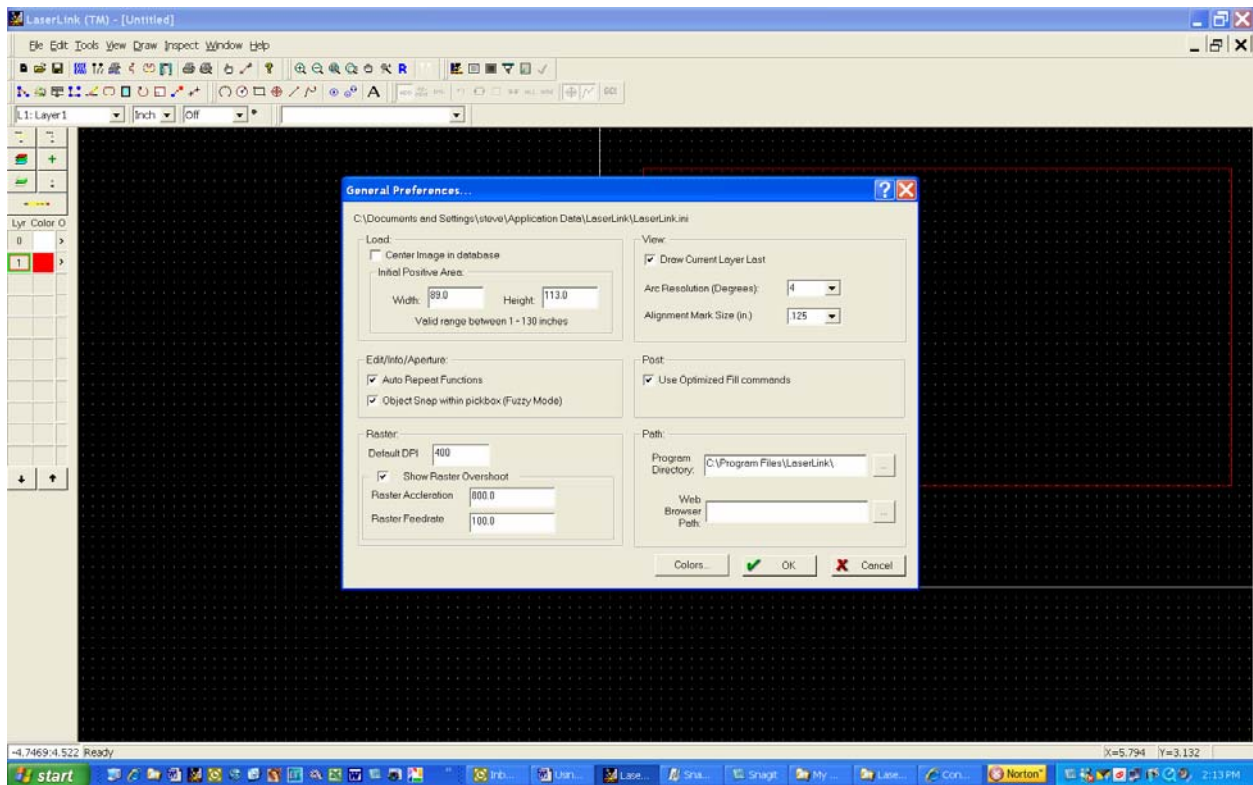




## File Menu

**“Preferences – General – Post Field”**: Post check box.

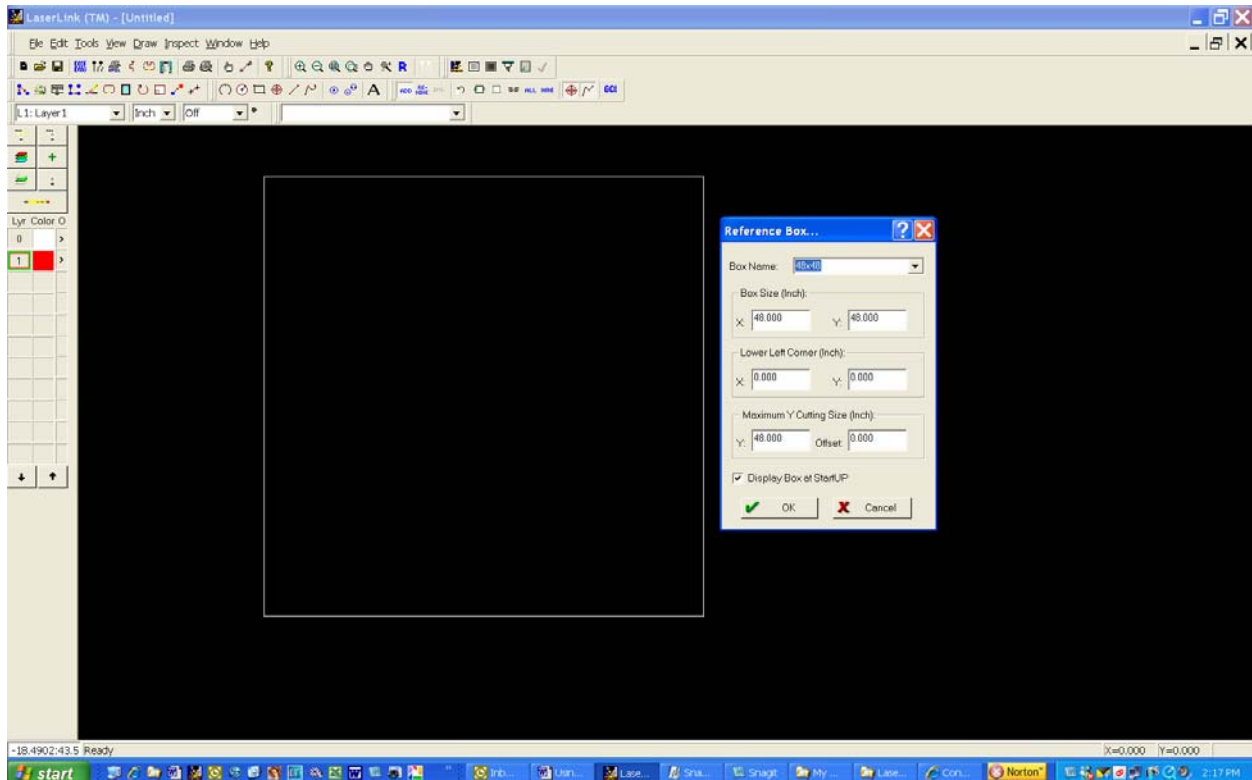
Checking this box reduces the size of .lmc raster engraving files. This results in faster processing.





## File Menu

**“Preferences – Cutting Box”**: Reference Box dialogue box. Typically you will nominate a 48”x 48” box or 48”x96” box. Next image shows 48” x 96” cutting area. (see next page)

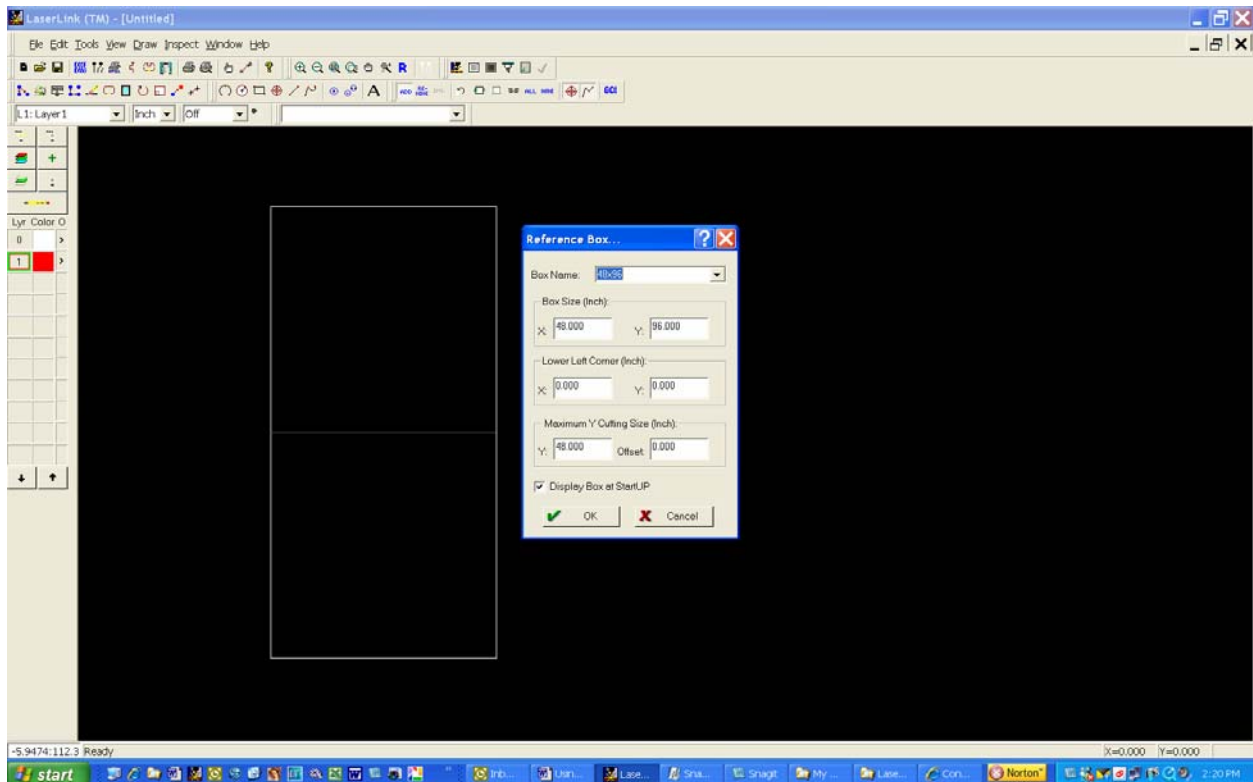






## File Menu

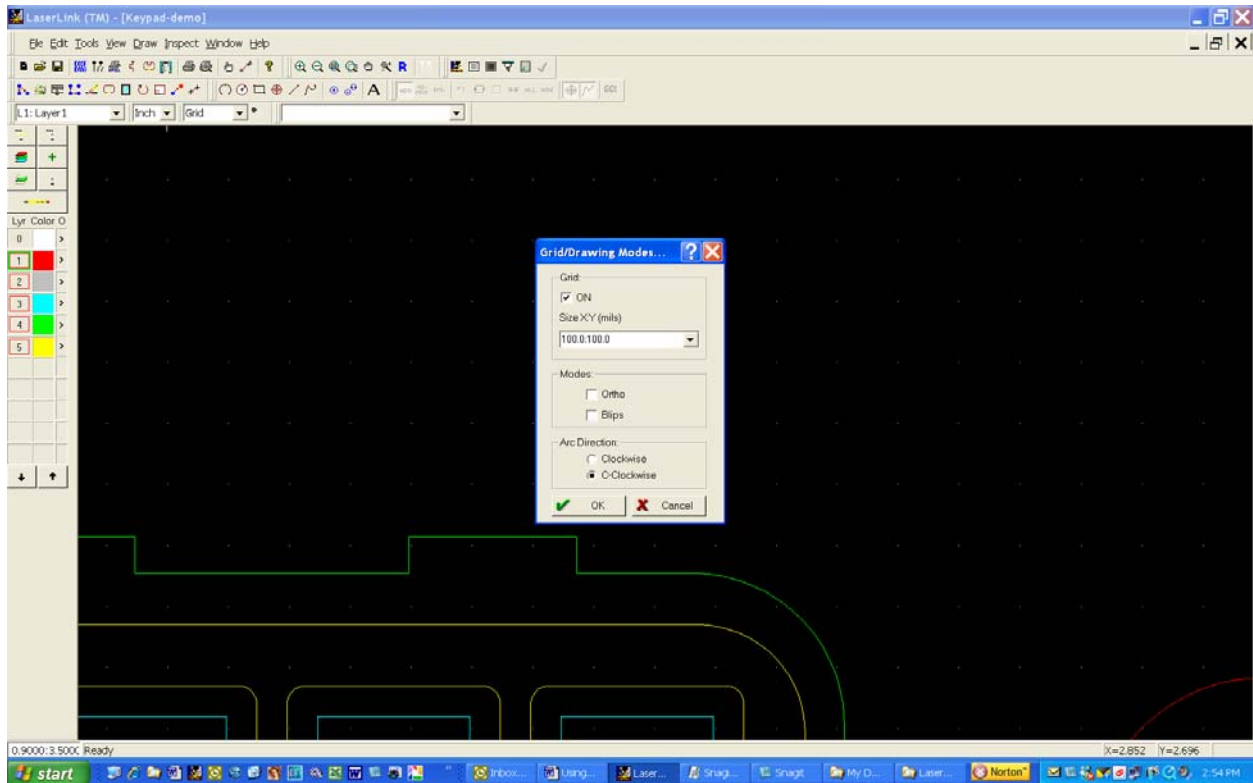
**“Preferences – Cutting Box”**: Reference Dialogue box. If your Laser Machining Center has a 48” x 96” bed size you will want a 48” x 96” cutting box to display at start-up. The software will automatically split the two 48”x48” sections for processing.





## File Menu

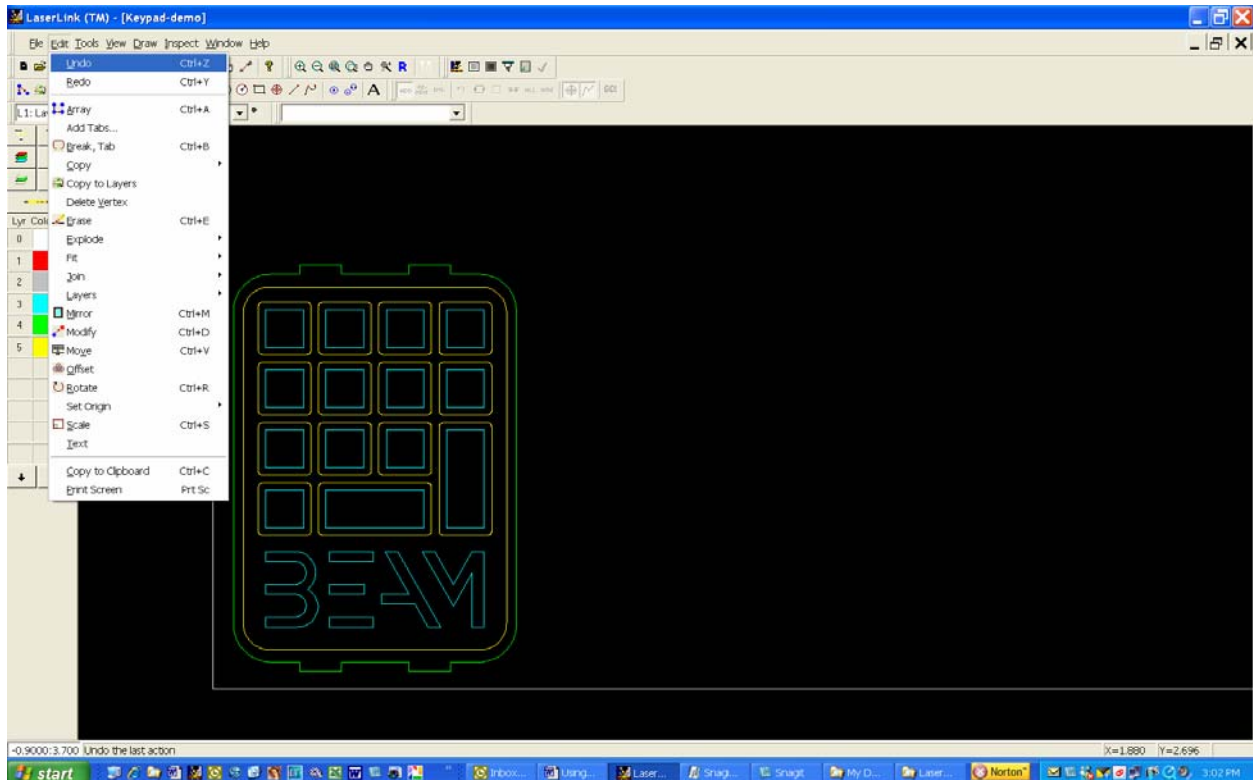
**“Preferences – Drawing Modes”**: You can turn on a grid overlay on the LaserLink working window to assist in drawing functions. In this case the grid size is .1”x.1”. When “grid” snap is turned on you can snap to the exact grid point. When checked “Ortho” will only allow you to make exactly horizontal or vertical moves.





## Edit Menu

“*Undo*”: An unlimited number of actions can be undone or redone in LaserLink. For faster undone use Keyboard shortcut “Ctrl Z”

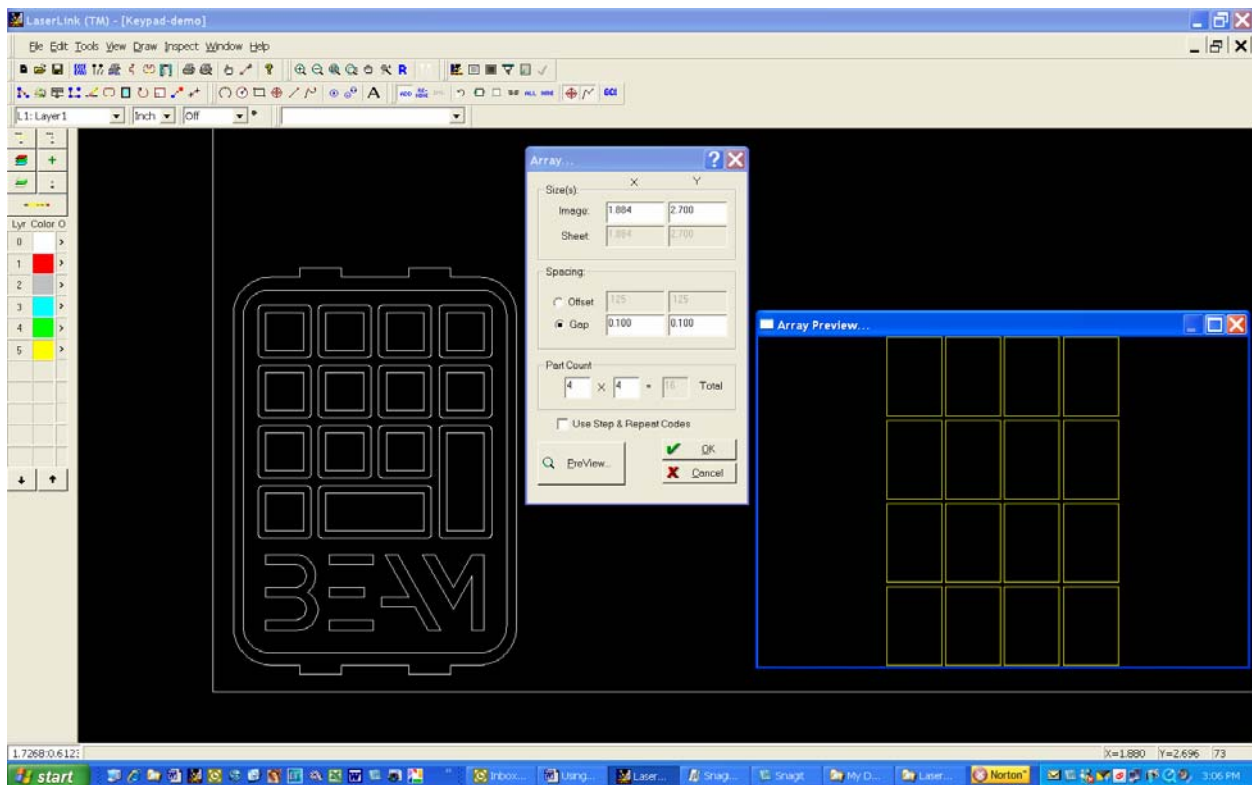




Edit Menu (Array Shortcut Key)

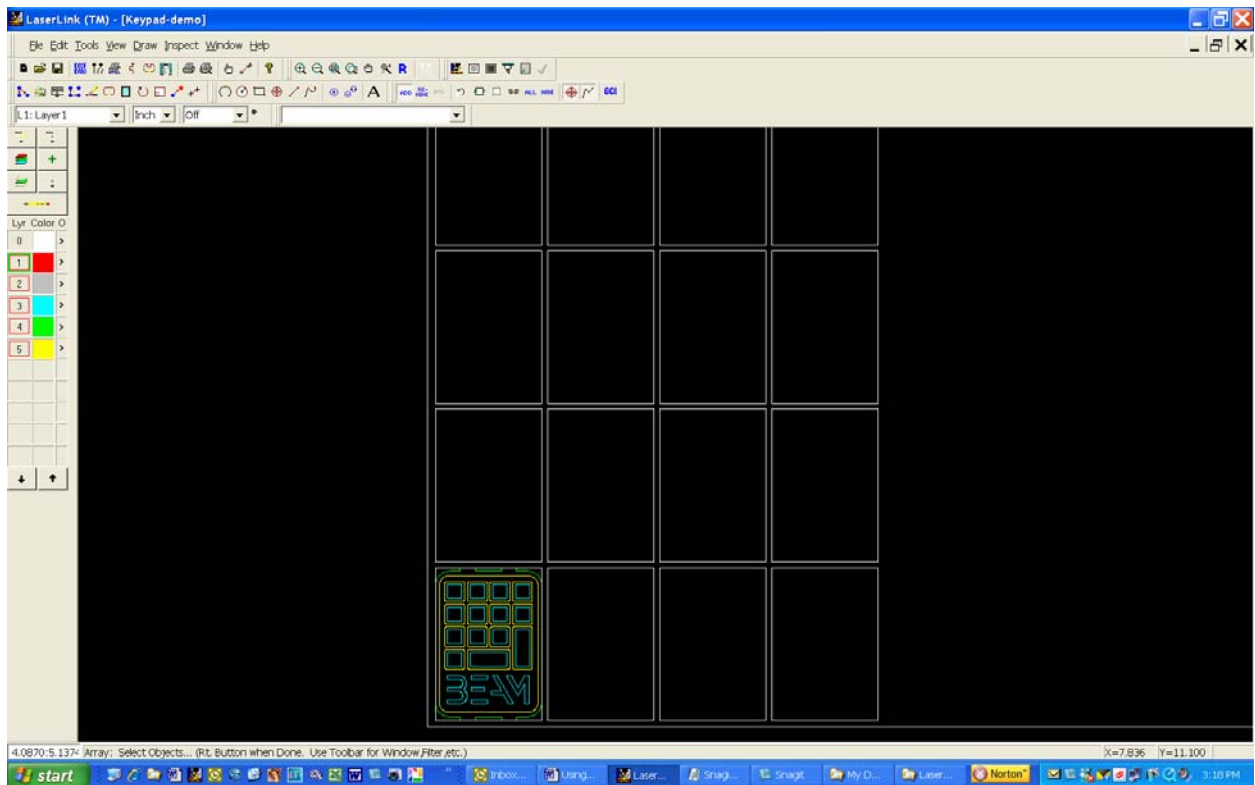
“**Array**”: Select Array from Edit menu. Use selection tool (the LaserLink selection pointer looks like a small square □) to select the features you wish to array. Features that have been correctly selected will display white. After selecting all the features you wish to array right click your mouse. The Array dialogue box will now display. Choose whether to offset or gap space the parts. Offset is the distance from the bottom left corner of the part to the bottom left corner of the next part. Gap is the space from the absolute boundary of the part to the absolute boundary of the next part.

Choose the number of parts you wish to array in x and y. Click “Use Step and Repeat Codes” check box if you wish to step and repeat the part. Step and repeat will repeat the entire job at each step. (see next page)



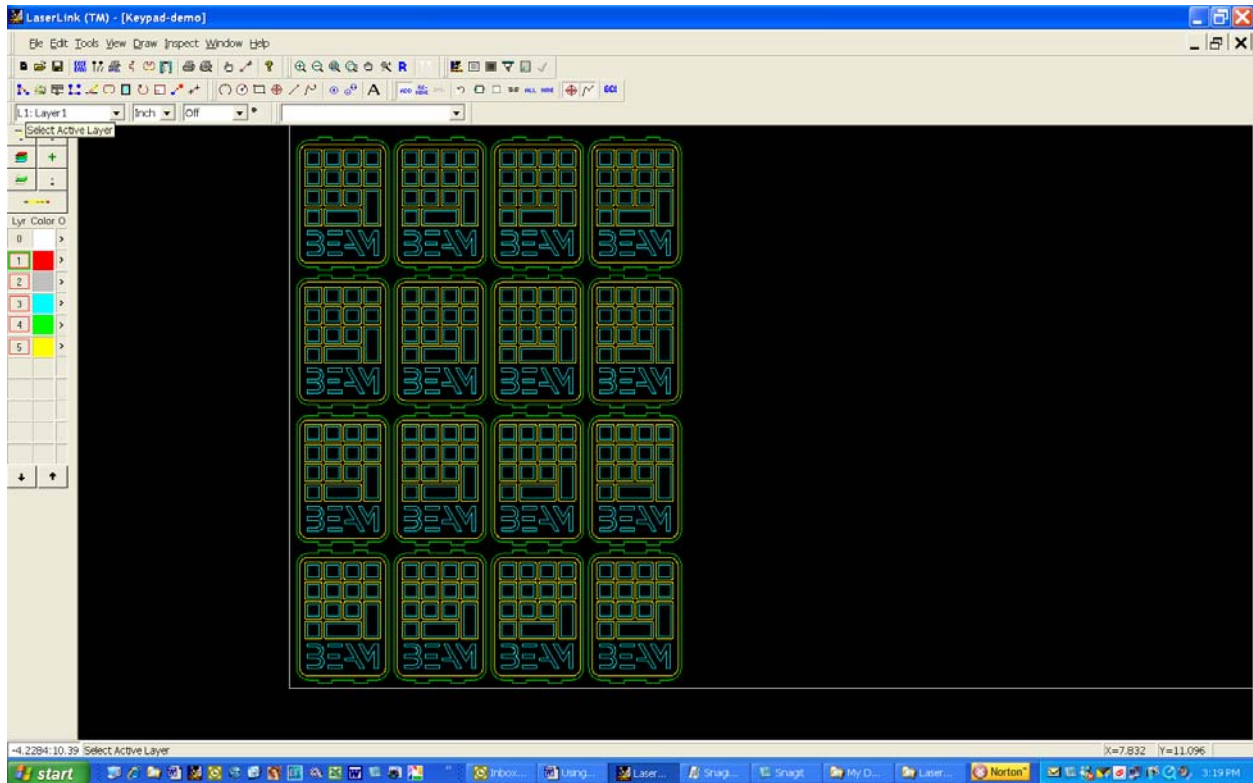


“Array”: continued. Array using step and repeat codes. The entire “beampad” part will cut before stepping to the next. If step and repeat codes are not used layers will cut on the entire array in the order in which they are entered into the process table. (see next page)





“**Array**”: continued. Array not using step and repeat codes. Layers will cut for all of the “beampads” before moving to the next cut layer in the process table. This is usually not recommended when more than one layer is being processed as there is a greater risk of wasted parts if the cut process fails.



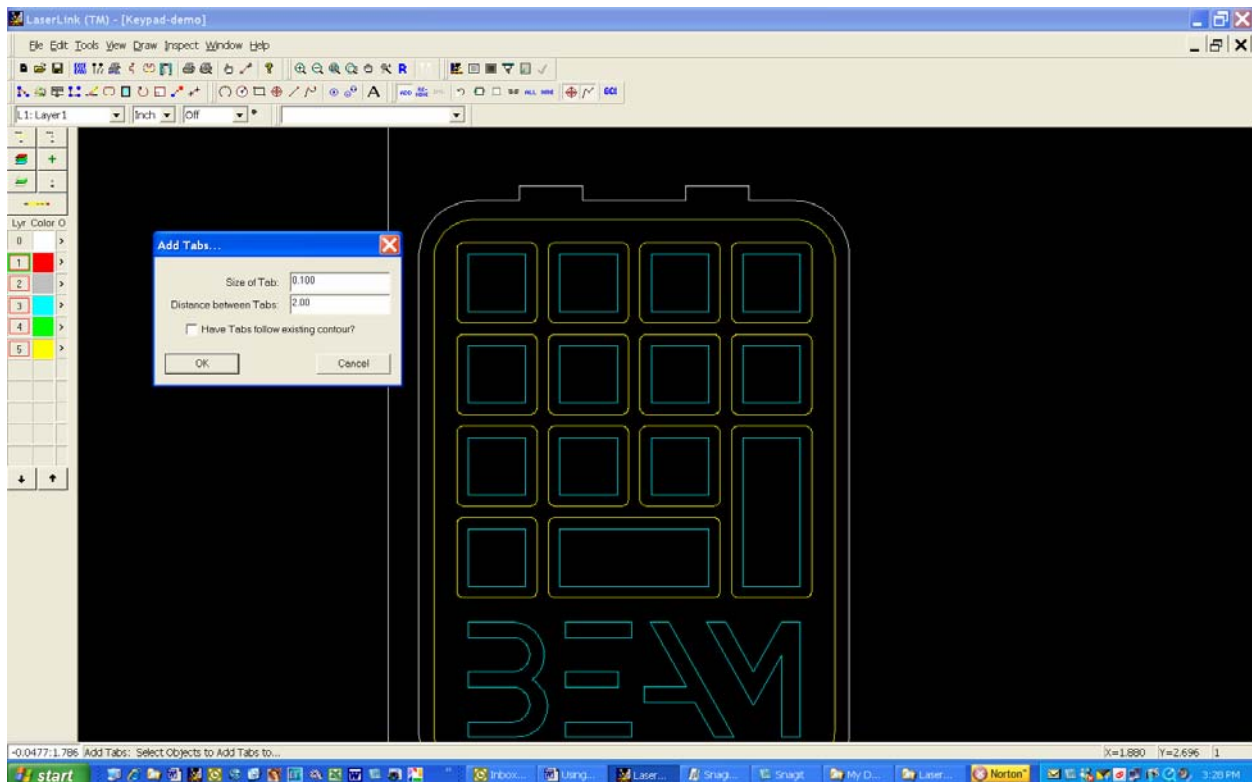


## Edit Menu

**“Add Tabs”**: Left click on “Edit” then “Add Tabs...” then use the selection tool “□” to pick the feature you wish to tab. After selection the feature will turn white. Right click to get the “Add Tabs” dialogue box.

The Add Tabs dialogue box allows selection of length of tab (the length of feature that will not be cut) and the distance between tabs.

Tabs can be very useful to hold a part in a carrier sheet for load/unload or shipping. *(see next page)*

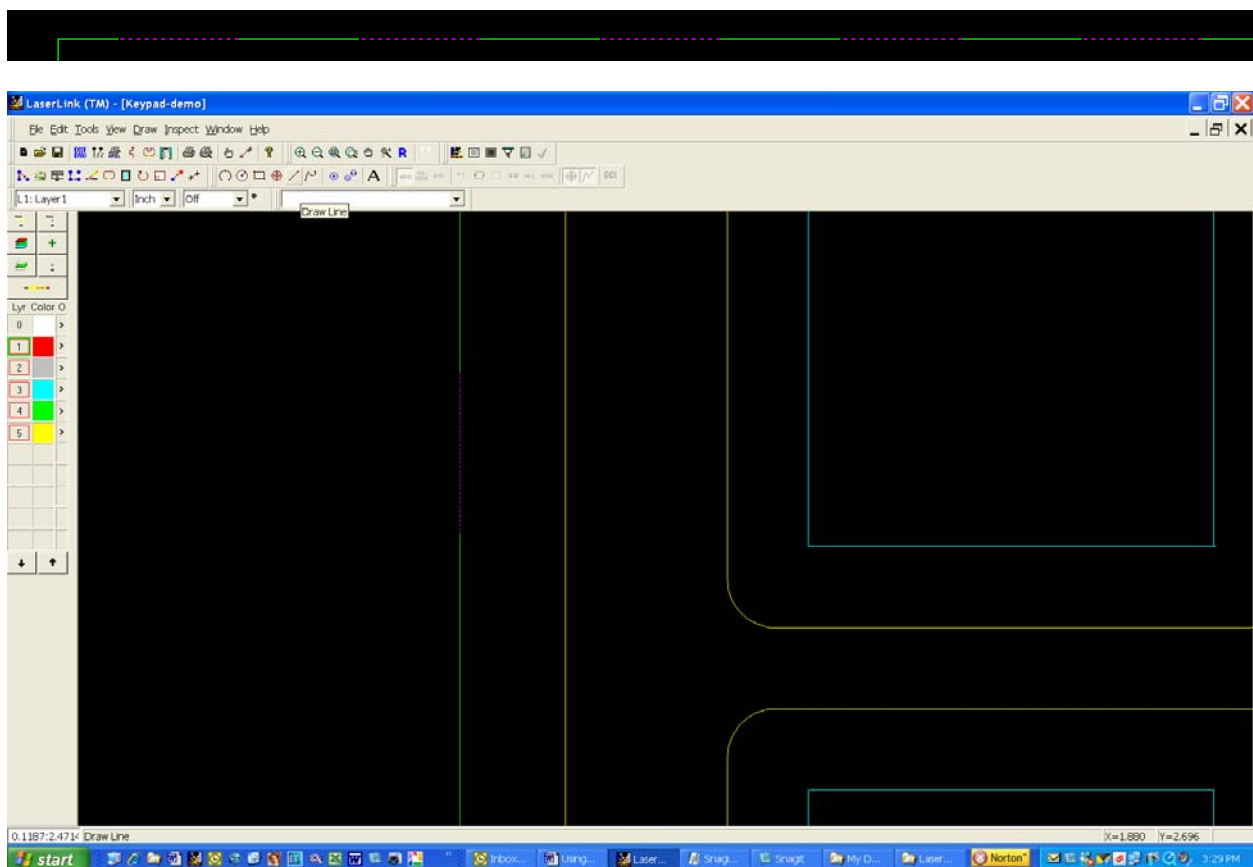




## Edit Menu

**“Add Tabs”**: continued. Tabbed area will display as a dotted line (seen here in purple). The feature will be treated as a continuous line, but the machine will turn off the laser at the dotted line point.

You can use this feature to create a high speed tear off or perforation line by creating very short tabs and short distances between tabs.



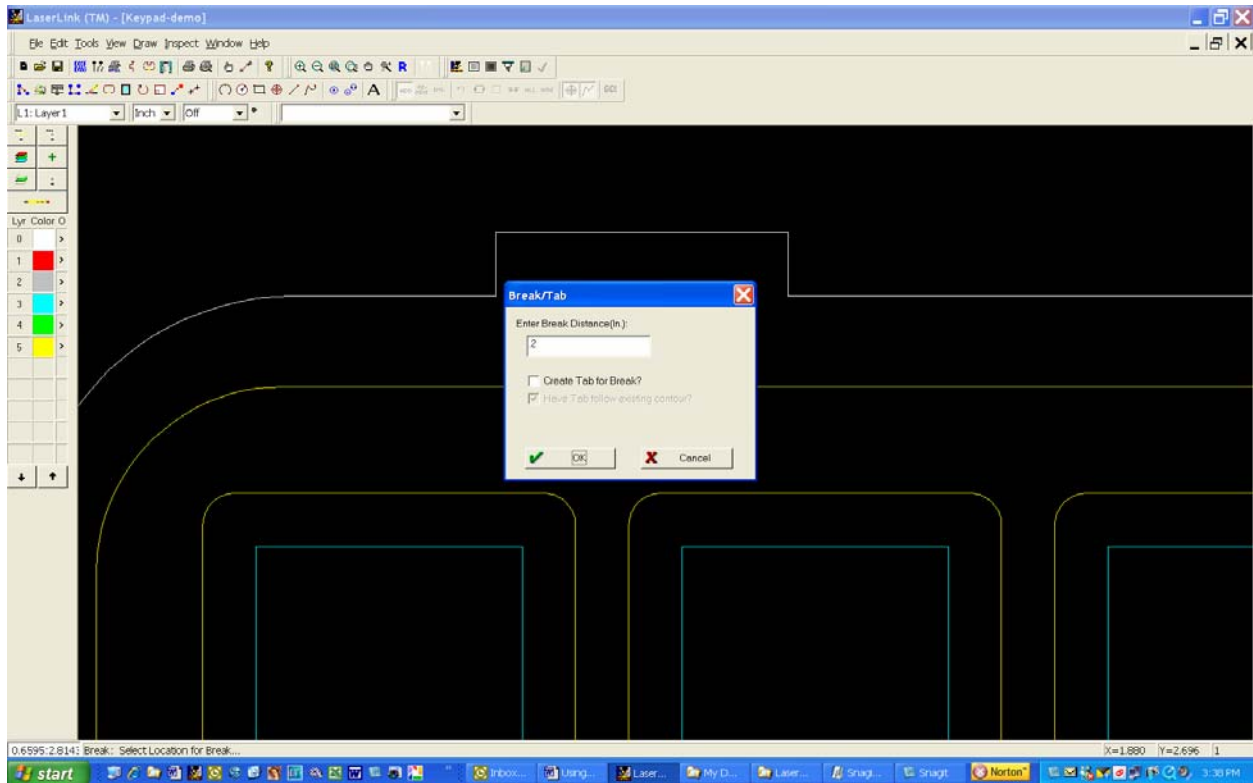




Edit Menu  (Break Shortcut Key)

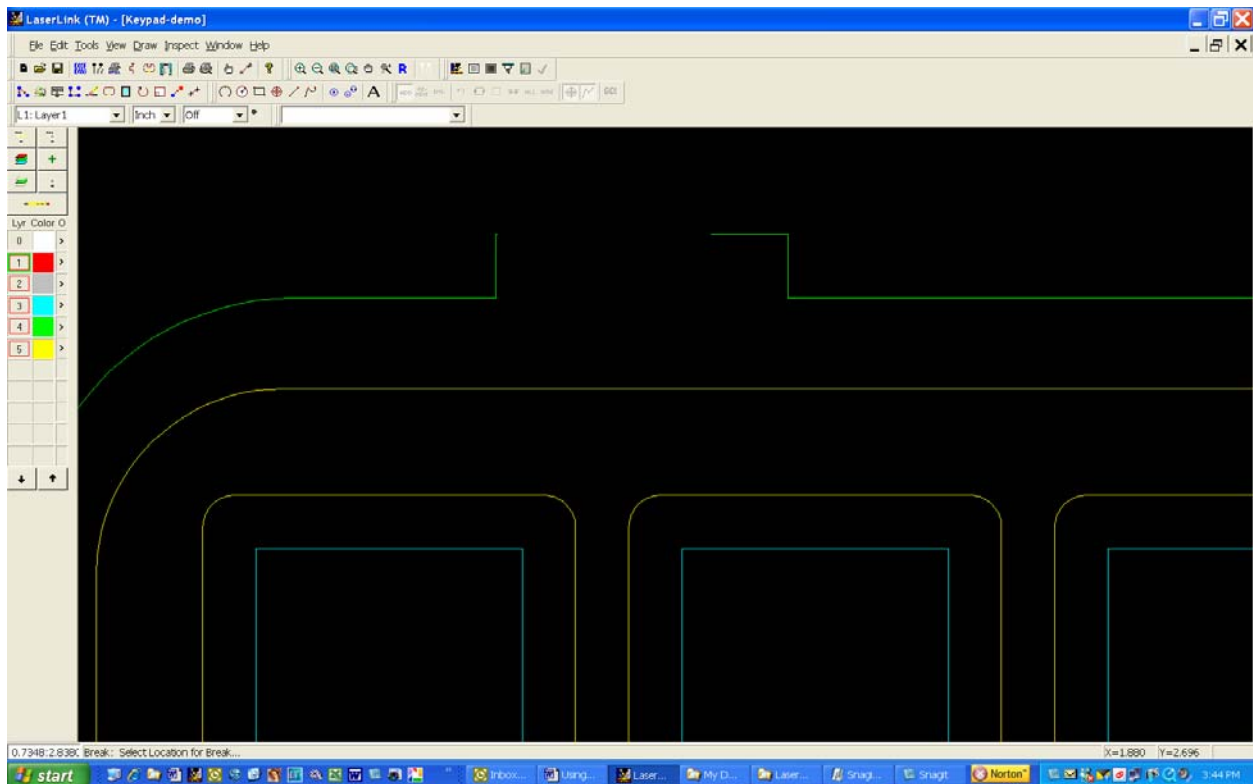
“**Break/Tab**”: Left click on “Edit” then “Break/Tab” and use the selection tool (in this case, the selection tool is a cross hair  $+$ ) to select where you wish to break the feature. Turn on object snaps if you wish to select a specific point. After selection the selected feature will turn white. Right click to display the “Break/Tab” dialogue box.

You must enter a distance of the break. Do not click “Create Tab for Break?” check box unless you wish to tab the part. (continued next page)




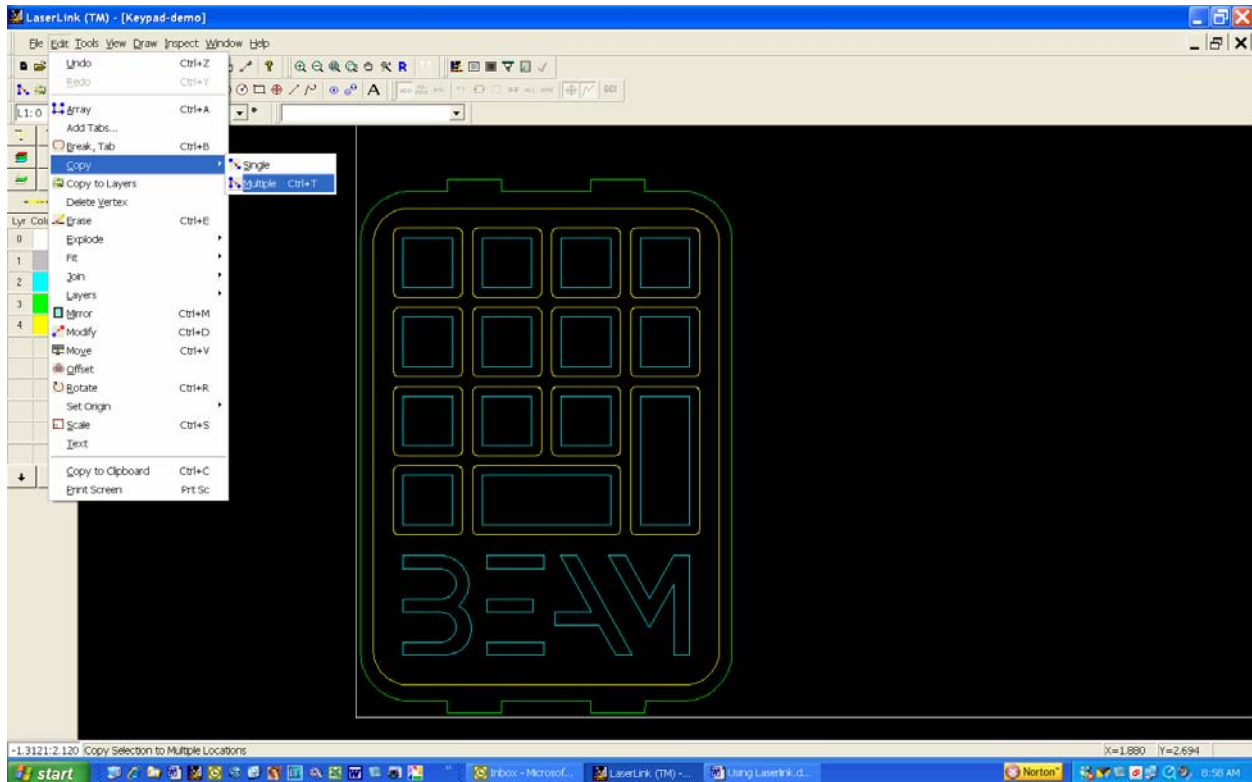


“Break/Tab”: continued. The feature has been broken.



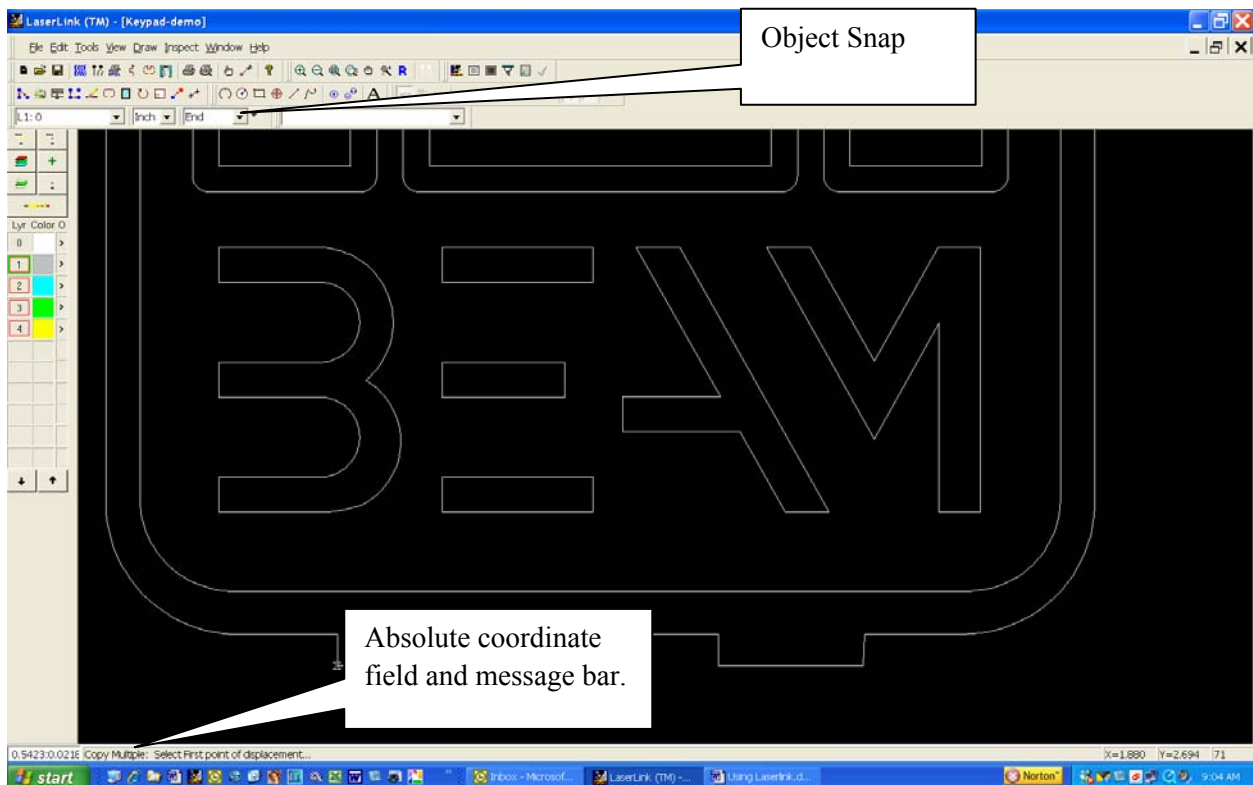
Edit Menu  (Copy Multiple Shortcut Key)

**“Copy - Single and Multiple”:** Left click “Edit” then “Copy” then “Multiple”. Use selection tool  to select the features you wish to copy. After selecting features they will turn white. After selecting all of the features you wish to copy right click mouse. A box will display around the selected features and the message bar at the bottom of the pane will say “Copy Multiple – Select first point of displacement”. (See next page)



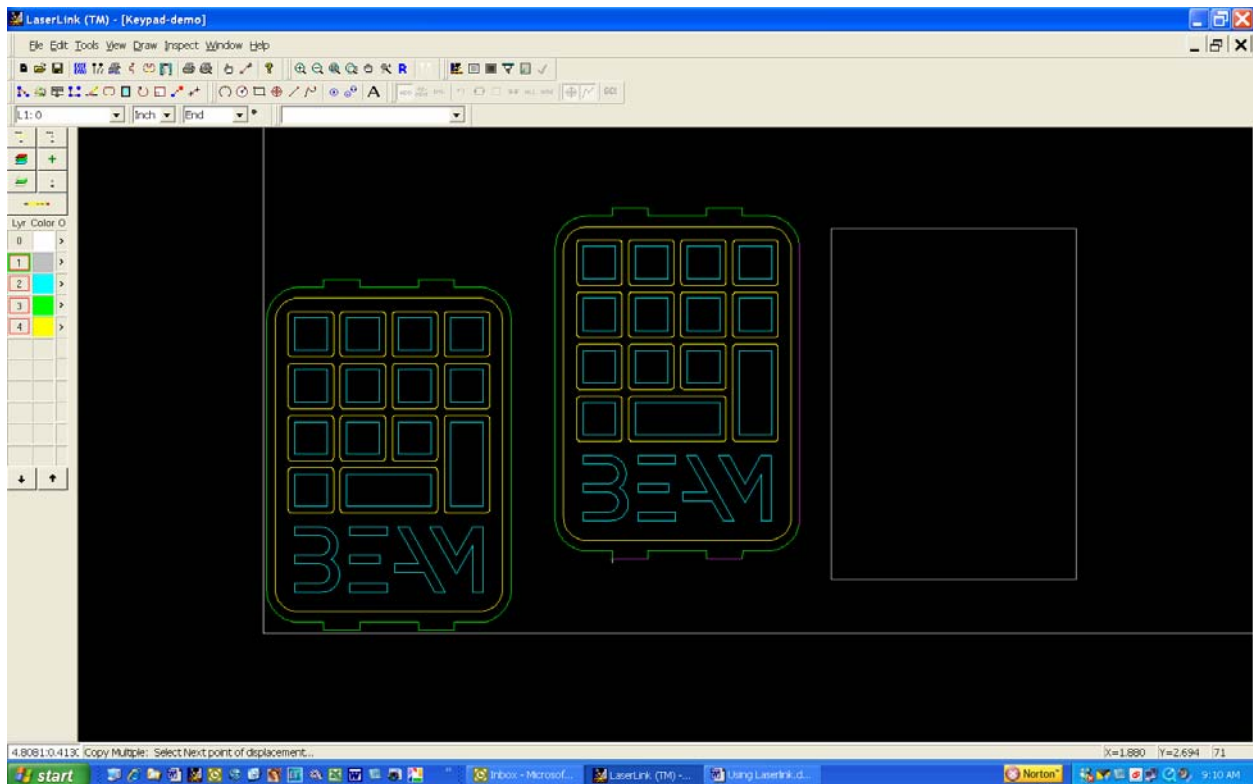


“Copy - Multiple”: – continued – Selecting first point of displacement. Turn on the object snap (in this case end) to select the first point of displacement. Immediately after left clicking the message bar will ask “Copy Multiple – select second point of displacement”. You can now enter absolute coordinates in the coordinate box for locating copies or simply use the displayed box to locate copy locations. (See next page)





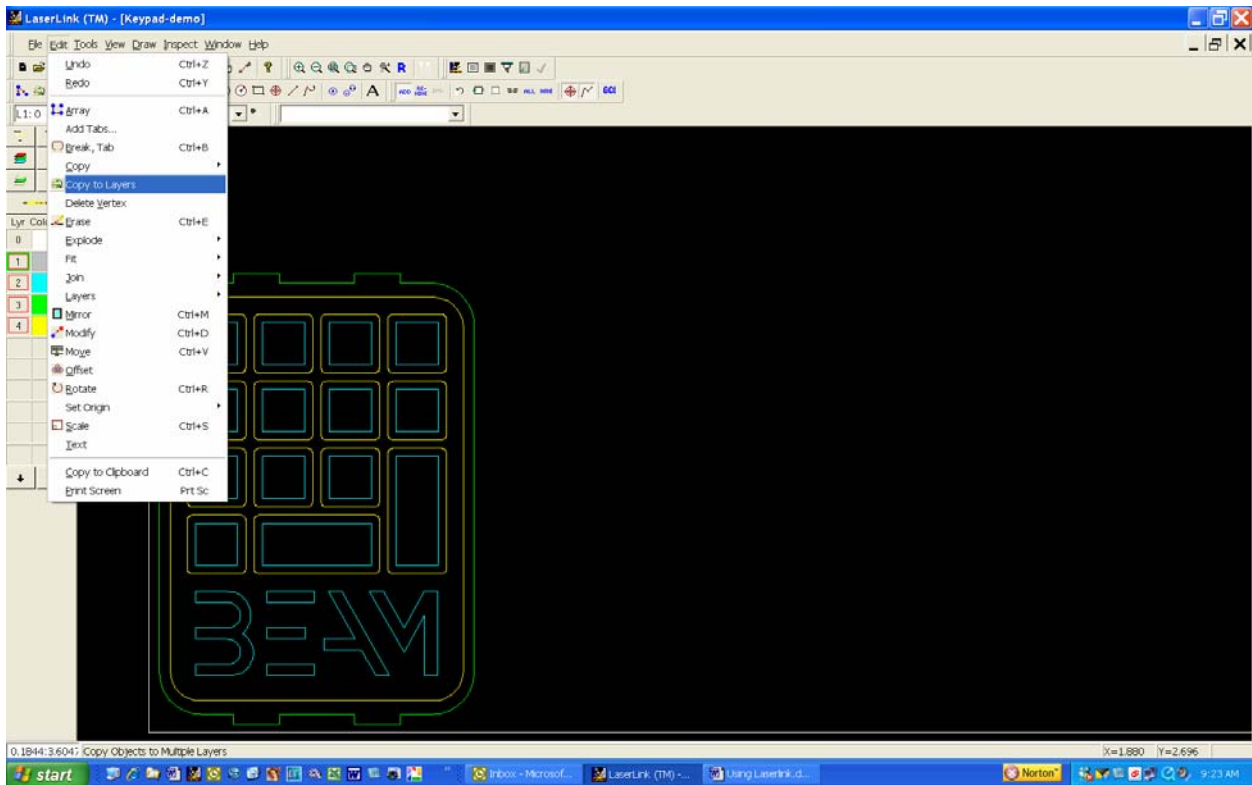
“Copy – Multiple”: continued. Left clicking drops a copy. Finish multiple copy by right clicking your mouse.





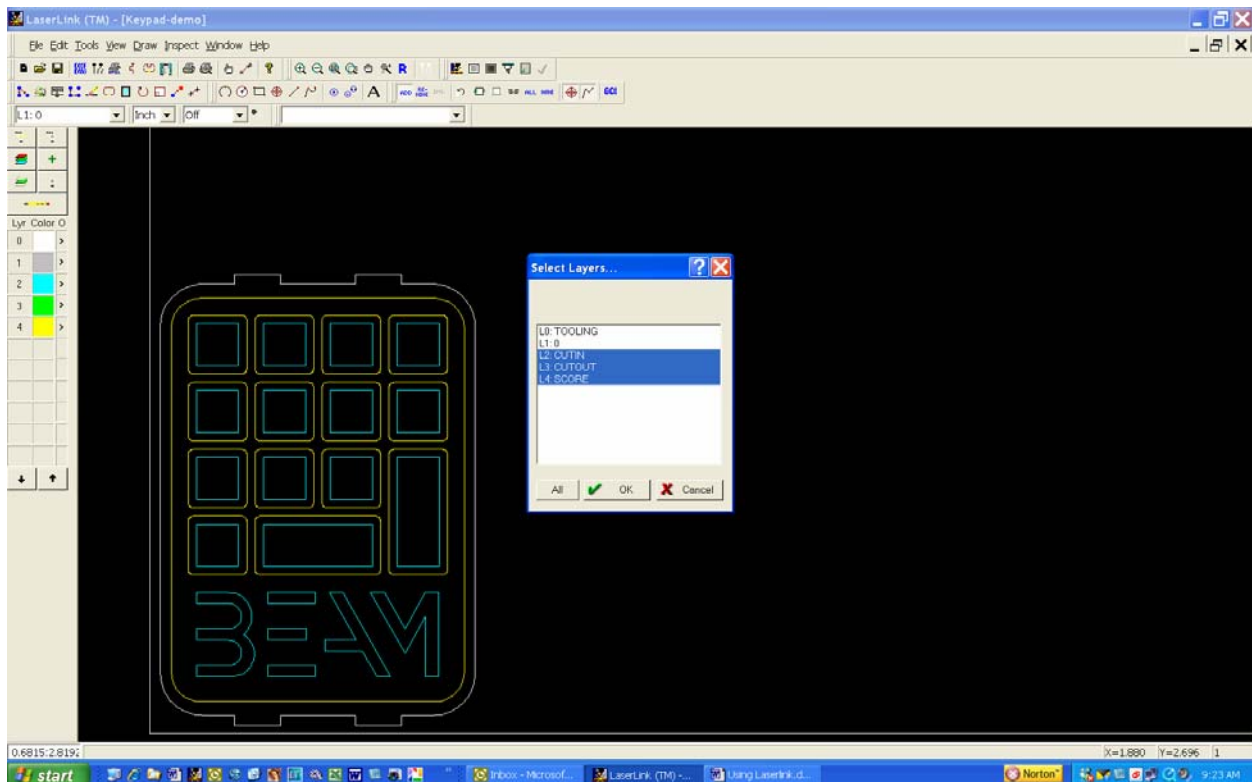
Edit Menu  (Copy to Layers Shortcut Key)

**“Copy to Layers”:** Left click “Edit” then “Copy to Layers” to get the selection tool “□”. Use the selection tool to left click all of the features you wish to copy to layers. After selection right click to get the “select layers” dialogue box. (see next page)





“Copy to Layers”: continued. Exterior line has been selected as indicated by the fact that it turns white. Choose the layers you wish to copy to this layer using the dialogue box and click OK. (see next page)

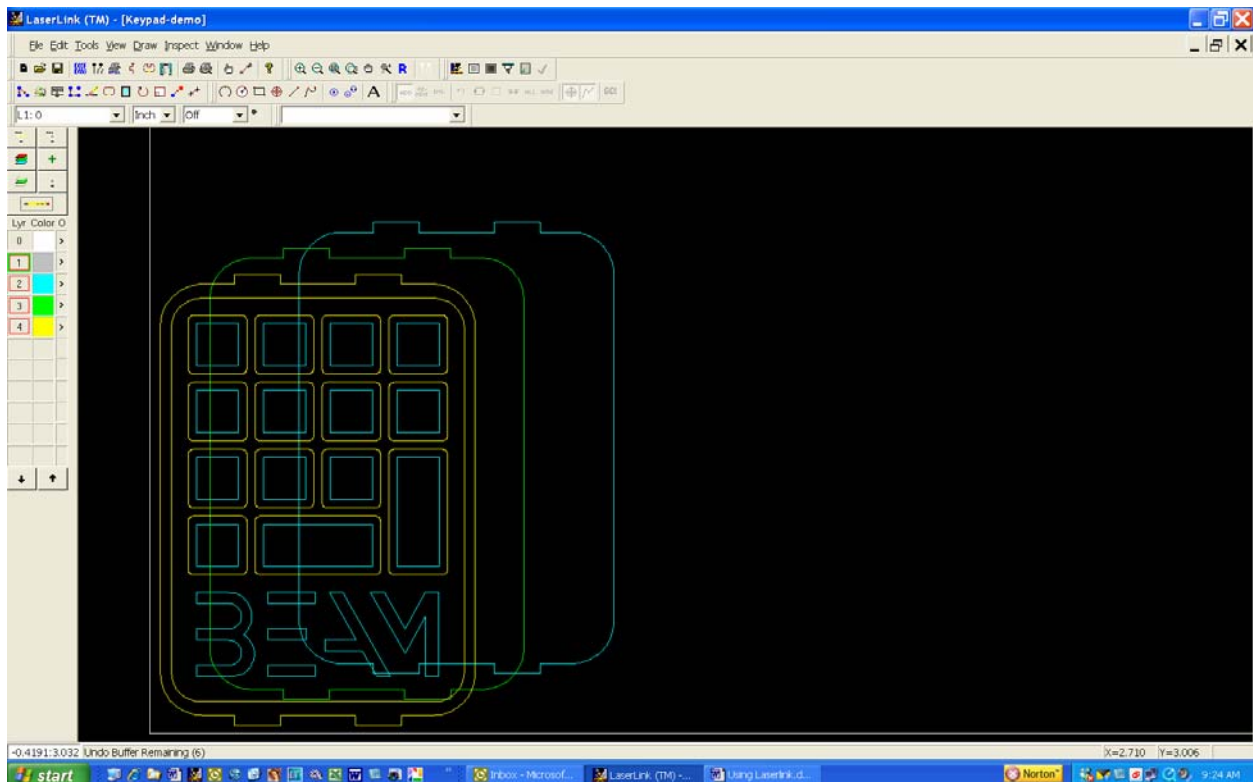




Edit Menu



“Copy to Layers”: continued. Layers have been moved and fanned here to display the new layers created.

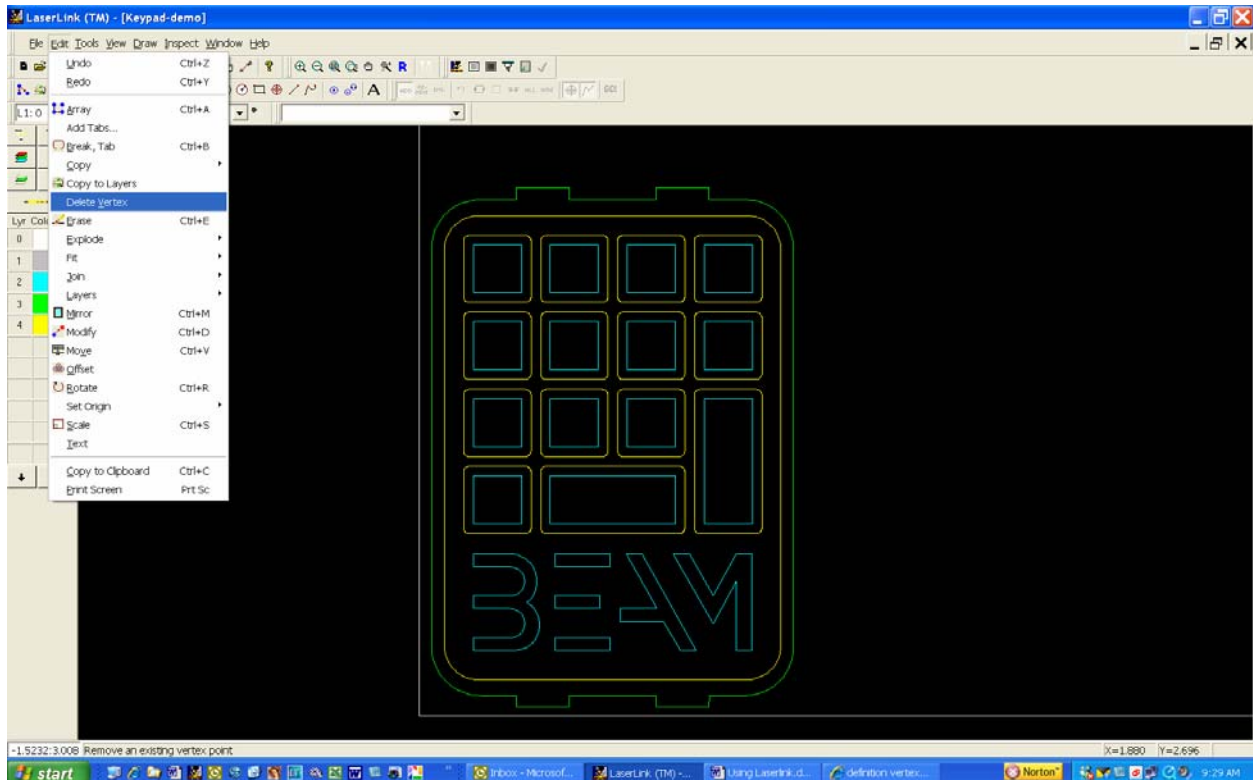






## Edit Menu

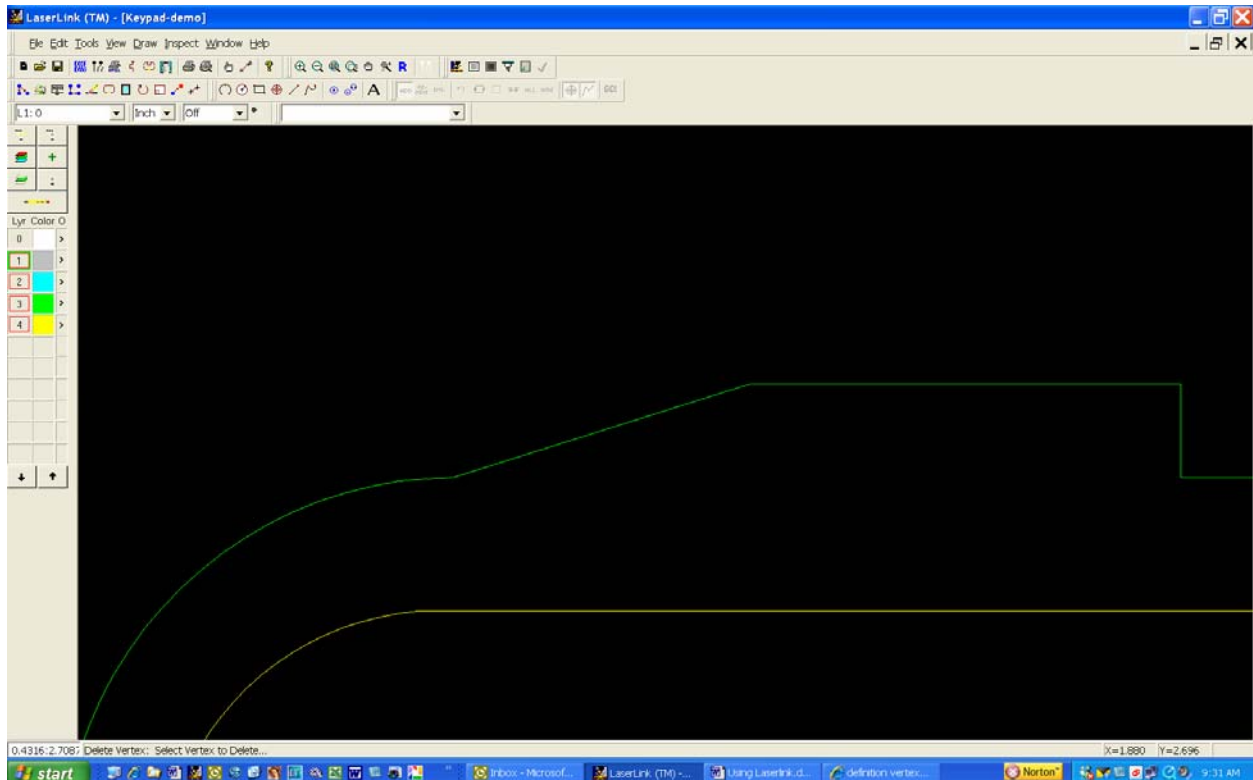
**“Delete Vertex”**: Deleting point at which two or more lines intersect. Left click “Edit” then “Delete Vertex” to get the selection tool “□”. (See next page)





## Edit Menu

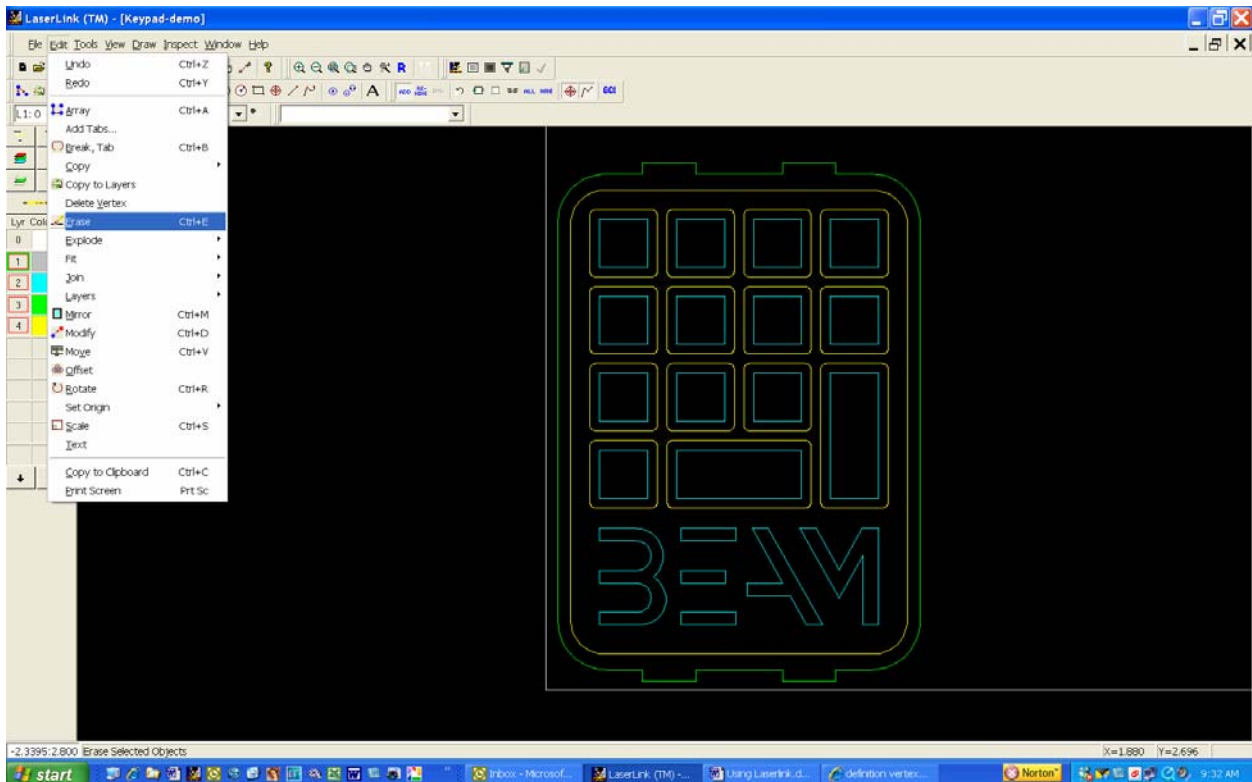
**“Delete Vertex”**: continued. Left clicking with the selection tool immediately deletes the vertex from the feature.






Edit Menu - (Erase Shortcut Key)

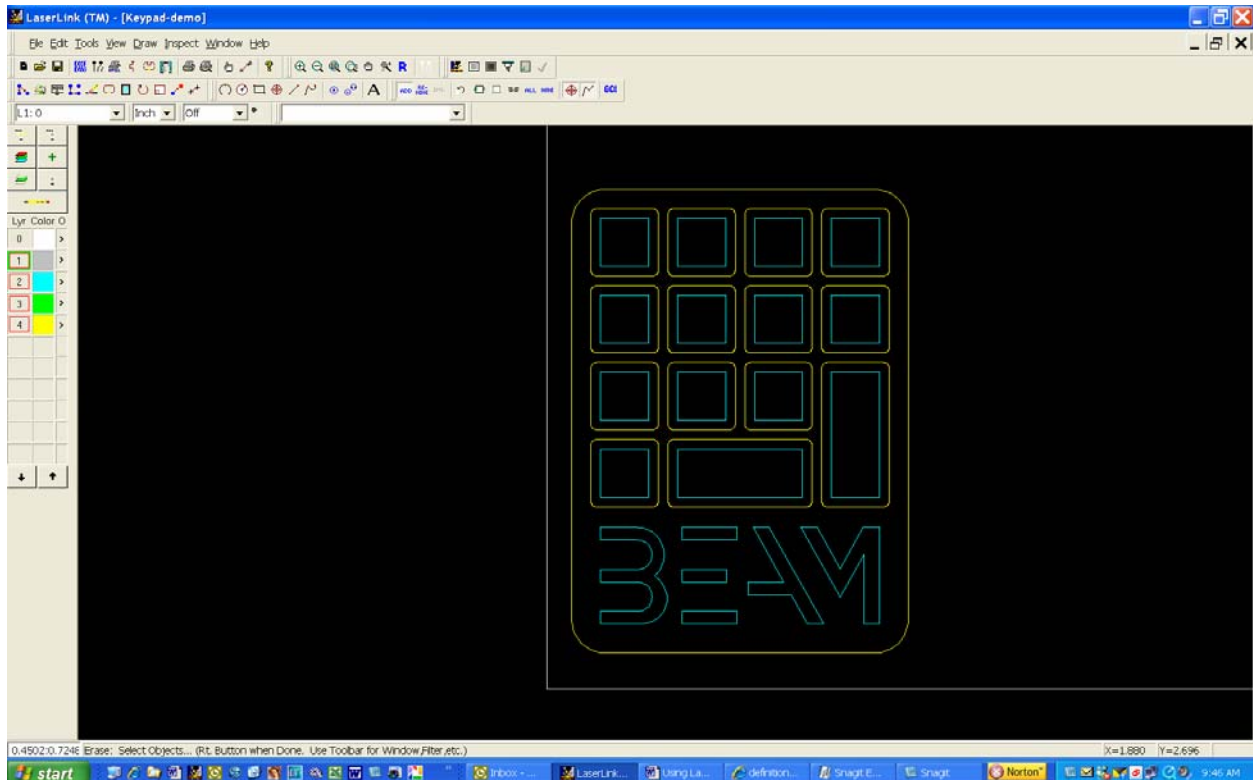
**“Erase”**: Left click “Edit” then “Erase” to get the selection tool “□”. Left click the features you wish to delete or used drag over selection to select larger areas. Selected features will turn white. (see next page)





Edit Menu - 

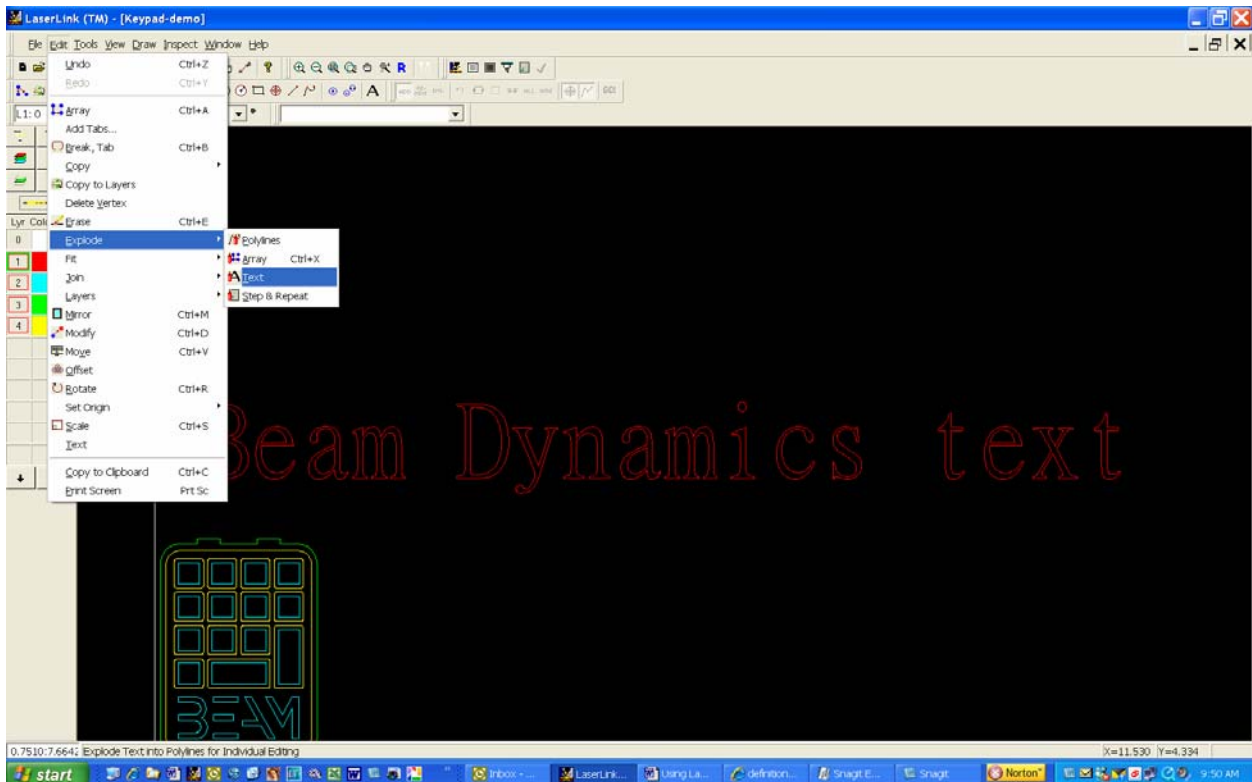
**“Erase”**: continued. Right clicking after selection will erase the features.





## Edit Menu

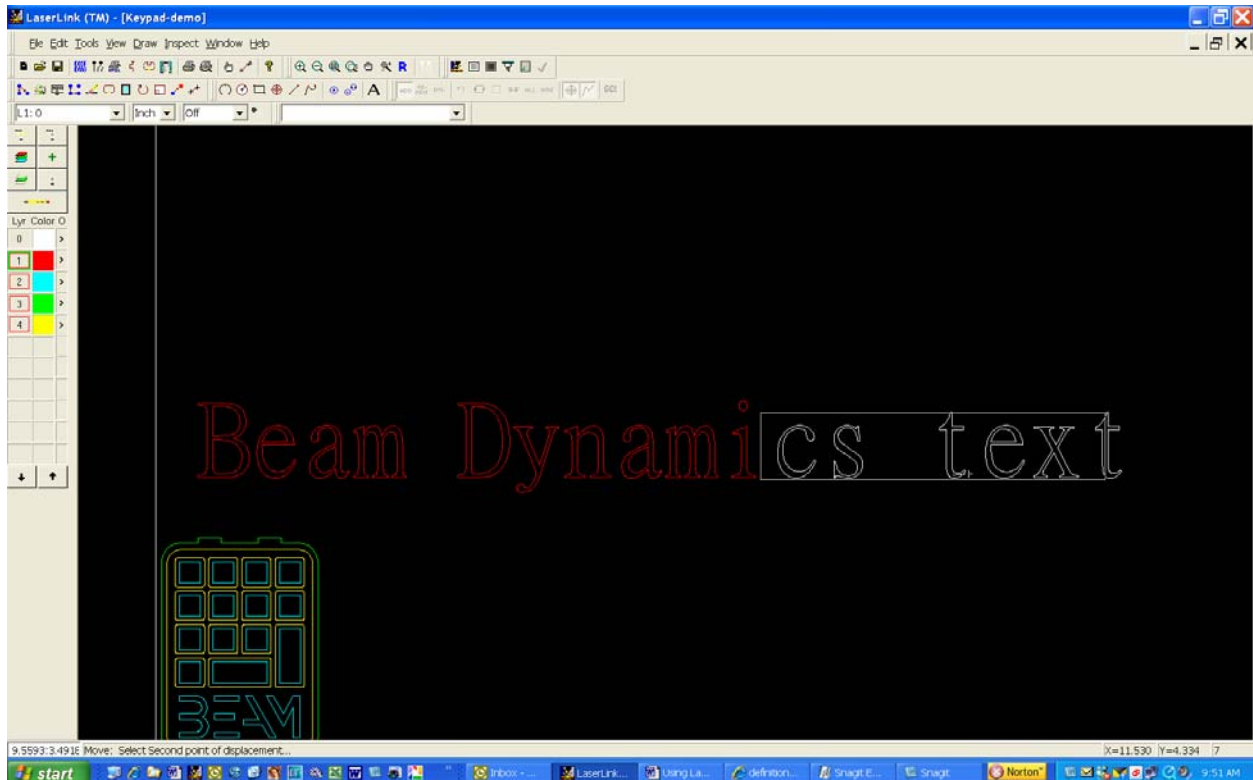
**“Explode”**: Left click “Edit” then “Explode” then “Polylines” or “Array” or “Text” or “Step & Repeat”. Use the selection tool “□” to select the feature to explode. Right clicking completes the explosion. Exploding turns the feature into lines and arcs that can be individually manipulated. (see next page for example)





## Edit Menu

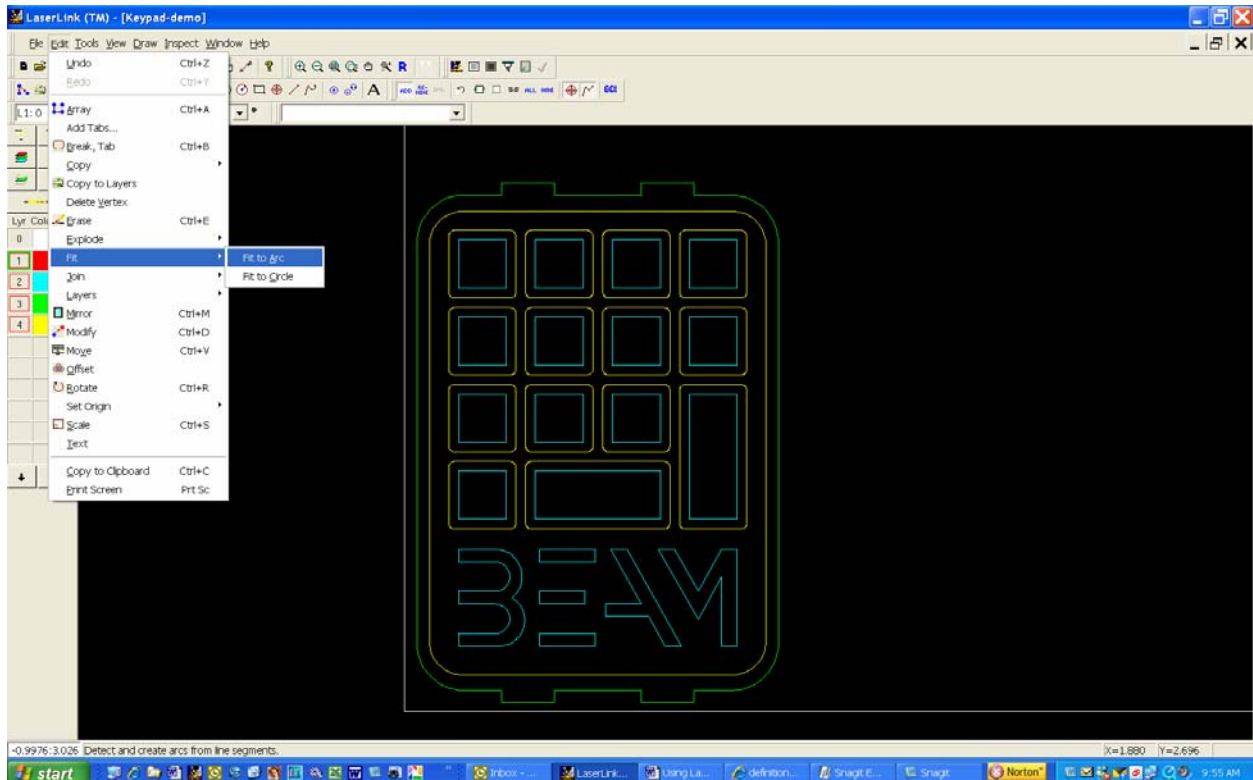
**“Explode”**: continued. Text has been exploded so that individual components can now be manipulated. If the text was not exploded it could only be manipulated with “Edit, Text” as a complete unit.





## Edit Menu

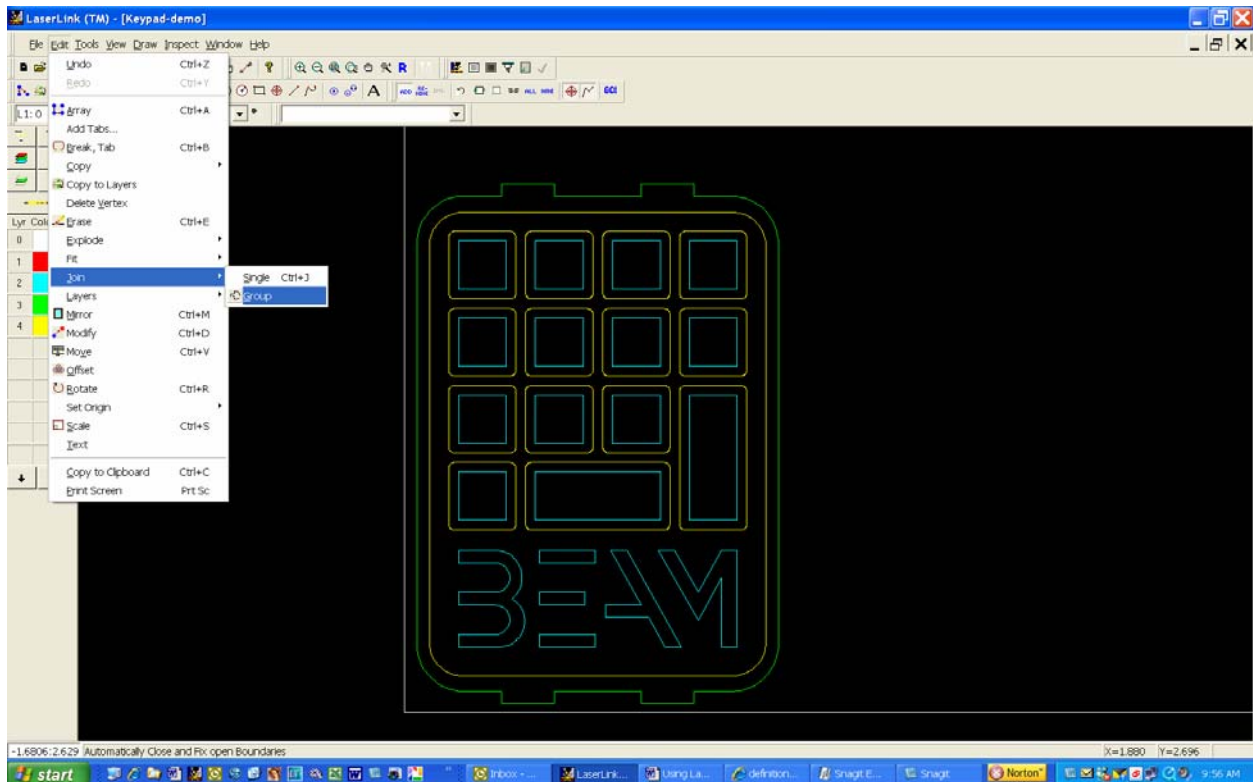
**“Fit to Arc”**: Left click “Edit” then “Fit” and “Fit to Arc” to get the selection tool “□”. Turn on snaps to select the feature you wish to fit to arc.





## Edit Menu

**“Join”**: Left click “Edit” then “Join” then “Single” or “Group”. If “Single” is selected use the selection tool “□” to select the feature you wish to join. The join function will then mathematically connect the feature into a single part. The benefit of joining is that the feature will be cut continuously rather than individual sections that might jump around. Using “Join” then “Group” you will be able to area select the entire part and LaserLink will attempt to join all features it believes should be mathematically connected. (see next page)

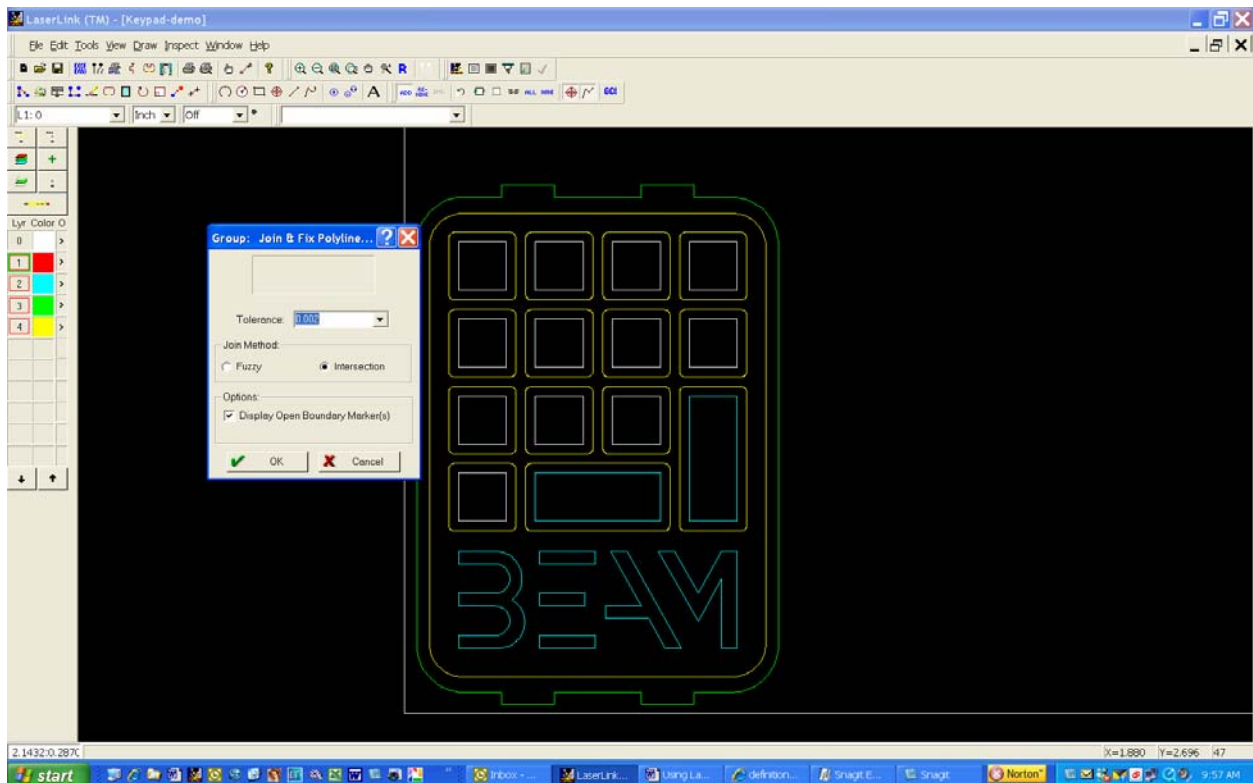






## Edit Menu

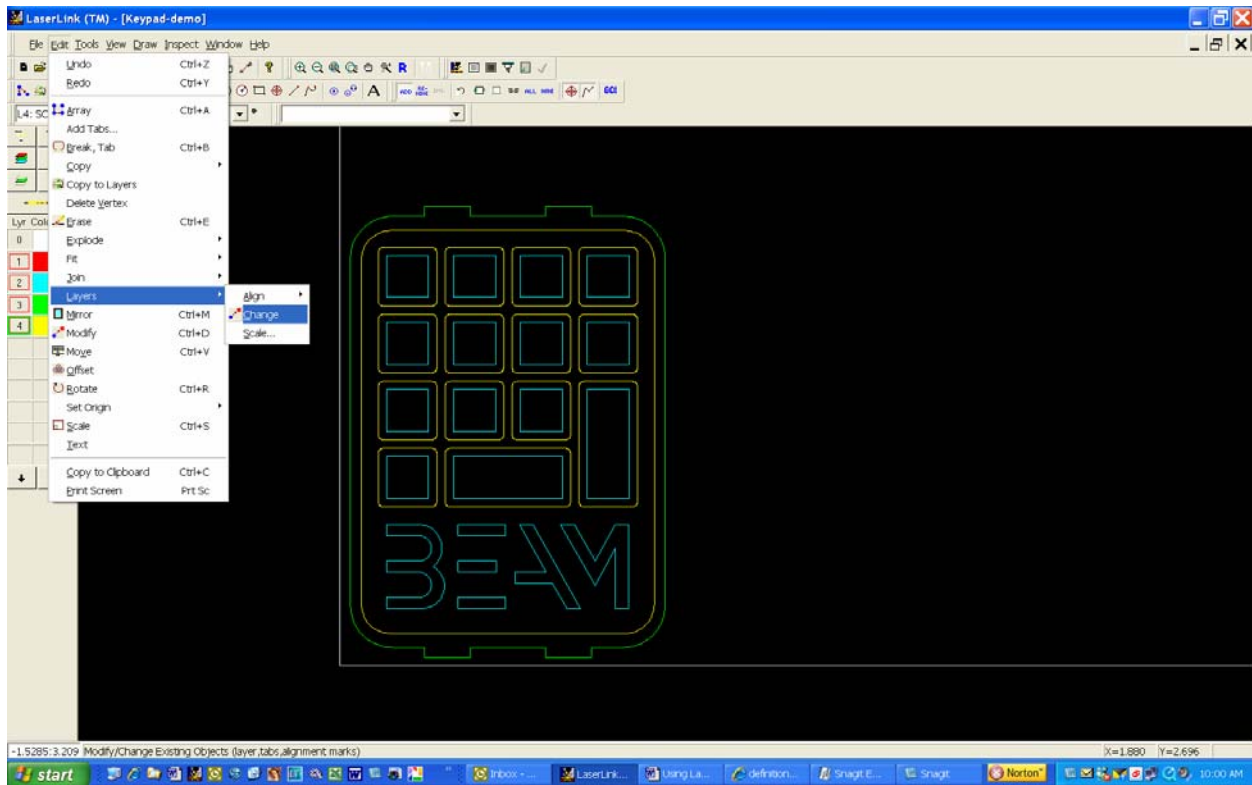
**“Join Group”**: continued. After selecting the features you wish to join right click to get the join and fix dialogue box. Select a tolerance (the distance LaserLink should use to assume lines should be connected) and a join method (Fuzzy or Intersection) Fuzzy forces a connection and Intersection connect only where lines could intersect. Click OK to complete.





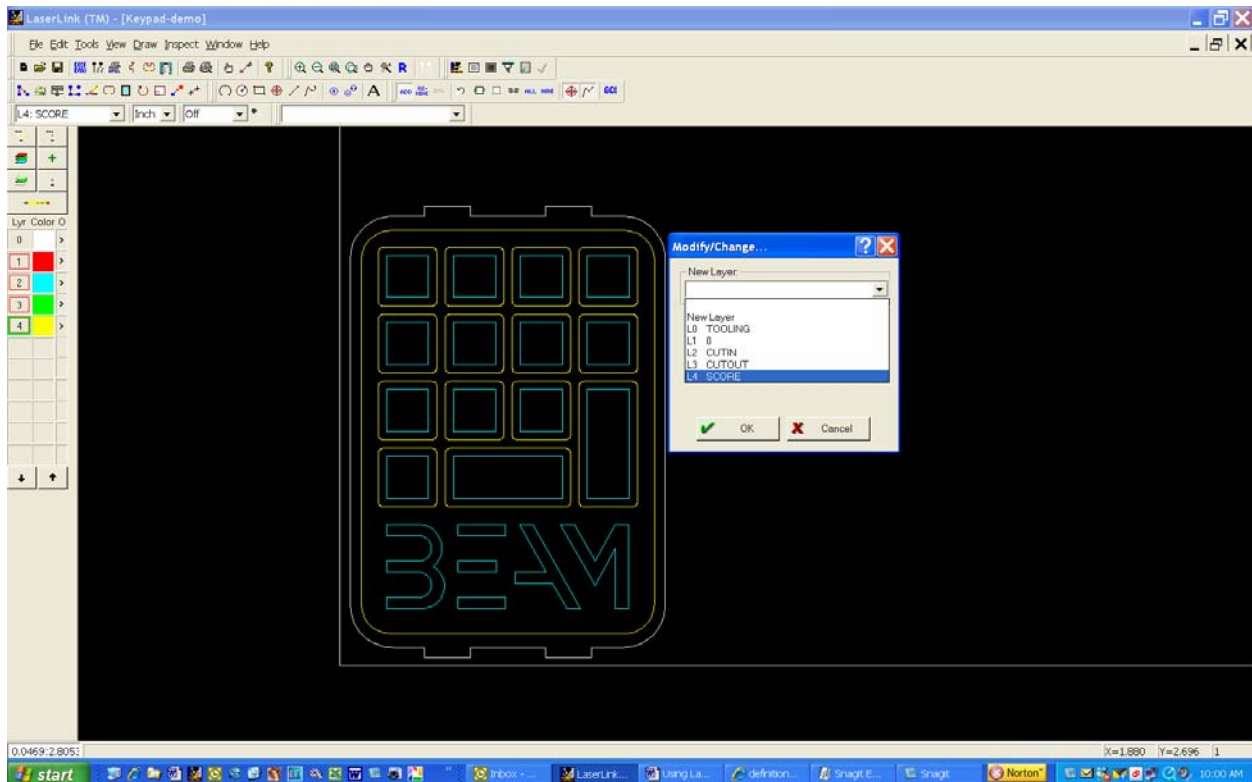
Edit Menu (Layers Change Shortcut Key)

**“Layers – Change”**: Left click “Edit” and navigate to “Layers” then “Change” and left click to get the selection tool “□”. Left click the feature you wish to change (modify) and then right click to get the “modify/change” dialogue box. (see next page)





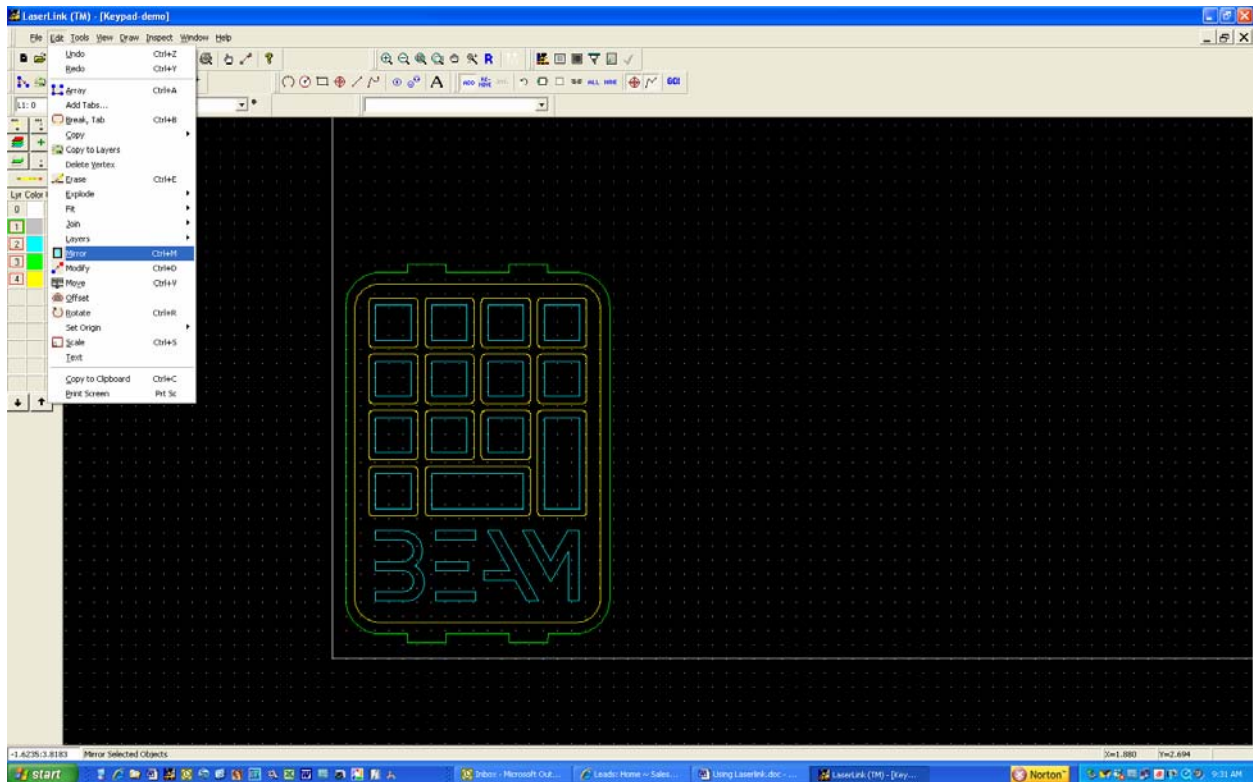
“Layers – Change”: continued. If you would like LaserLink to place the feature on a new layer select “New Layer” from the drop down list. If you would like to assign the feature to an existing layer highlight that layer from the dropdown list and left click “OK” to apply. *Please note that if you are changing layers or modifying an alignment marks feature the dialogue box will include a vision system program number selection option. This tells the vision system which program number (stored in its memory) should be used for the registration process.*





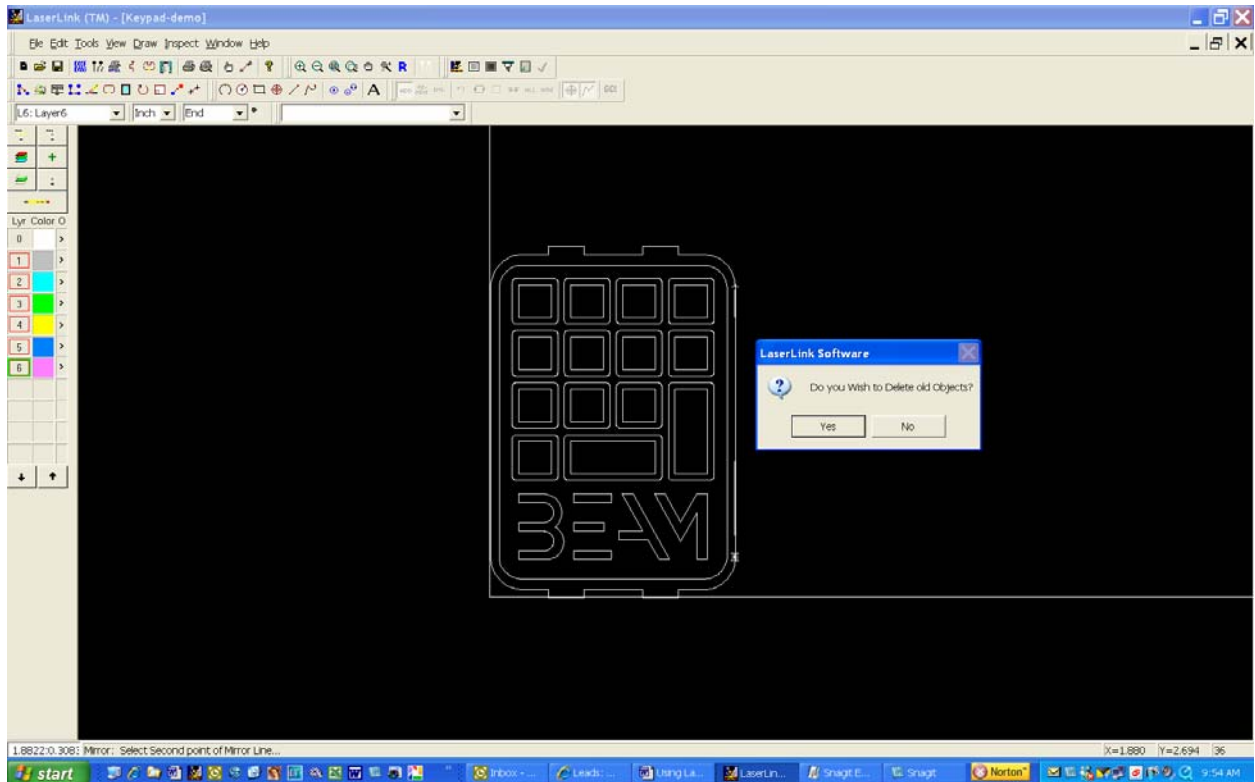
Edit Menu - (Mirror Shortcut Key)

**“Mirror”**: Left click “Edit” then “Mirror” to get your selection tool “□”. Left click the objects you wish to mirror. After selecting all of the features you wish to mirror right click and turn on your “object snaps” to select the line on which you will be mirroring the object. Follow the instructions in the message pane to “select first point of mirror line” left click then “select the second point of mirror line”. After selection of the second mirror point you will be asked whether you wish to delete old object. In this case we won’t delete old object. (see next page for completed mirror)



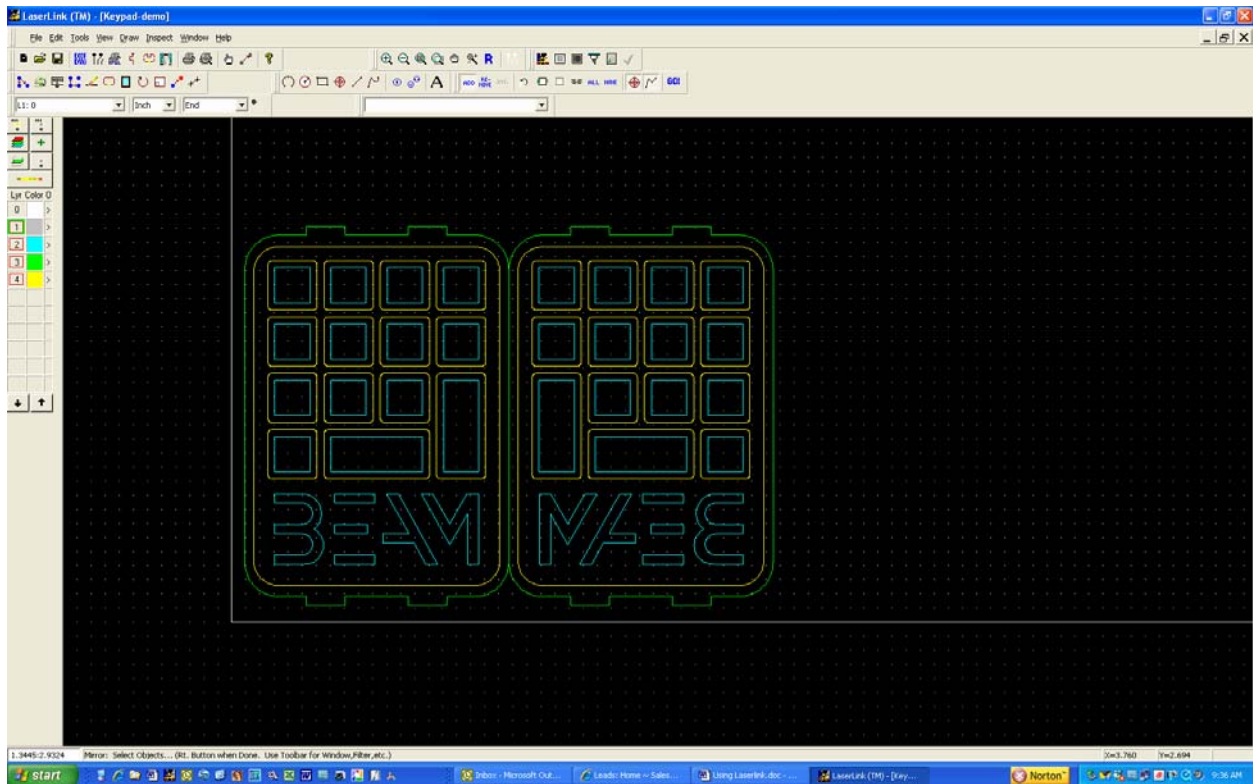


“*Mirror*”: continued. Notice object snaps are turned on “end” and message pane indicates “select second point of Mirror line”. Right clicking brings up the “delete old objects” selection.





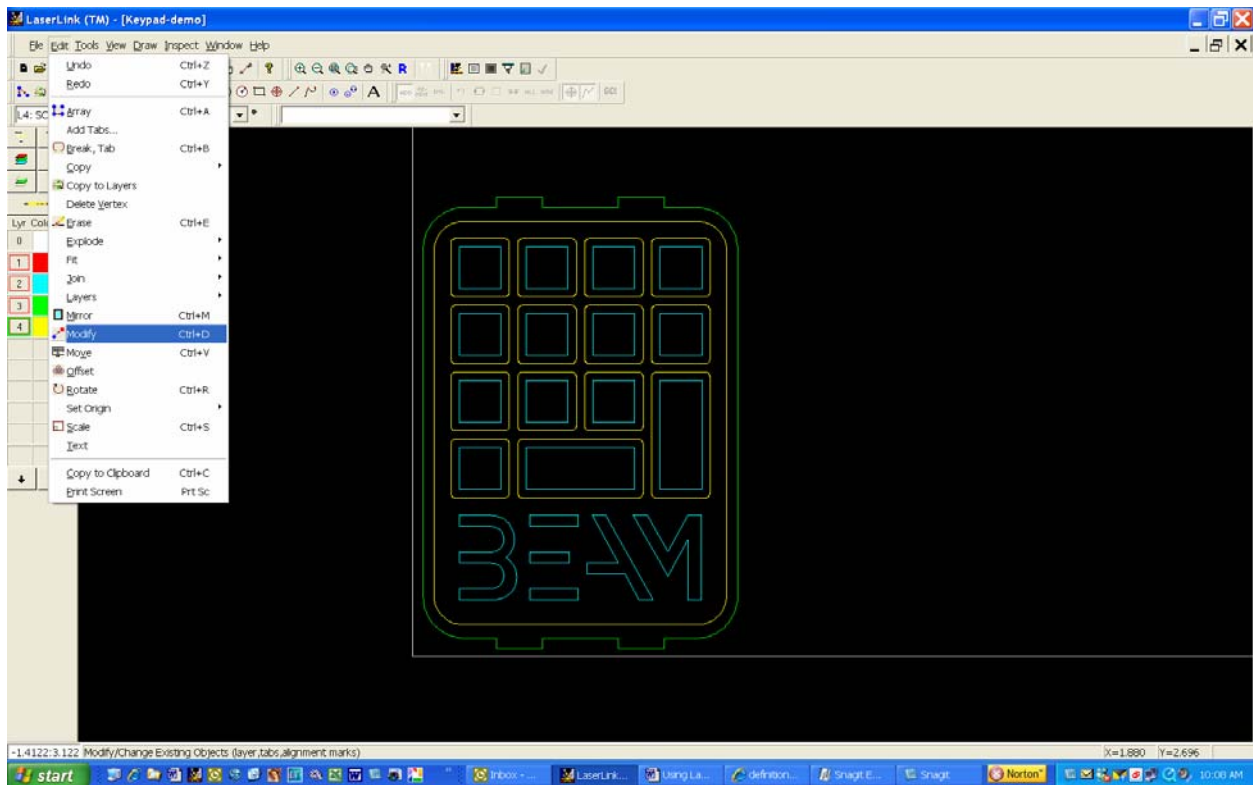
“Mirror”: continued. Completed mirror





Edit Menu (Modify Shortcut Key)

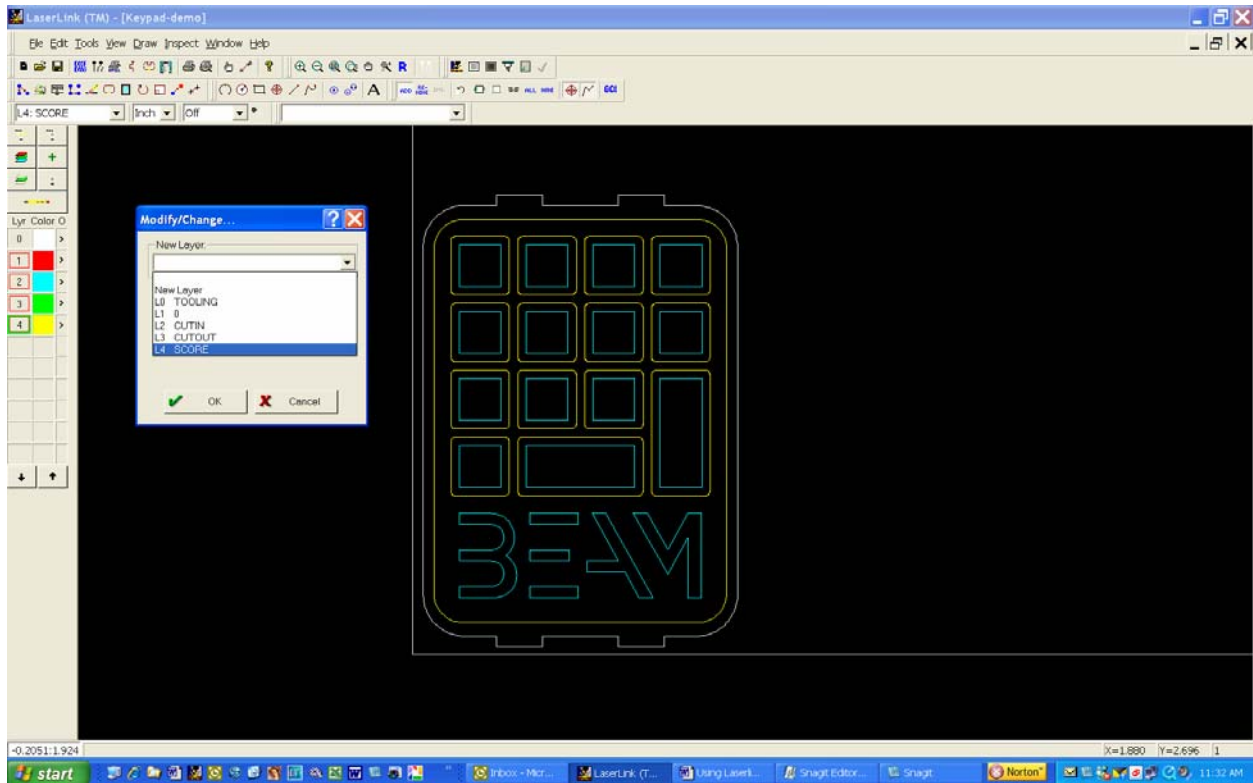
**“Modify”**: Modify steps identical to “Layers Change”. Left click “Edit” then “Modify” to get your selection tool “□”. After selecting all of the features you wish to Modify right click to get your “modify/change” dialogue box. (see next page)





Edit Menu

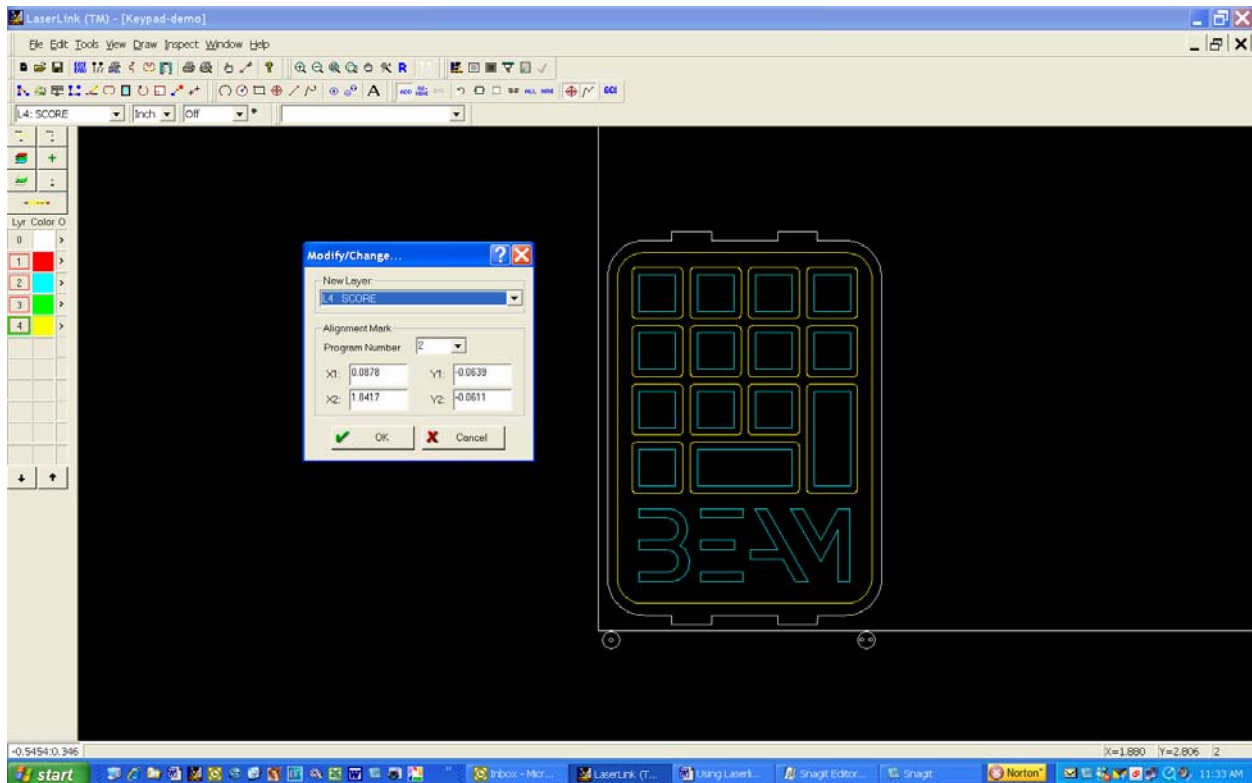
“Modify”: continued. If you would like LaserLink to place the feature on a new layer select “New Layer” from the drop down list. If you would like to assign the feature to an existing layer highlight that layer from the dropdown list and left click “OK” to apply. (see next page)







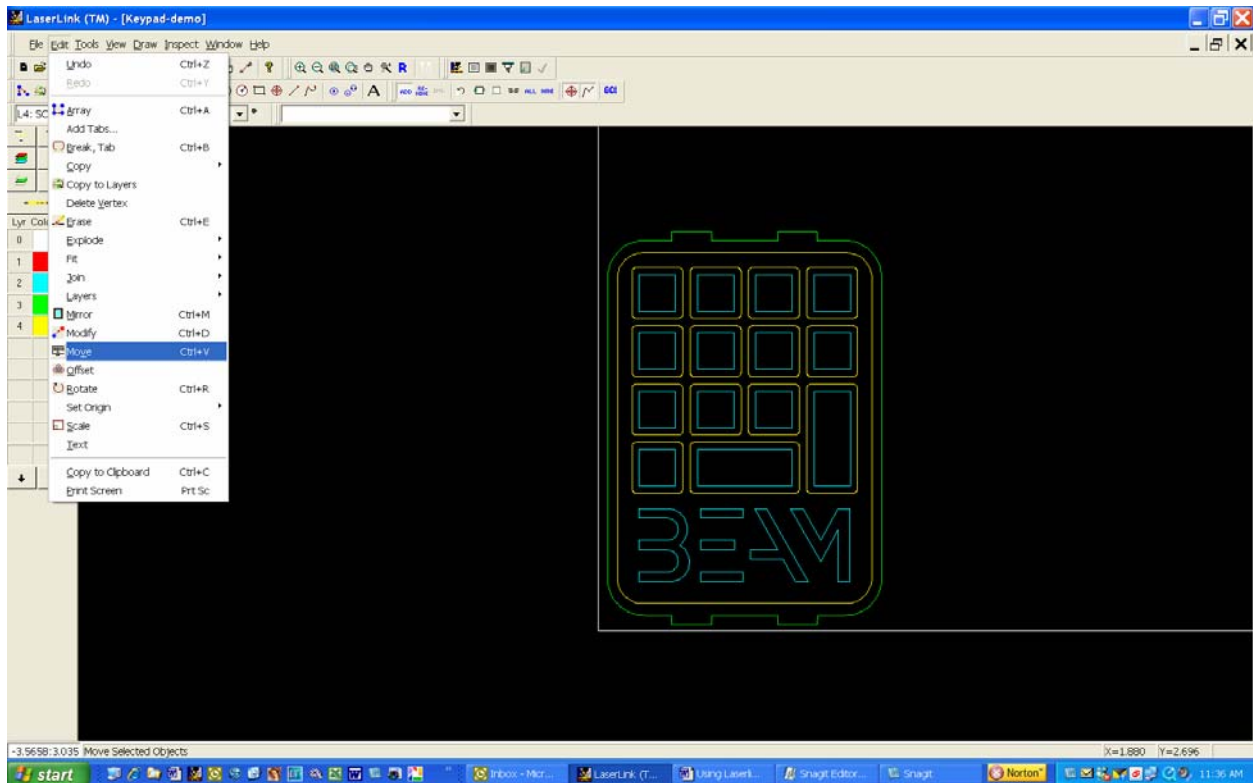
“**Modify**”: continued. When vision alignment is involved. If you are changing layers or modifying an alignment marks feature the dialogue box will include a vision system program number selection option. This tells the vision system which program number (stored in its memory) should be used for the registration process.





Edit Menu (Move Shortcut Key)

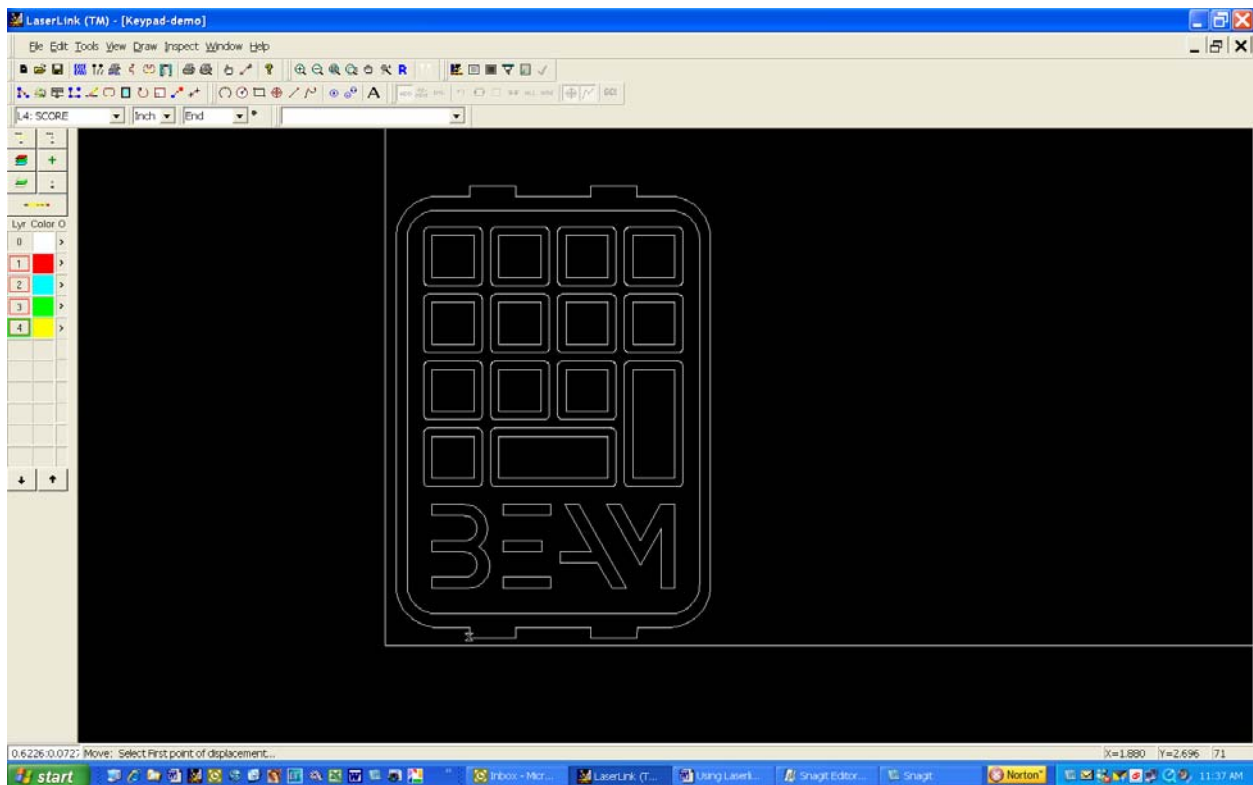
**“Move”**: Left click “Edit” then “Move” to get your selection tool “□”. Use the selection tool to left click or group select all of the features you wish to move. Following selection right click and a box will appear around of the features to be moved. The message pane will ask you to “select the first point of displacement”. (see next page)





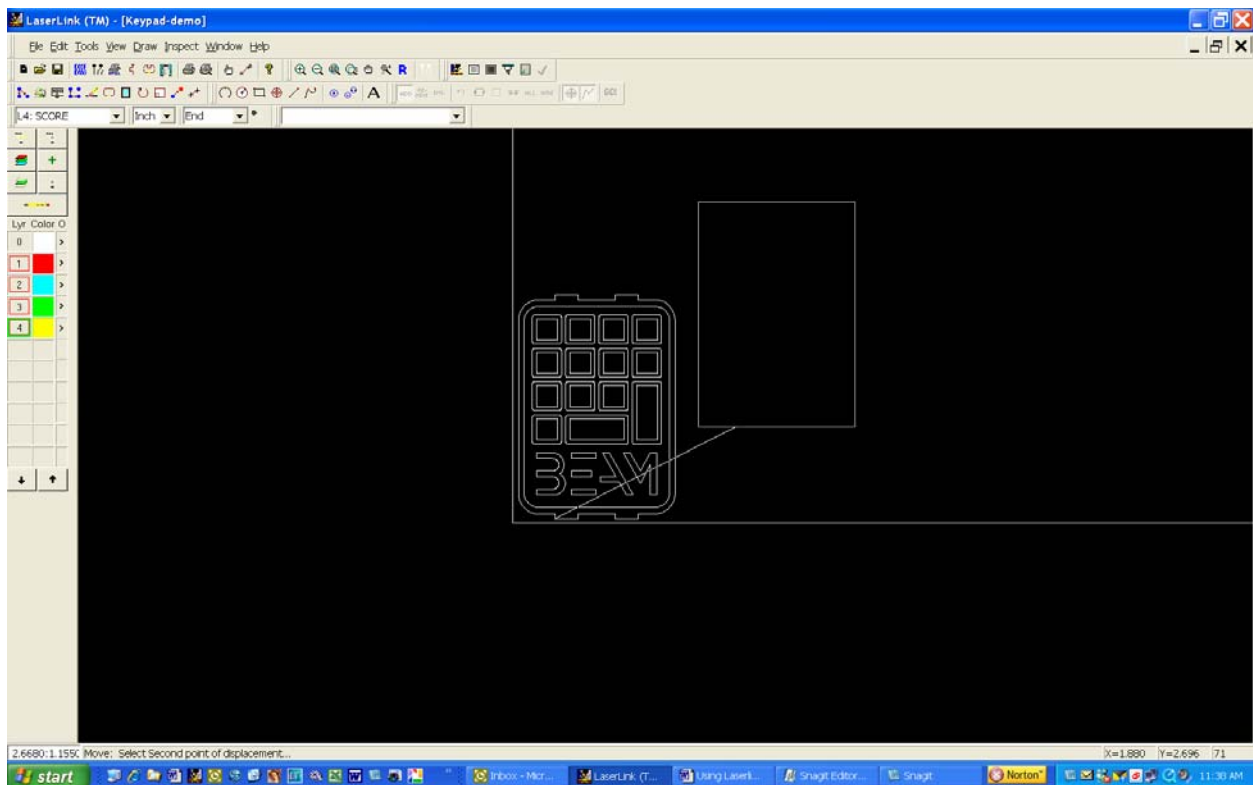
Edit Menu

**“Move”**: continued. The first point of displacement is the point of the feature you wish to move to the second point of displacement. Turn on your object snaps and snap “left click” to a point you wish to be the first point of displacement. The message pane will automatically indicate “select second point of displacement”. (see next page)





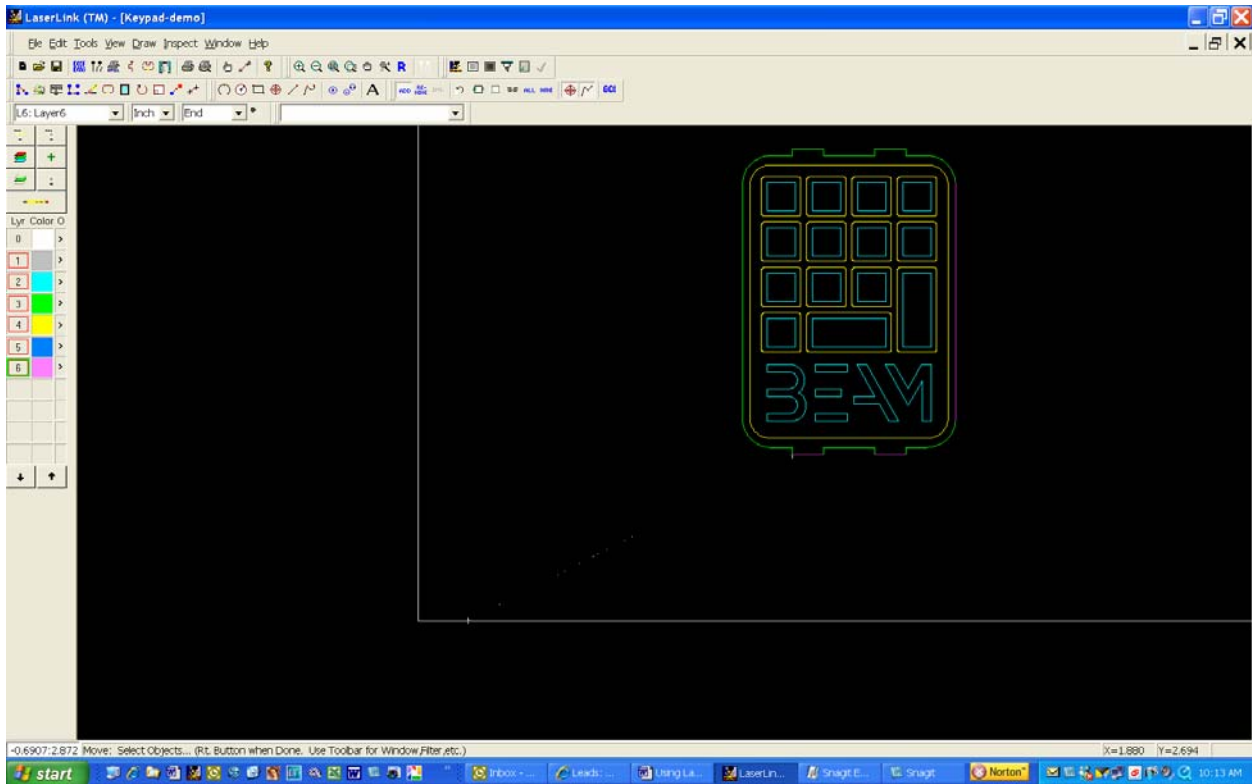
**“Move”**: continued. A move box connecting the first point of displacement to the second point of displacement will be displayed. Left clicking drops the object to the new location. You can also use the coordinate box to enter the first and second points of displacements using absolute coordinates. *(see next page)*





Edit Menu

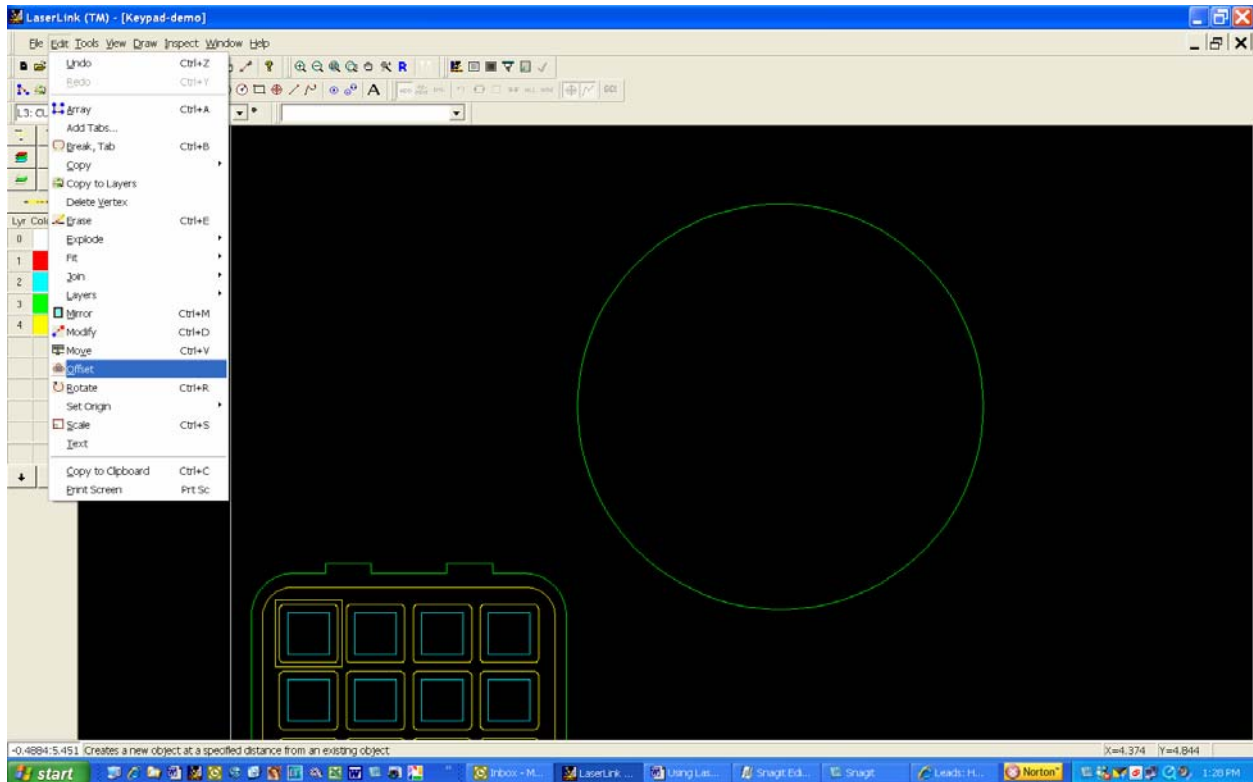
“Move”: continued. Move completed.





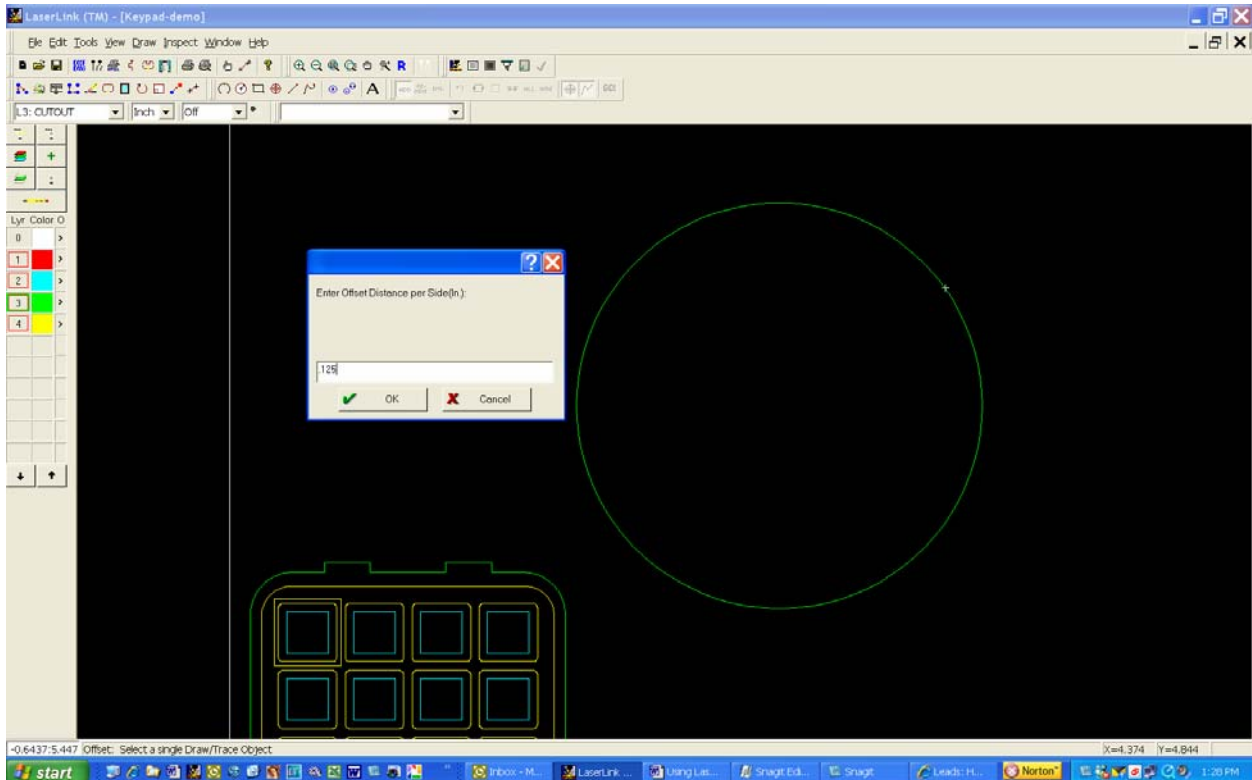
Edit Menu (Offset Shortcut Key)

**“Offset”**: Left click “Edit” then “Offset” to get your selection tool “□”. Left click the feature you wish to offset then right click to get the offset distance dialogue box. (see next page)



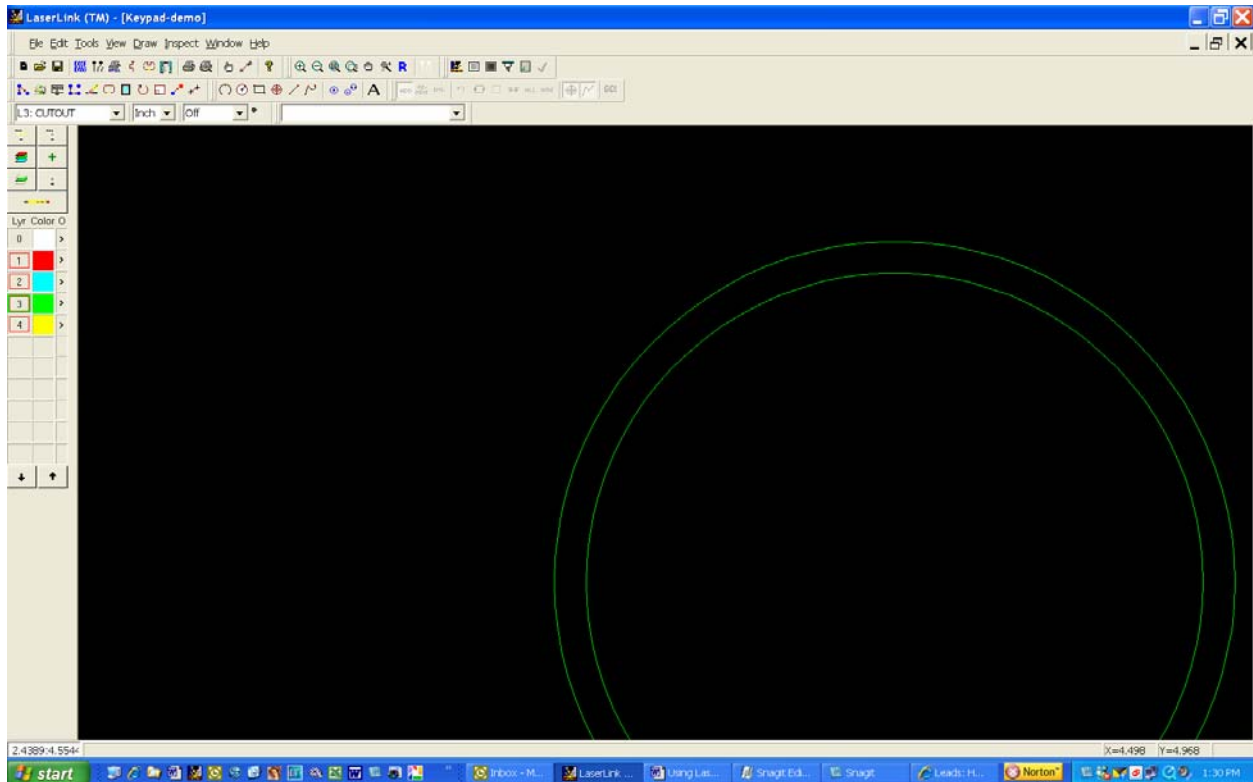
Edit Menu 

**“Offset”**: Enter the distance you wish to offset then click “OK”. (see next page)





“Offset”: continued. Left click inside or outside the line you are offsetting and the new offset line will be created.

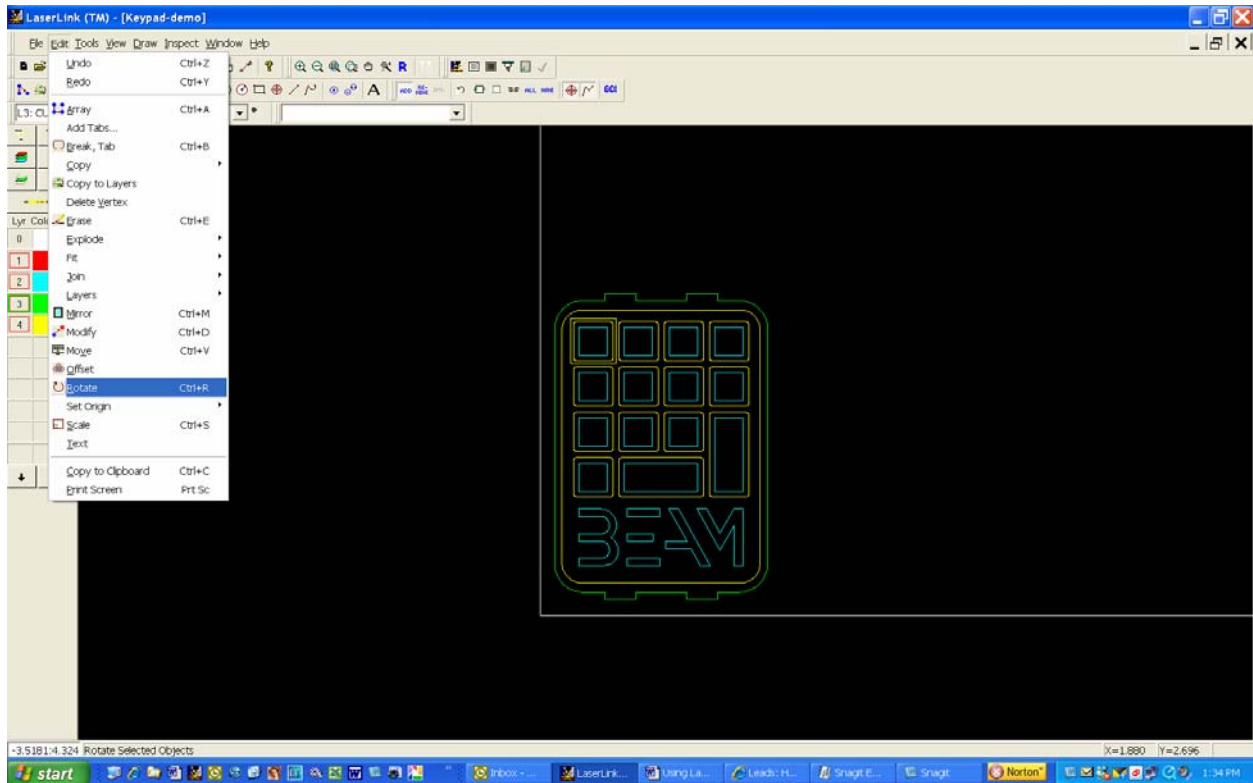






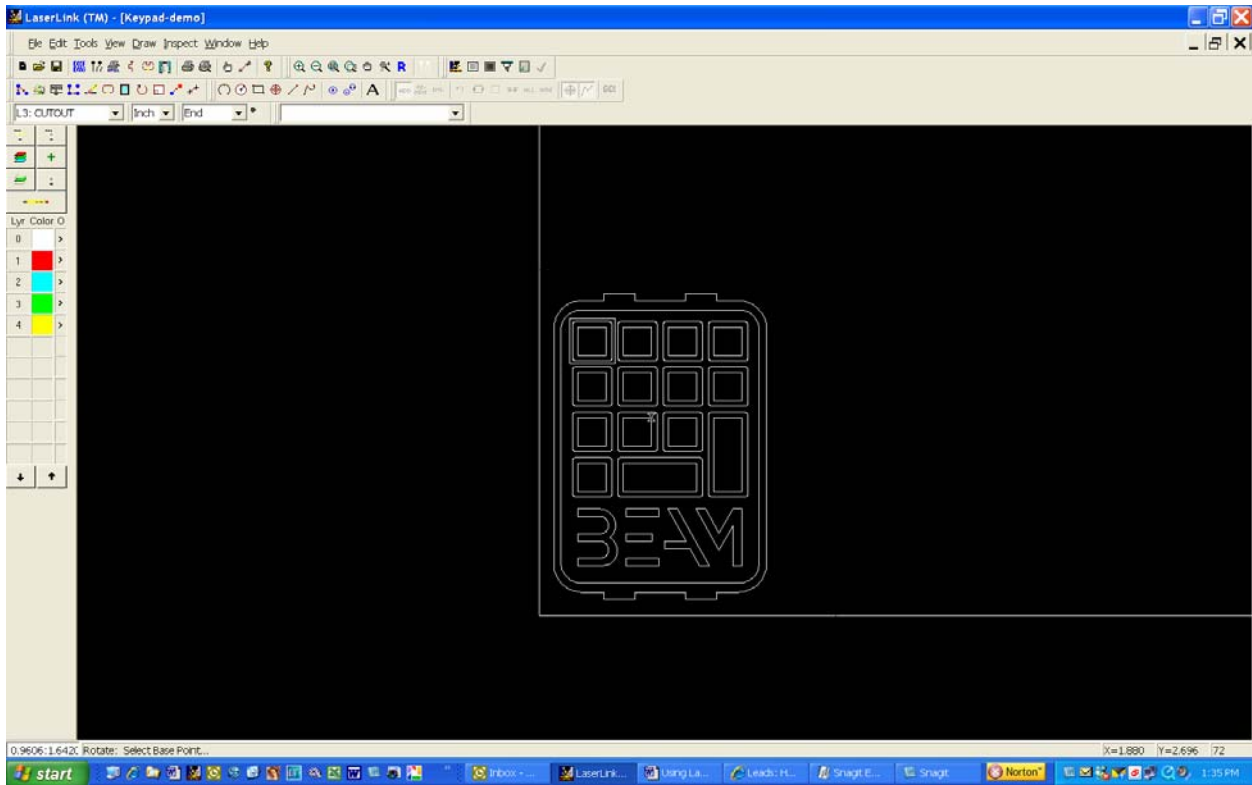
Edit Menu  (Rotate Shortcut Key)

**“Rotate”**: Left click “Edit” then “Rotate” to get your selection tool “□”. Left click all of the features you wish to rotate then right click. After right clicking you will notice the message pane asks “Rotate: Select Base Point...” (see next page)



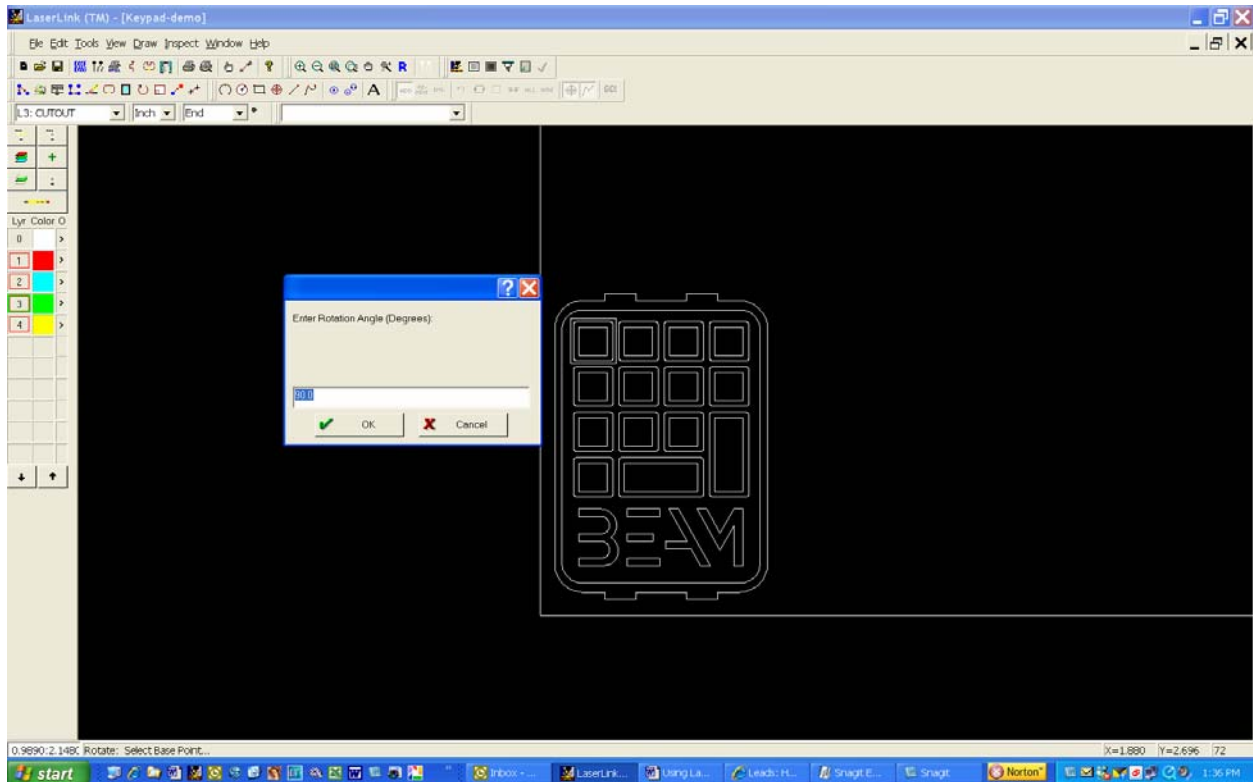


**“Rotate”**: continued. Turning on “object snaps” you can snap to the point around which you wish to rotate the part. After left clicking the base point of rotation the rotation dialogue box will display. (see next page)



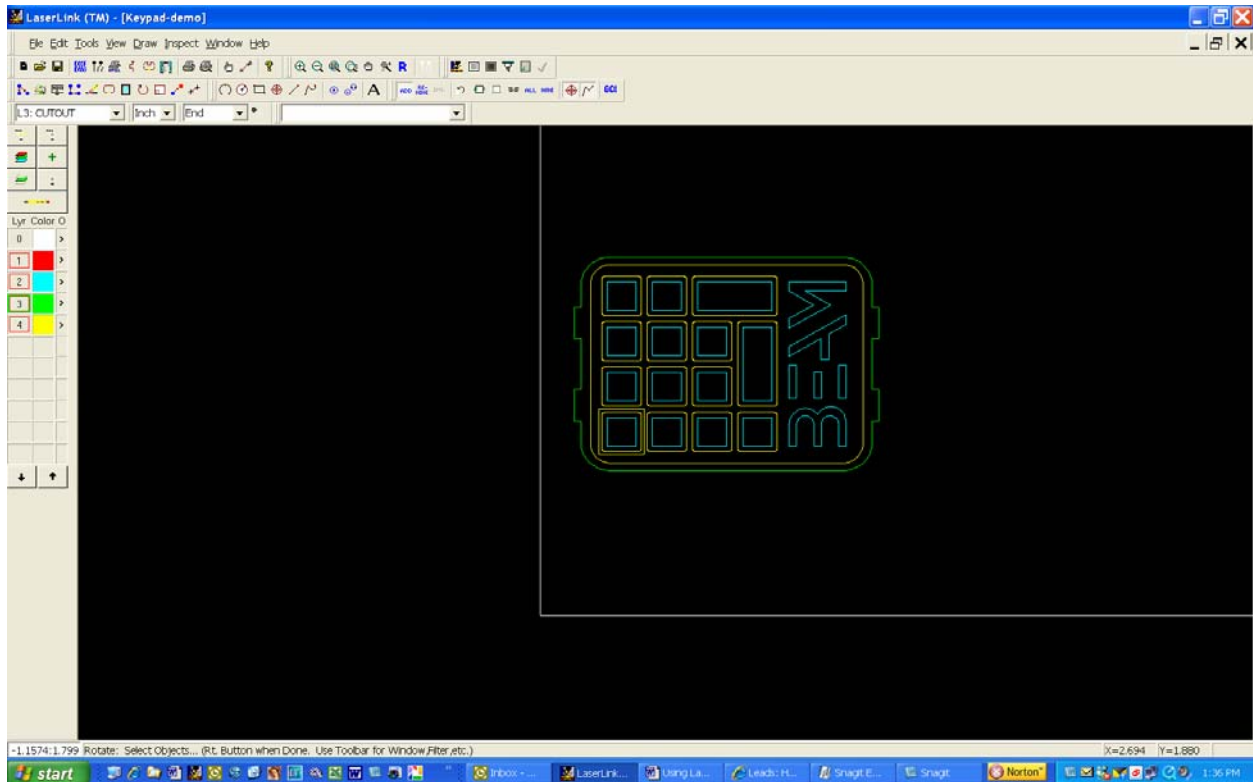


**“Rotate”**: continued. Enter the degrees you wish to rotate the part then click “OK”. (See next page)





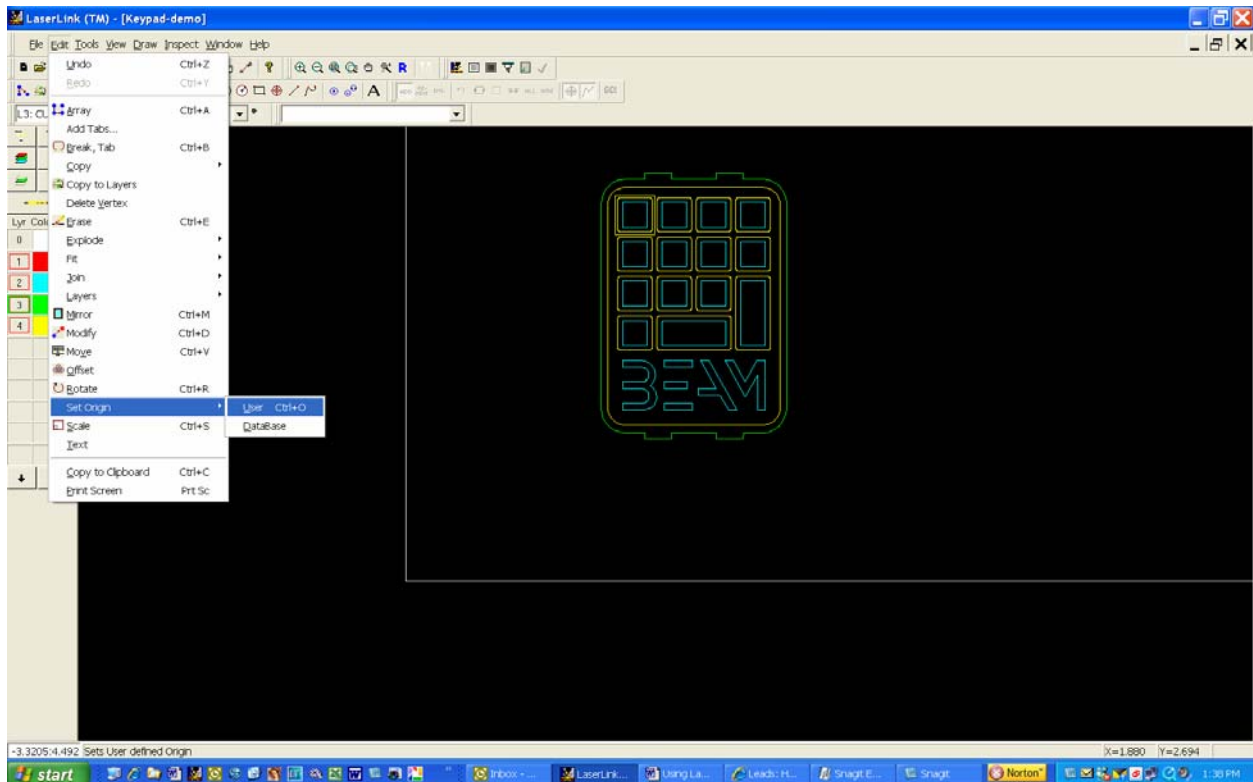
“Rotate”: continued. Part after rotation.





## Edit Menu

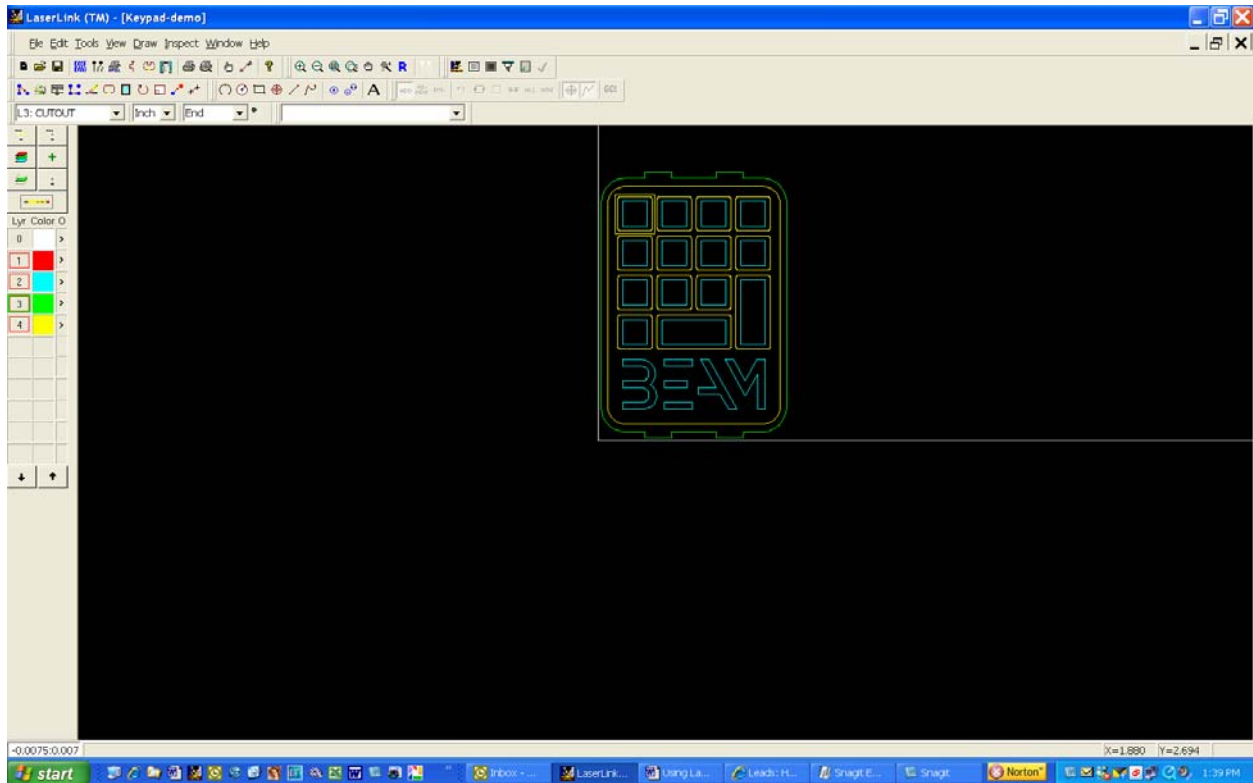
**“Set Origin”**: Left click “Edit” then maneuver to “Set Origin” and left click either “User” or “Database” to get your selection tool “+”. Left click on the location you wish to set as origin then hit “Redraw” and the new origin will display. Setting origin allows you to alter the location of the cutting box in relation to the part. Typically, operators will want to bring a single feature close to the “0,0” front left corner location on the cutting box. There are two methods for setting origin – User and Database. Basically, User moves the part while Database moves the cutting box. (*see next page*)






## Edit Menu

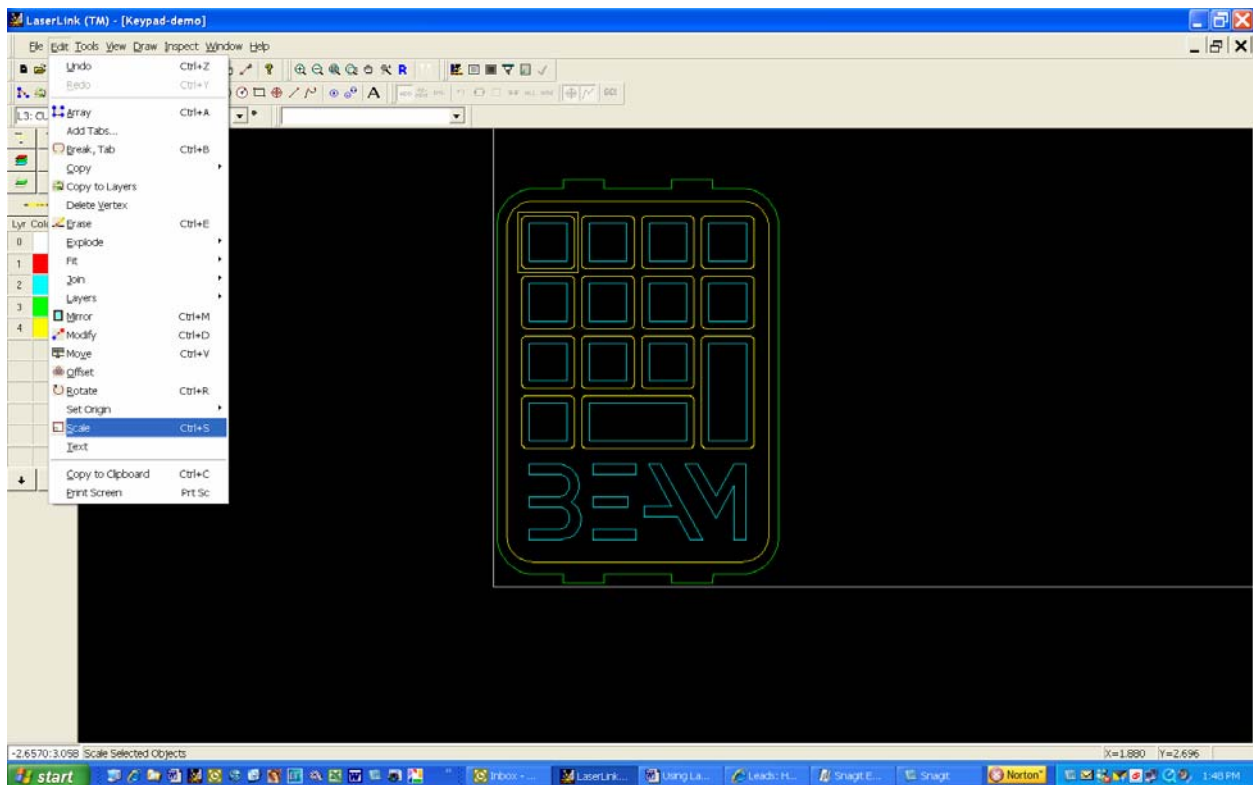
“Set Origin - User”: continued. Origin changed. (See next page)





Edit Menu  (Scale Shortcut Key)

**“Scale”:** Left click “Edit” then “Scale” to get your selection tool “□”. Either individually left click select or group select by left click and dragging over (left click, drag, left click) the features you wish to scale. Right click after selecting and follow the message pane instruction to select a base point from which to scale. After left clicking the base point the Scale Factor Dialogue box will appear. (see next page)

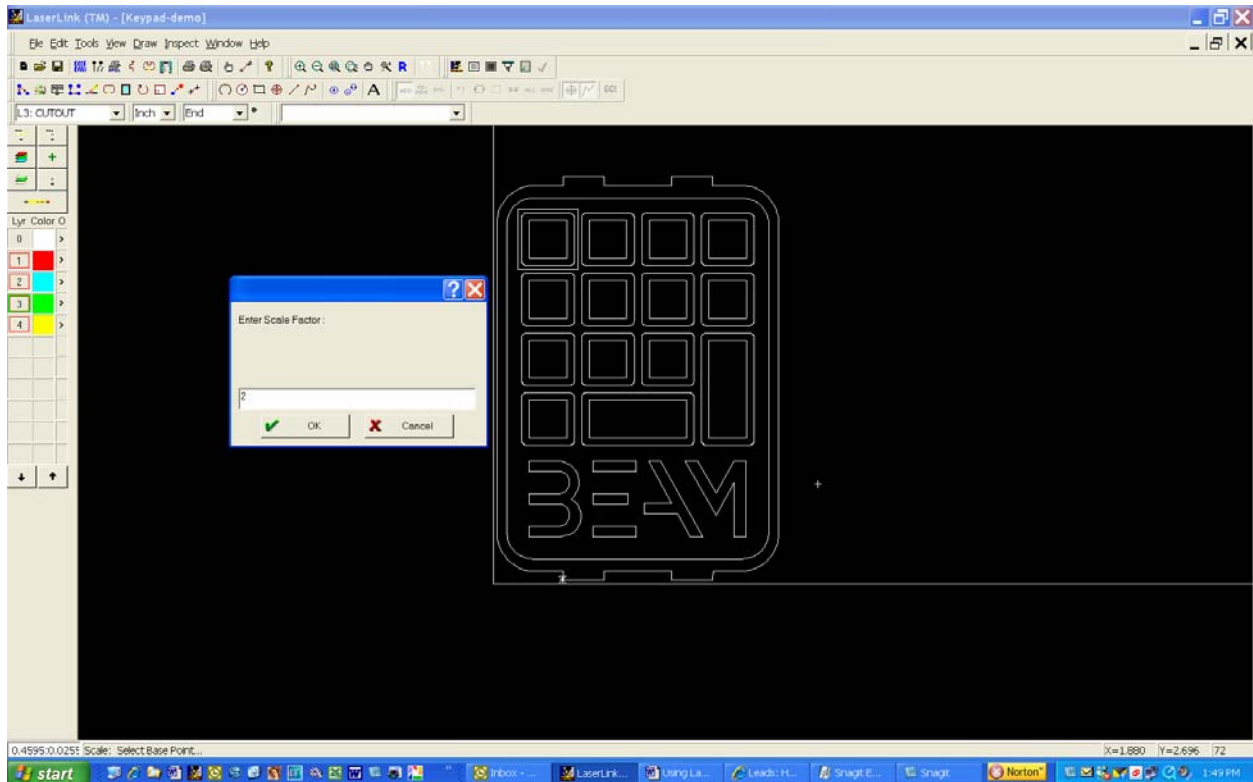




Edit Menu



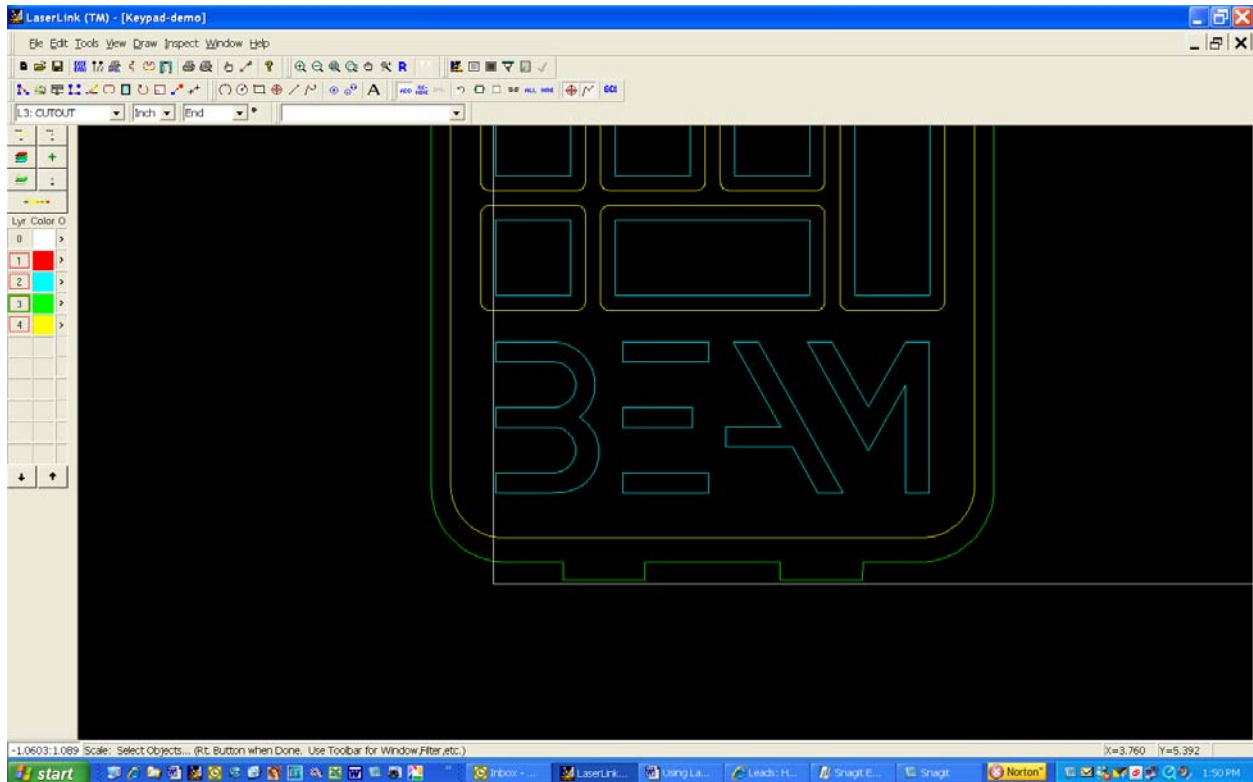
“Scale”: continued. Enter the scale factor into the dialogue box. *(see next page)*







“Scale”: continued. Object has been scaled.

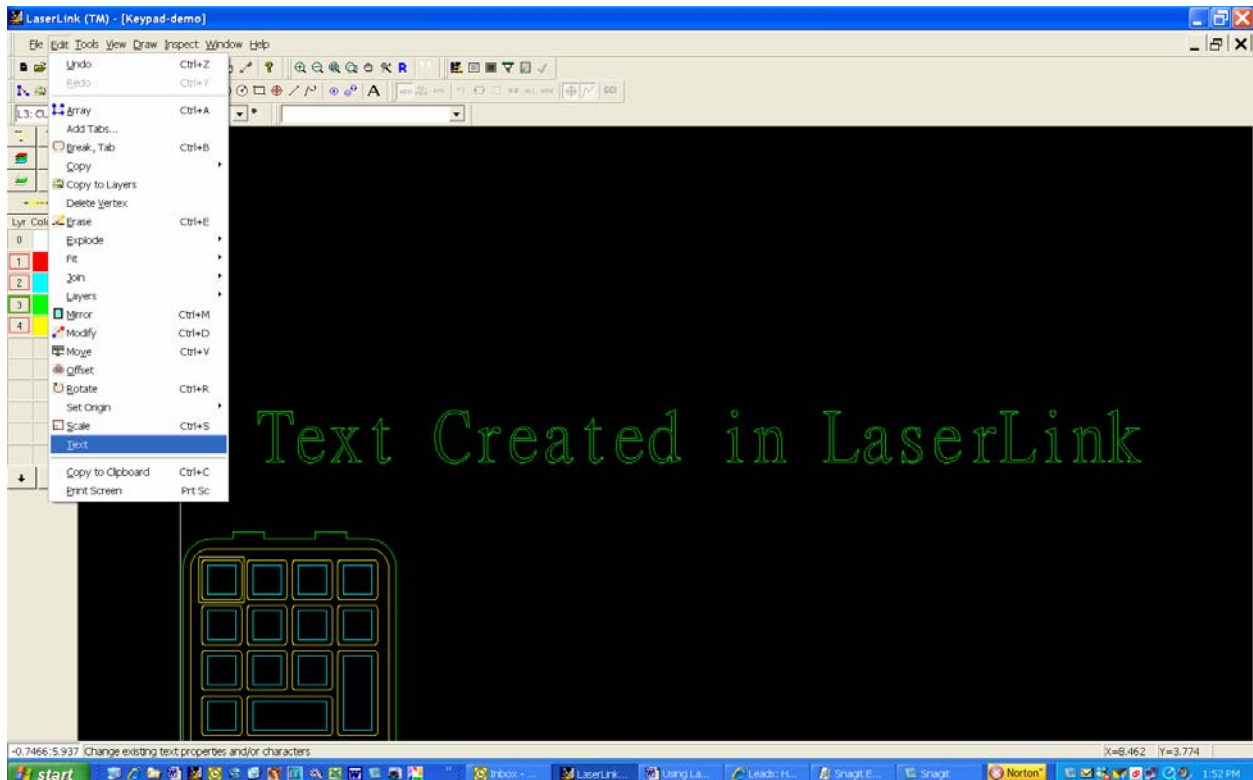




## Edit Menu

**“Text”**: Allows you to edit existing text that has been drawn in LaserLink with “Draw” tools.

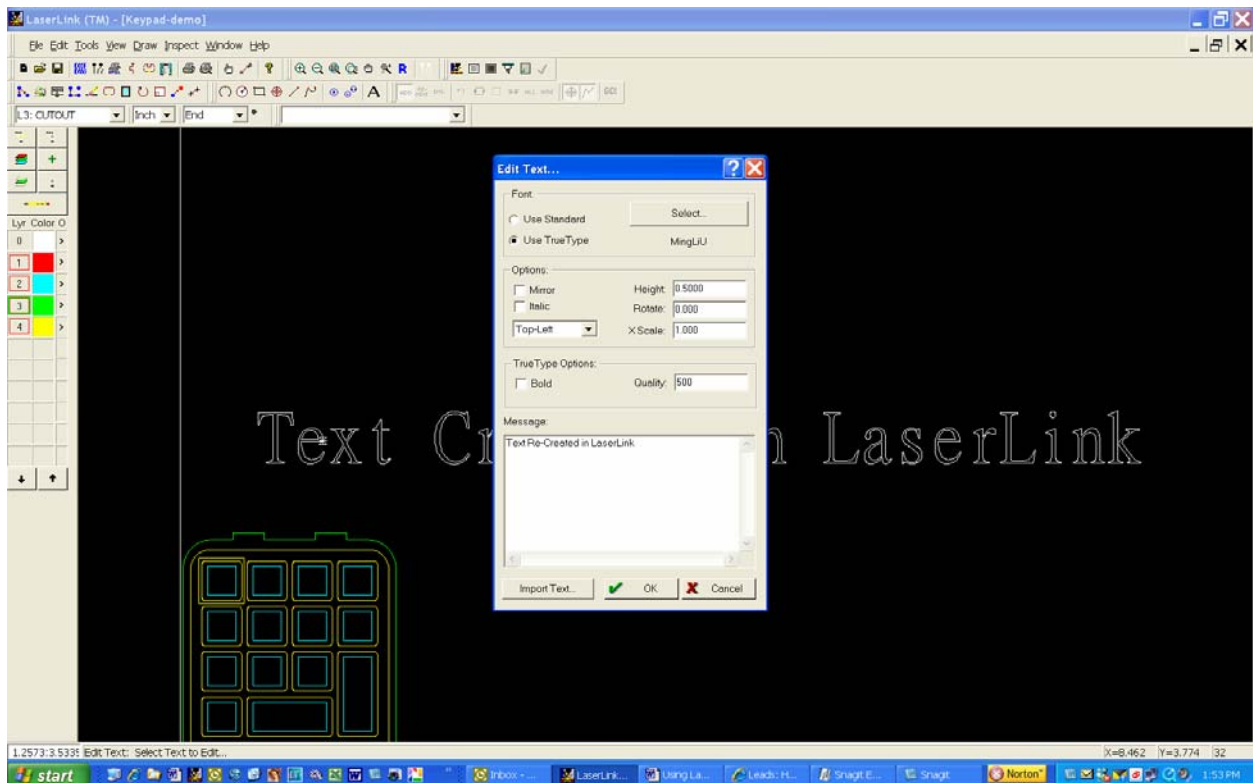
Left click “Edit” then “Text” to get your selection tool “□”. Use the selection tool to left click anywhere on the existing text. After clicking the “Edit Text” dialogue box will appear. (*see next page*)





## Edit Menu

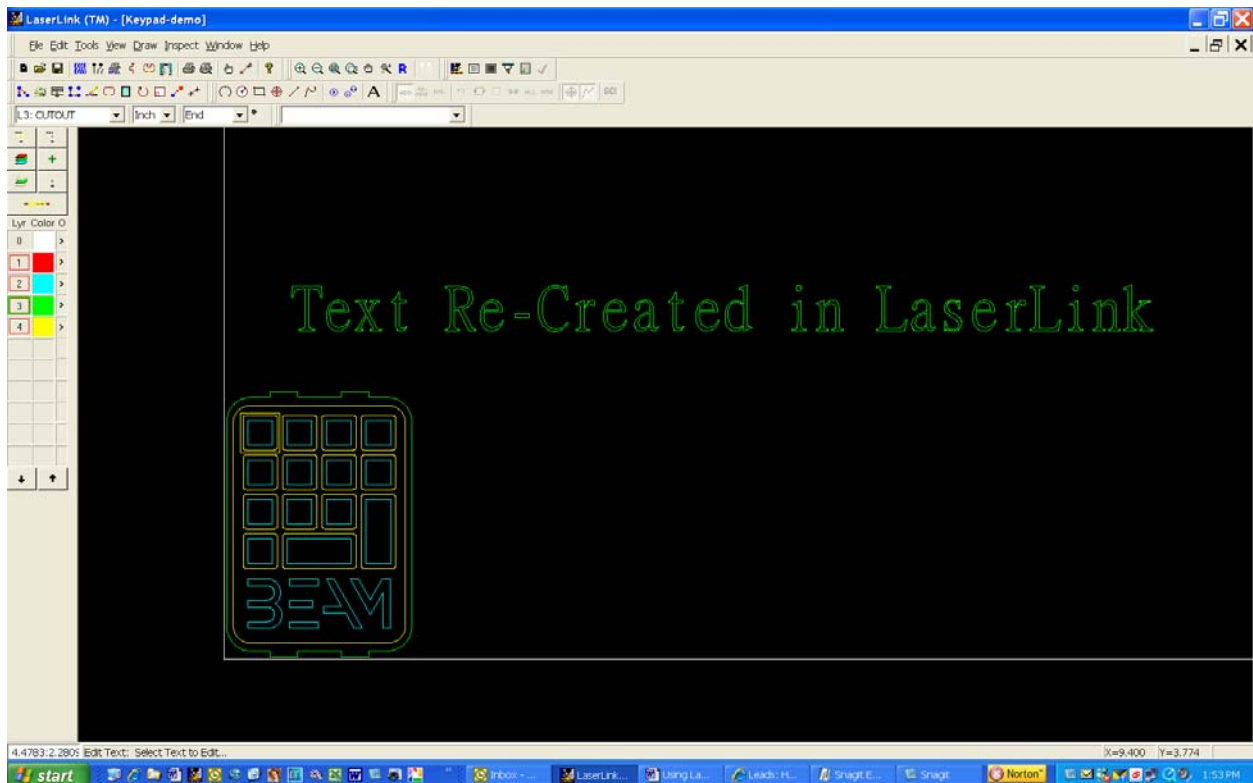
“Text”: continued. Make text edits in dialogue box and click “OK”. (See next page)





Edit Menu

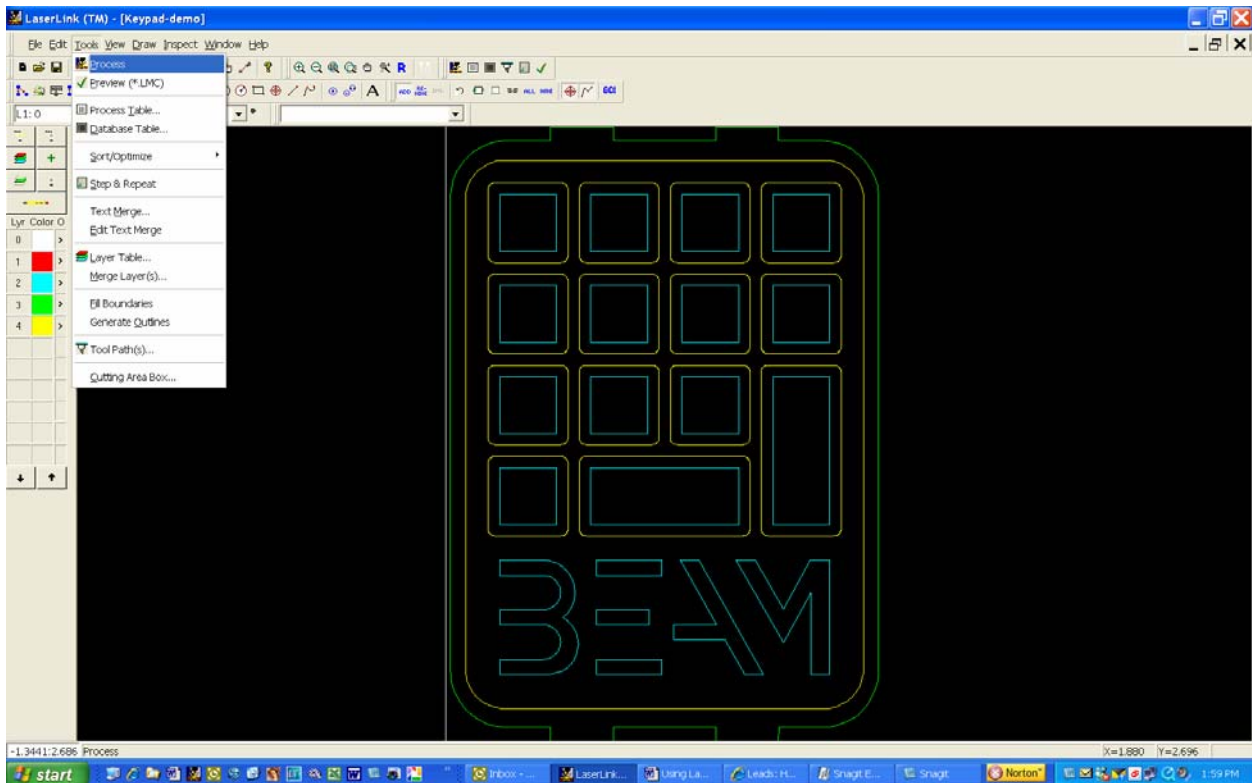
“Text”: continued. Text edit complete.





Tools Menu (Process Shortcut Key)

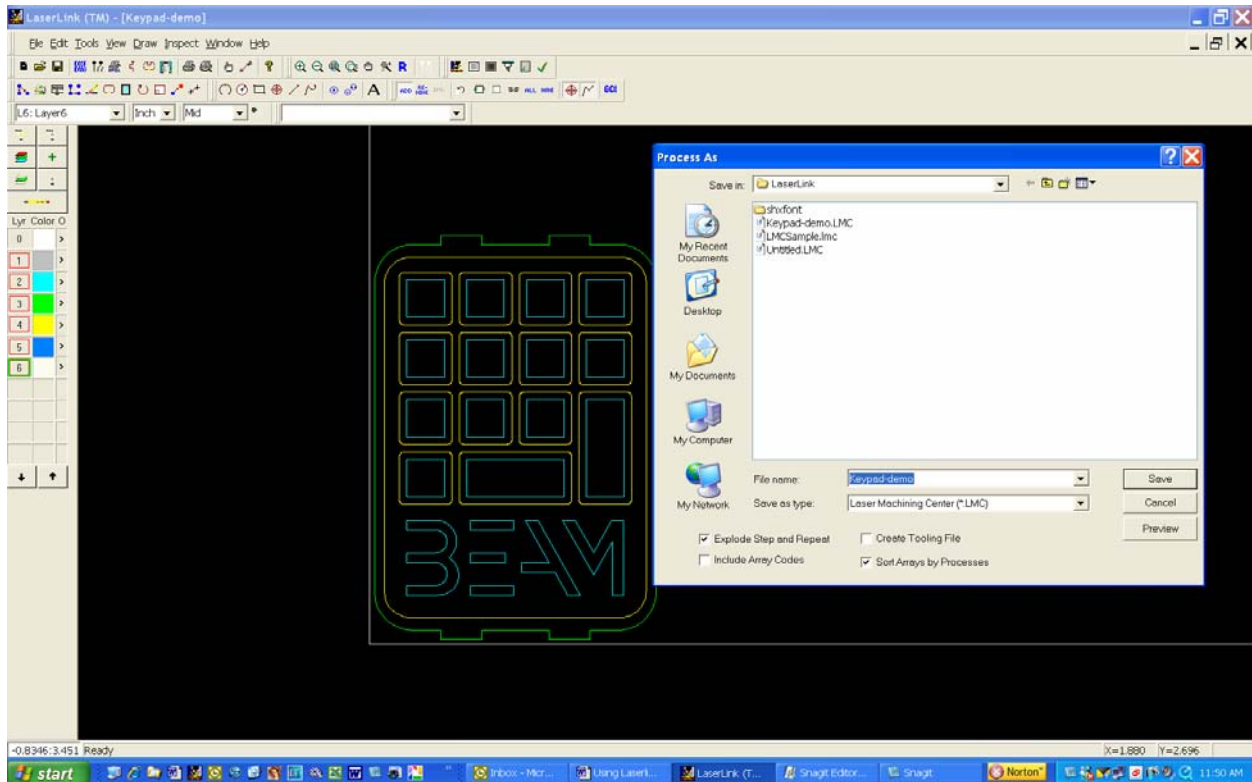
**“Process”**: Left click “Tools” then “Process”. This function requires an existing “Process Table” to process. You will be warned if a Process Table has not yet been created. If a Process Table has been created you will be prompted to save an .lmc (*laser machining center*) file. (see next page)





Tools Menu 

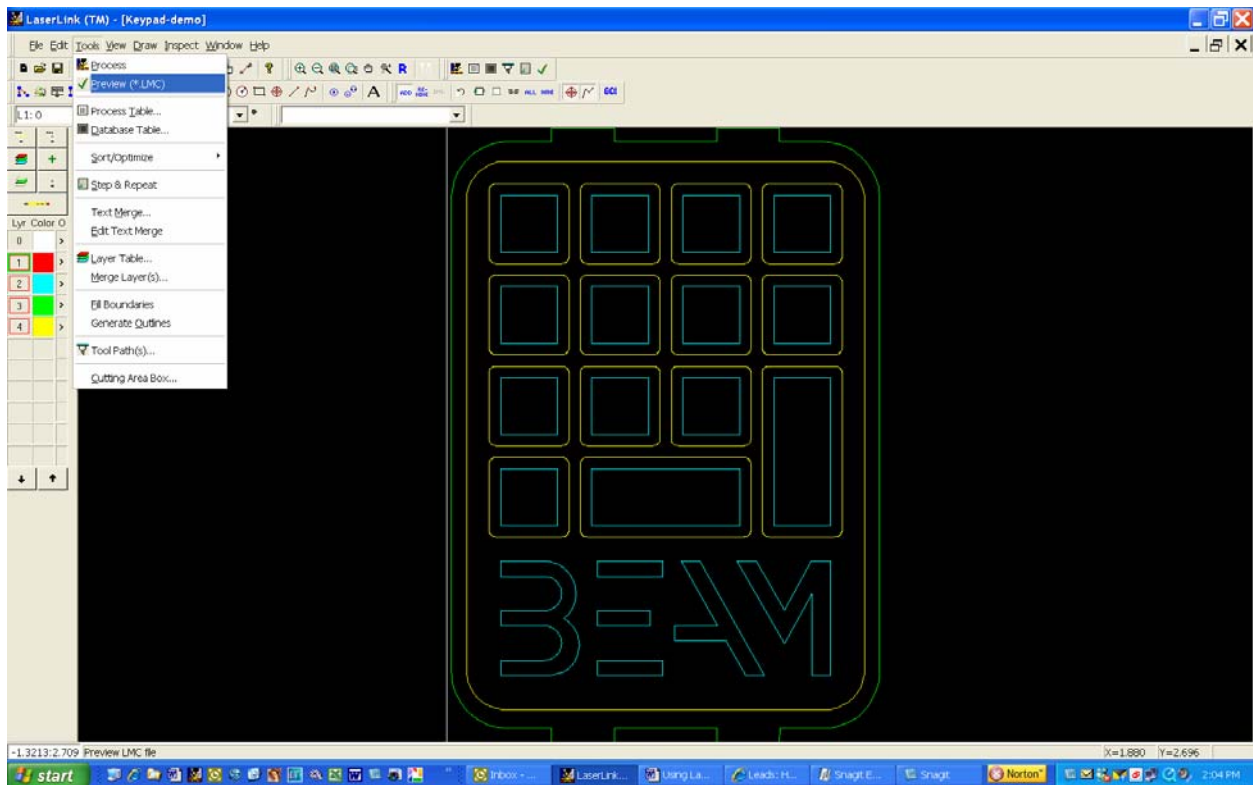
“Process”: continued. Process File creates the .lmc file. The .lmc contains the instructions the machine uses to run the part.





Tools Menu (Preview Shortcut Key)

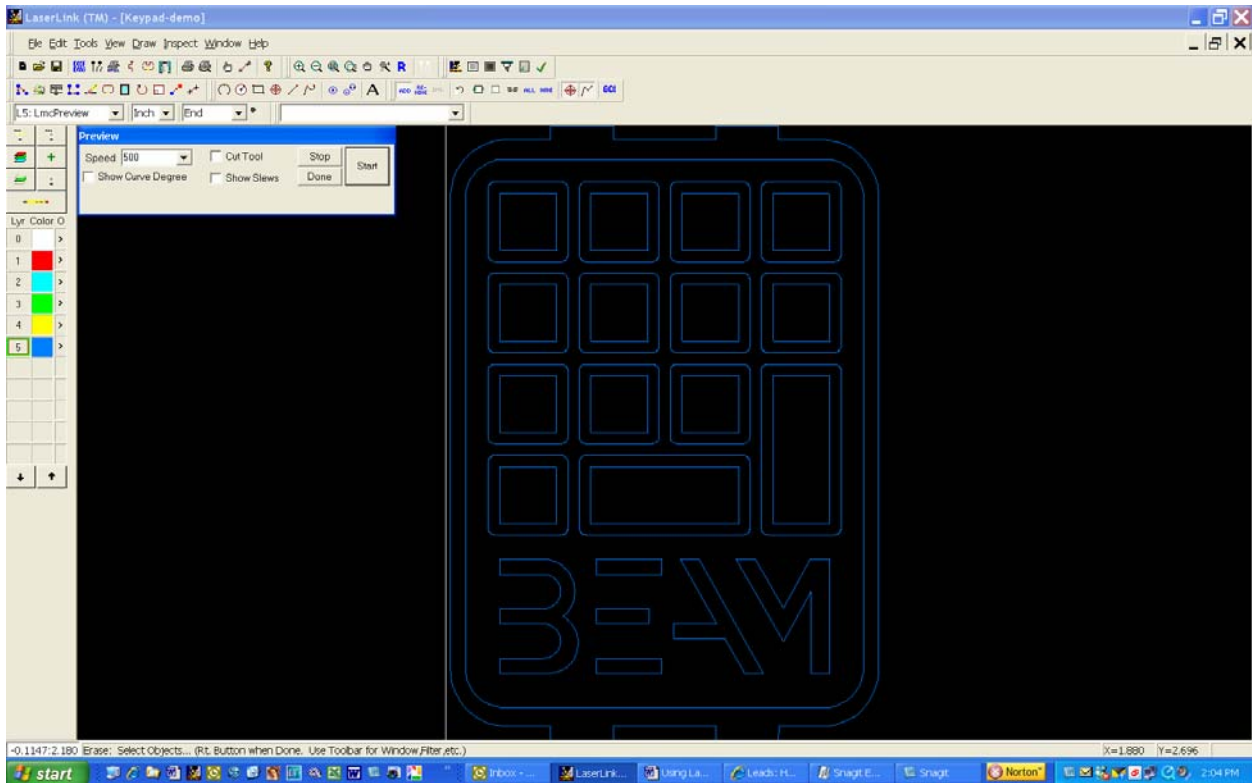
**“Preview”**: Allows you to preview the .lmc machine language to confirm all features will be cut. Files can only be previewed after a Process Table has been created and the file “Processed” to create an .lmc. Left click “Tools” then “Preview” to get the preview dialogue box. (see next page)





Tools Menu

**“Preview”**: continued. The .lmc is displayed (if nothing is displayed you know you did something wrong). You can now animate the cut process (order of cut) by selecting speed (lower speed provides a faster animation speed). Click start and the file will animate cut order. (see next page)

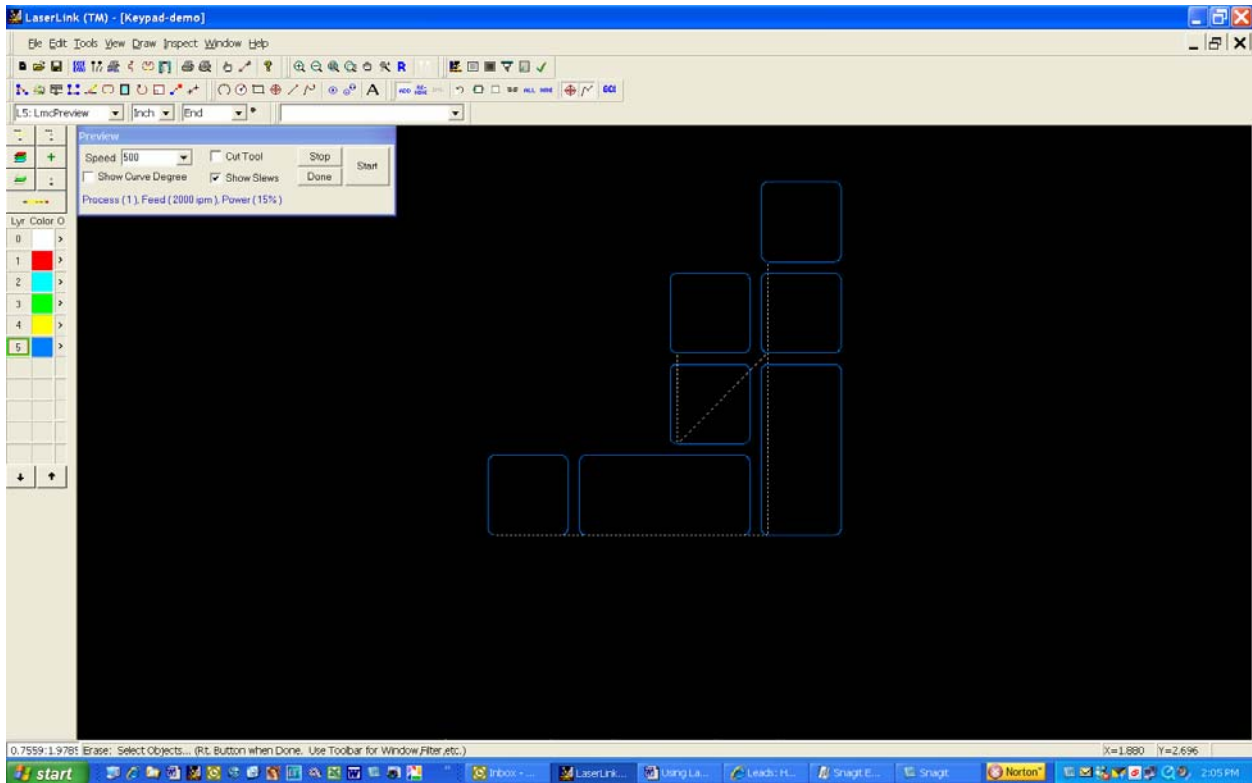






Tools Menu

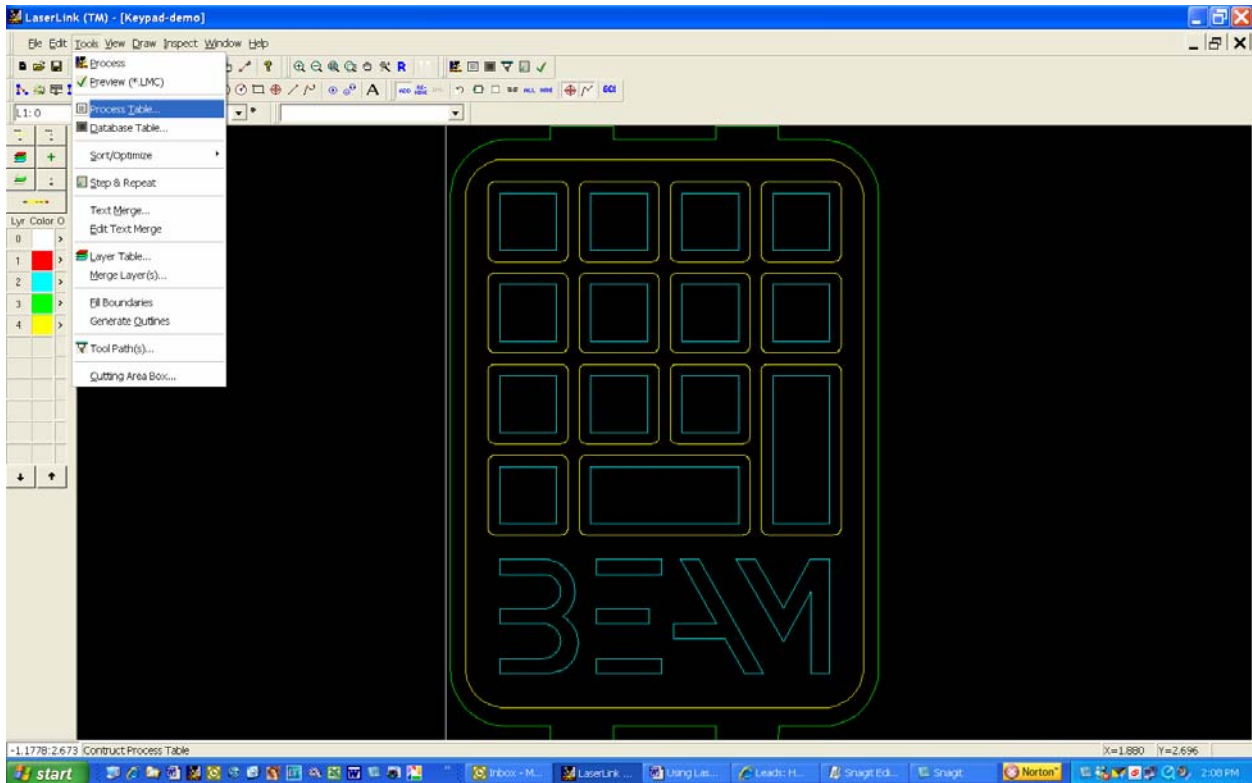
**“Preview”**: continued. You can also check the “show slews” box to see the repositioning moves the machine will make. The “Cut Tool” check box will show to “0” layer that is exclusively used in the Lumen DCC function of the machine.





Tools Menu (Process Table Shortcut Key)

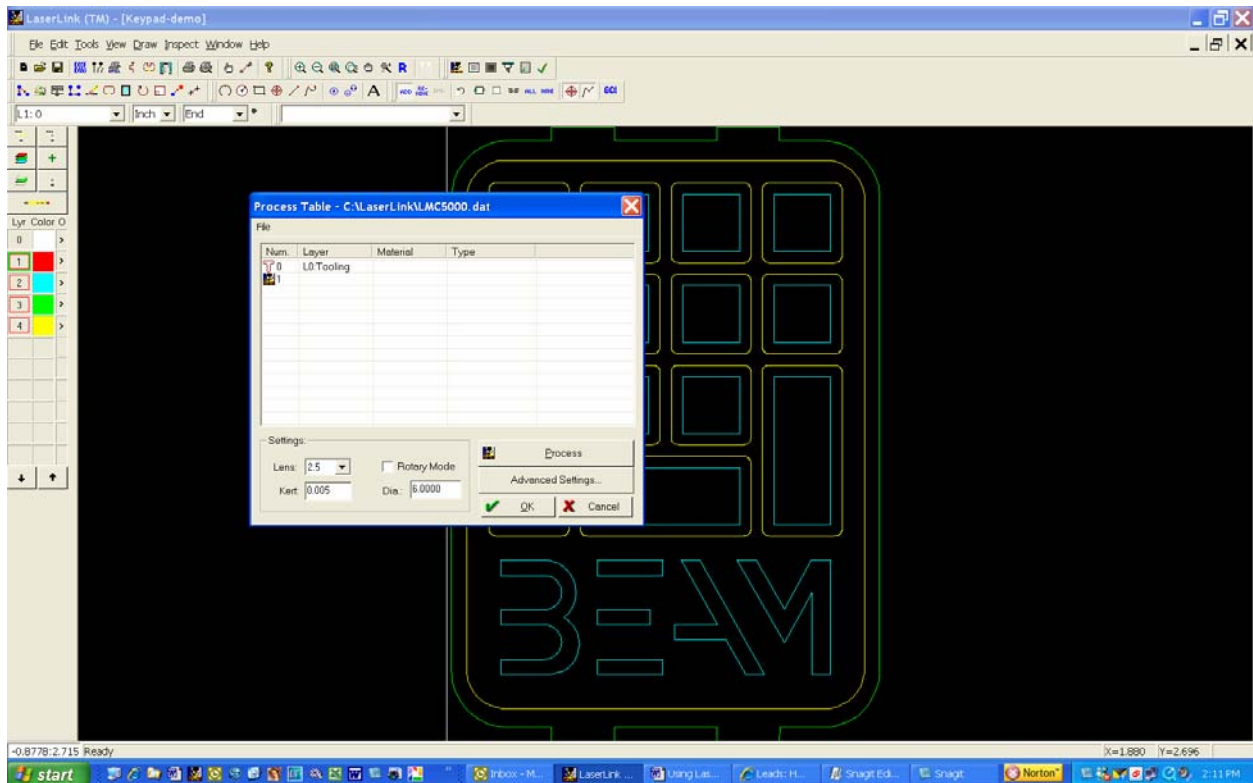
**“Process Table”:** The process table allows you to select the order in which layers will cut and the processes used to perform the cuts. Begin by left clicking “Tools” and “Process Table”. The Process Table dialogue box will then appear. (see next page)





Tools Menu

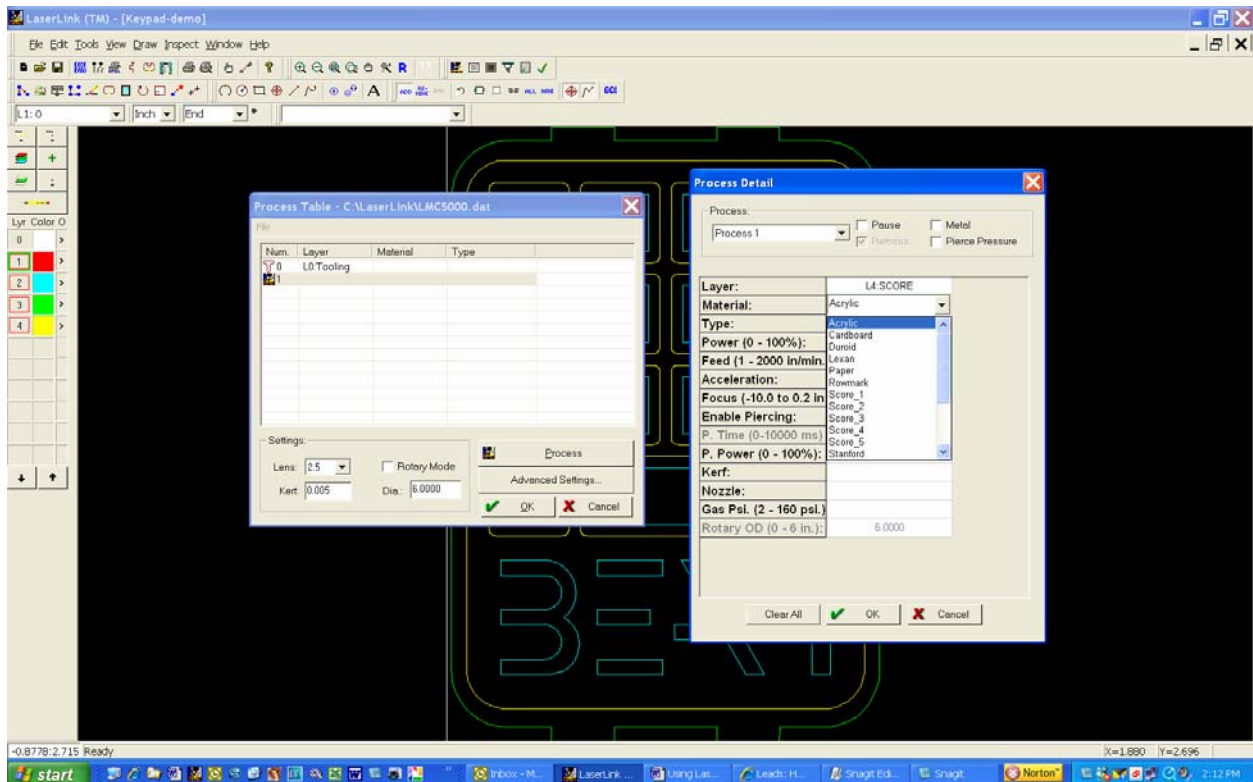
“**Process Table**”: continued. Begin completing the blank Process Table by double left clicking the Num. 1 box. Second process will be Num. 2 box. If you are processing identical materials with the same layer names you can also save a .ptf process table file. Then you just need to open an existing .ptf to complete the Process Table. (see next page.)





Tools Menu

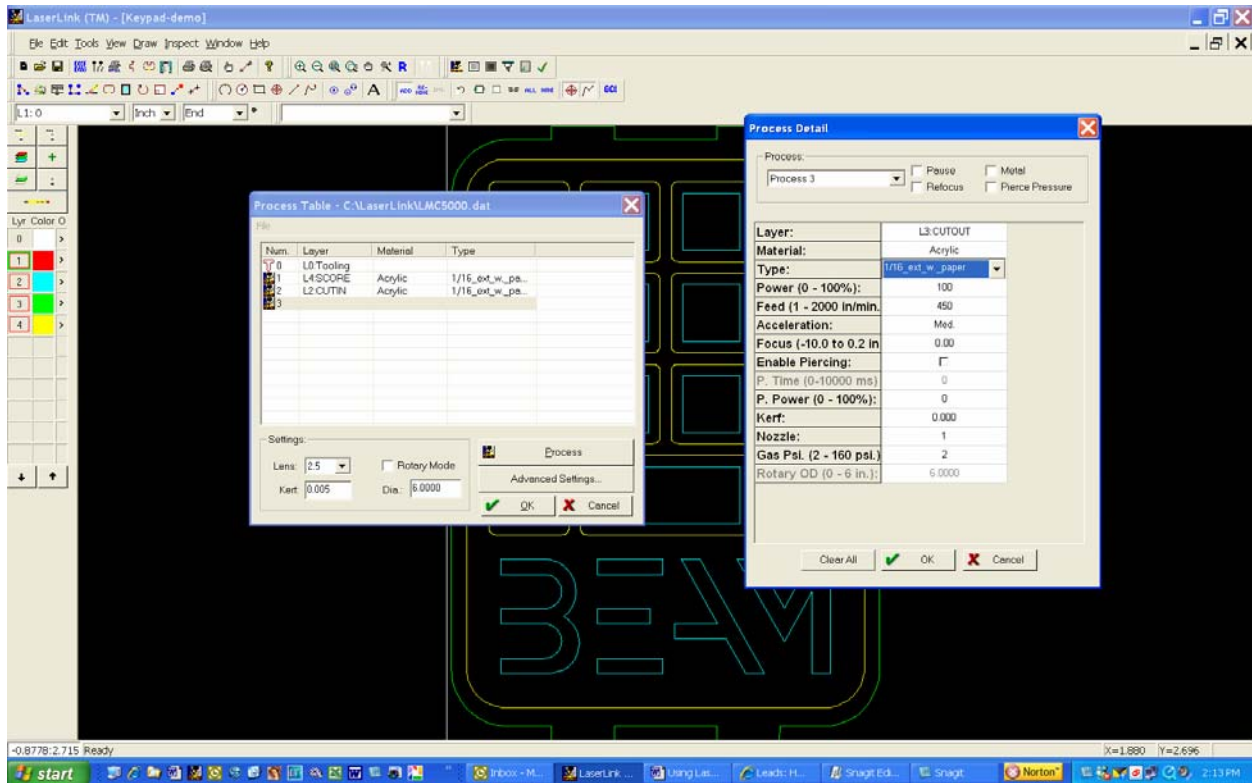
**“Process Table”**: continued. After double clicking Num. 1 box the Process Detail dialogue box will appear. Left click on the blank Layer field and select the layer you want to process first. Then left click on the blank Material field to select the materials then left click Type and select details. These selections refer to the “Database” Table where materials process parameters are saved. The remainder of the fields will complete automatically. You can also change individual process parameters if required. *(see next page)*





Tools Menu

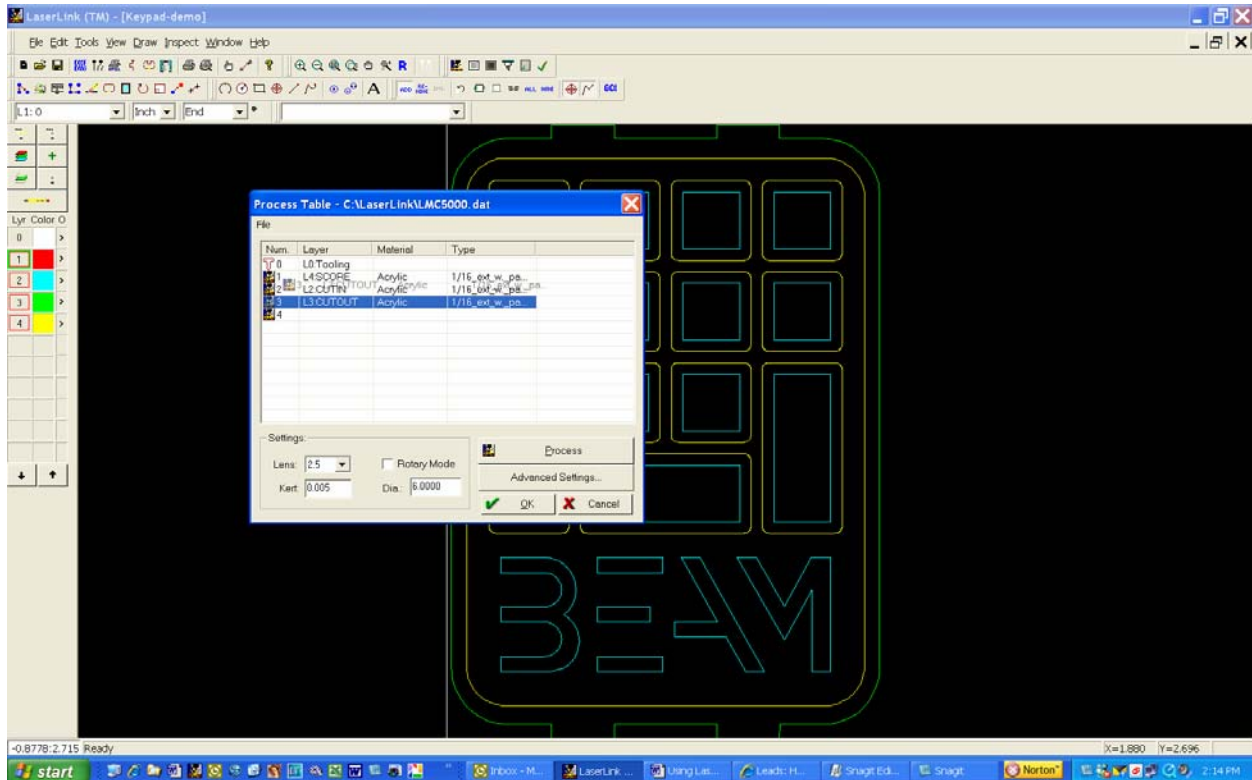
**“Process Table”**: continued. Complete the remainder of processes for all of the layers you wish to process. Keep in mind that the order selected in the Process Table is the order in which the layers will process. (see next page)





Tools Menu

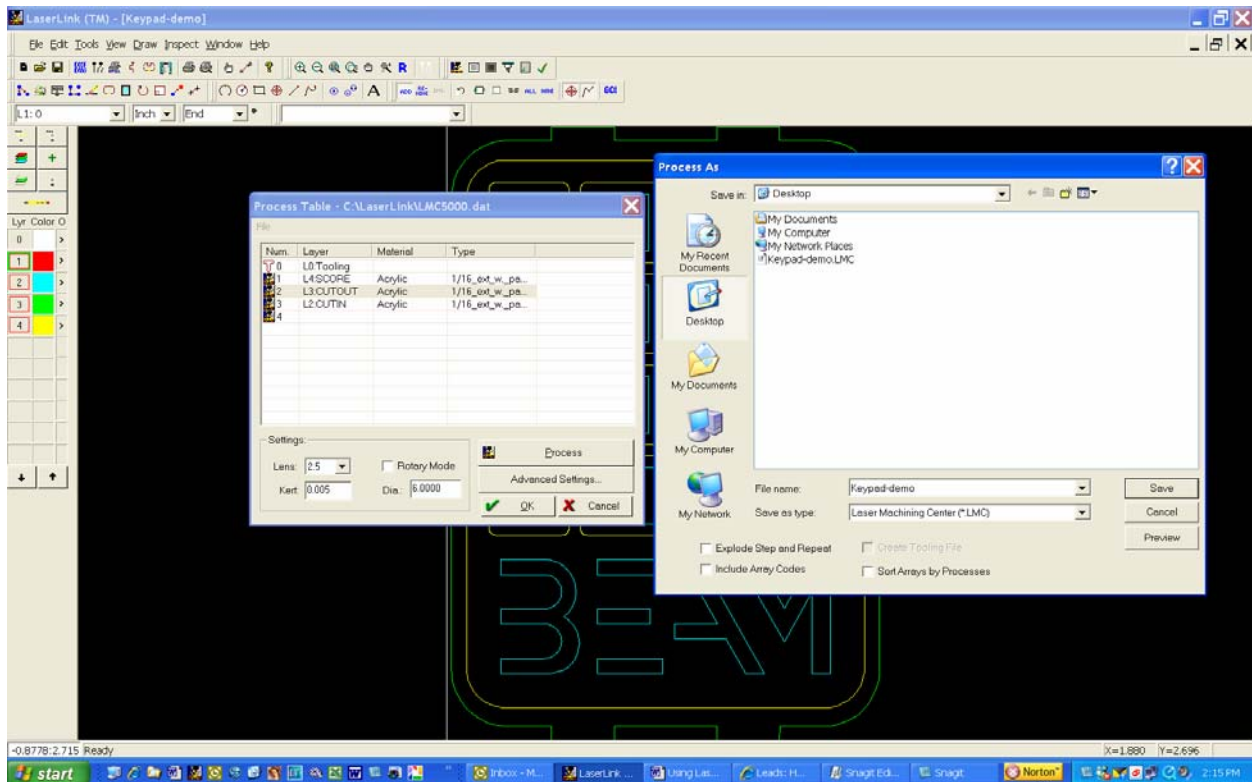
“**Process Table**”: continue. If you wish to move the layer cut order you can pick up a process by left clicking and holding and moving to the position you require in the order. (See next page)





Tools Menu

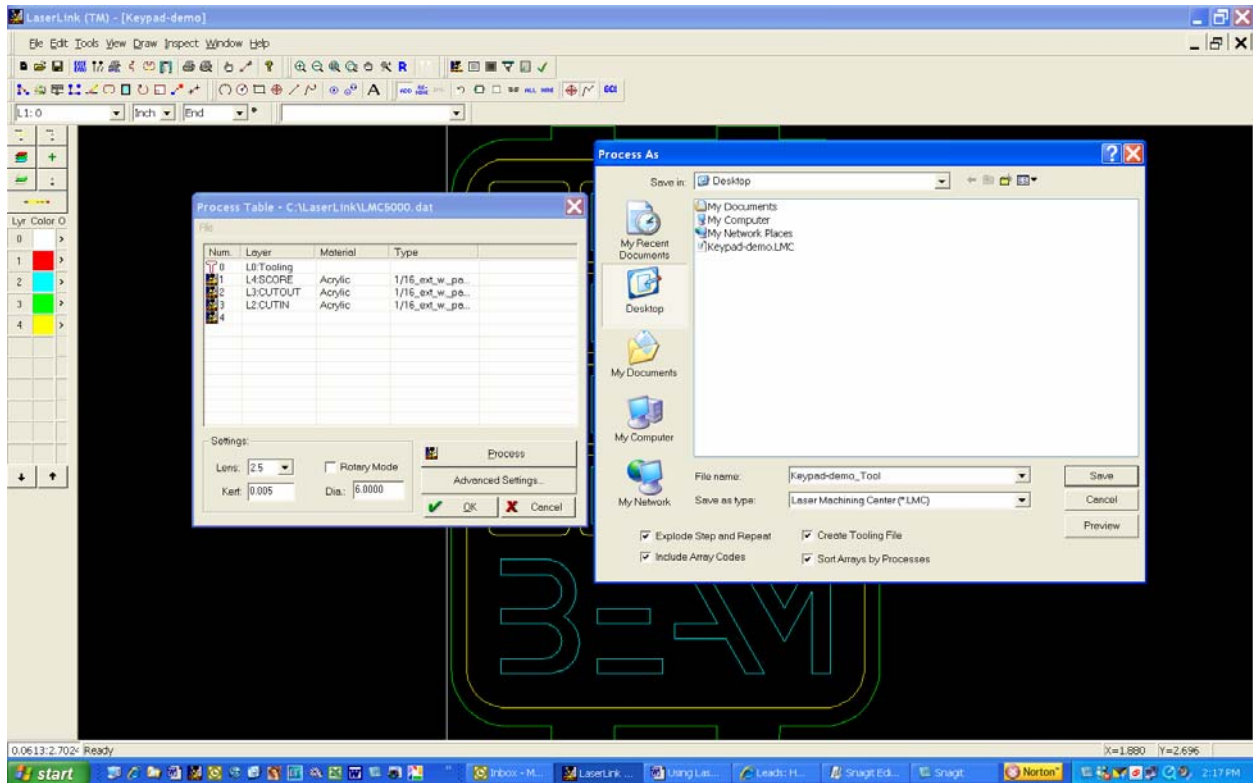
**“Process Table”**: continue. After completing the Process Table click the “Process” tab to create the .lmc file. This is the same as clicking “Tools – Process”. (See next page)





Tools Menu

**“Process Table”**: continue. There are a number of check boxes allowing Exploding of Step and Repeats (removing items from step and repeat); Create Tooling file, Include Array Codes, Sort Arrays by Processes (for use with Lumen DCC functions).



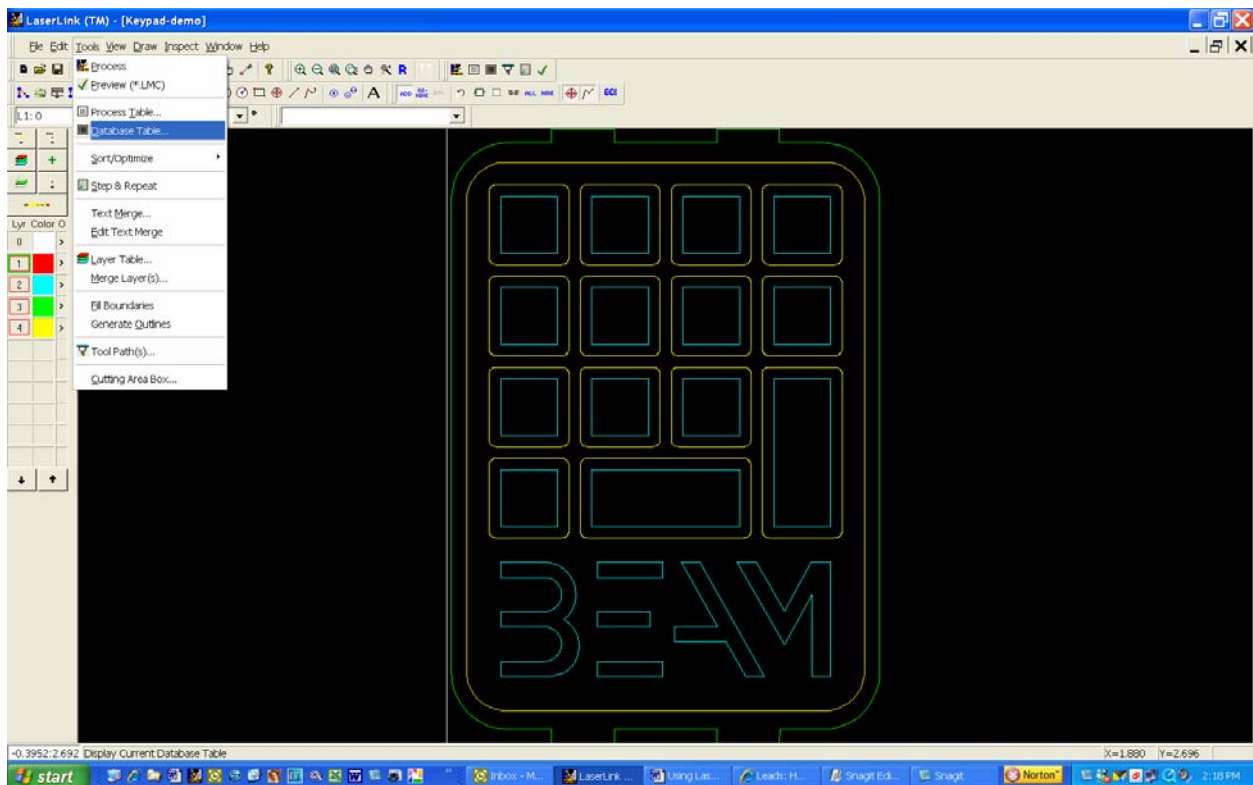




Tools Menu (Database Shortcut Key)

**“Database Table”**: The Database Table is where all process information for particular materials is stored. By saving new processes and new materials to the process table you can build a valuable database of process information for your materials. The Database Table enables you to automatically complete the Process table.

To Open the Database table Left click “Tools” then “Database Table” and the Database Table will appear. (see next page)





Tools Menu 

“Database Table”: continued. A number of standard materials are already included in the Database Table. These processes are only approximations as all lasers will vary slightly. (See next page)

The screenshot shows the LaserLink (TM) software interface. A 'Database - C:\LaserLink\LMC5000.dat' window is open, displaying a table of material properties. The table includes columns for Material, Type, Power, Feed, Focus, Pierce Time, Pierce Power, Enable Pierce, Kerf, R/L, Gas, and Accel. The table lists 21 materials with their respective parameters.

Material	Type	Power	Feed	Focus	Pierce Time	Pierce Power	Enable Pierce	Kerf	R/L	Gas	Accel.
1	Acrylic 1/16_ext_w_paper	100	450	0.00	0	0	<input type="checkbox"/>	0.000	1	2	Med.
2	Acrylic 1/16_ext_wo_paper	100	600	0.00	0	0	<input type="checkbox"/>	0.000	1	2	Med.
3	Acrylic 1/8_cast_w_paper	100	200	0.00	0	0	<input type="checkbox"/>	0.000	1	2	Med.
4	Acrylic 1/4_cast	100	100	0.00	0	0	<input type="checkbox"/>	0.000	1	2	Slow
5	Acrylic 1/32_cast_w_paper	35	600	0.00	0	0	<input type="checkbox"/>	0.000	1	2	Med.
6	Acrylic 1/4-flame	60	50	0.00	0	0	<input type="checkbox"/>	0.000	1	2	Slow
7	Acrylic 1/2_fast	100	40	0.00	0	0	<input type="checkbox"/>	0.000	1	2	Med.
8	Acrylic 1/2_flame	100	30	0.00	0	0	<input type="checkbox"/>	0.000	1	2	Med.
9	Cardboard 1_ply_matboard	30	600	0.00	0	0	<input type="checkbox"/>	0.000	1	40	Med.
10	Cardboard Custom_light_score	5	600	0.00	0	0	<input type="checkbox"/>	0.000	1	20	Med.
11	Cardboard corrugated	100	600	0.00	0	0	<input type="checkbox"/>	0.000	1	30	Med.
12	Duroid .030	90	600	0.00	0	0	<input type="checkbox"/>	0.000	1	2	Slow
13	Lexan .010*(wo mask)	40	600	0.00	0	0	<input type="checkbox"/>	0.000	1	40	Med.
14	Lexan .010*(wo mask)	20	100	0.00	0	0	<input type="checkbox"/>	0.000	1	60	Med.
15	Lexan .040*(wo mask)	70	600	0.00	0	0	<input type="checkbox"/>	0.000	1	40	Med.
16	Lexan .040*(wo mask)	60	75	0.00	0	0	<input type="checkbox"/>	0.000	1	60	Med.
17	Paper .010*	10	600	0.00	0	0	<input type="checkbox"/>	0.000	1	2	Med.
18	Paper Thermal	10	450	0.00	0	0	<input type="checkbox"/>	0.000	1	2	Fast
19	Paper Thermal_Score	7	600	0.00	0	0	<input type="checkbox"/>	0.000	1	2	Fast
20	Rowmark score_light	5	600	0.00	0	0	<input type="checkbox"/>	0.000	1	10	Slow
21	Rowmark 1/16	30	600	0.00	0	0	<input type="checkbox"/>	0.000	1	30	Slow



Tools Menu



“Database Table”: continued. Click “Add New Item” to add a new item to the Database Table. The next time you use the Process Table the new items will be available.

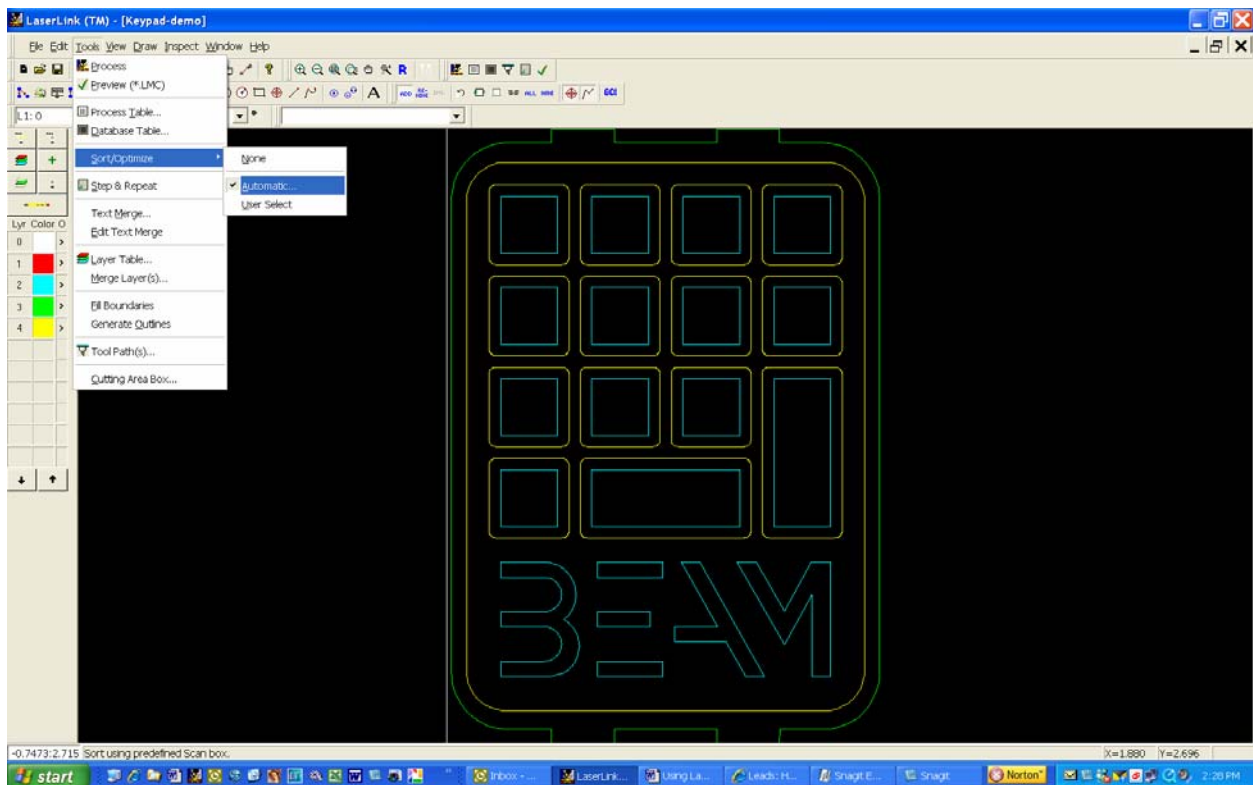
The screenshot shows the LaserLink (TM) software interface. A window titled "Database - C:\LaserLink\LMC5000.dat" is open, displaying a table with the following columns: Material, Type, Power, Feed, Focus, Pierce Time, Pierce Power, Enable Pierce, Kerf, R/L, Gas, and Accel. The table contains 20 rows of data. Below the table is an "Add New Item" button. The software interface also shows a toolbar, a menu bar, and a status bar at the bottom.

Material	Type	Power	Feed	Focus	Pierce Time	Pierce Power	Enable Pierce	Kerf	R/L	Gas	Accel.
20	Rowmark	score_light	5	600	0.00	0	0	0.000	1	10	Slow
21	Rowmark	1/16	30	600	0.00	0	0	0.000	1	30	Slow
22	Score_1	Very_fine	5	600	0.00	0	0	0.000	1	2	Med.
23	Score_2	Medium_fine	8	600	0.00	0	0	0.000	1	2	Med.
24	Score_3	Medium	10	600	0.00	0	0	0.000	1	2	Med.
25	Score_4	Medium_heavy	12	600	0.10	0	0	0.000	1	2	Med.
26	Score_5	Heavy	15	600	0.20	0	0	0.000	1	2	Med.
27	Stanford	W_Strip-taped	60	300	0.00	0	0	0.000	1	2	Slow
28	Steel	22_gauge	100	115	0.00	100	0	200.000	1	2	Fast
29	Steel	14_gauge	100	75	0.00	100	0	600.000	1	2	Med.
30	Steel	.004	100	600	0.00	100	0	100.000	1	2	Slow
31	Drill	Steel	100	600	0.00	100	0	200.000	1	2	Med.
32	Stanford	Etching	15	600	0.00	0	0	0.000	1	2	Slow
33	Engrave	Barcode	40	250	-0.15	0	0	0.000	1	2	Med.
34	graff	cut	10	600	0.00	0	0	0.000	1	2	Med.
35	graff	drill	0	1	0.00	5	0	25.000	1	2	Med.
36	Unobtainium	.001*	100	2000	-0.15	0	0	0.005	1	20	Med.
37	Align	Mark	0	200	0.00	0	0	0.005	1	2	Med.
38	Crystal	Fabric_single_kiss	12	720	0.00	0	0	0.005	1	5	Med.
39	Crystal	Fabric_double_cut	39	720	0.00	0	0	0.005	1	5	Med.
40	Acrylic	5 inches	1	0.00	0	0	0	0.005	1	2	Med.



## Tools Menu

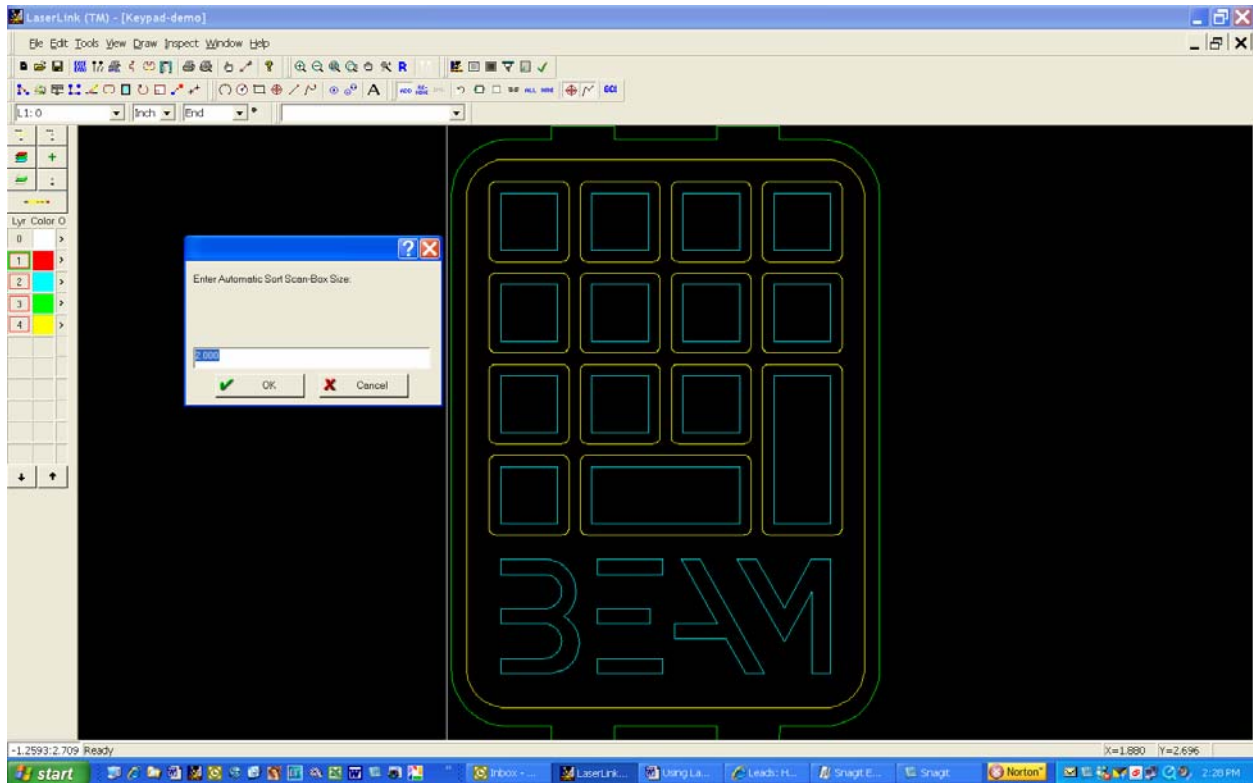
**“Sort/Optimize”**: Automatic or User sort. LaserLink will attempt to automatically sort the order in which parts cut. Alternatively, you can select the exact order in which features cut (keeping in mind all of one layer will cut before moving to the next layer). Start by left clicking “Tools” then maneuver to Sort/Optimize” and left click “Automatic” or “User Select”. If “Automatic” is selected the Automatic Sort Optimize dialogue box will display. *(see next page)*





## Tools Menu

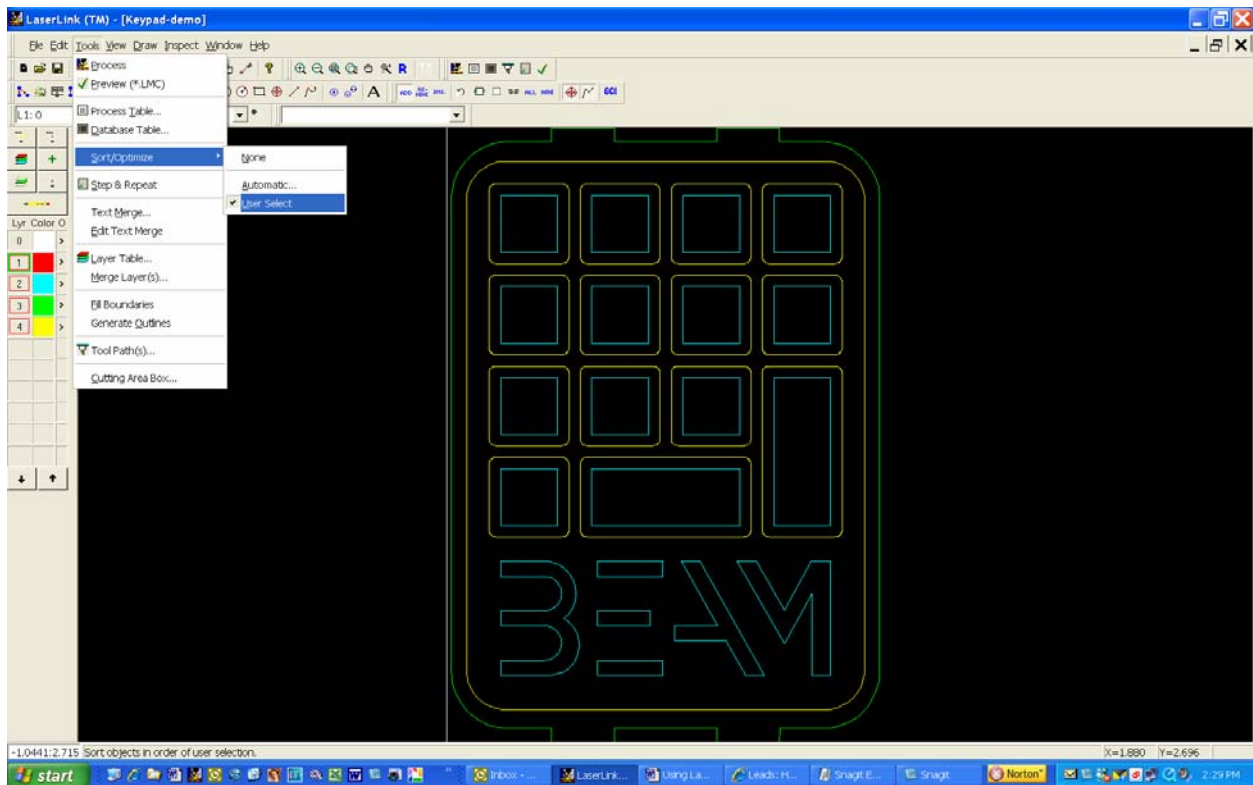
**“Sort/Optimize”**: continued. Automatic sort dialogue box allows you to select the size (in inches) of the scan box. The scan box scans (invisibly) back and forth on the cutting area box from the bottom corner up. When a line is hit by the scan box it will cut that line. You can change the size of the box to create a more optimal automatic sort. (see next page)





Tools Menu (User Select INSERT, ADD, REMOVE Shortcut keys)

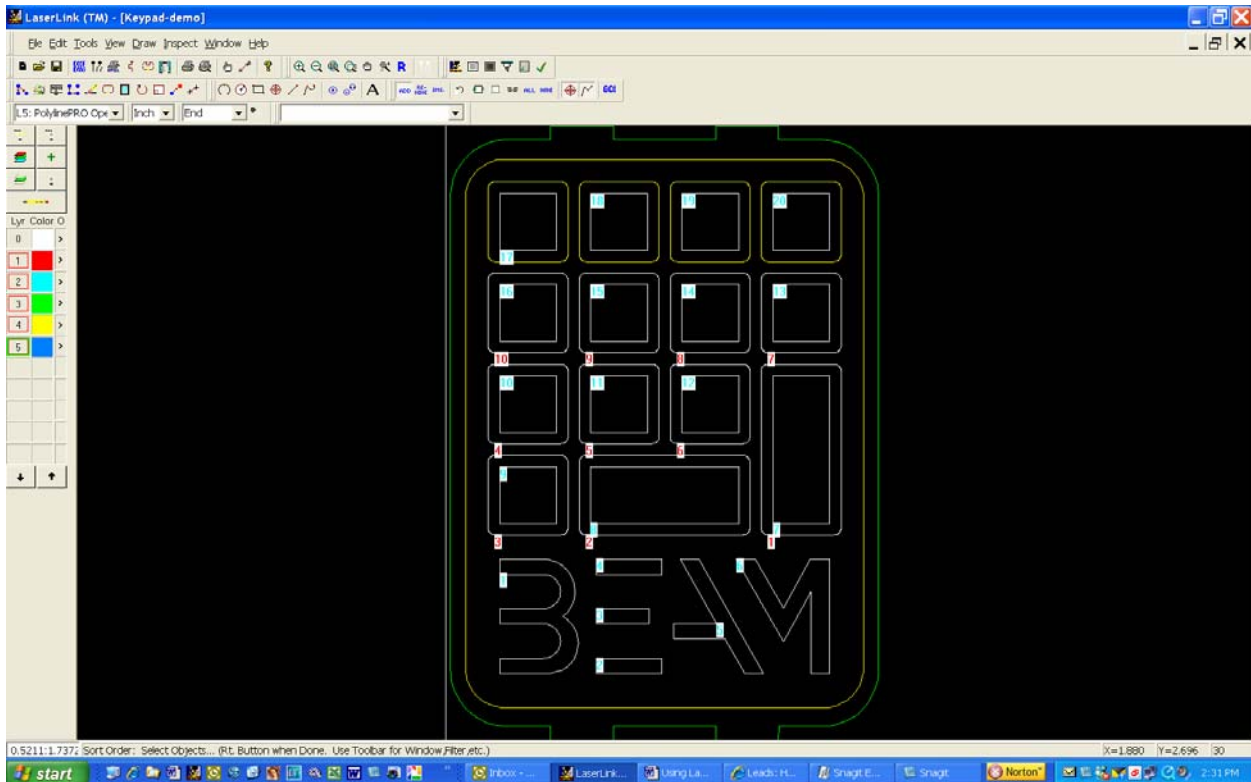
**“Sort/Optimize”**: User sort. When “User Sort” is selected you will be given a selection tool “□”. Use the selection tool to select actual order that parts are to be cut in. When sort is completed right click away from the part to finish..(see next page)





Tools Menu

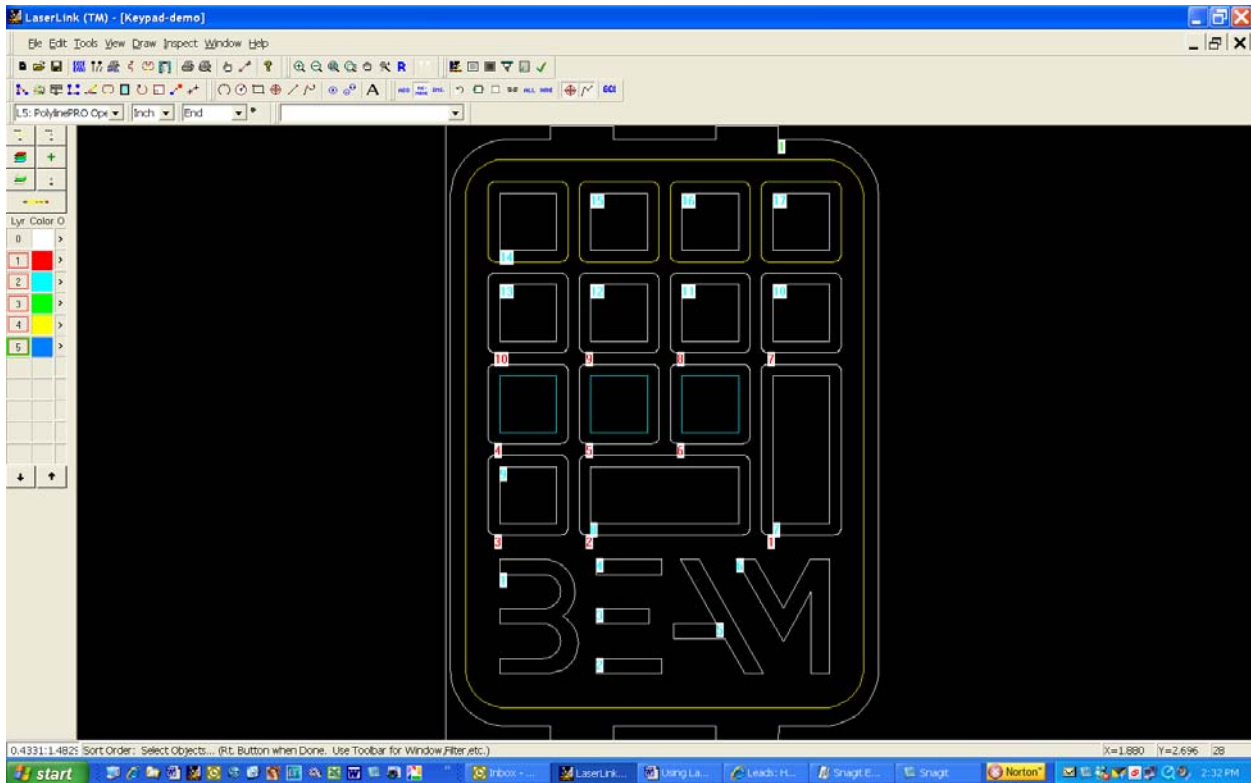
“Sort/Optimize”: continued. User sort. Sort order will be indicated by number. (see next page)






Tools Menu

“Sort/Optimize”: continued. User sort. Use the ADD, REMOVE and INSERT tools to add or remove items from the User sort. ADD will add the item to the end of the sort. INSERT allows you to add an item into the middle of an existing sort order.



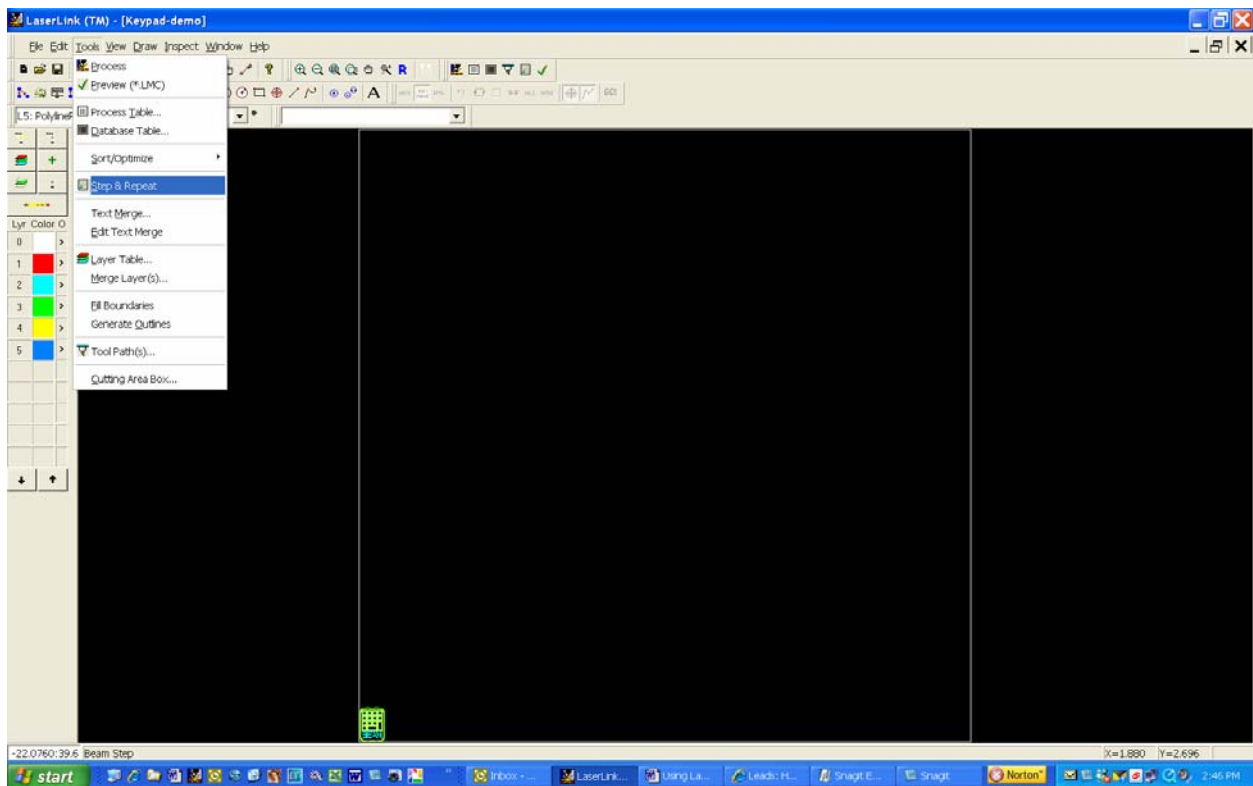




Tools Menu  (Step and Repeat Shortcut Key)

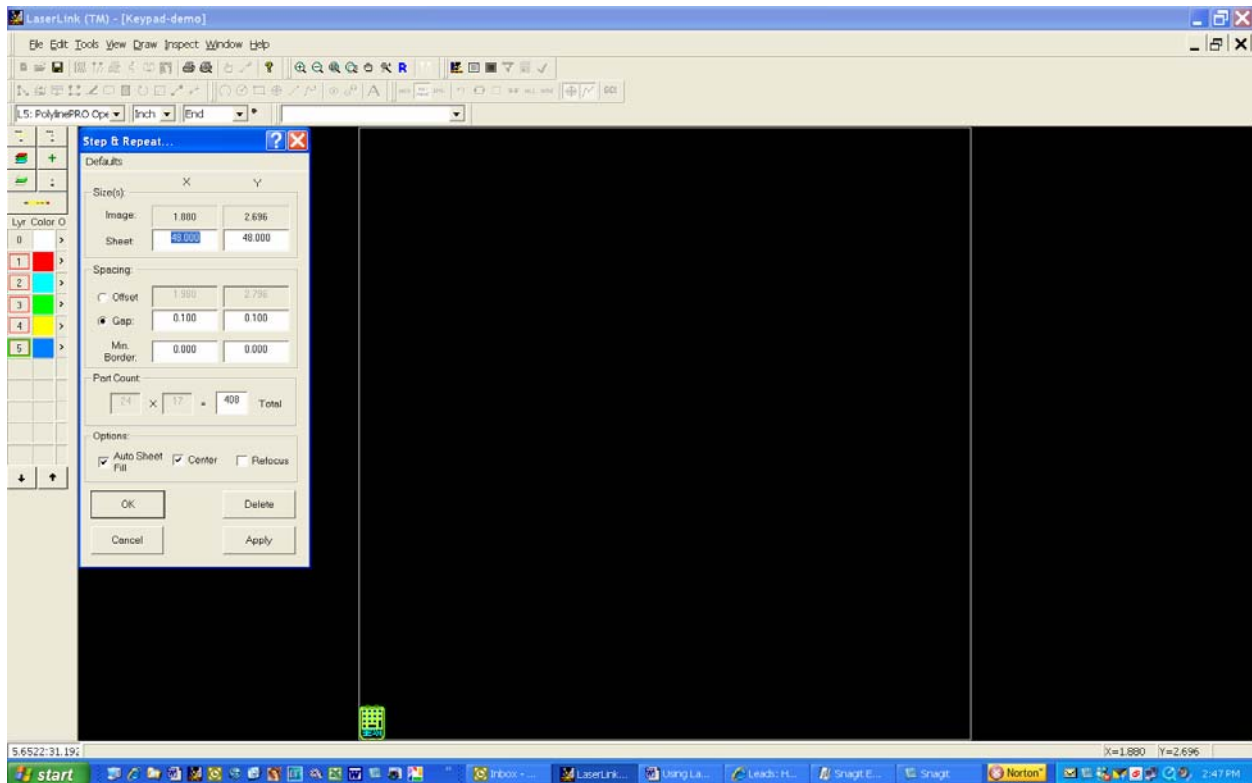
**“Step and Repeat”**: Allows you step a job to a sheet size or over the entire cutting bed. Although similar to “Array” in spacing parts “Step and Repeat” differs in that you can complete processing of all layers of a particular part before moving to the next part.

Left click “Tools” then “Step and Repeat” to get the Step and Repeat dialogue box. (see next page)





**“Step and Repeat”**: continued. Chose spacing scheme. Offset measures the x,y distance from the 0,0 bottom left corner of each part. Gap measures the distance in x,y from the boundary extent of the part. In this case, a gap of .1” is used in x and y to Step and Repeat over a 48” x 48” sheet size. (see next page)

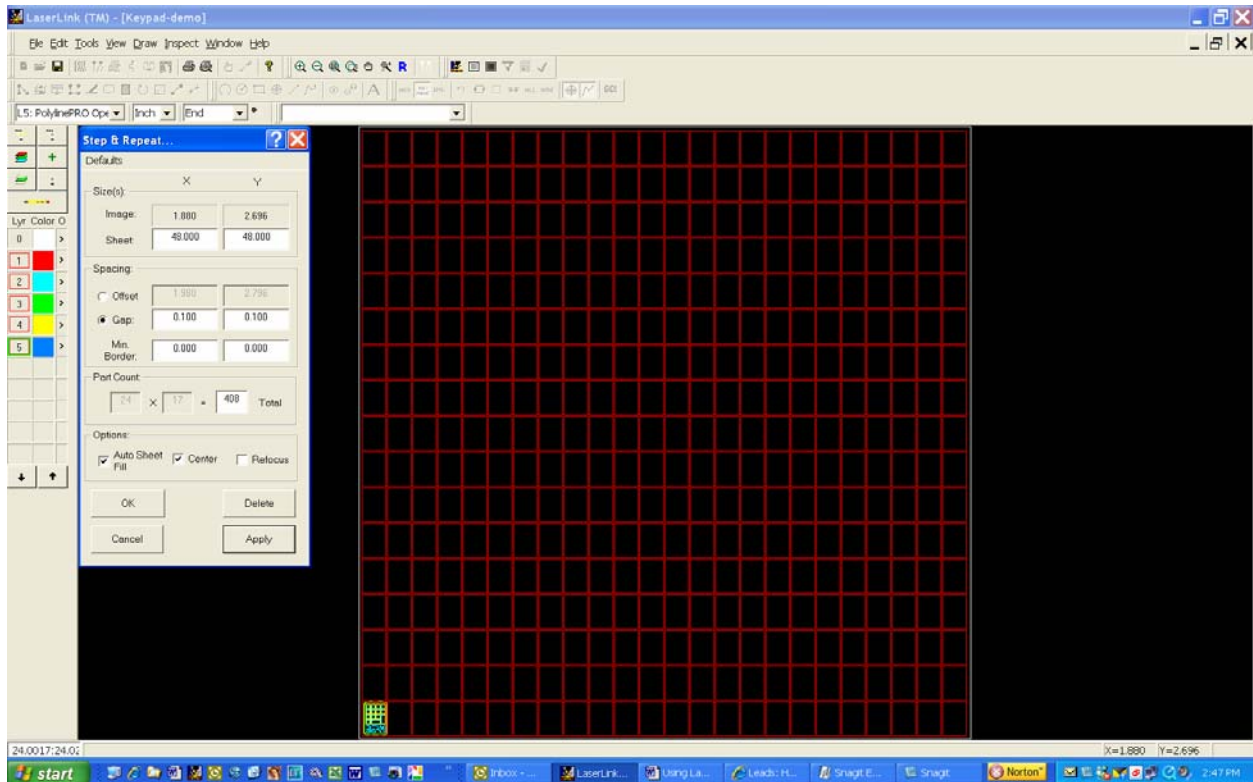




Tools Menu



**“Step and Repeat”**: continued. Hitting apply displays the location of each step. If “Refocus” check box is checked the machine will refocus at each step. (see next page)

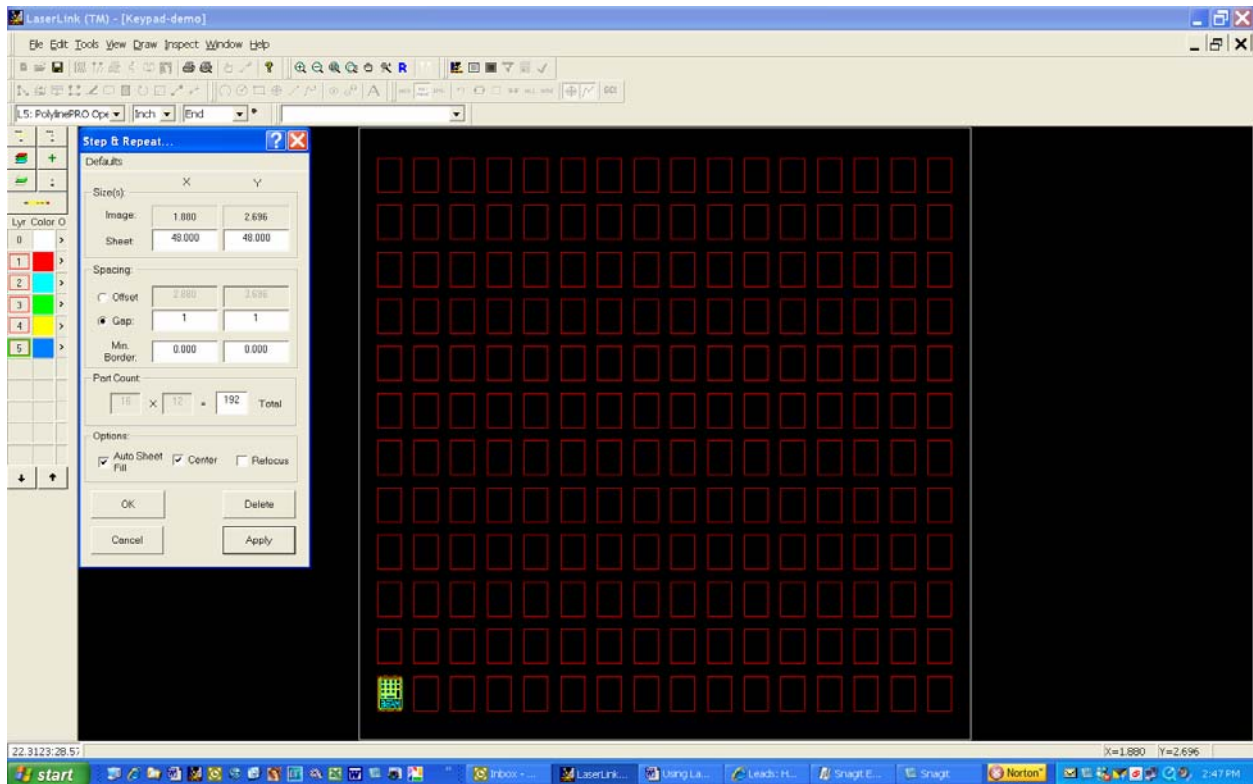




Tools Menu



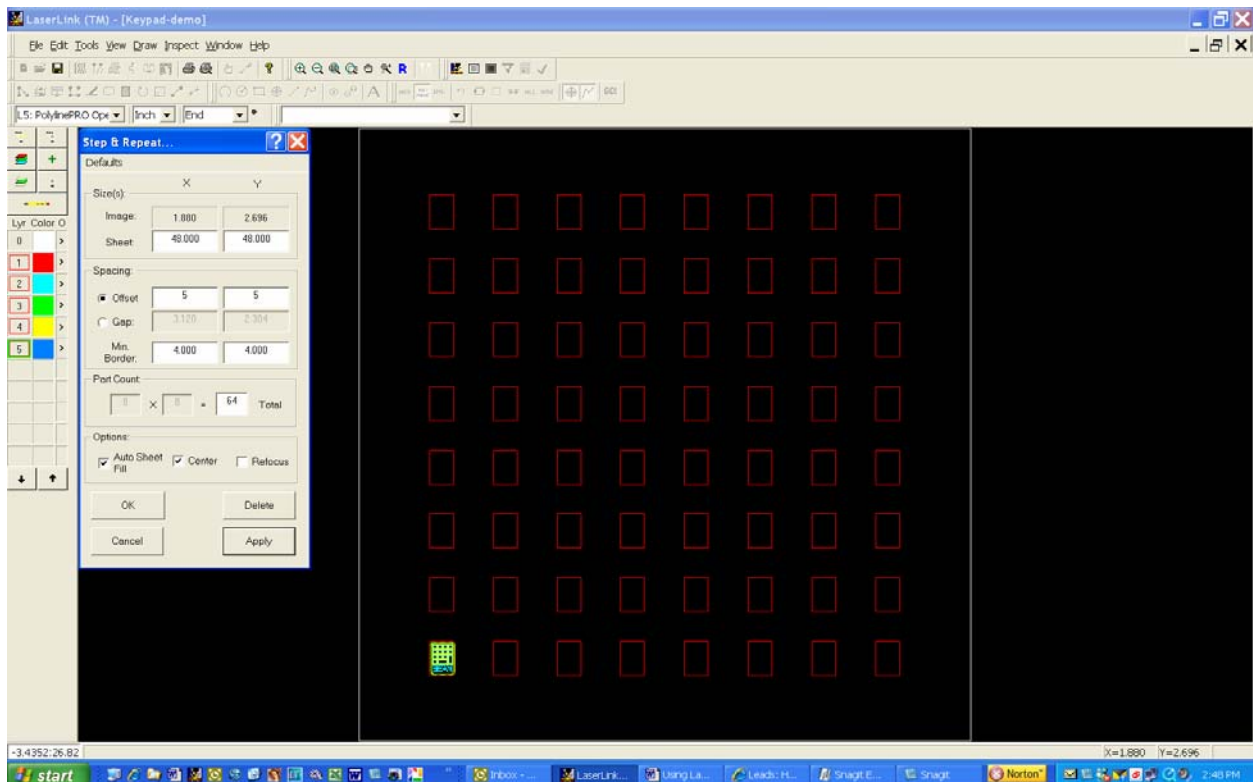
“Step and Repeat”: continued. In this case a Gap of 1” in x and y is used. (see next page)



Tools Menu



**“Step and Repeat”**: - continued. When Offset spacing is selected. In this case the measurement is 5” in x and y from the bottom left corner of each box to the bottom left corner of the next box. *(see next page)*

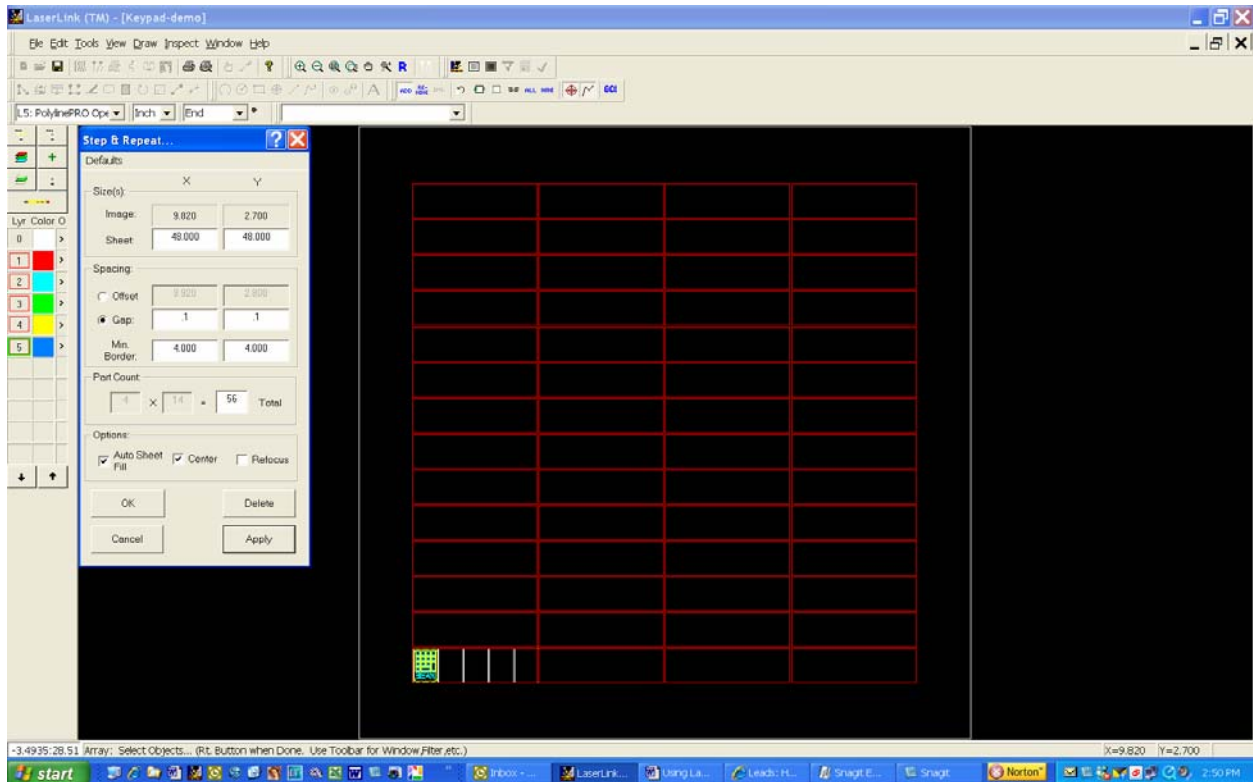




Tools Menu

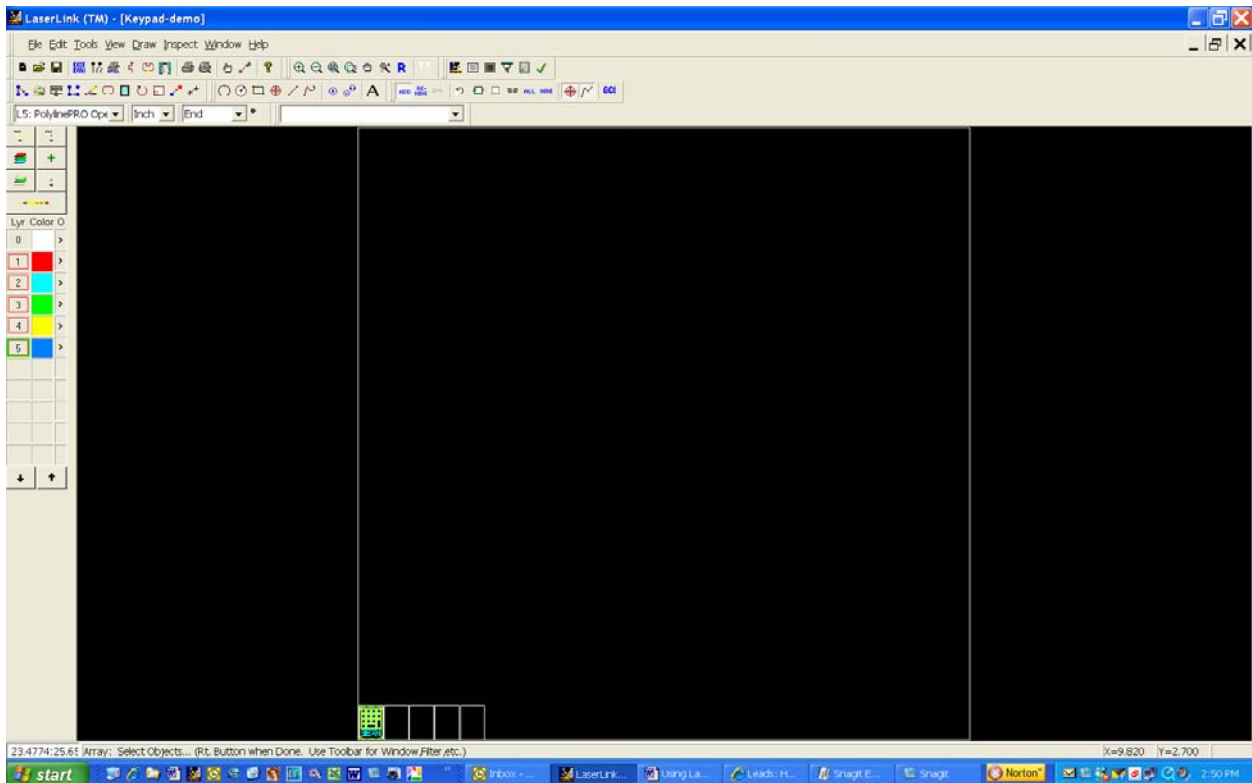


“*Step and Repeat*”: continued. An existing array or array created using step and repeat codes can also be Step and Repeated to create a “Nested Step and Repeat”. (see next page)





**“Step and Repeat”**: continued. After “Step and Repeat” is applied the part will display in its original location again. You can access the step and repeat information again by clicking “Step and Repeat” again or Preview.

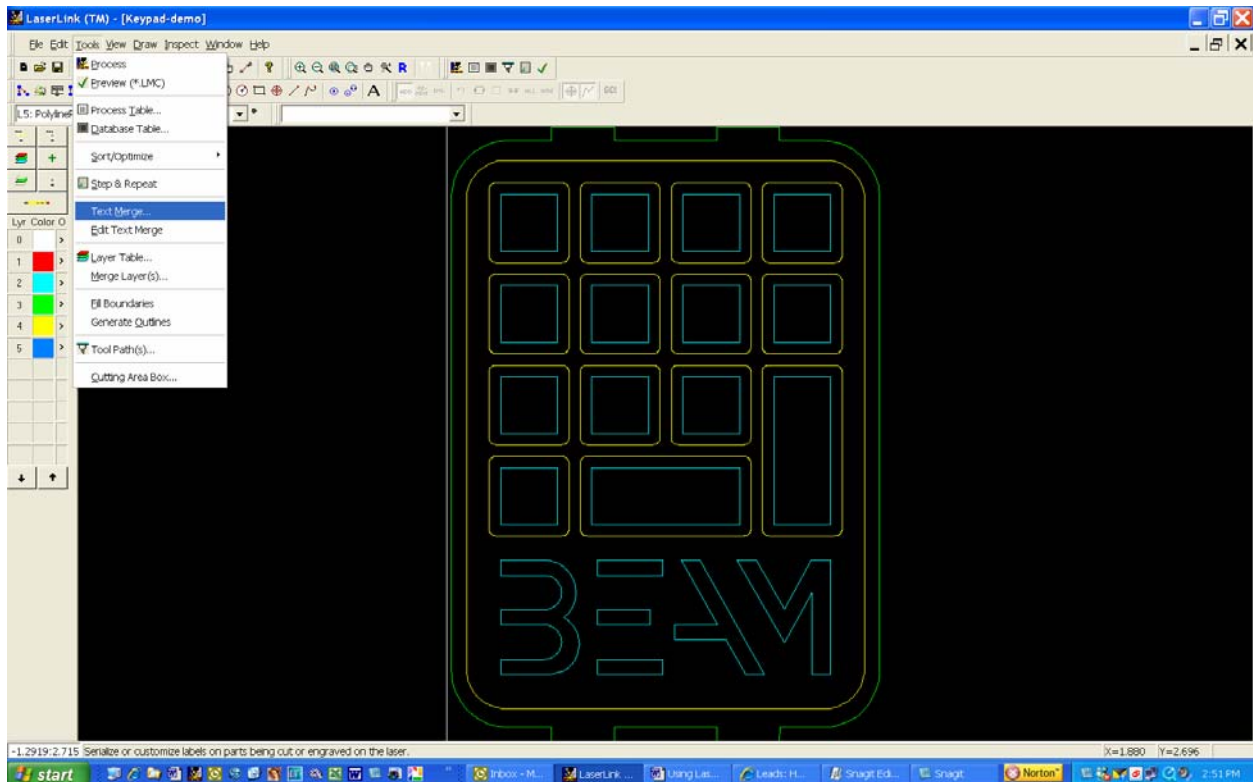




## Tools Menu

**“Text Merge”**: Text merge allows you to insert a comma delimited list of information or create a part serialization feature. When combined with Step and Repeat LaserLink can automatically keep track and update a serial number sequence.

Begin by left clicking “Tools” then “Text Merge” to get your selection tool “□”. Use the selection tool to choose where you wish to insert the text merge. Left clicking will launch the Text Merge dialogue box. (see next page)

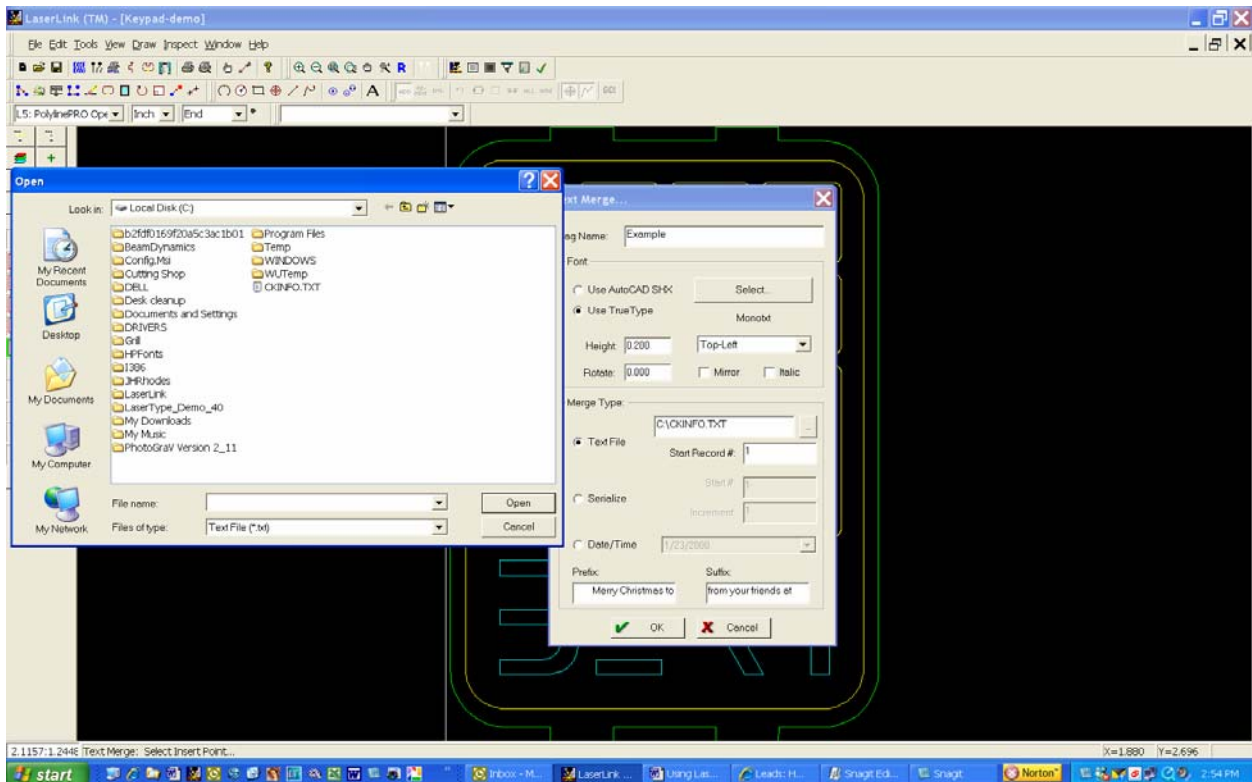






## Tools Menu

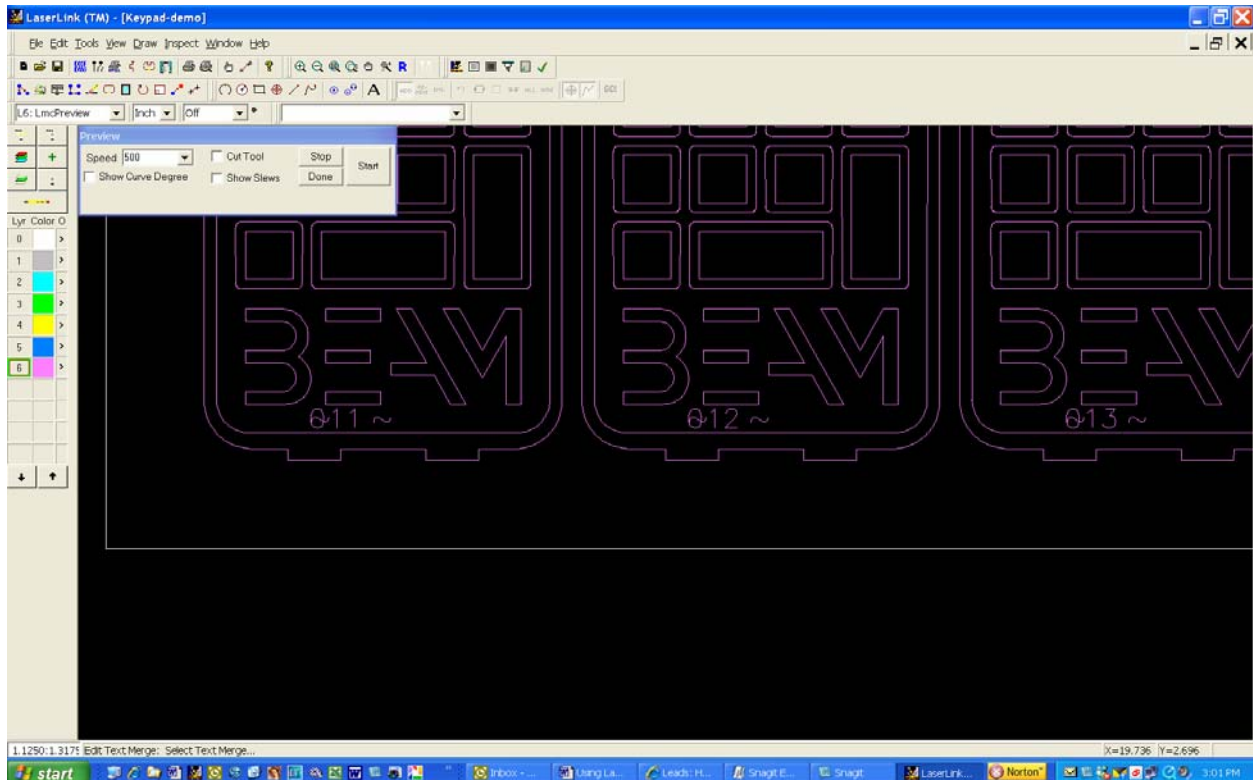
**“Text Merge”**: continued. Select whether you will be importing a text file or creating a serialization. If a text file is to be created select the comma delimited .txt file with the information. If serialization, select the starting number and increment then click OK. (*see next page*)





## Tools Menu

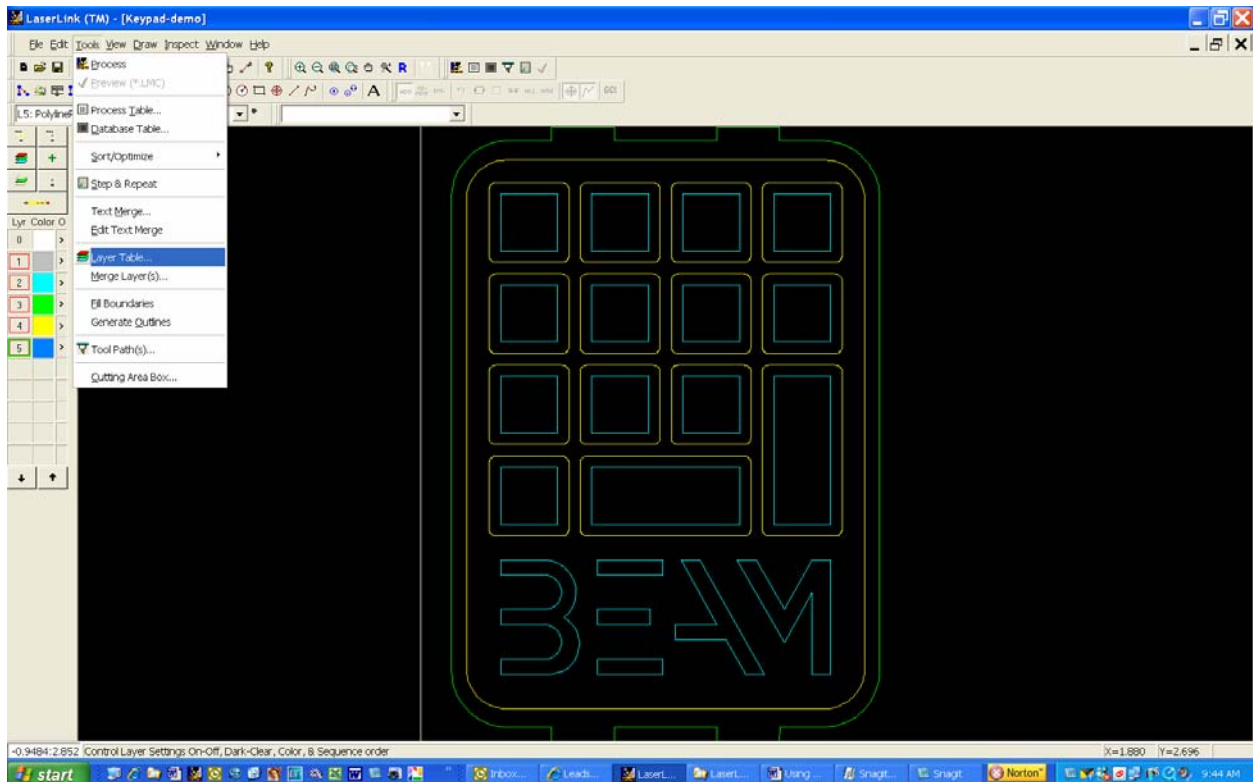
**“Text Merge”**: continued. Preview of a Step and Repeated serialization. LaserLink will keep track of serialization and update every time the file is re-processed.





Tools Menu (Layer Table Shortcut Key)

“Layer Table”: Left Click “Tools” then “Layer Table” to get the Layer Control dialogue box. (see next page)

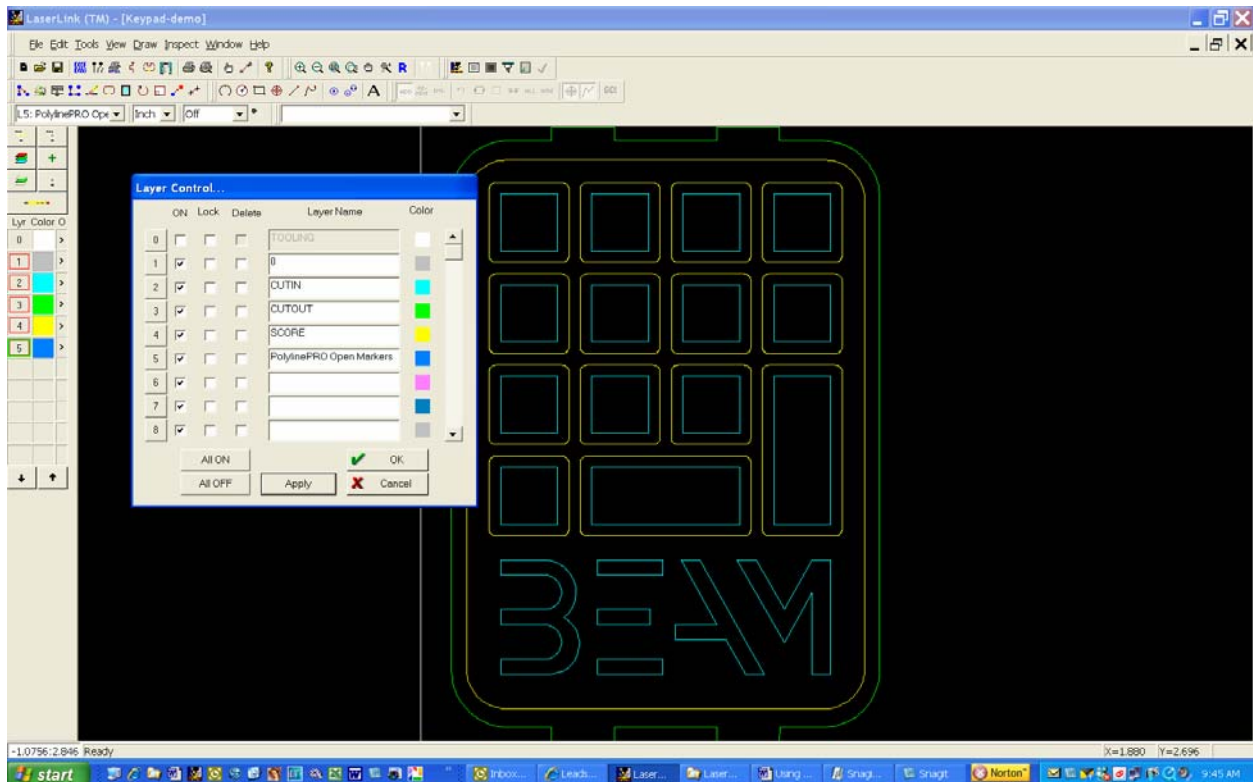




Tools Menu

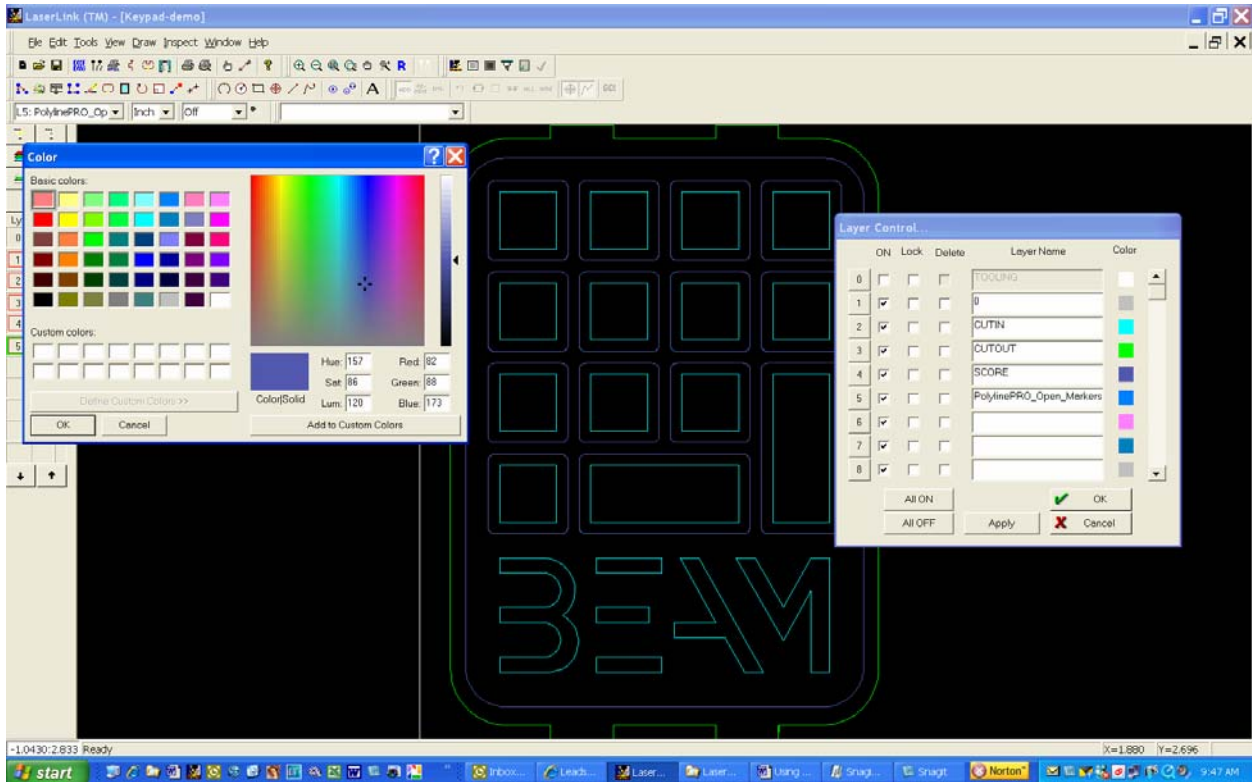
“Layer Table”: continued. Use the Layer Control dialogue box to name layers, turn layers on or off. You can also use the always on top layers menu to quickly turn layers on or off and change colors.

Lyr	Color	O
0		>
1	Grey	>
2	Cyan	>
3	Green	>
4	Yellow	>
5	Blue	>



Tools Menu 

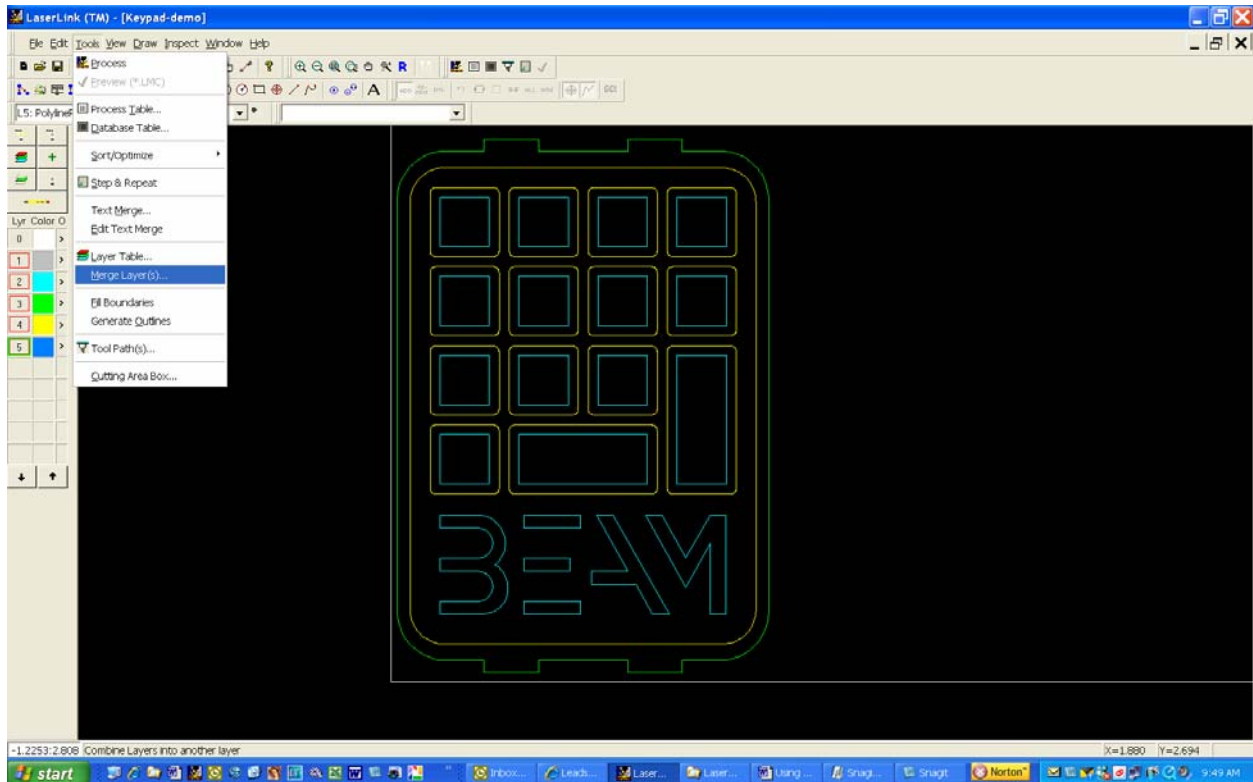
“Layer Table”: continued. Layer colors changed.





## Tools Menu

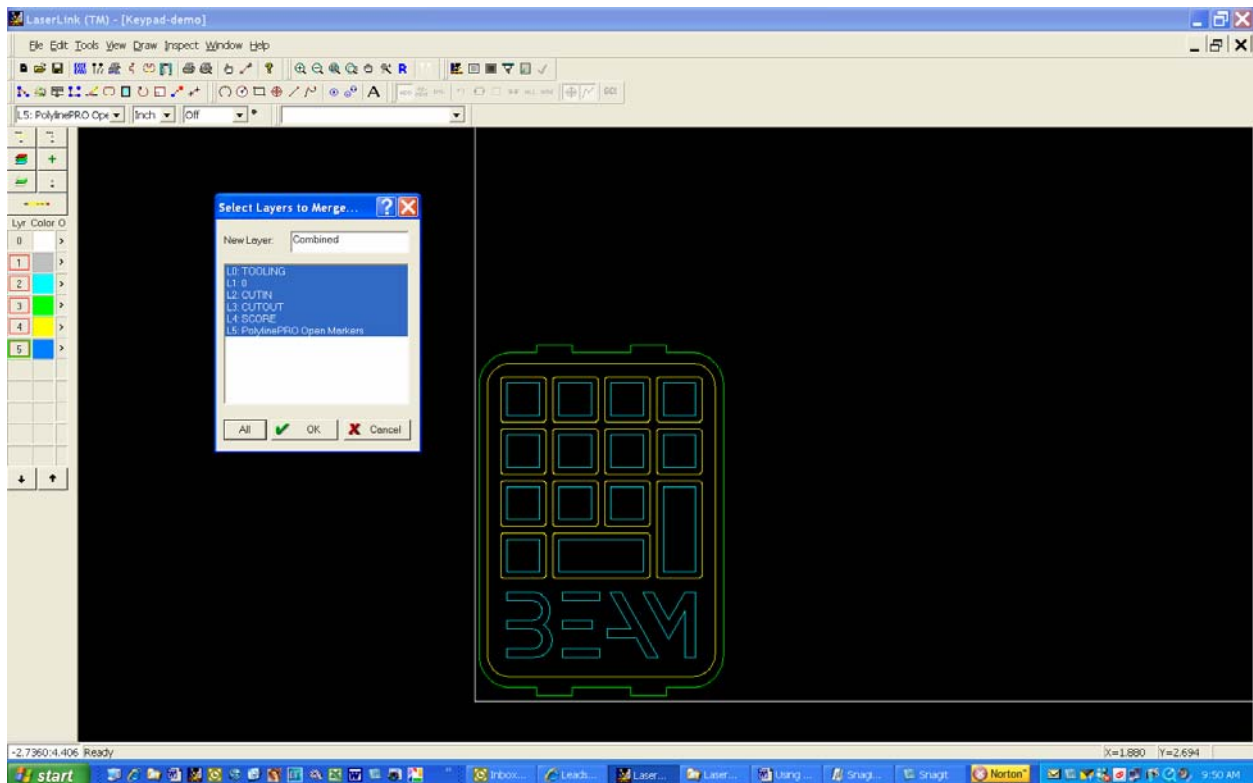
**“Merge Layers”**: Left click “Tools” then “Merge Layers” to get the Select Layers to Merge dialogue box. (See next page)





## Tools Menu

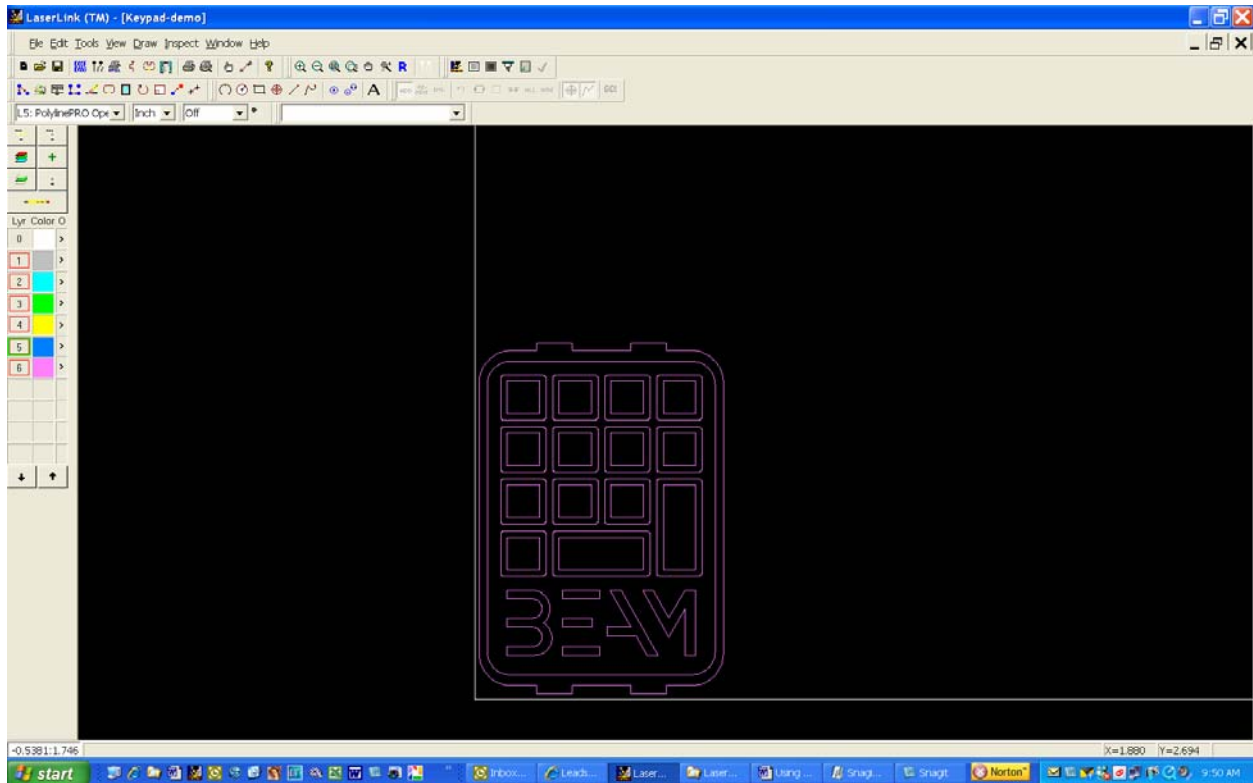
“Merge Layers”: continued. Select the layers you wish to merge into one. (See next page)





## Tools Menu

“Merge Layers”: continued. Layers merged into single new layer created.

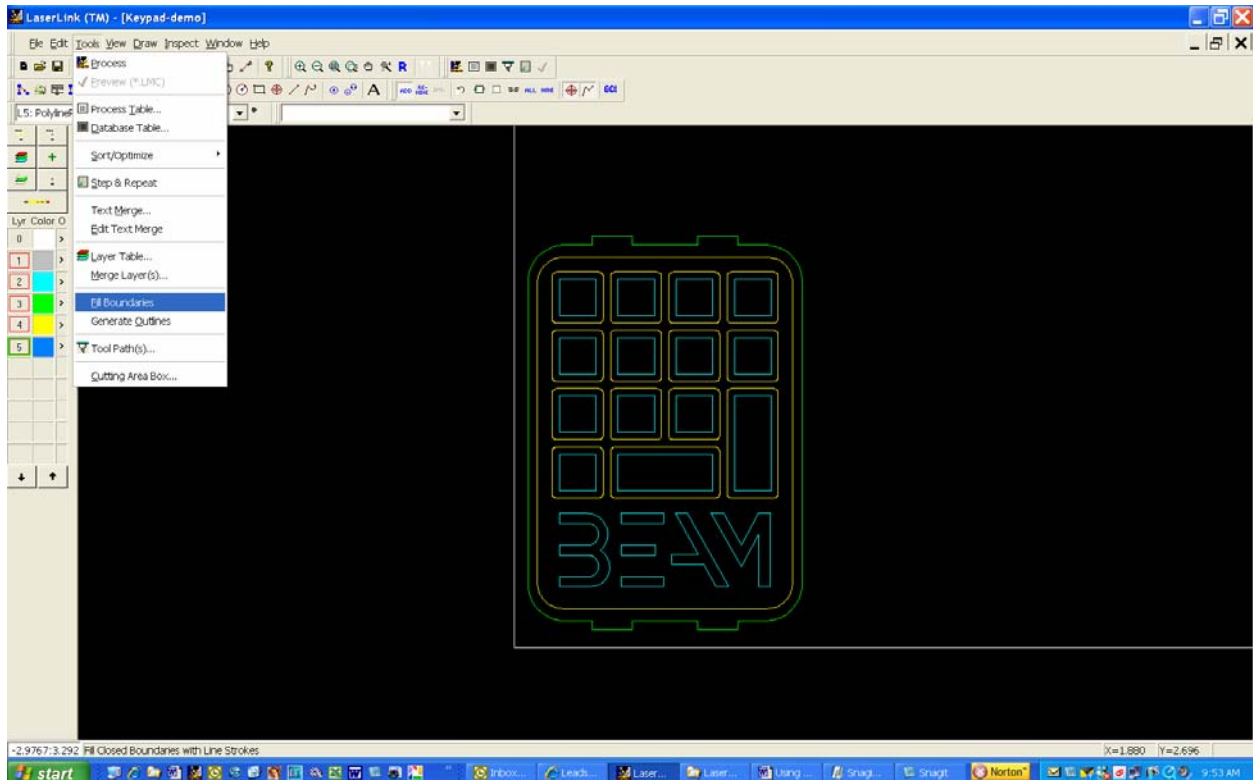






## Tools Menu

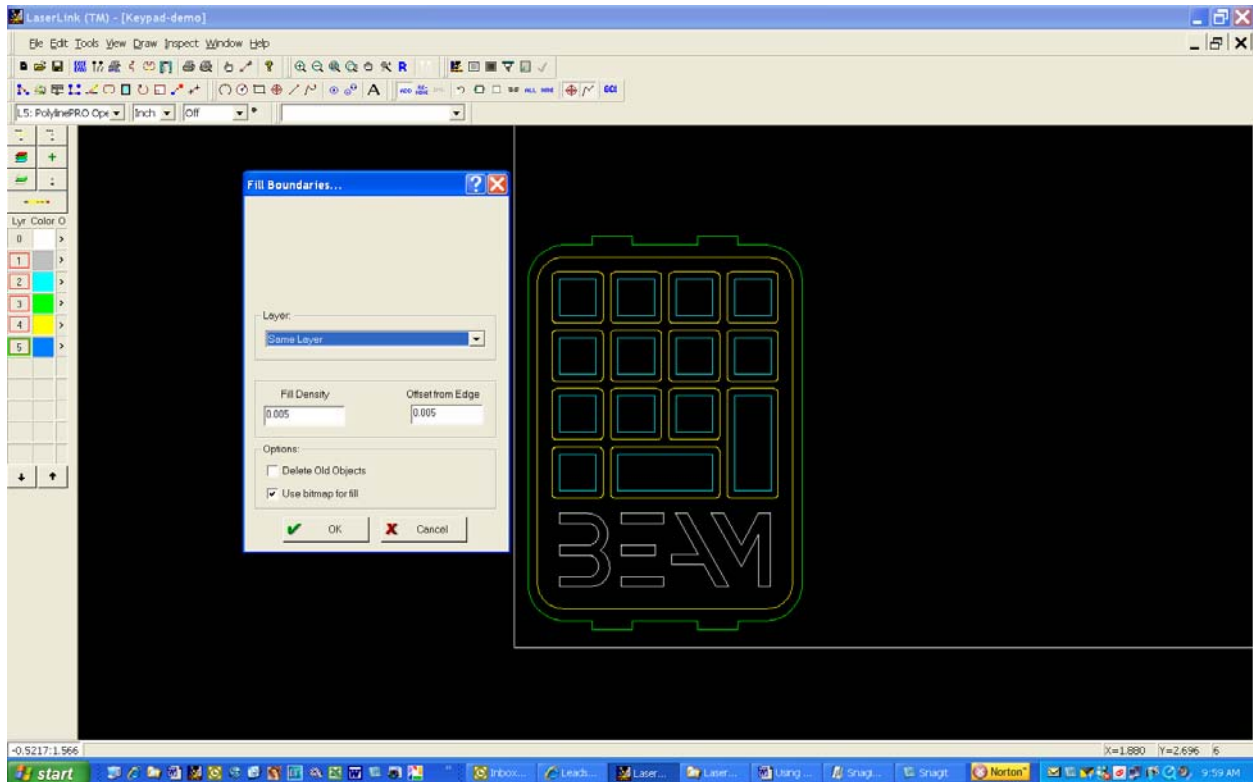
**“Fill Boundaries”:** Left click “Tools” then “Fill Boundaries” to get the selection tool “□”. Use the selection tool to select the features you wish to fill. *(See next page)*





## Tools Menu

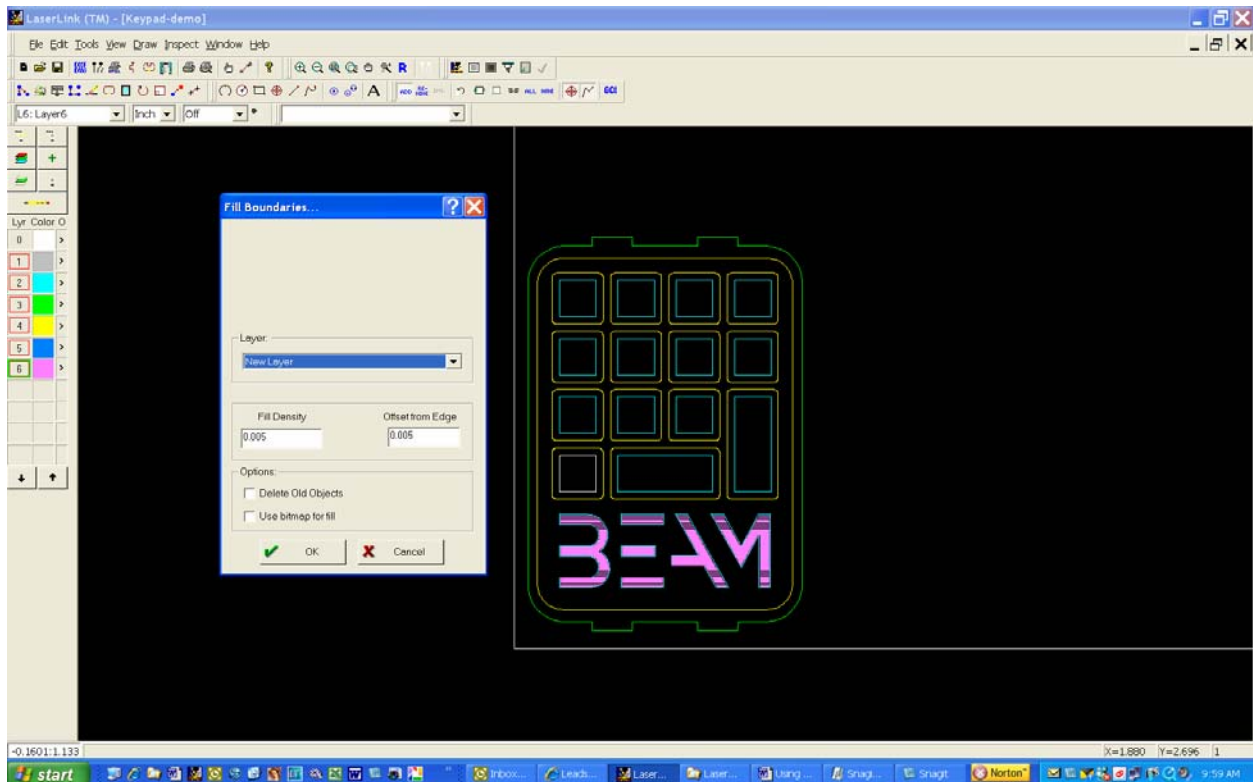
**“Fill Boundaries”**: continued. The selected feature will turn white after selecting. Right click to get the Fill Boundaries dialogue box. Select the layer you wish the fill to be on (or let LaserLink create a new layer automatically) then complete the fill density. Fill density is the step up in the Y axis direction. Keep in mind the spot size (focus point of the beam) when choosing the fill density. You can create interesting effects by varying the density or even defocusing the beam by changing the focus offset in the process table. Choose whether or not to delete the vector outline of the feature you are filling. (See next page)





## Tools Menu

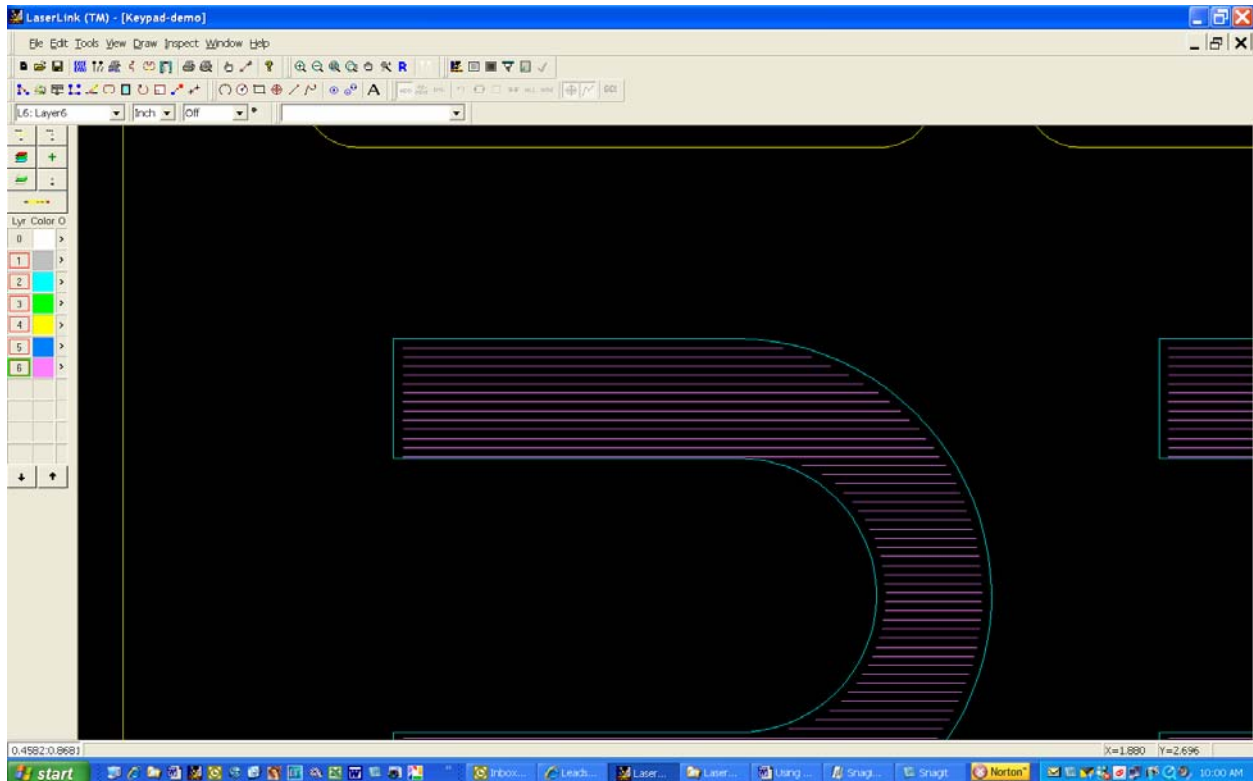
**“Fill Boundaries”**: continued. Feature has been filled and Old Objects have not been deleted. In this case the fill has been offset from the edge by .005” so as to do a clean crisp outline of the engraved feature. (See next page)





## Tools Menu

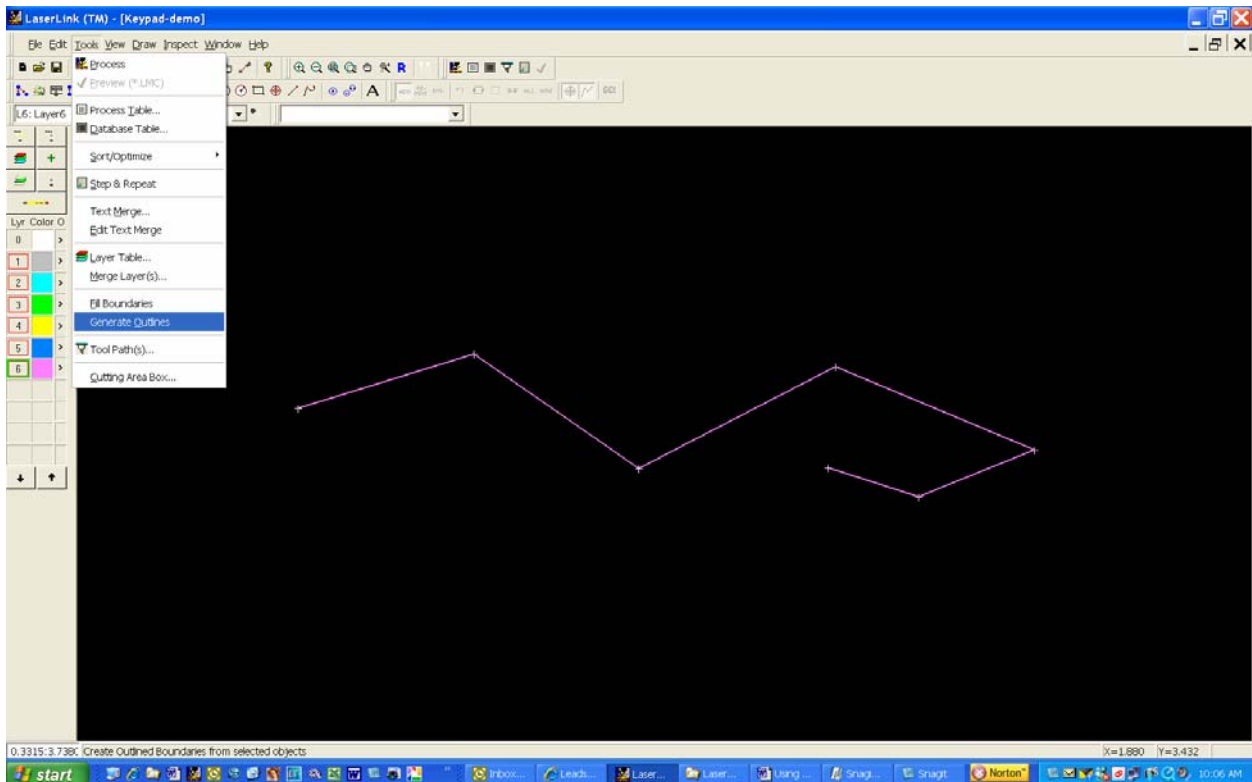
“Fill Boundaries”: continued. Close up of fill path the laser will follow.





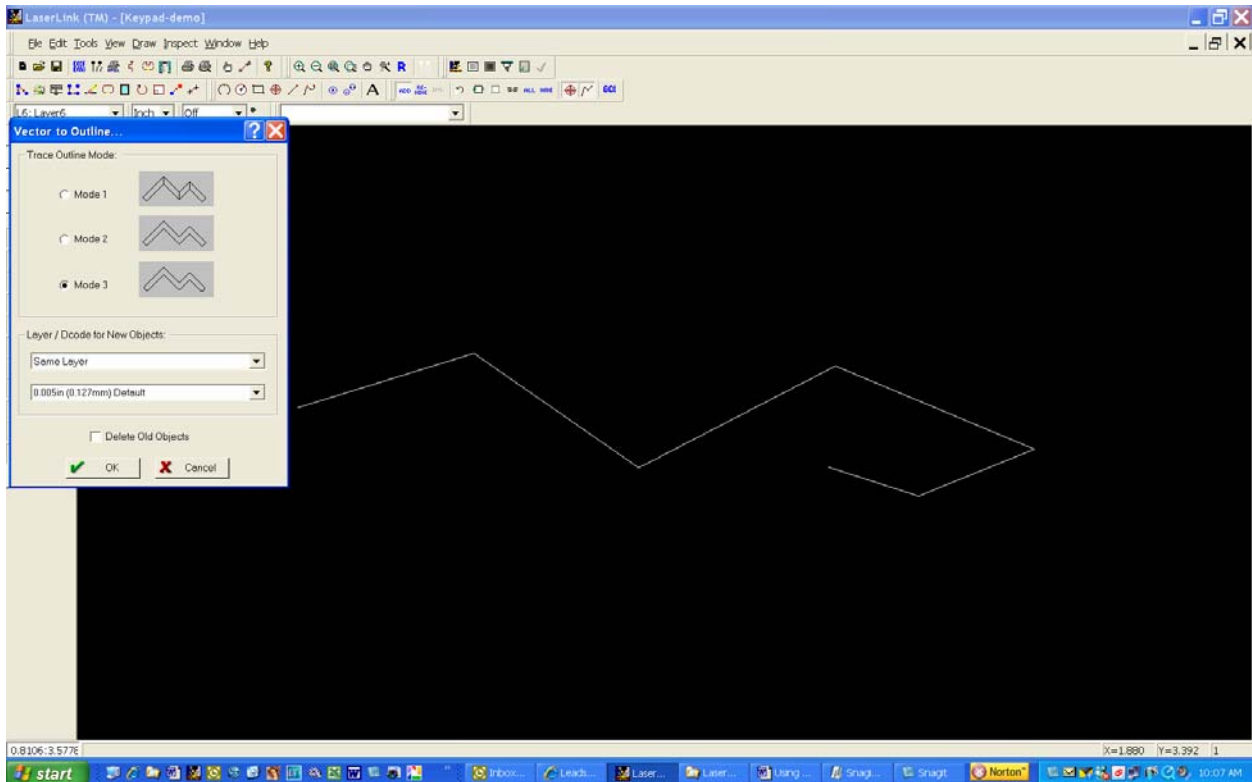
## Tools Menu

**“Generate Outlines”**: Left click “Tools” then “Generate Outlines” to get the selection tool “□”. Use the selection tool to select the features you wish to outline then right click to get the Vector to Outline dialogue box. (See next page)



## Tools Menu

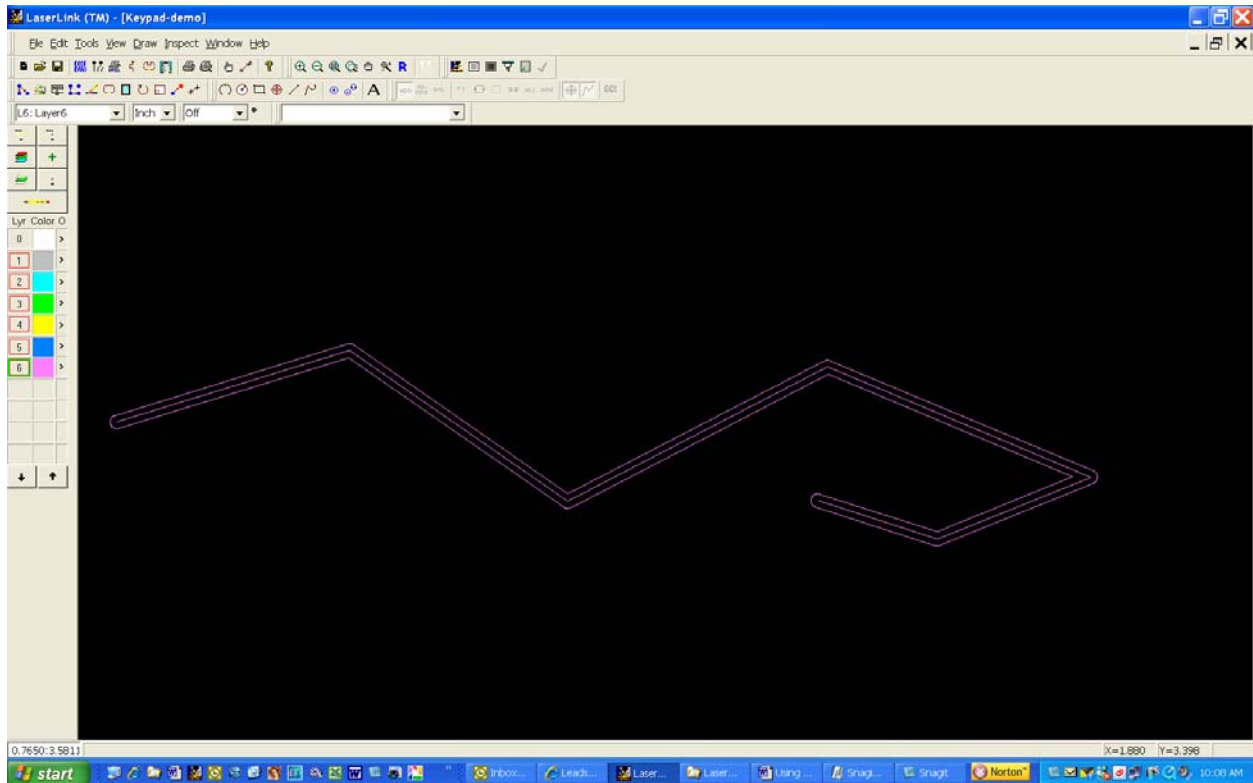
**“Generate Outlines”**: - continued. Select which mode you wish to outline in, what layer you want to outline to be in and the distance of the outline from the original then click OK. (See next page)





## Tools Menu

“*Generate Outlines*”:  
continued. Outlined line complete.

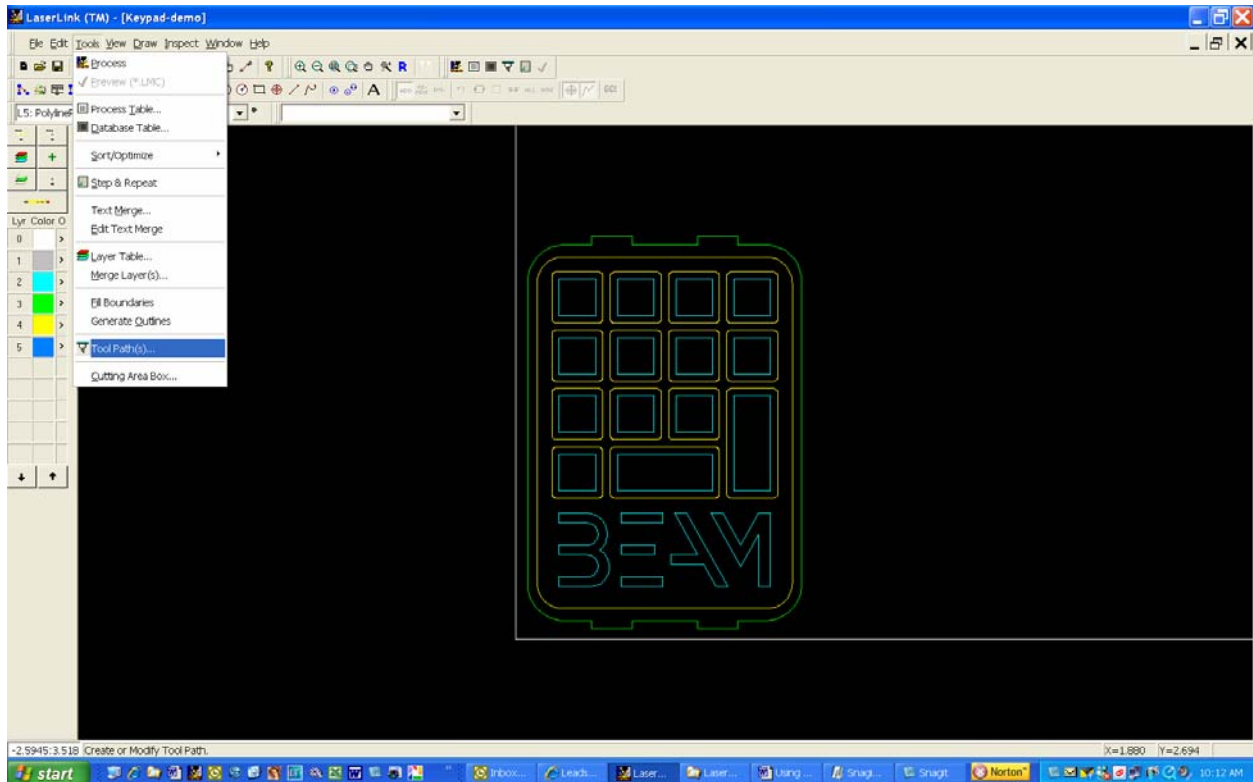




Tools Menu (Tool Path Shortcut Key)

**“Tool Path”:** Creating tool paths allows you to compensate for the kerf of the laser beam, begin and end cuts in “waste” areas, select the start and stop points in a cut and choose the direction of cuts. Tool Paths can be set automatically on import of the file or using the Tools Tool Path menu item.

First left click “Tools” then “Tool Paths” to get the Tool Paths Dialogue box and the selection tool “□”.  
(See next page)

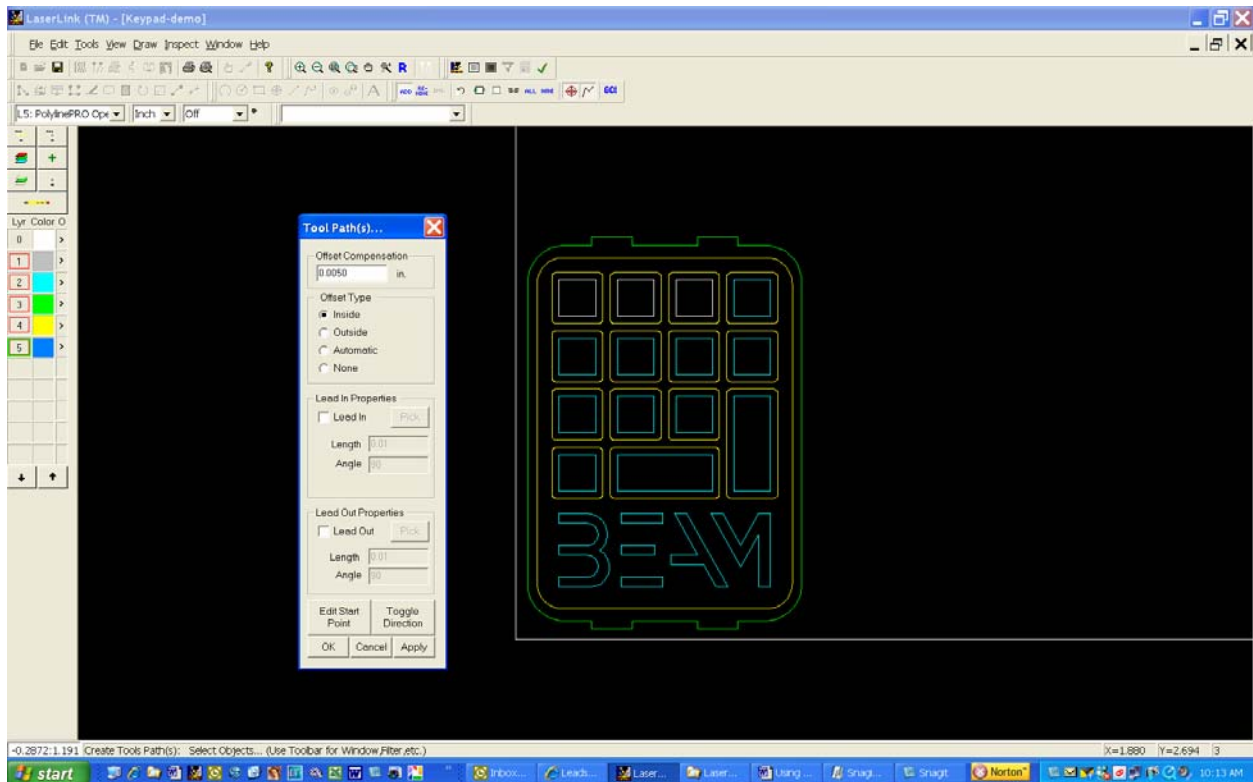






Tools Menu

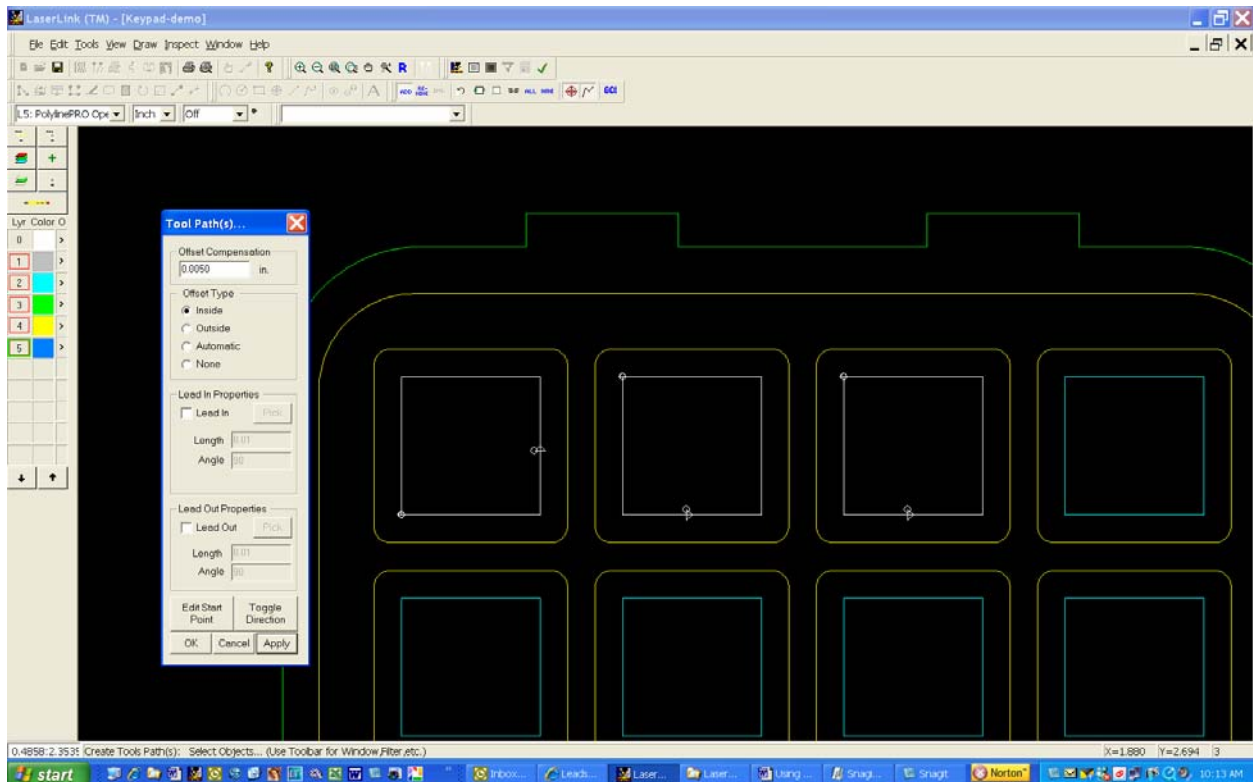
**“Tool Path”**: continued. Use the selection tools to select the features you wish to tool path. You can use area selection to select the entire part as well. (See next page)





## Tools Menu

**“Tool Path”**: continued. After selecting the features you wish to compensate enter the offset compensation (typically to account for  $\frac{1}{2}$  the laser cut kerf) and select the offset type whether inside or outside the line. If you choose Automatic LaserLink will attempt to determine what are outside features and inside features and kerf compensate appropriately. Click “Apply” to apply the tool path offsets. (See next page)



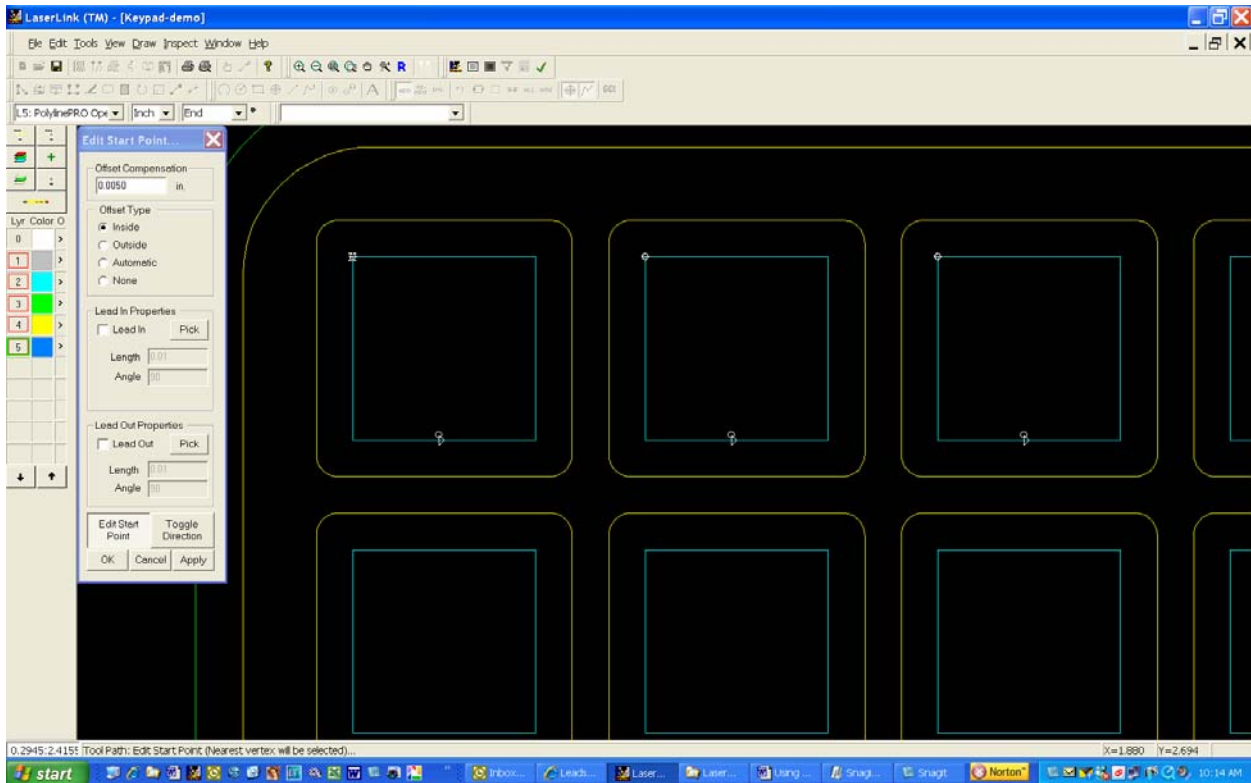
Tools Menu



**“Tool Path”**: continued. A close up of the Tool Path shows an arrow indicating the direction of the and a small circle that indicates which side of the line the kerf compensation has been applied. The



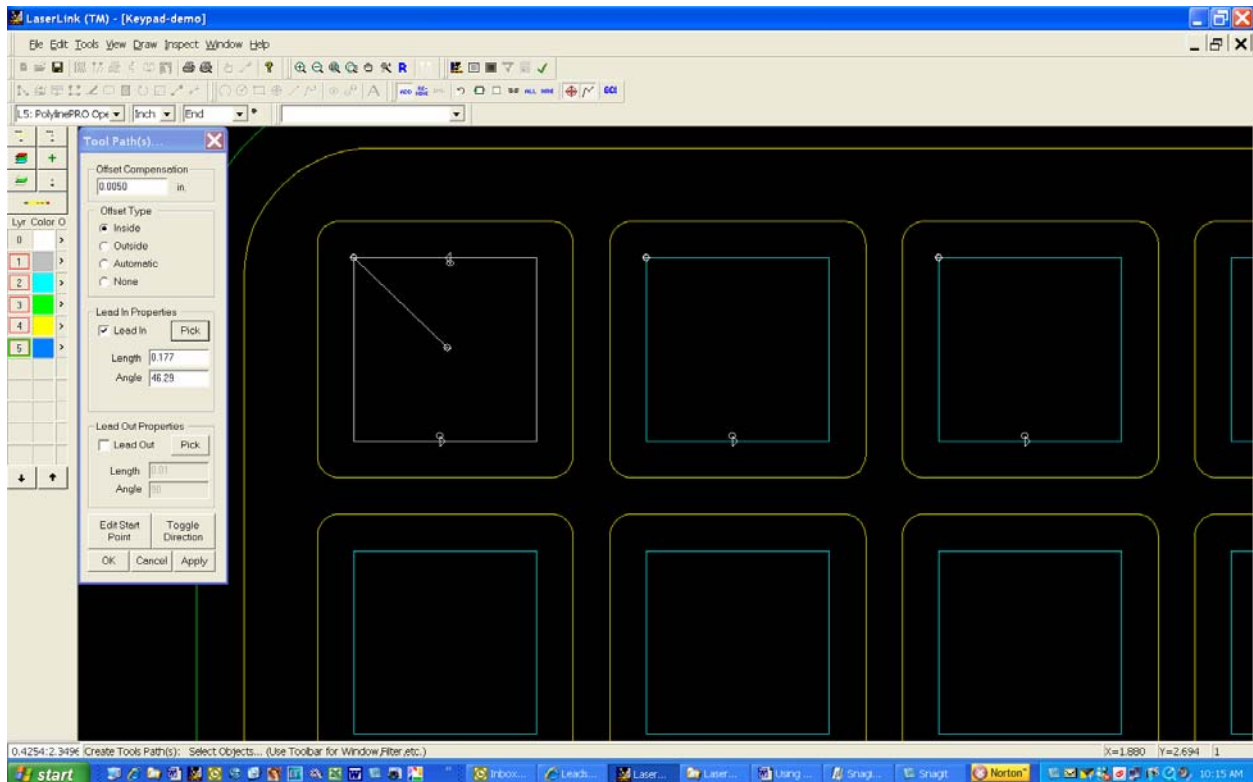
start point of the cut is indicated by this symbol (See next page)





## Tools Menu

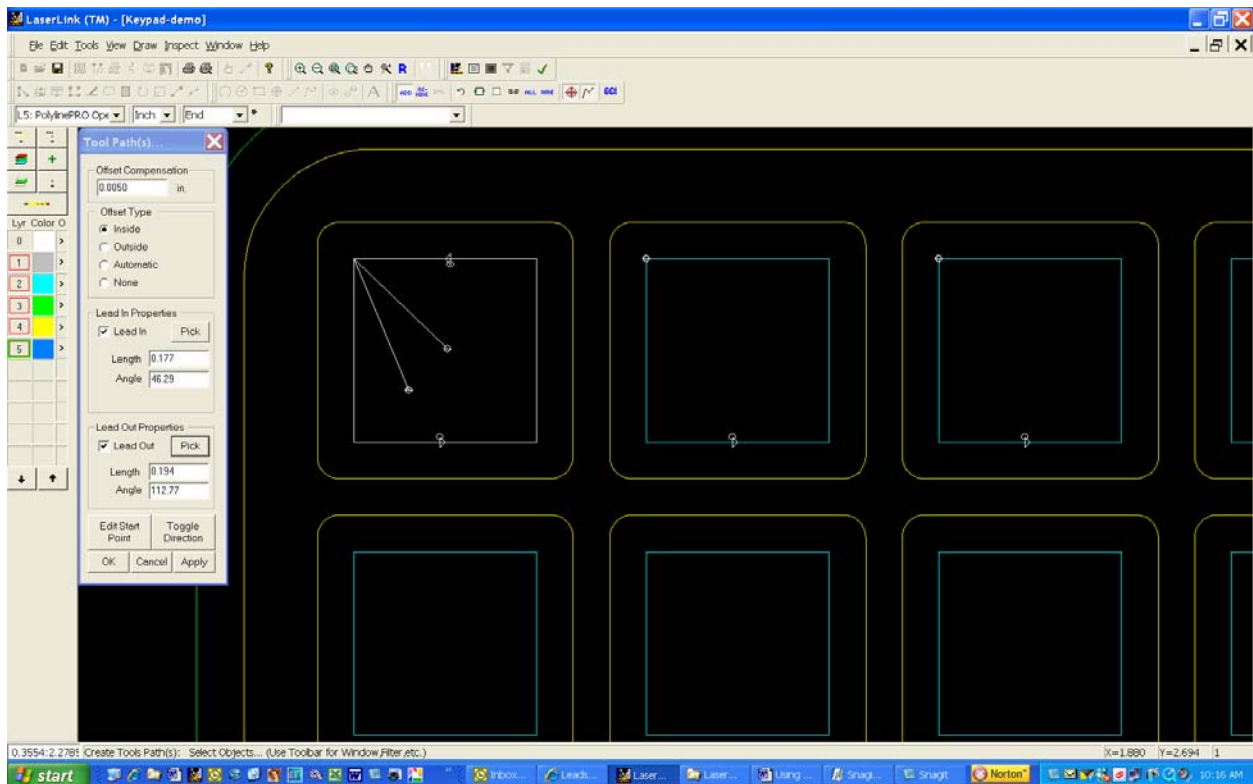
**“Tool Path”**: continued. You can also elect to create lead-ins and lead-outs. Lead ins are typically used in metal cutting and other applications where the start point of the cut can cause a surface blemish on the part. Use your selection tool to select the feature you on which you wish to apply a lead in. Check the lead in box and left click the “Pick button”. A line will form between the start point and your selection tool. Place the selection tool where you wish to start the cut and left click again to apply. *(See next page)*





Tools Menu

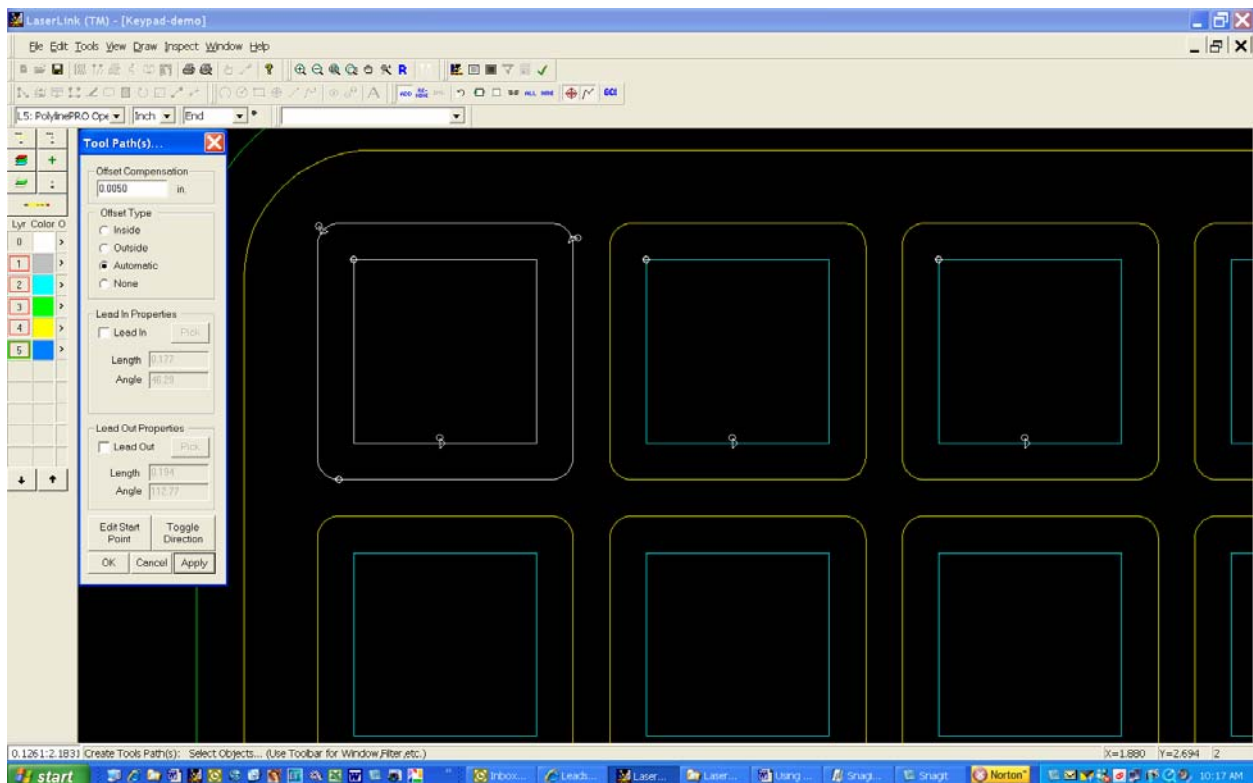
“*Tool Path*”: continued. Follow same steps to create a lead out. (See next page)





## Tools Menu

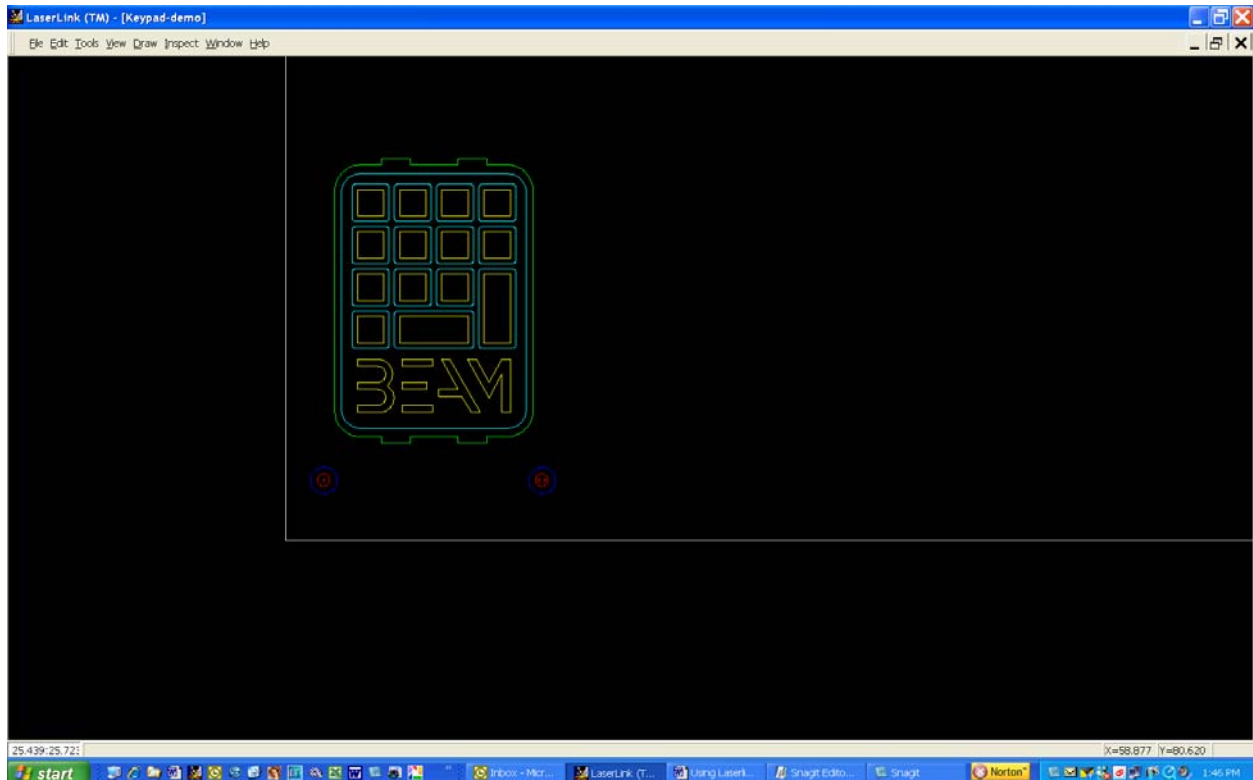
“Tool Path” continued. Selecting Automatic tool path compensation. Outside feature compensates outside, inside feature compensates inside. You can also use the “Edit Start Point” to change the start location of a cut. This can be useful in creating optimum cut paths and ensuring the laser head avoids obstacles. Toggle Direction changes the direction of cut.





## View Toolbars

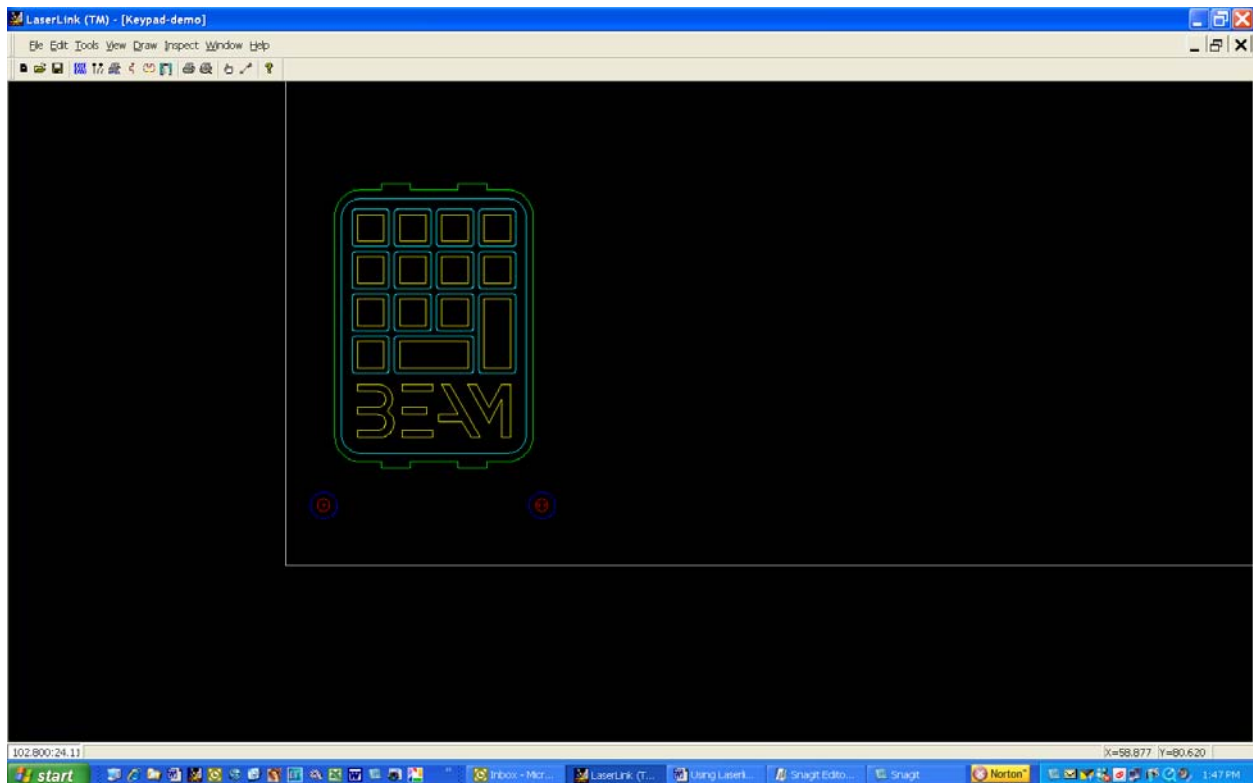
**“Menu Bar”:** LaserLink offers a number of shortcut key toolbars that can be turned on or off in the “View” “Toolbars” check boxes. *(see next page)*





## View Toolbars

**“File Bar”:** Turning on the “File” Toolbar gives you shortcut keys to create a new drawing, open an existing file, save file, import dxf or dwg file, import gerber data, import hpgl, import drill data, import mill data, import photo, print, print preview, process query, measure or call up the help menu. Holding your cursor over the shortcut will give a brief description of its function.

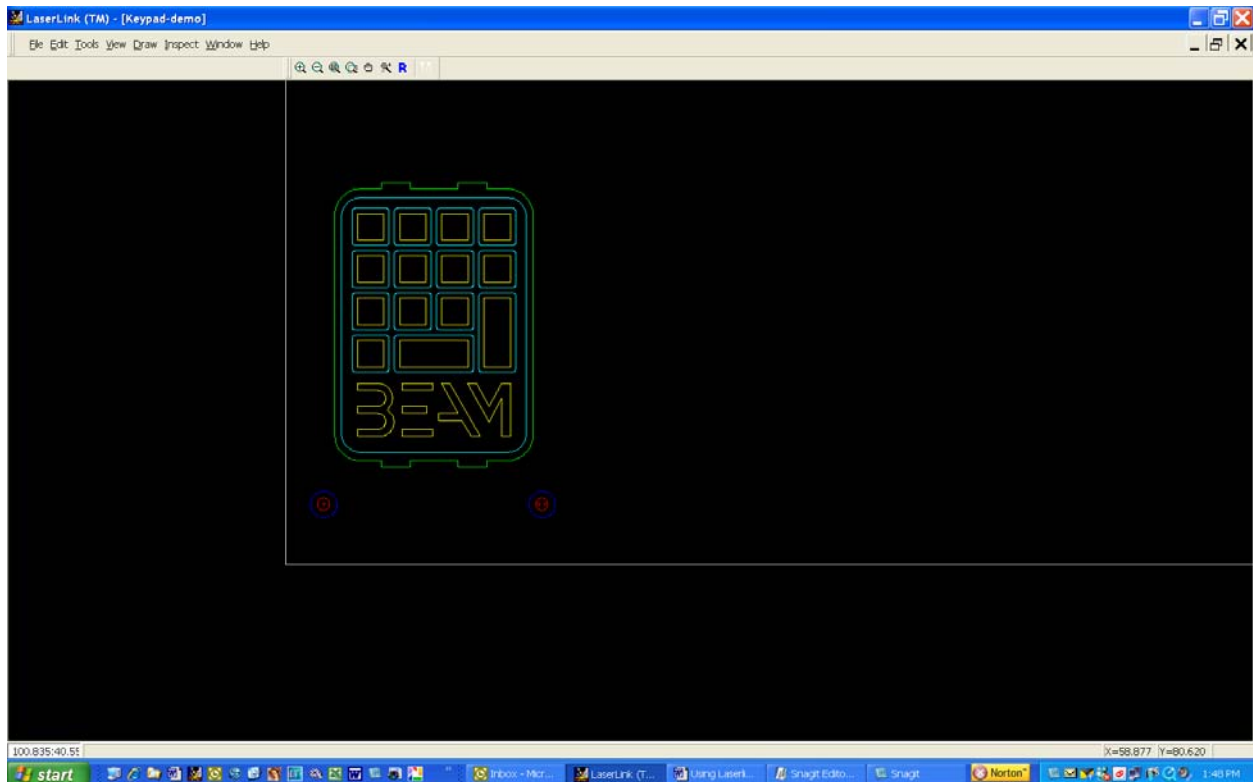






## View Toolbars

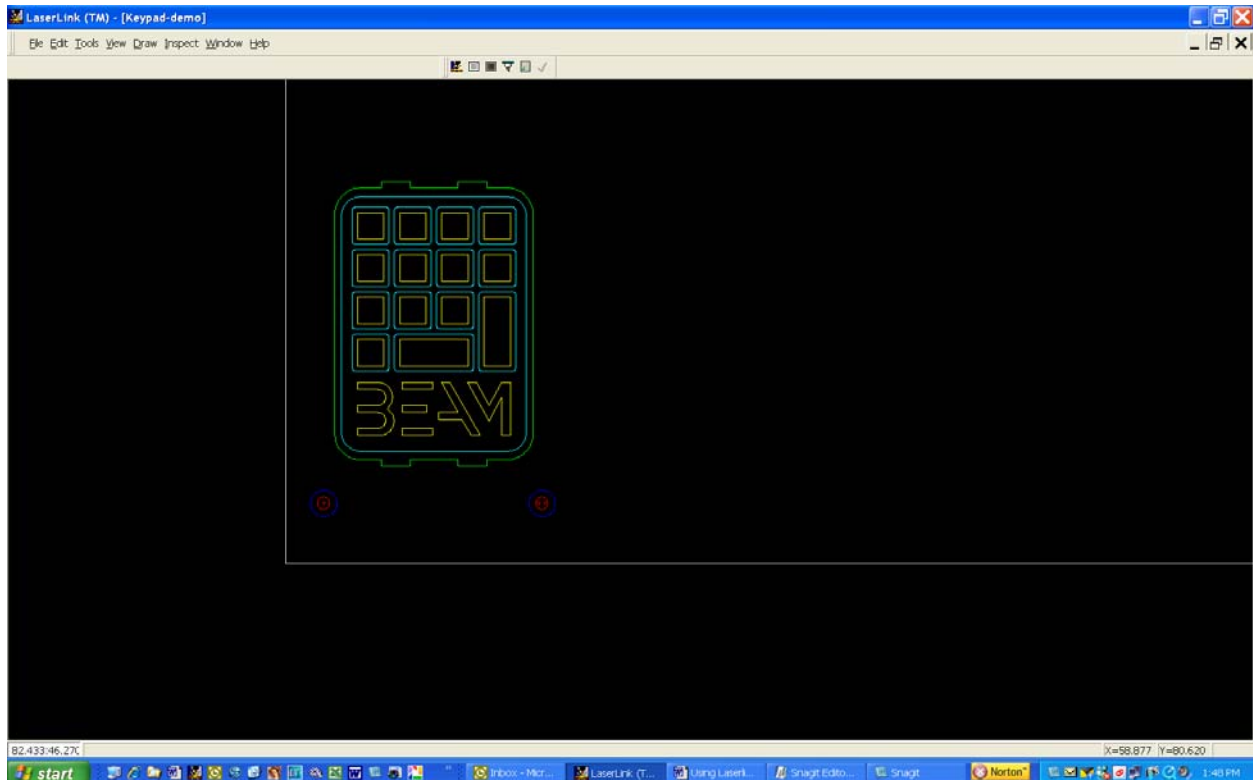
**“View”:** This toolbar gives you the zoom, pan and redraw shortcut keys. You can zoom in and out, zoom all or zoom to a particular area. If your mouse has a scroll wheel you can dynamically zoom in and out. Pan enables you to grab and move the image.





## View Toolbars

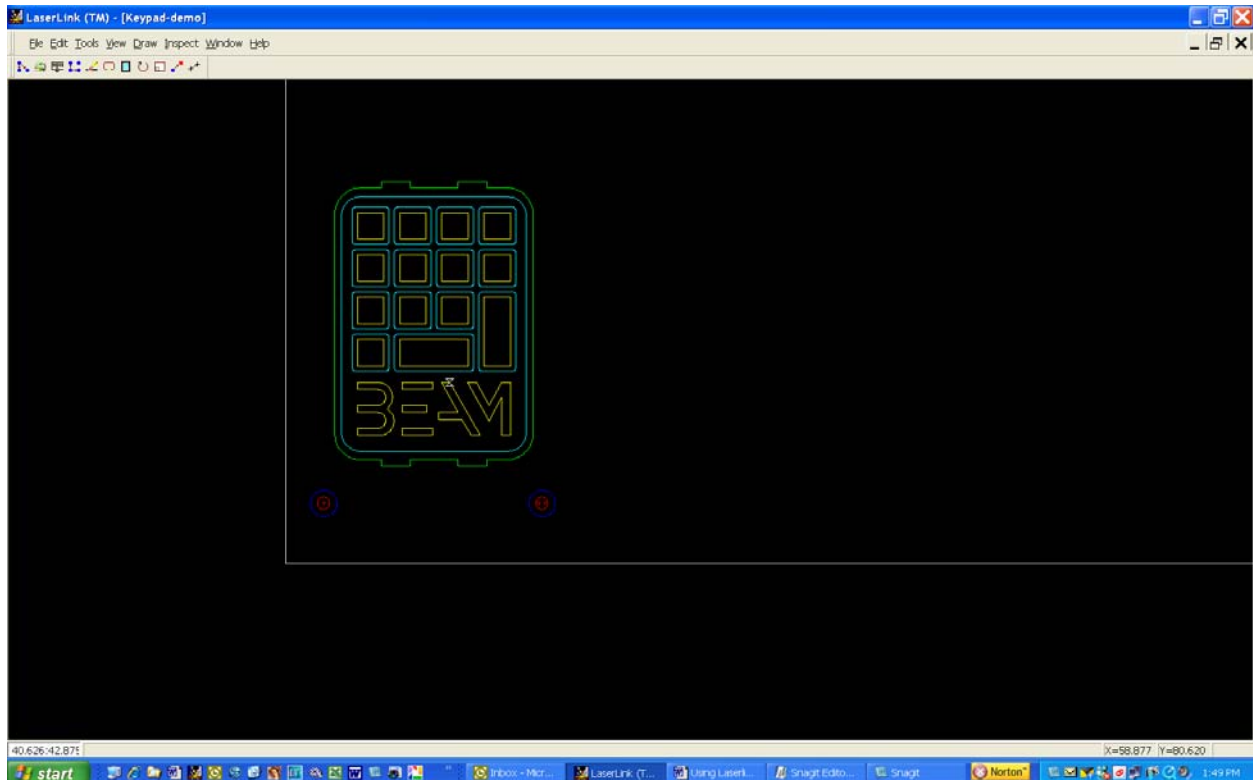
**“Tools”:** This toolbar displays shortcuts to process files, process table, database table, tool pathing, and creating step and repeats.





## View Toolbars

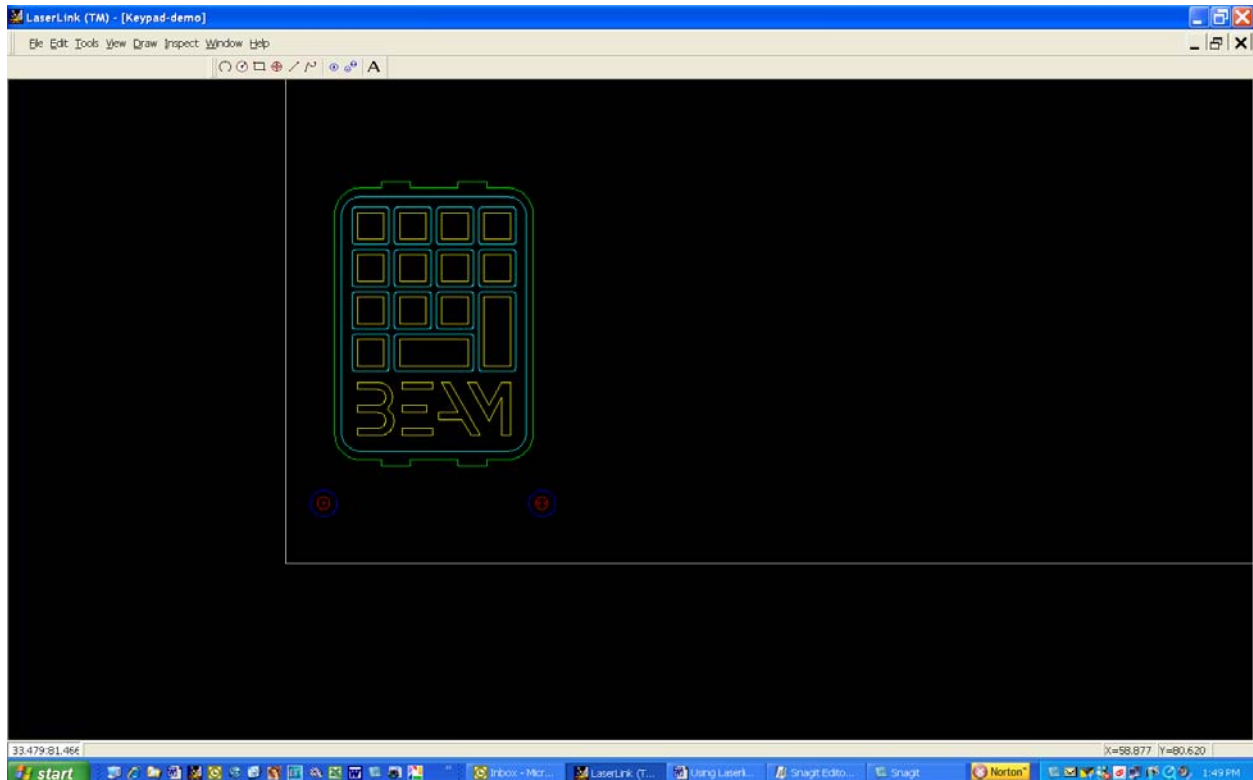
**“Edit”**: Provides shortcuts to copy multiple, copy to layers, move objects, array, erase, break, mirror, rotate, scale, modify and align layers.





## View Toolbars

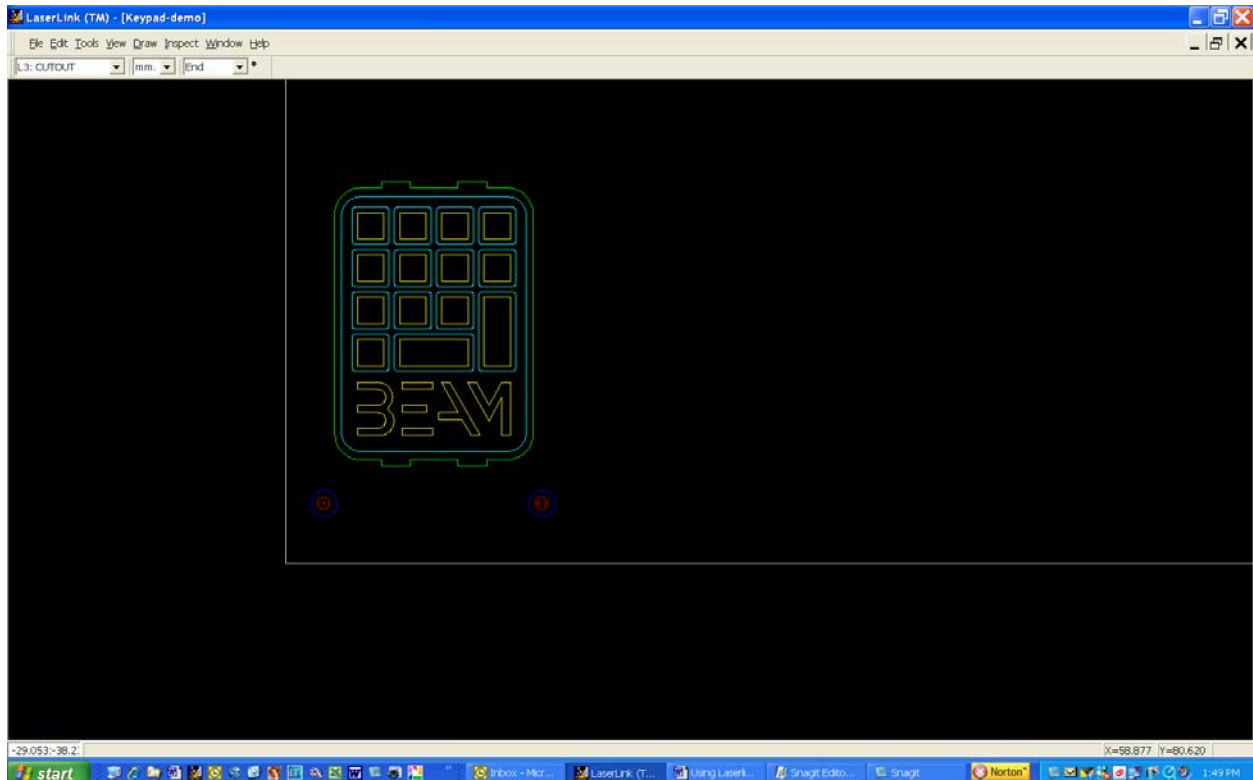
**“Draw”**: Draw toolbars for shortcut keys to create 3 point arcs, circles, rectangles, drills, lines, polylines, single and double alignment marks and Text.





## View Toolbars

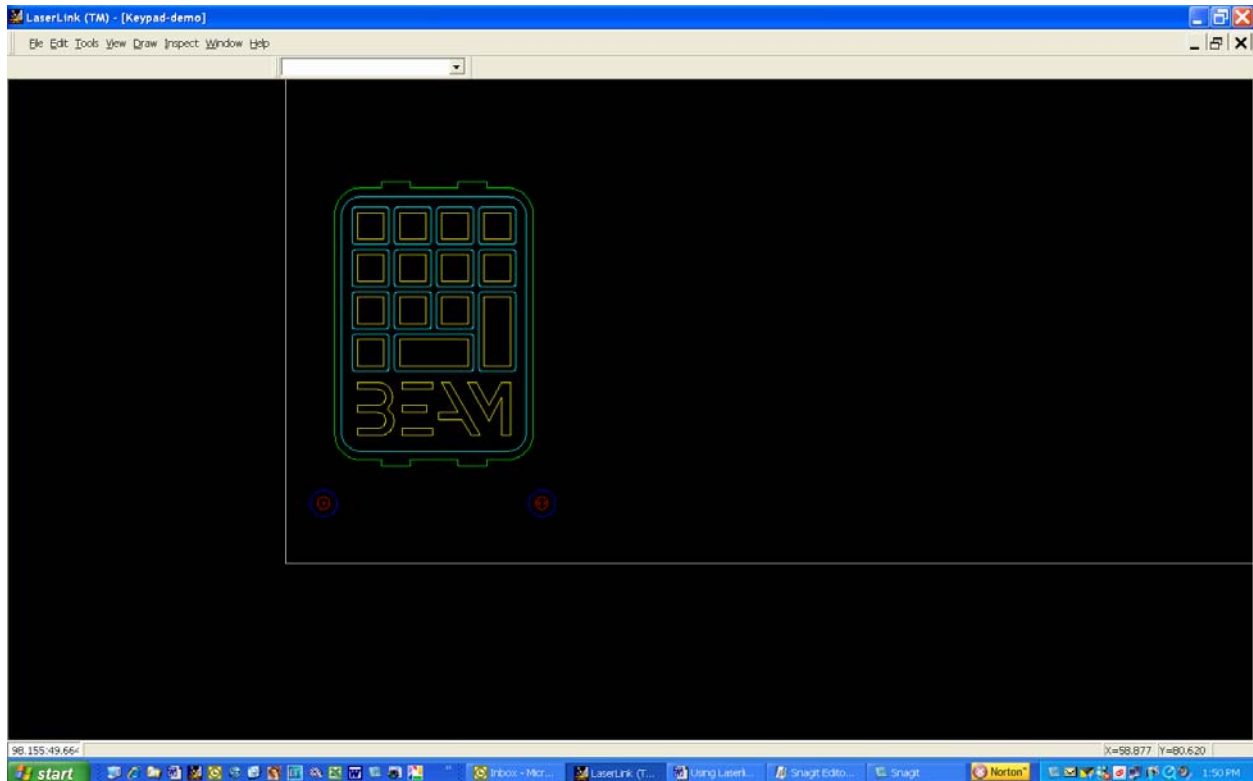
**“Coordinate”**: Coordinate toolbar allows for selection of Active Layer, Measurement units and object snaps.





View Toolbars

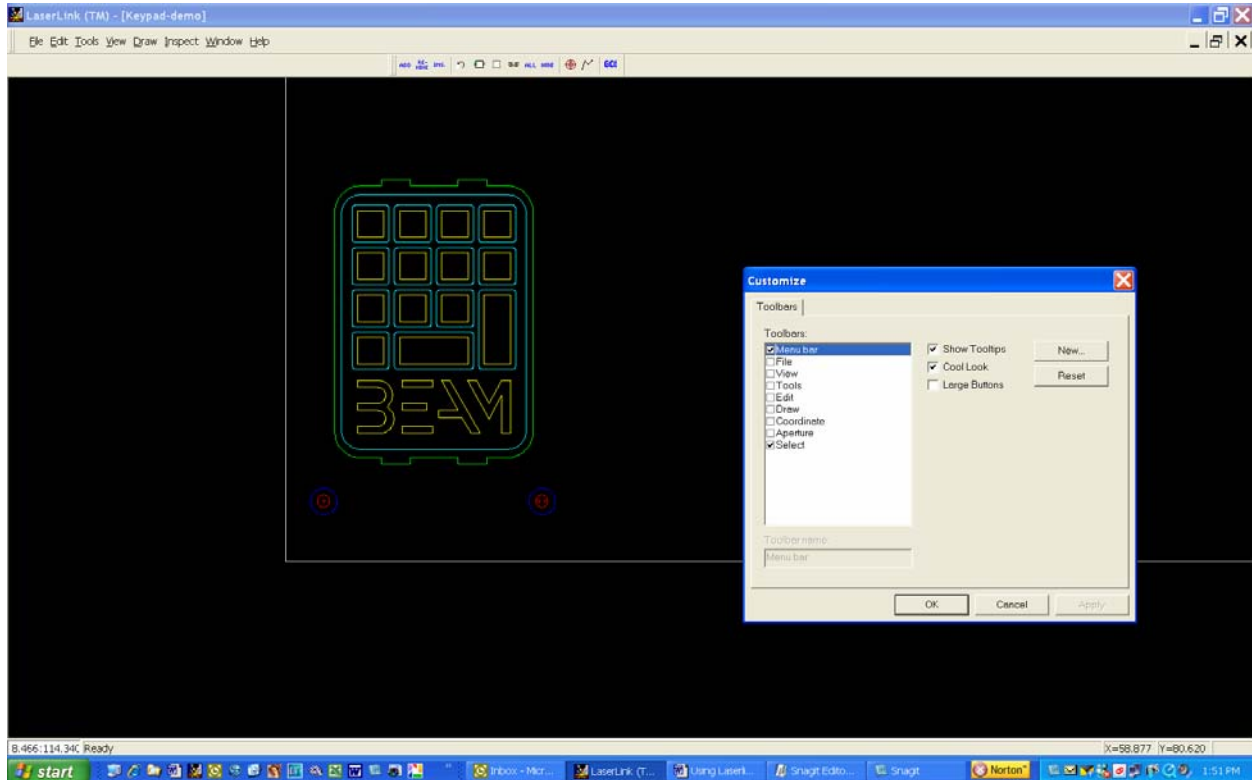
“Aperture”: Toolbar displays the aperture window.





## View Toolbars

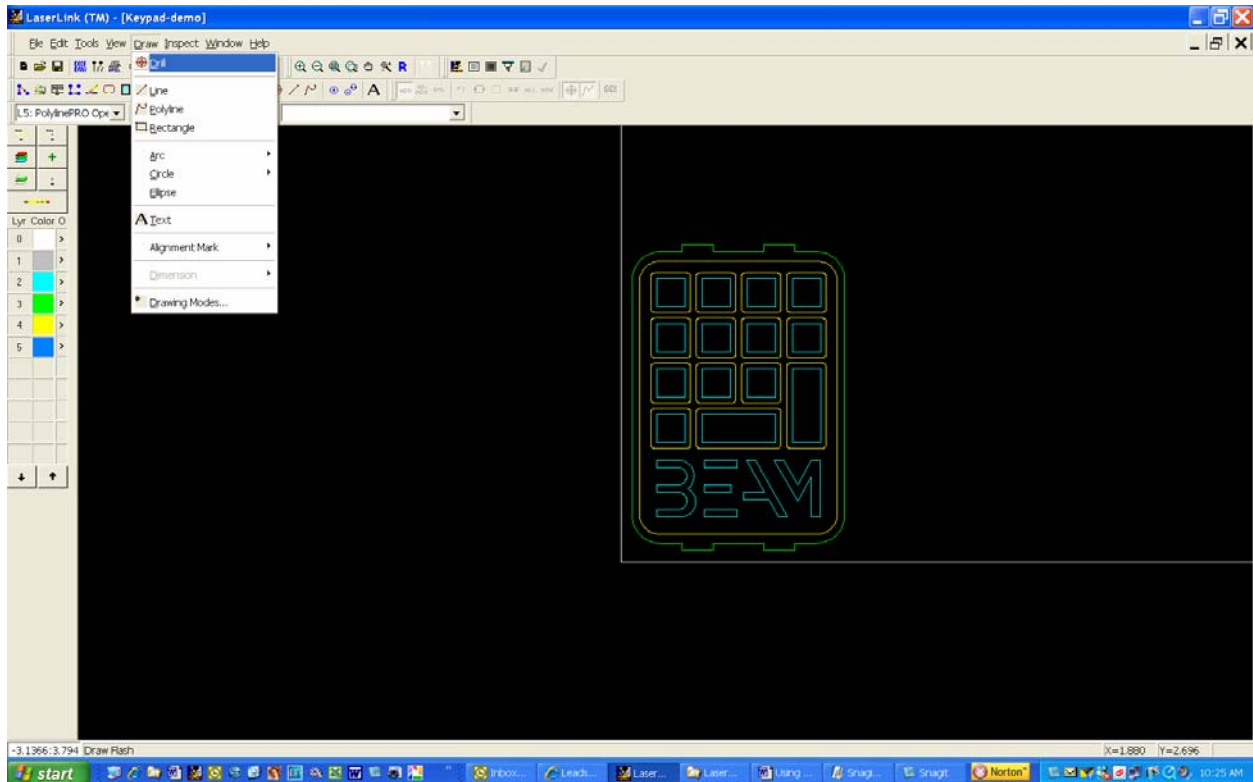
**“Select”**: Select tools are used to add, remove and insert items into user sort orders. Additional selection shortcuts are available only using these shortcut keys.





Draw Menu (Drill Shortcut Key)

“Drill”: Left click “Draw” then “Drill” to get the selection tool “+” or “□” if object snaps are turned on. Left click to place the drill point. (See next page)

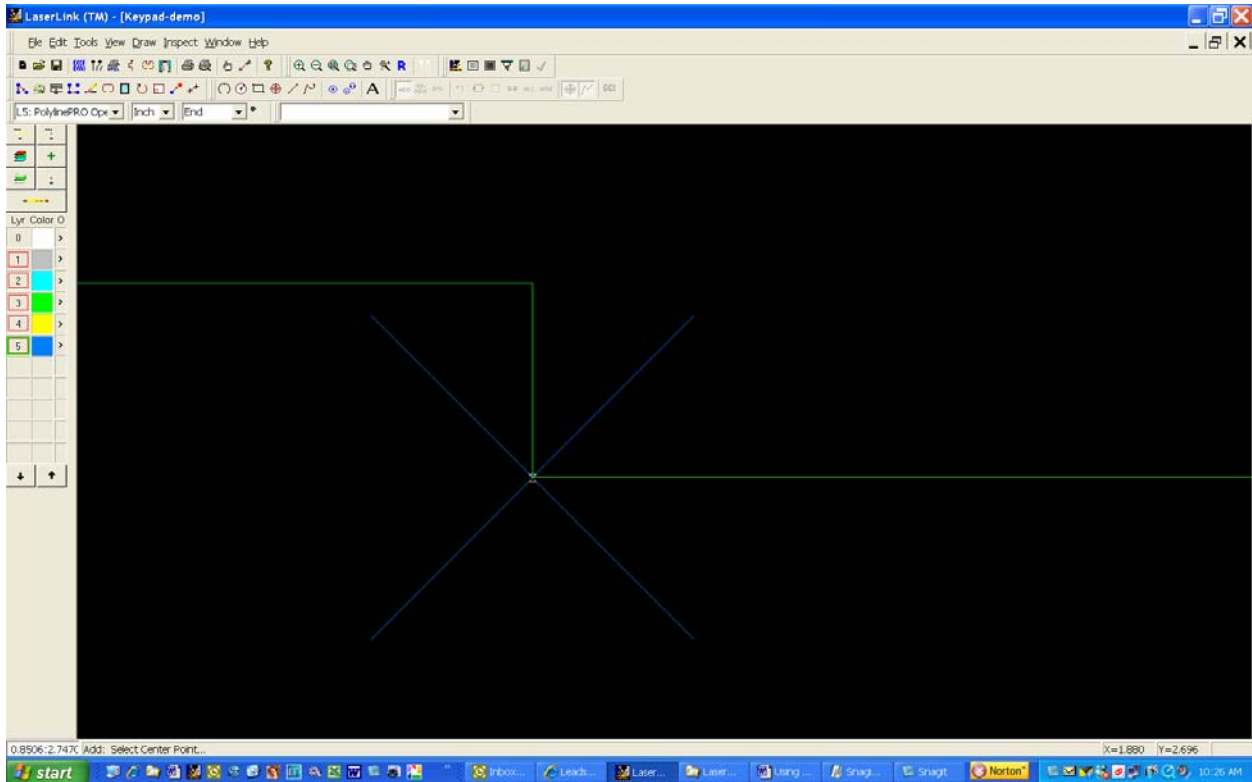






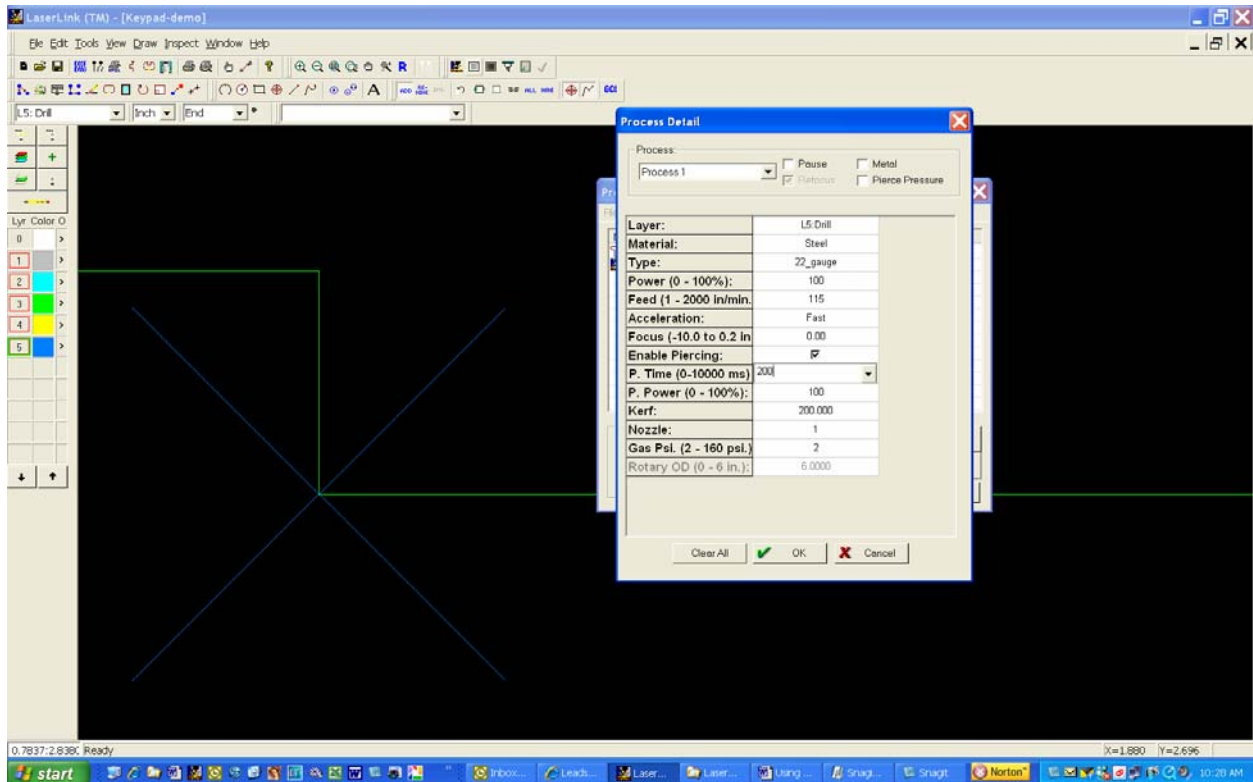
Draw Menu


“Drill”: continued. Center of drill location is indicated by a large X. (See next page)



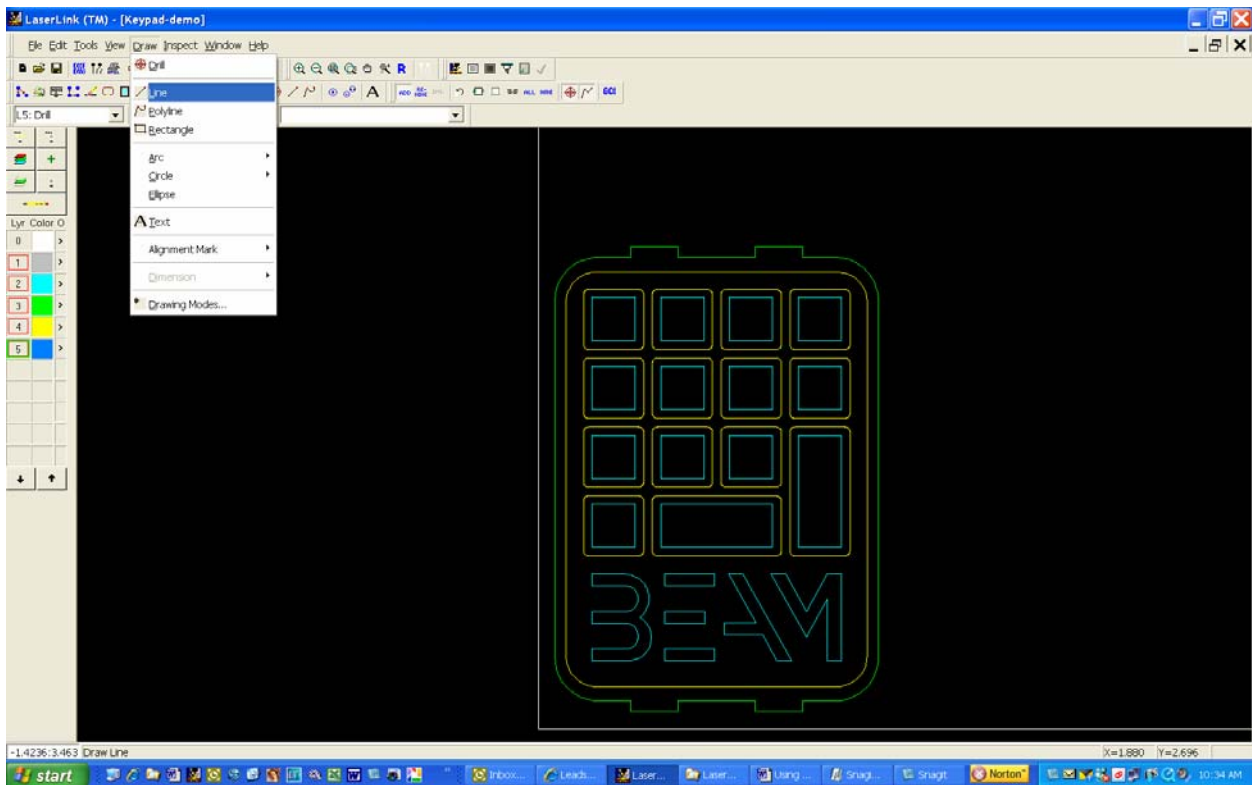
Draw Menu 

“*Drill*”: continued. A drill is set up in the LaserLink Process Table by checking “Enable Piercing” and selecting a pierce time and power.



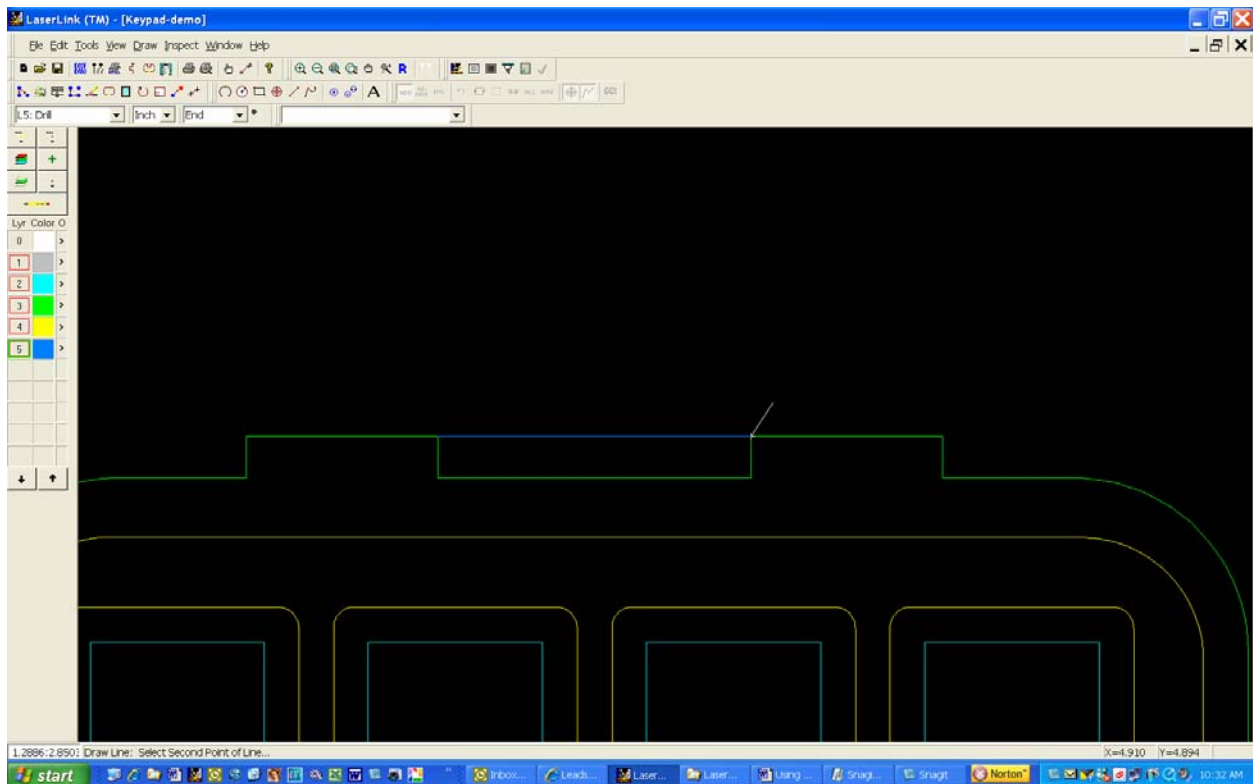
Draw Menu  (Draw Line Shortcut Key)

**“Line”:** Left click “Draw” then “Line” to get your selection tool “+”. Follow the steps in the message pane at the bottom left corner of the active screen to select the first point of the line. Turn on Object Snaps to snap start point to a specific location. (See next page)



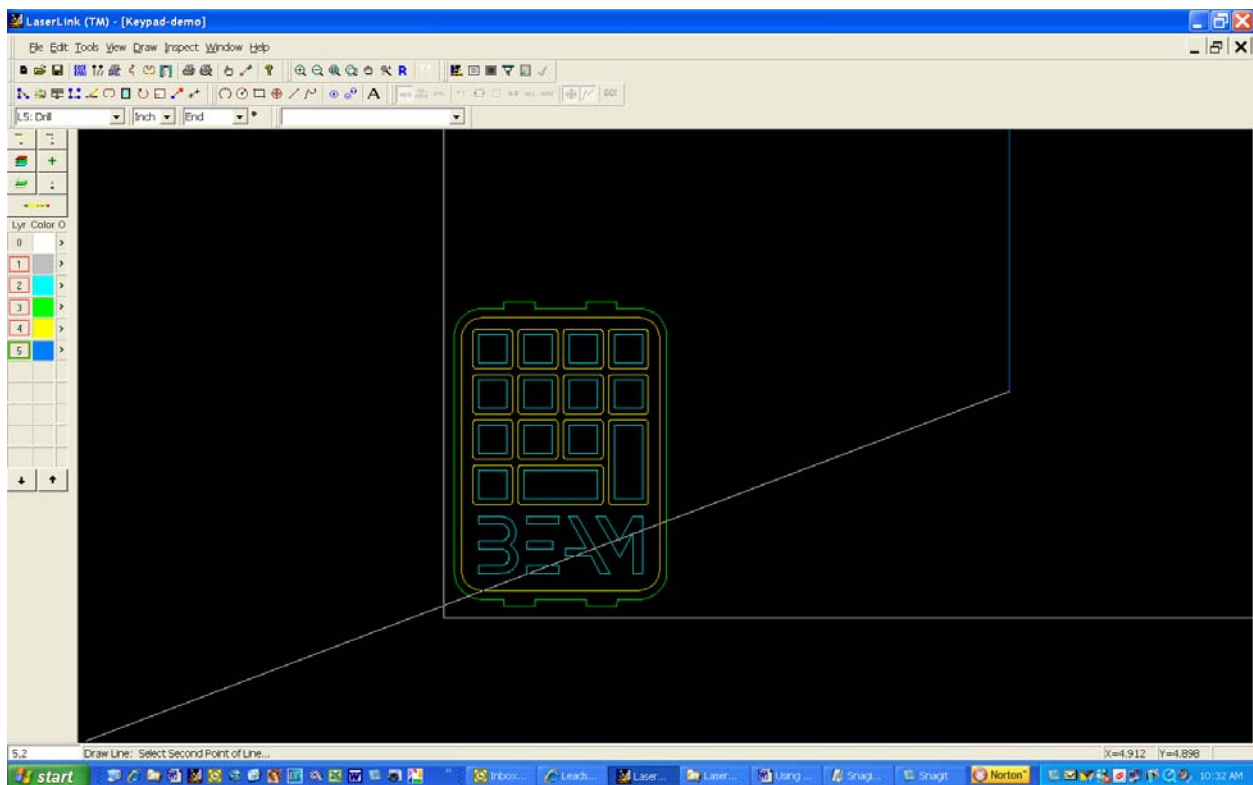



“Line”: continued. Snap first and second point of line. (See next page)



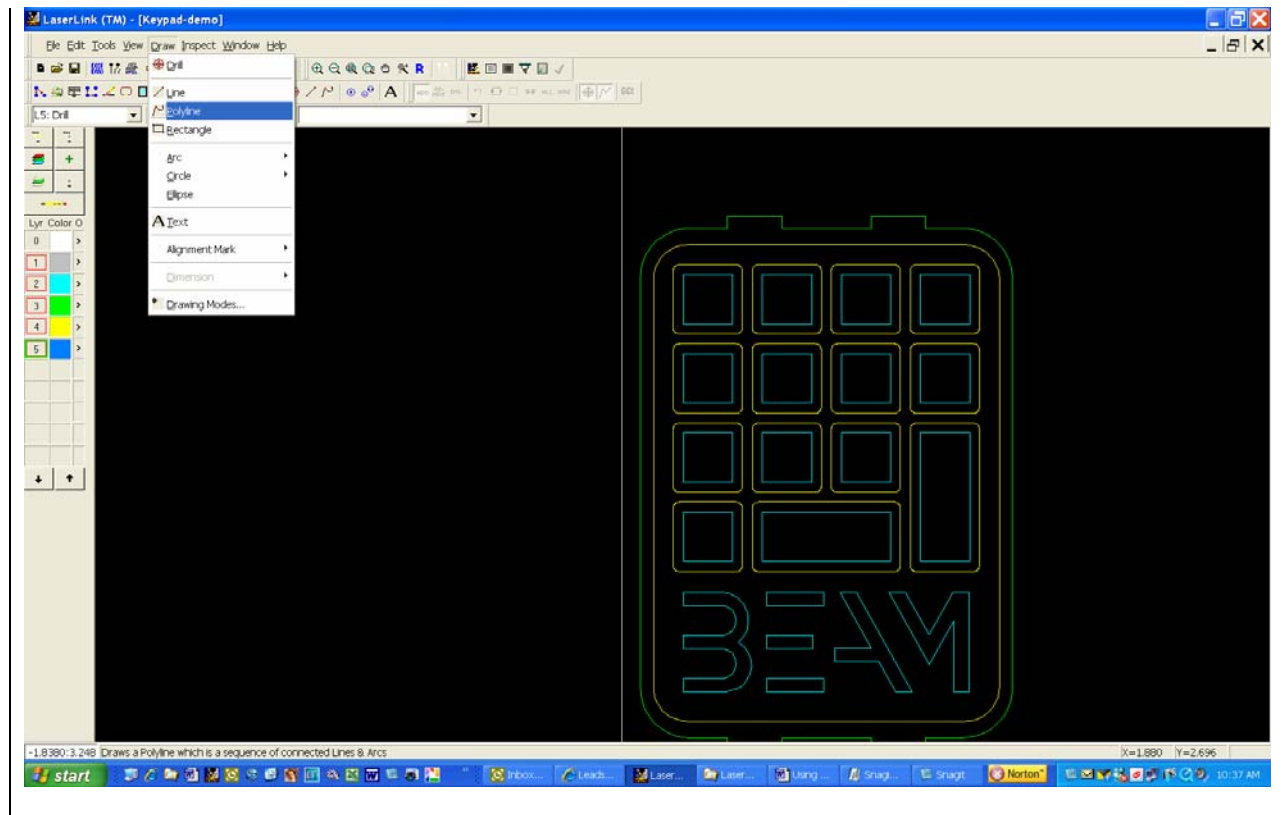


**“Line”**: continued. Draw lines to exact coordinates using the coordinates entry box at the bottom left of the screen.



Draw Menu  (Polyline Shortcut Key)

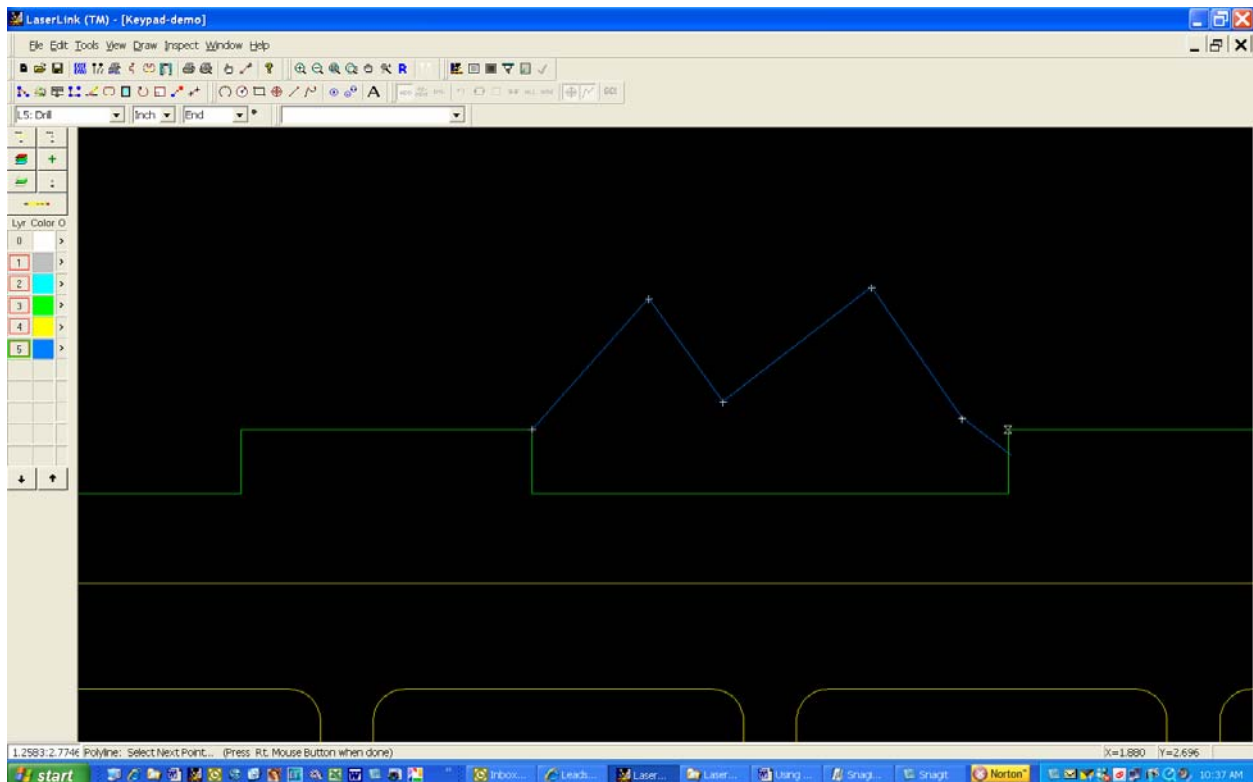
**“Polyline”**: Left click “Draw” then “Polyline” to get selection tool “+”. Follow instructions in lower message pane to select first point then next points of polyline. (See next page)





Draw Menu

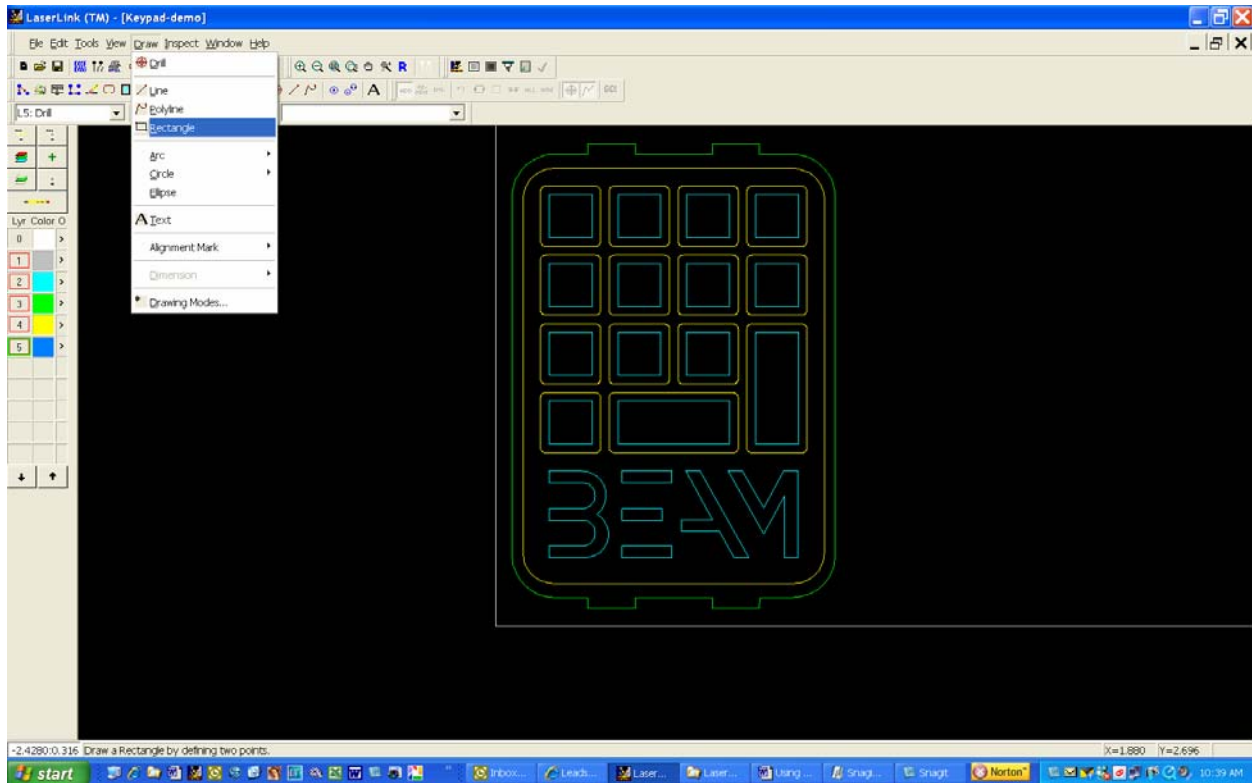
**“Polyline”**: continued. You can also use Object Snaps when creating a polyline. When finished with the Polyline right click and select “End” to complete.





Draw Menu (Rectangle Shortcut Key)

**“Rectangle”:** Right click “Draw” then “rectangle” to get your selection tool “+”. Turn on object snaps if you are snapping your start point to a specific feature. Alternatively, you can enter absolute coordinates in the coordinate pane at the bottom left of the screen. (See next page)



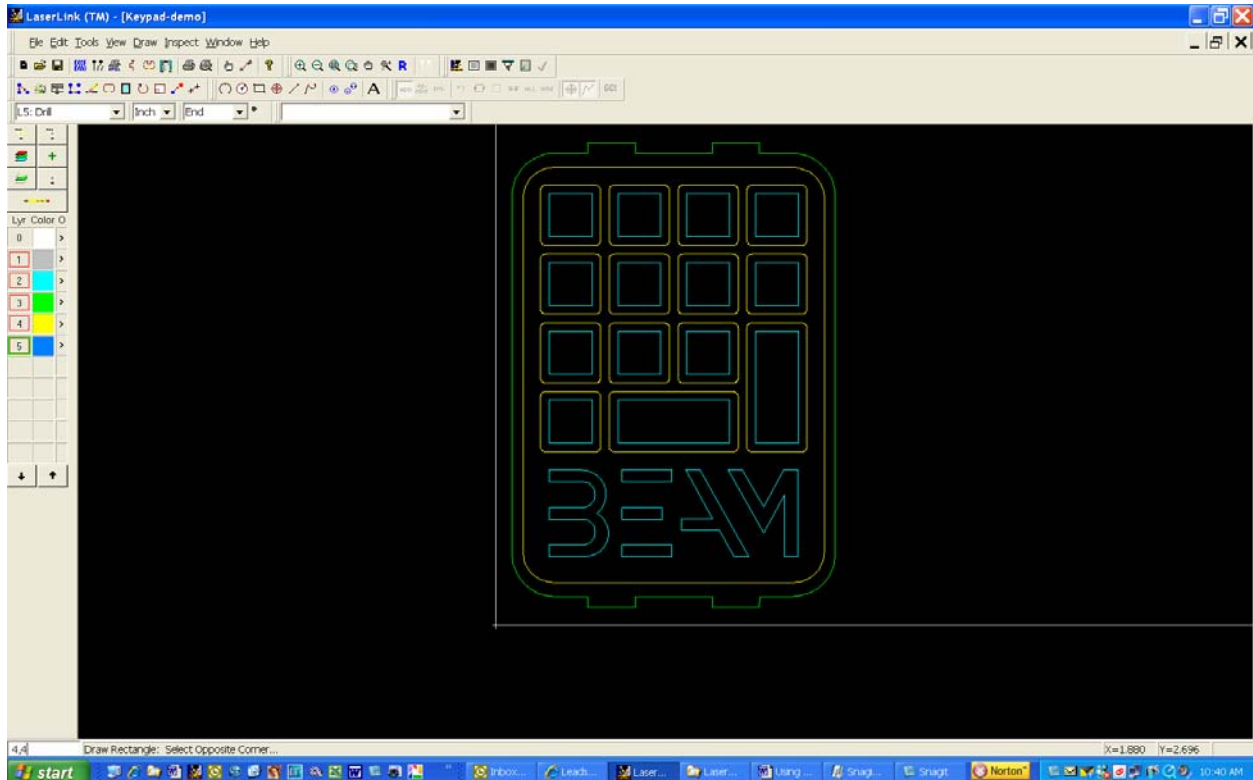




Draw Menu



**“Rectangle”**: In this case a rectangle is being created with first corner at 0,0 and second corner at 4,4. (See next page)

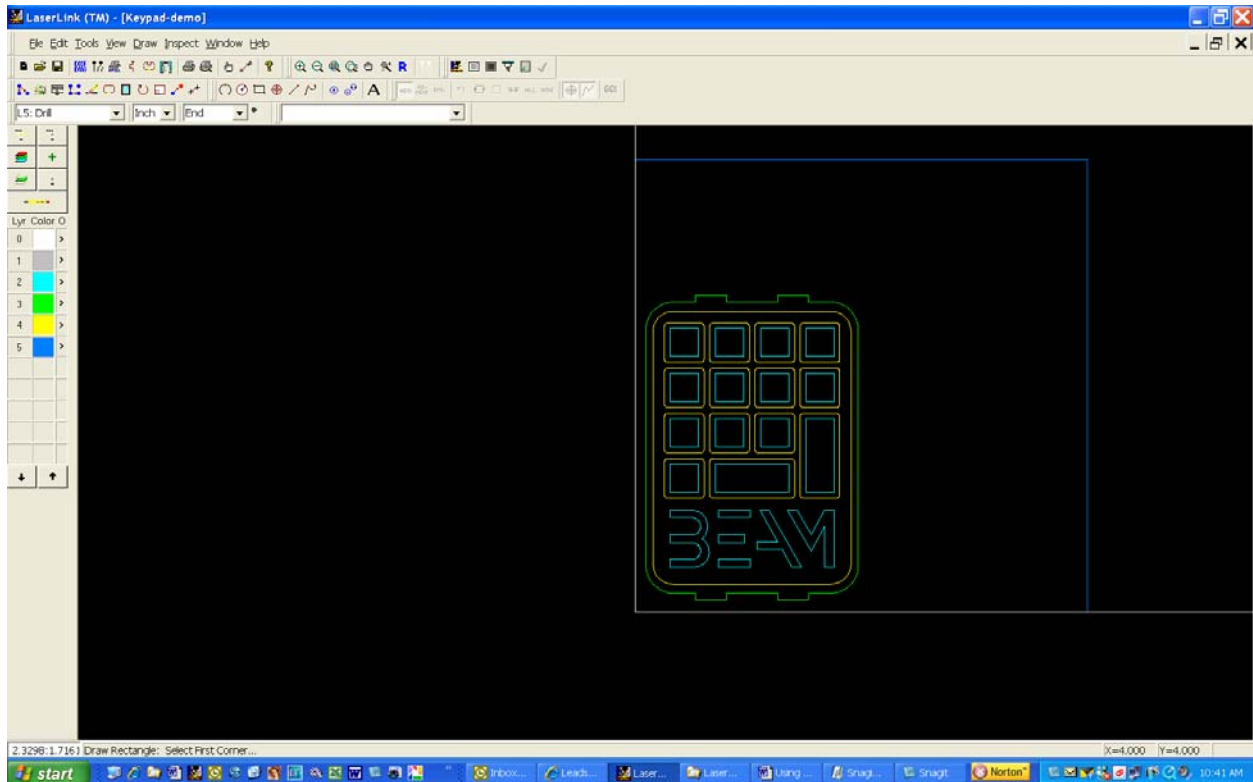




Draw Menu



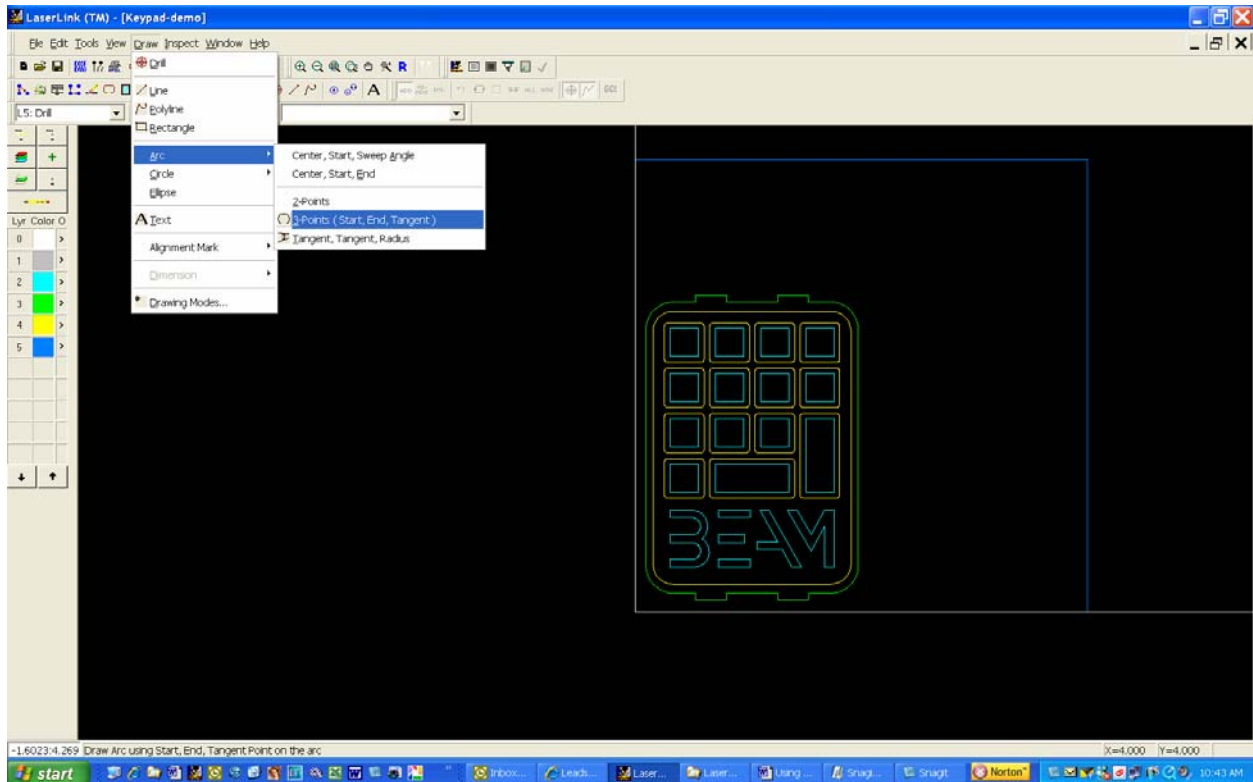
**“Rectangle”**: continued. Completed rectangle.





Draw Menu (Arc Shortcut Key)

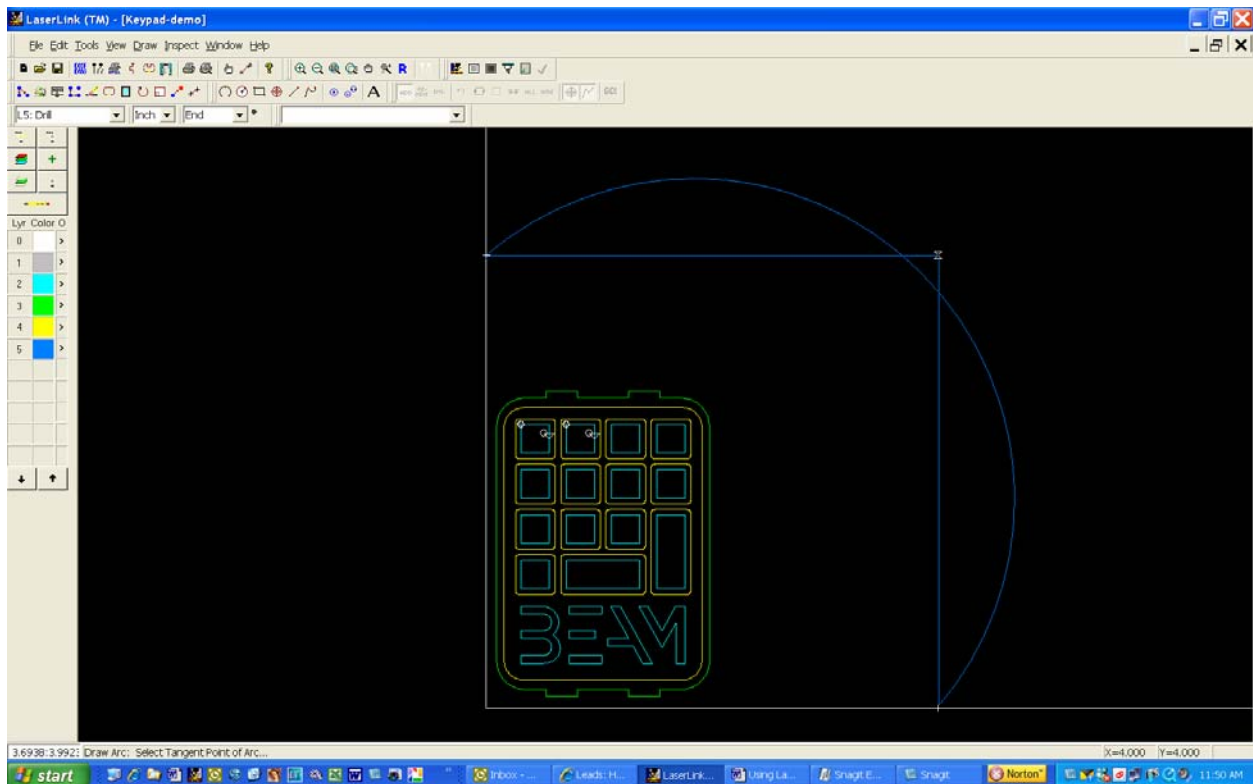
“Arc”: Left click “Draw” then navigate to “Arc” and left click “3-Points (Start, End, Tangent)” to get your selection tool “+”. (See next page)





Draw Menu 

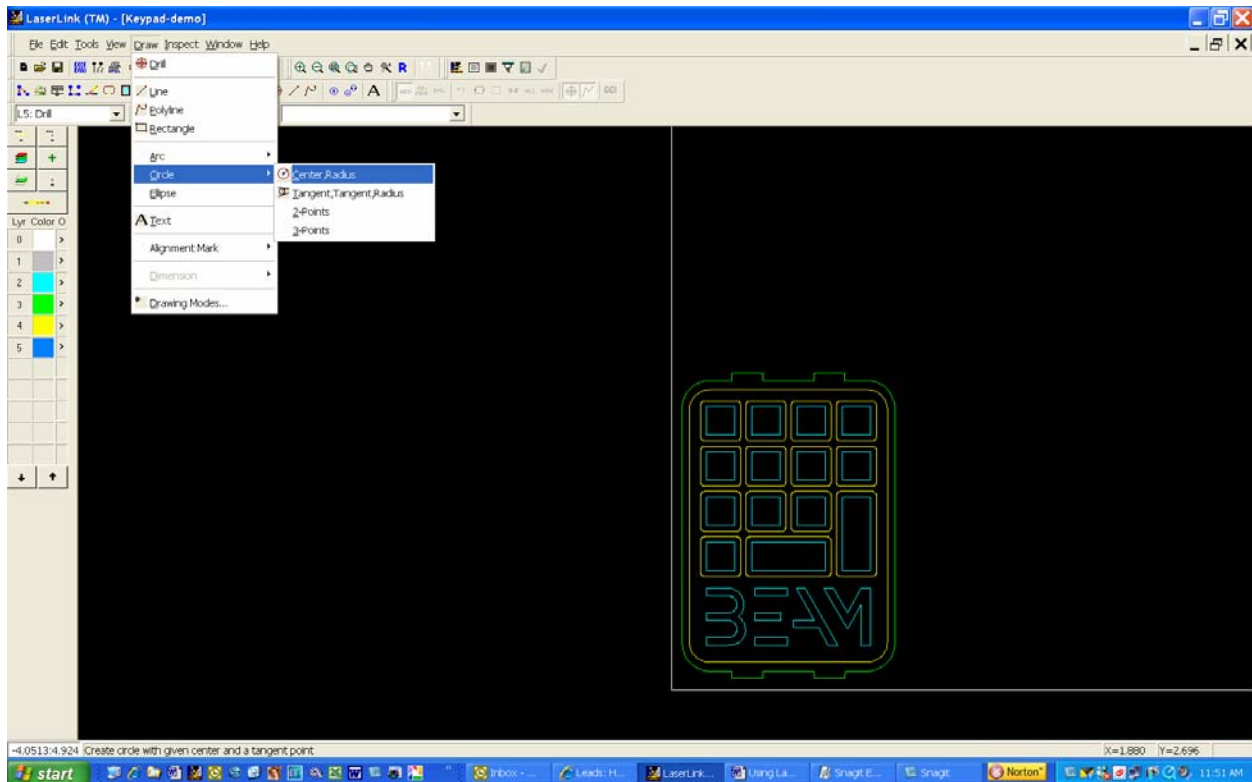
“Arc”: continued. Left click first the start point of the arc, then left click the end point of the arc and finally left click the tangent. Follow the steps in the message pane at the bottom left of the active screen.





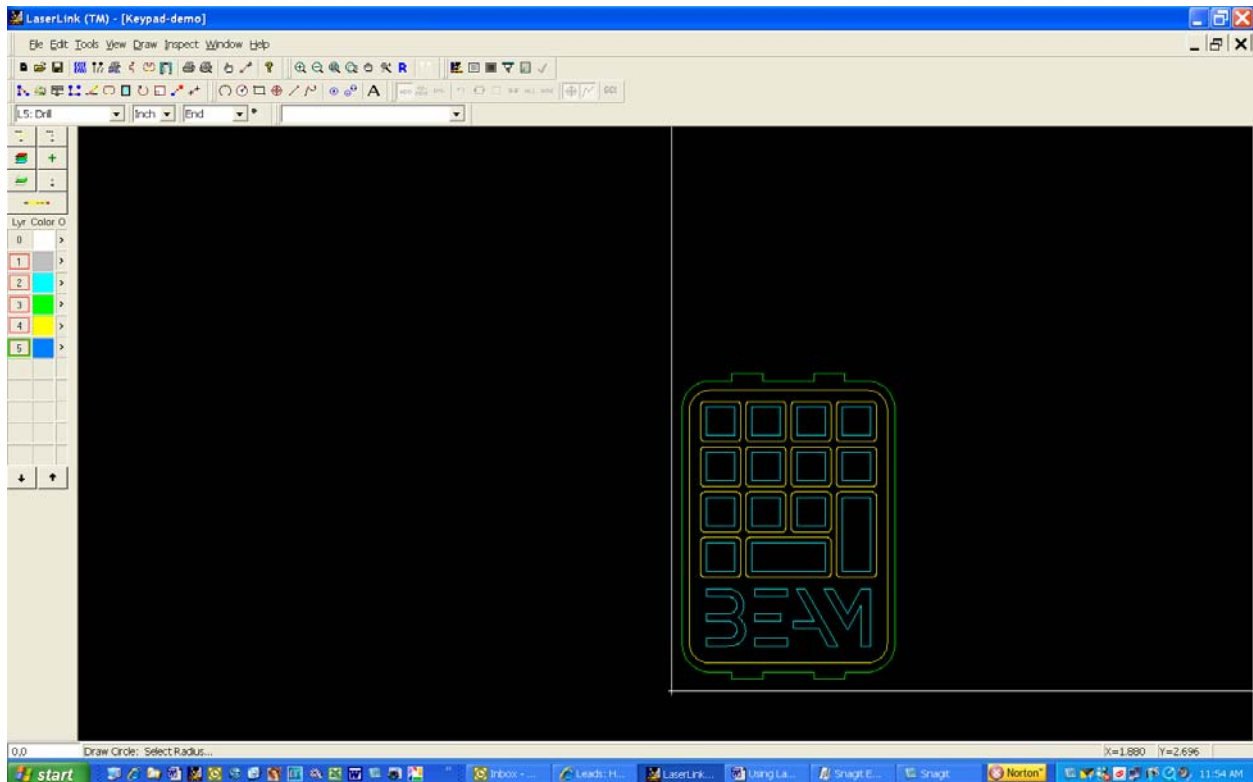
Draw Menu (Draw Circle Shortcut Key)

“Circle”: Left click “Draw” navigate to “Circle” and left click “Center, Radius” to get your selection tool “+”. Follow instructions in the message pane at the bottom left corner of the active screen.





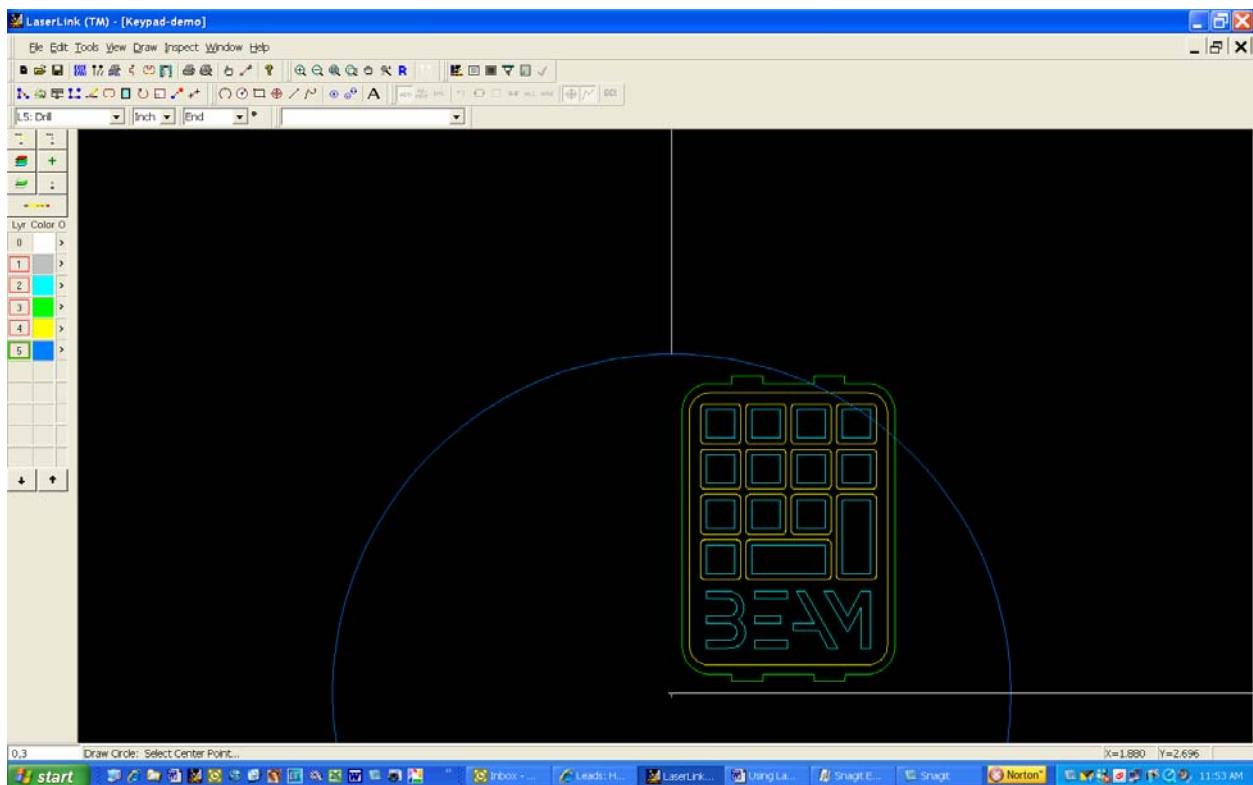
“Circle”: continued. Use the coordinates entry box to place the center of circle at 0,0 then hit enter. (See next page)





Draw Menu

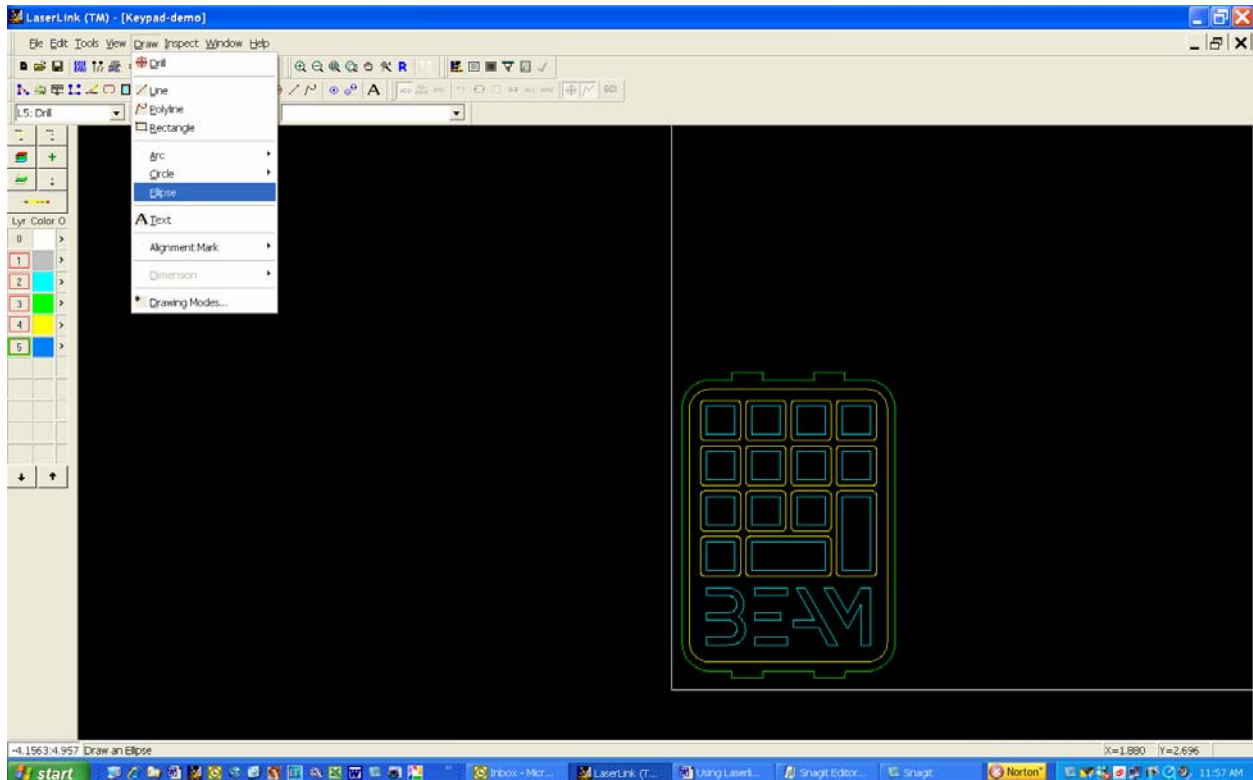
“Circle”: continued. Use the coordinates entry box to enter the radius of the circle at 0,3 then hit enter to create the circle with a 3” radius.





## Draw Menu

**“Ellipse”:** Left click “Draw” then “Ellipse” to get your selection tool “+”. Select first and second corner of ellipse. (See next page)

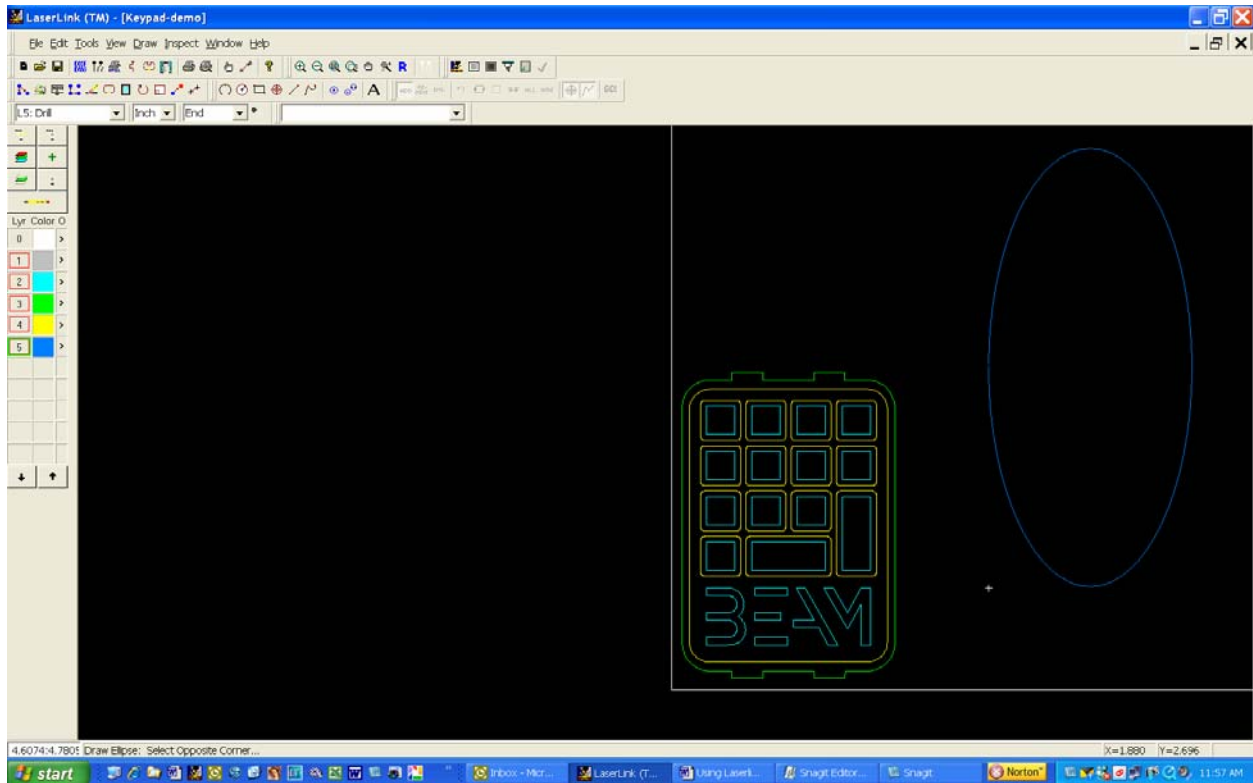






## Draw Menu

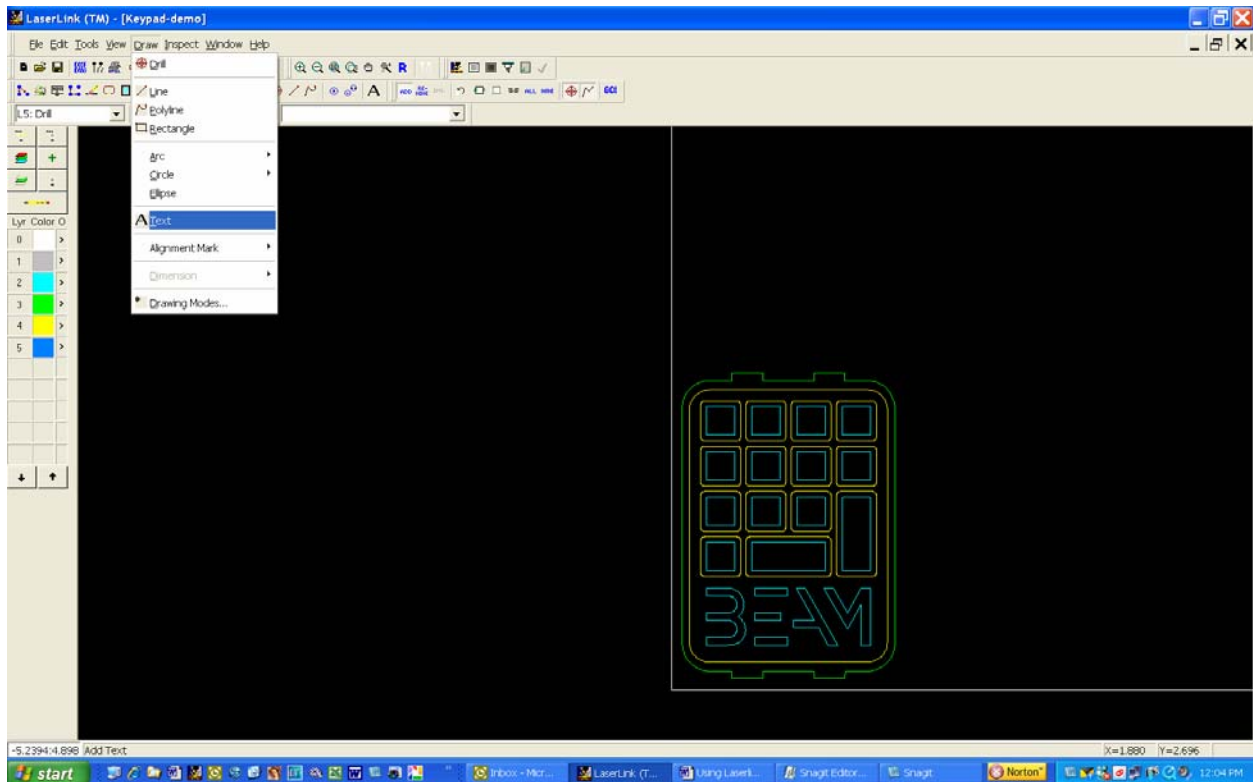
“*Ellipse*”: continued. Ellipse completed.





Draw Menu (Text Shortcut Key)

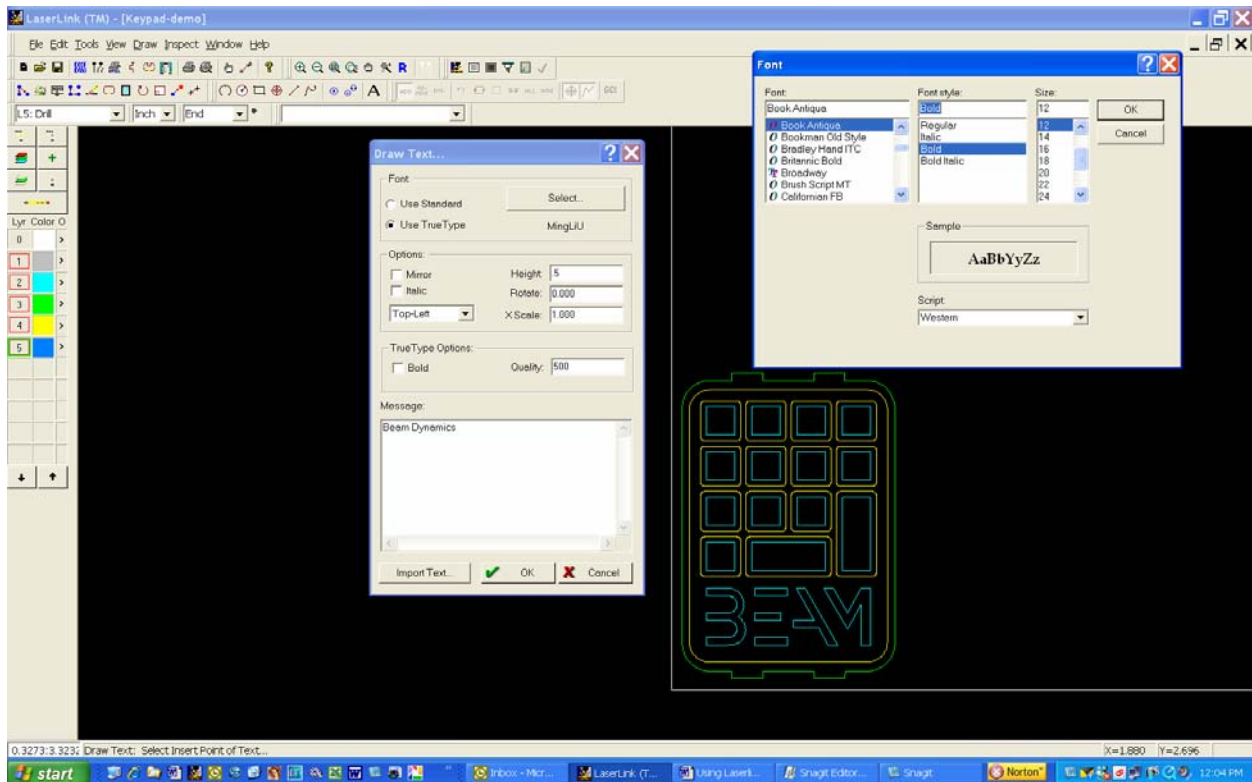
**“Text”:** Left click “Draw” then “Text” to get your selection tool “+”. Left click the location where you wish to insert text and the Text dialogue box will appear. (See next page)





Draw Menu

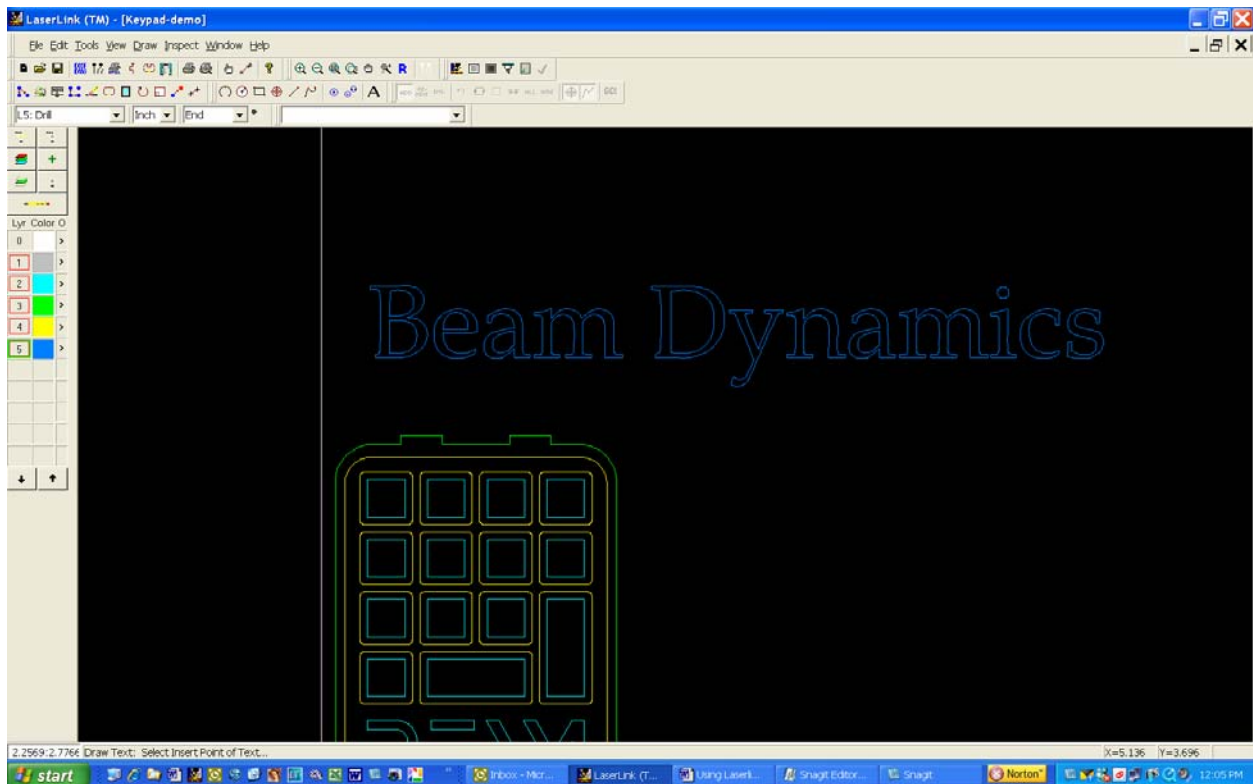
“Text”: continued. Type the message in the message pane and select the Font type you wish to use. LaserLink can use any TrueType font. (See next page)





Draw Menu

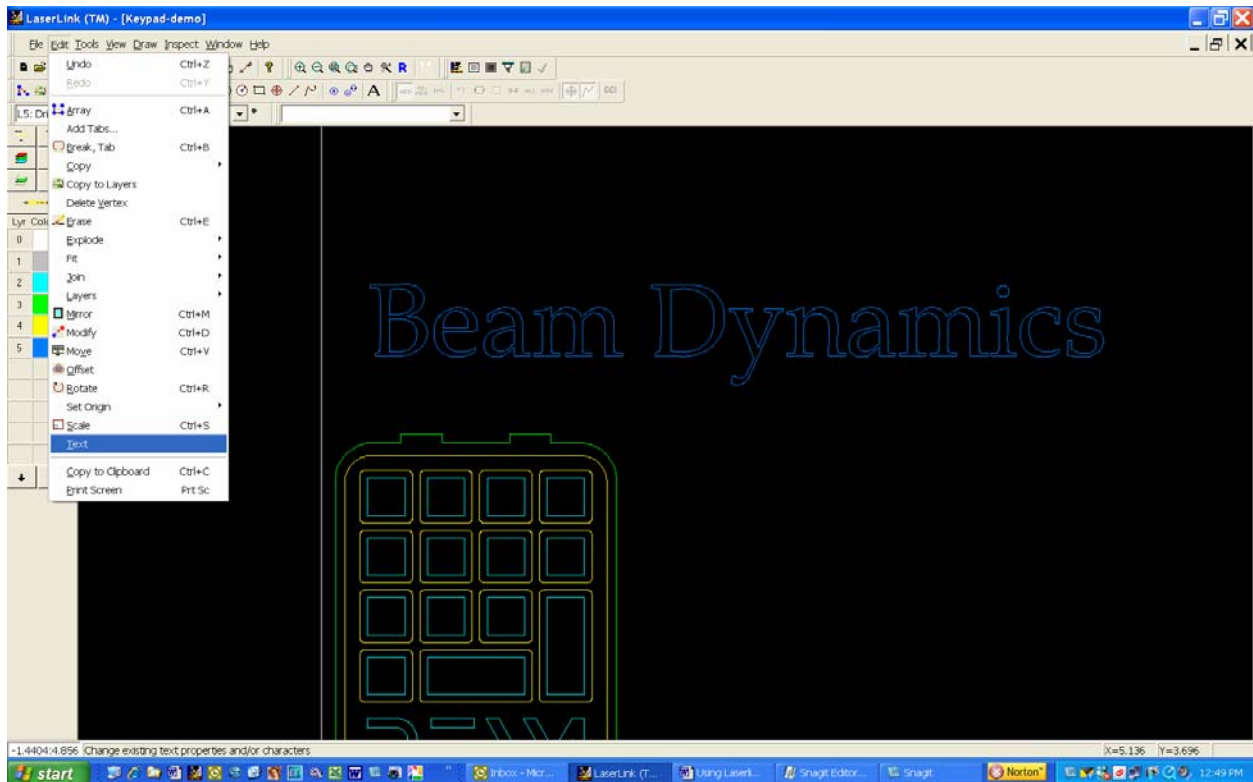
“Text”: Clicking OK applies the text. (See next page)





## Draw Menu

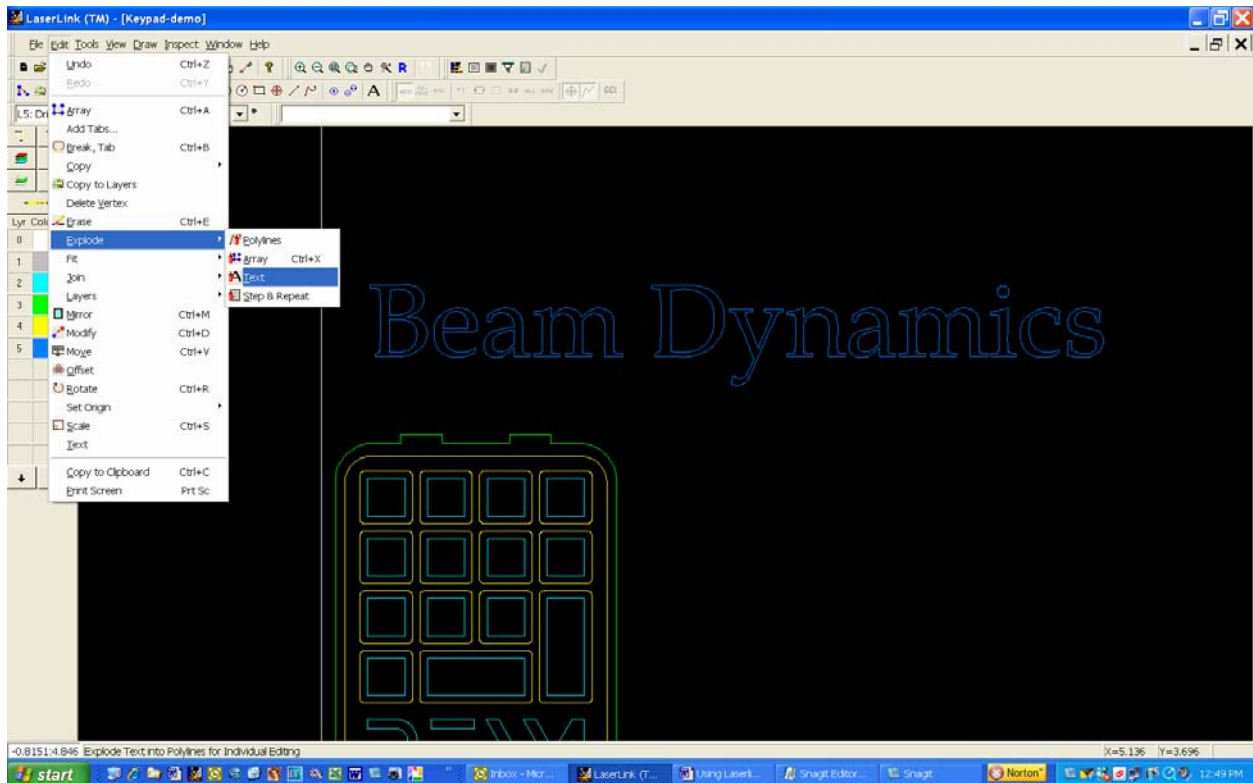
**“Text”**: Editing text can only be done from the Edit Menu. Left click “Edit” then “Text” and use your selection tool to select the text you wish to edit. The text edit dialogue box will appear. (See next page)





## Draw Menu

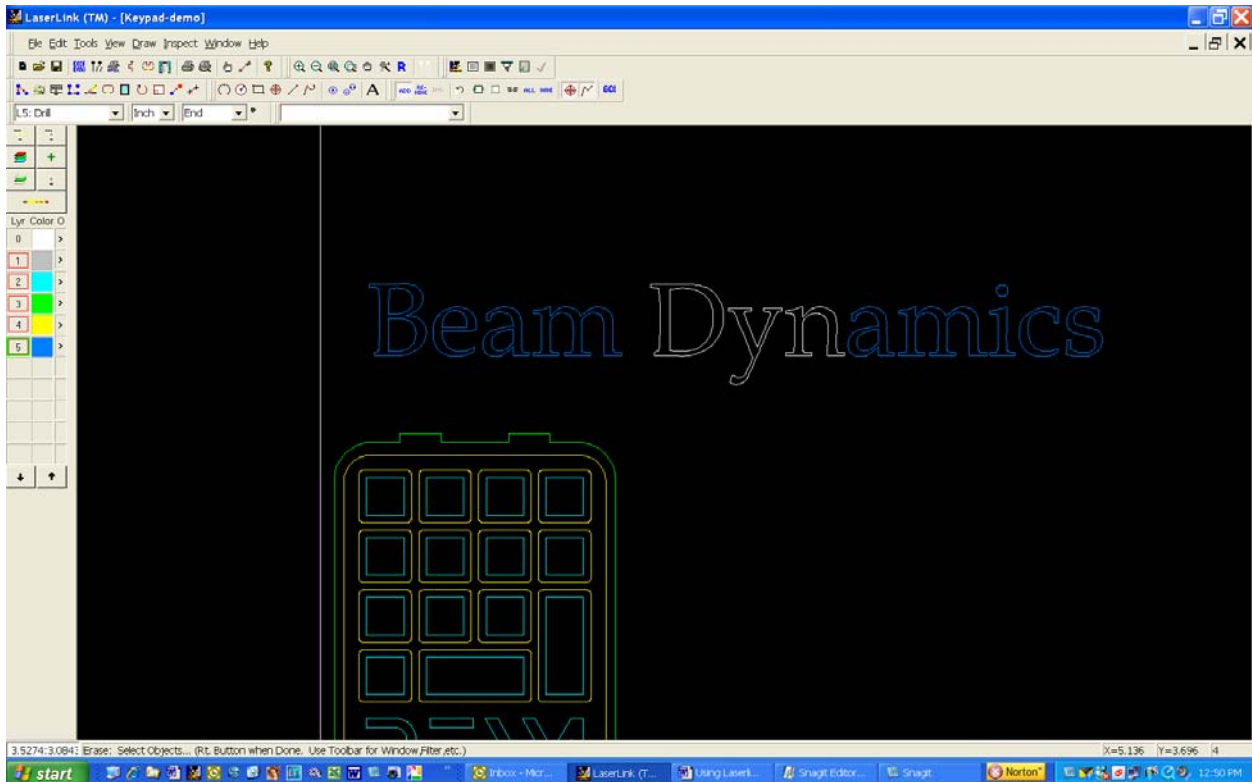
**“Text”**: Text is considered a complete feature. If you wish to edit a particular component of text you will need to explode the text to turn it into polylines. Left click “Edit” navigate to “Explode” then left click “Text” to get your selection tool. Select the text you wish to Explode. Text is now polylines and can no longer be edited using text editing tools. (See next page)





Draw Menu

“Text”: Features of text that has been exploded can now be individually manipulated.

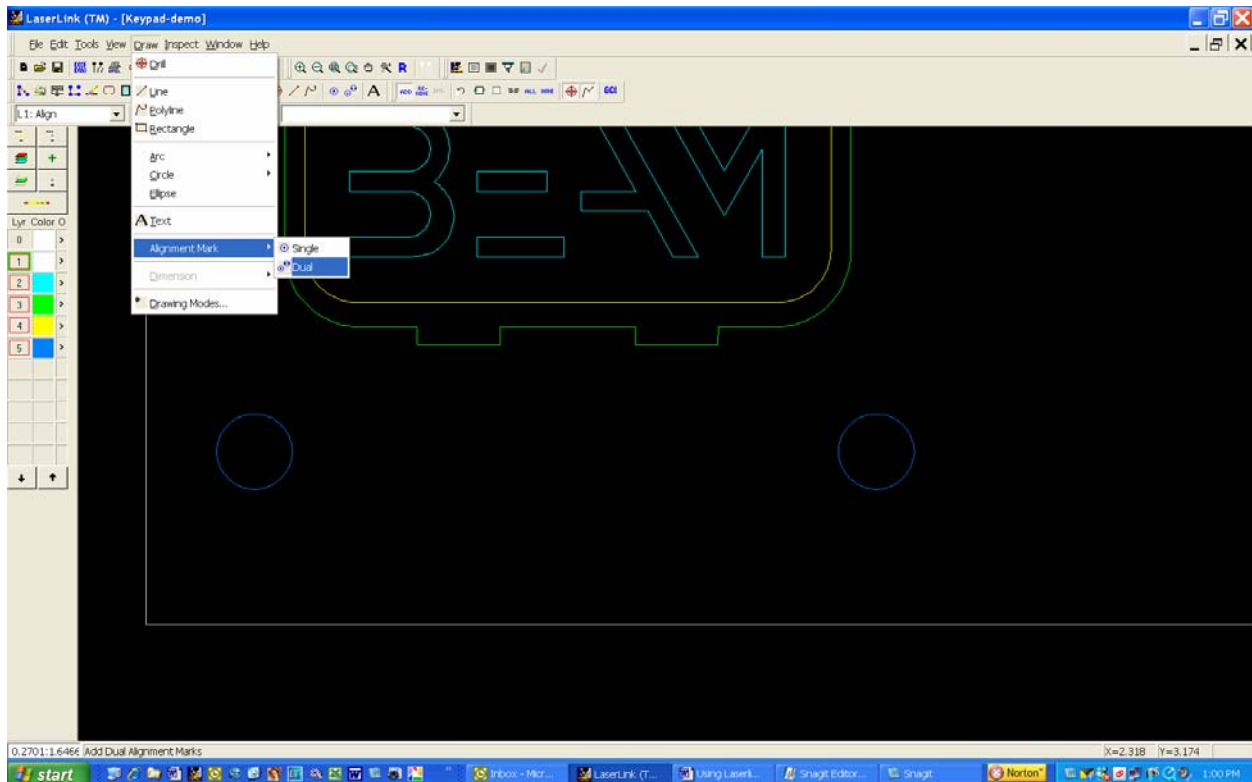




Draw Menu (Alignment Mark Dual Shortcut Key)

**“Alignment Mark - Dual”**: Draw alignment marks are used to tell a Laser Machining Center with machine vision where to look for registration markings. Typically alignment with dual marks is used to correct rotation and offset and single marks are used to determine offset.

To begin, left click “Draw” navigate to “Alignment Mark” then left click “Dual” to get your selection tool “+”. Typically you will use Object snaps to snap to the center of the registration features. (See next page)



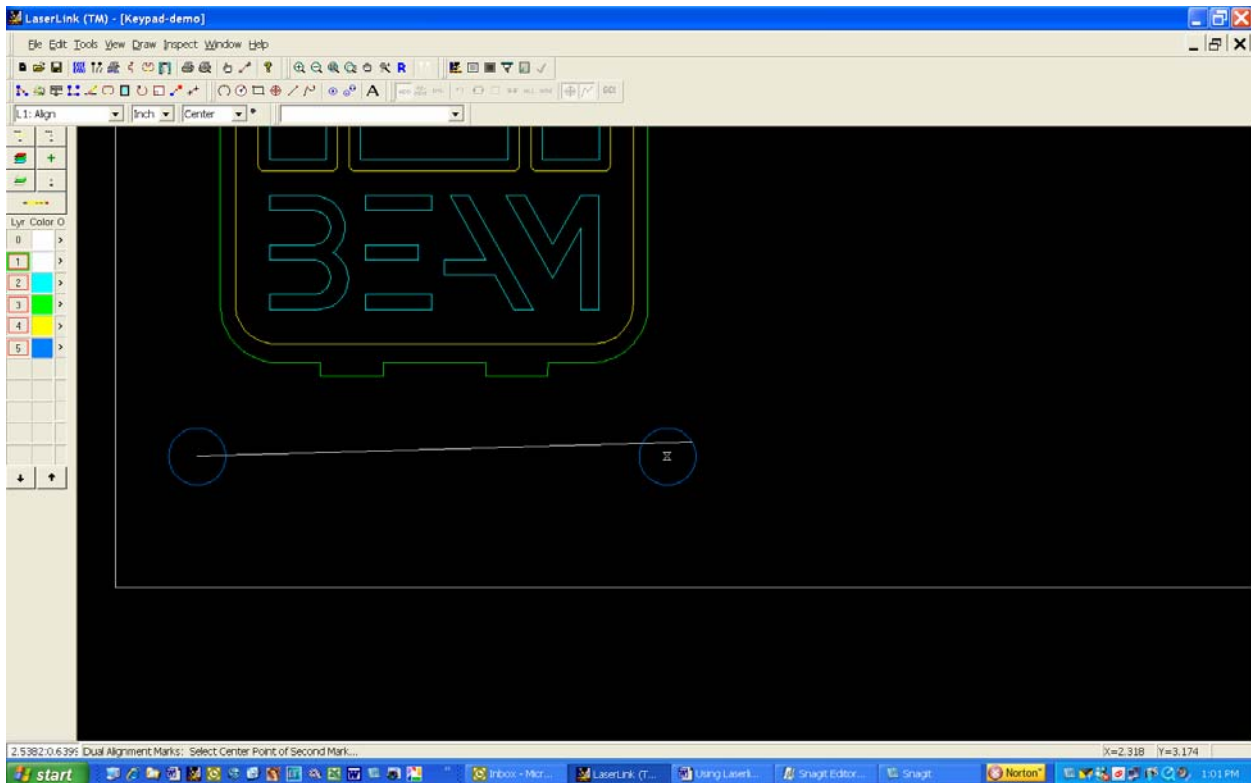




Draw Menu



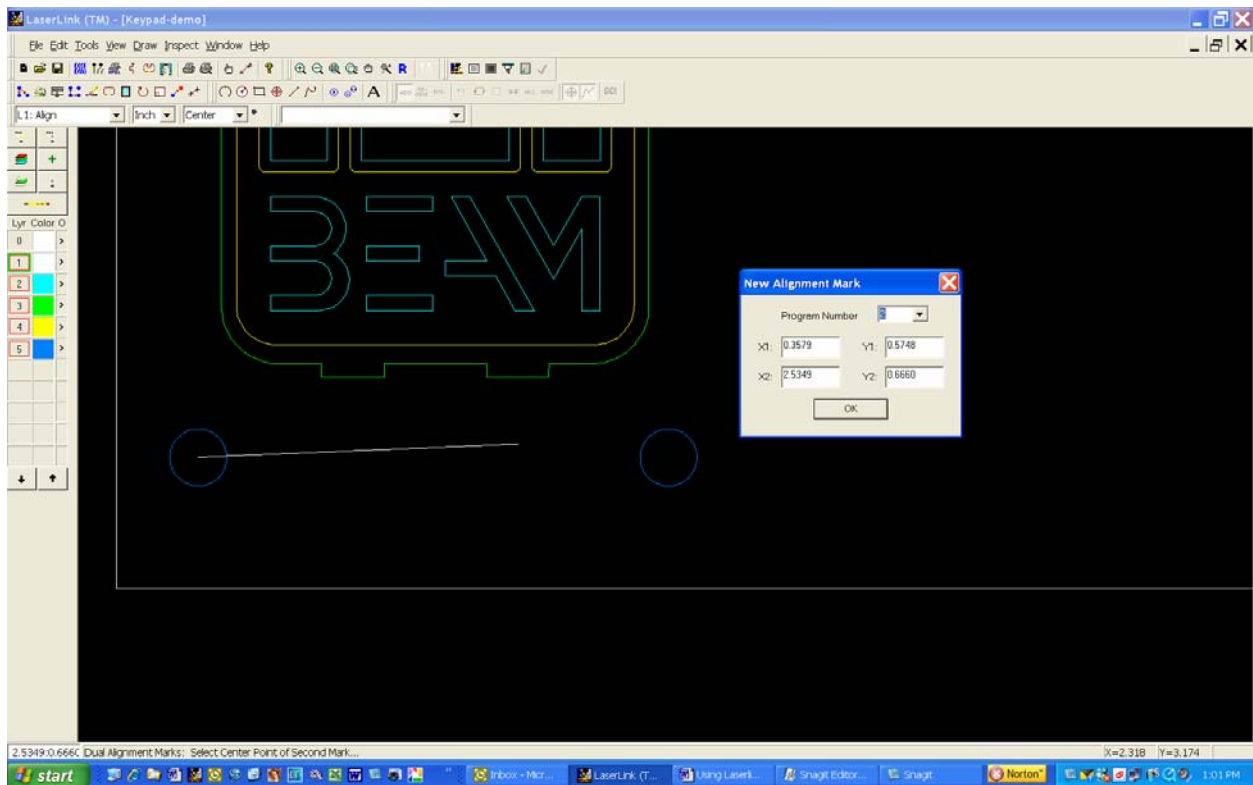
“**Alignment Mark - Dual**”:  
continued. Follow instructions in the message pane at the bottom left of the screen to snap to the first and second alignment point. LaserLink creates an unseen line between the first and second alignment points. This unseen line can be selected along with the alignment mark indicators on each end by clicking on it. (See next page)





Draw Menu

“**Alignment Mark - Dual**”:  
continued. After left clicking to place the second alignment mark location a “New Alignment Mark” dialogue box will appear. Use this dialogue box to select the Program Number on the vision system controller where the image of the registration mark is stored. (See next page)

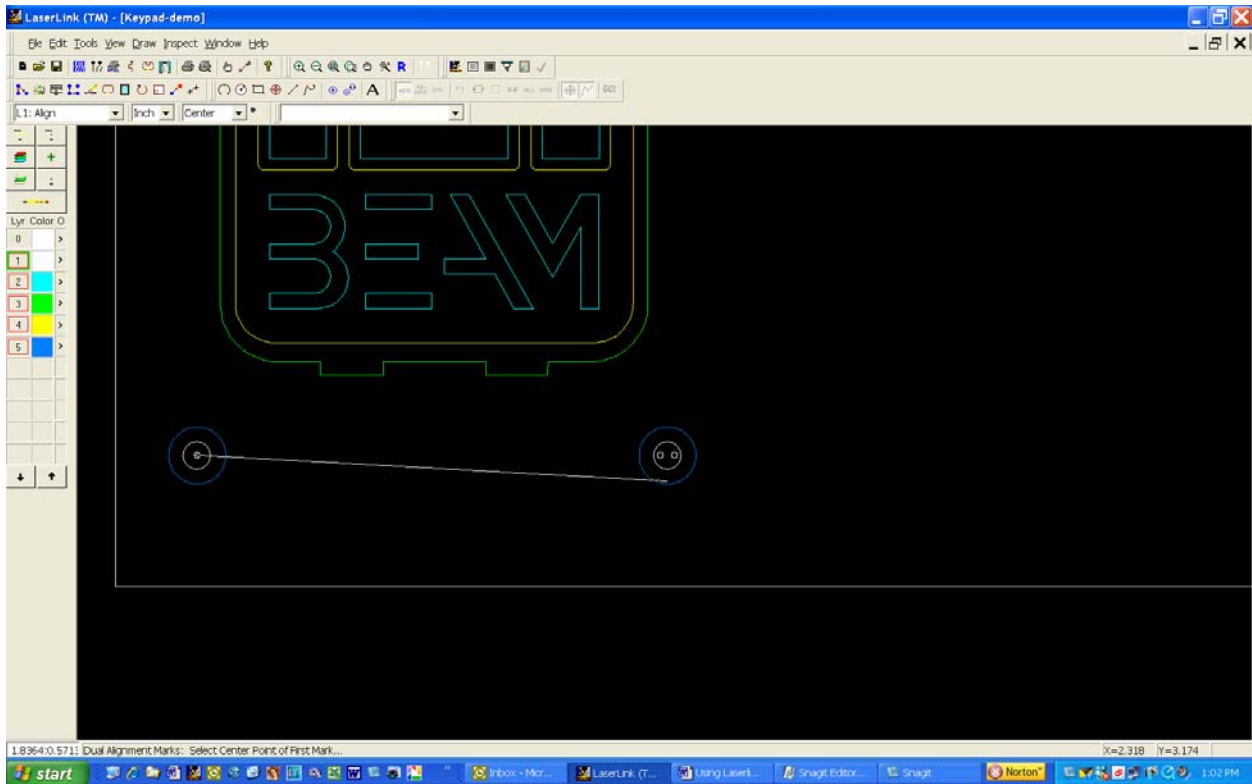




Draw Menu



“Alignment Mark - Dual”: continued. Dual Alignment marks displayed. (See next page)

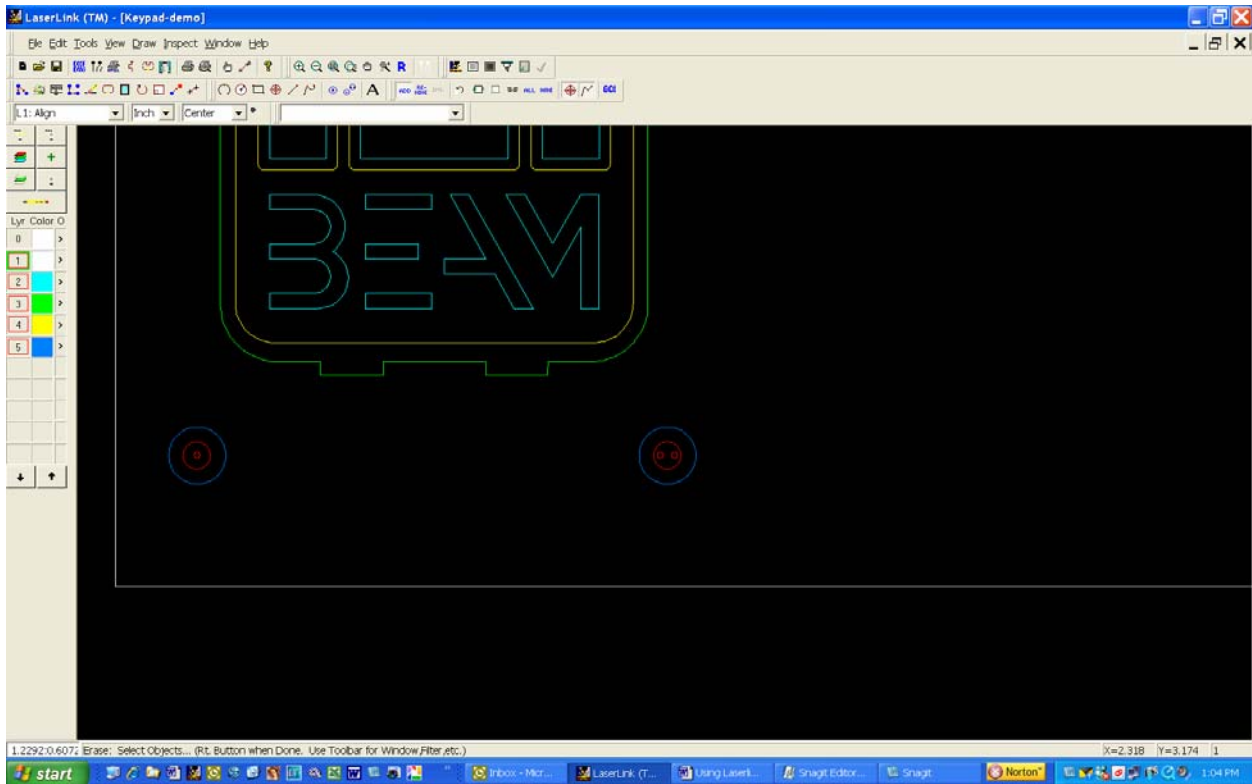




Draw Menu



“Alignment Mark - Dual”: continued. Dual Alignment Marks placement complete.

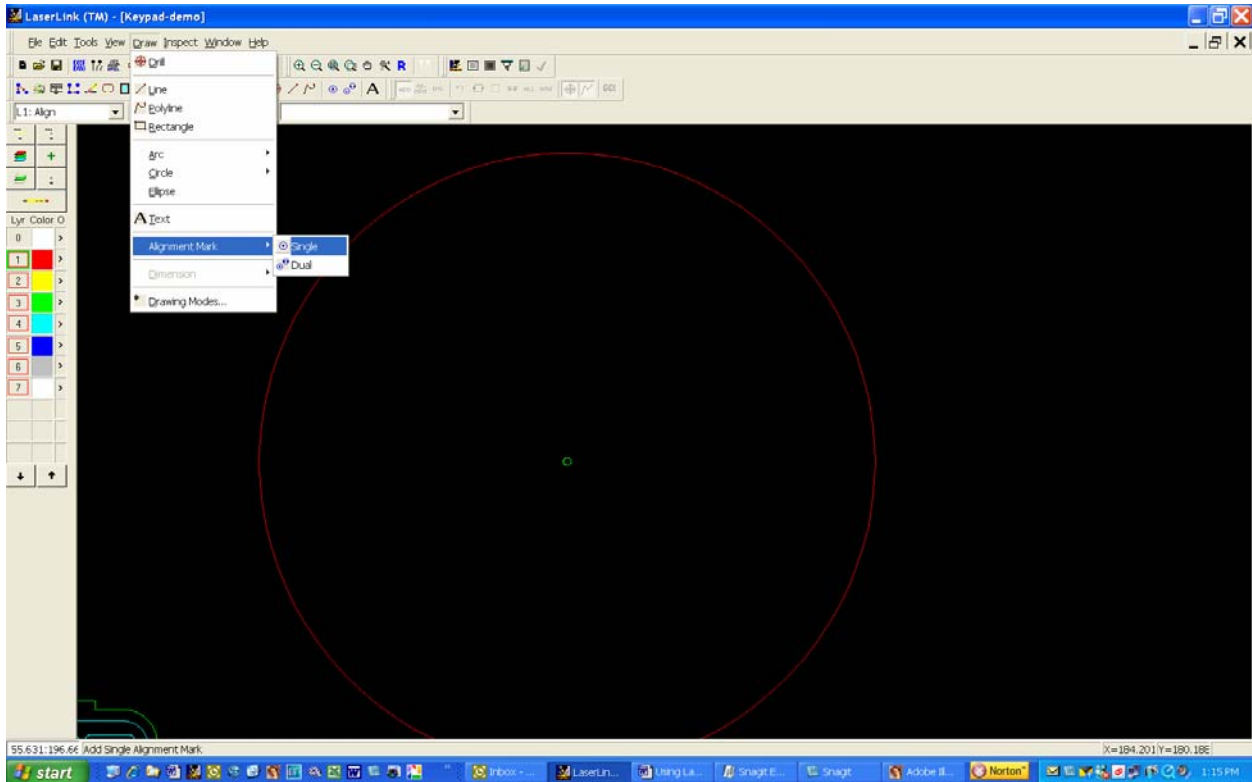




Draw Menu (Alignment Mark Single Shortcut Key)

“**Alignment Mark - Single**”: A single alignment mark can be used to register a feature that does not require rotation information like a clock face with the registration mark in the center of the dial.

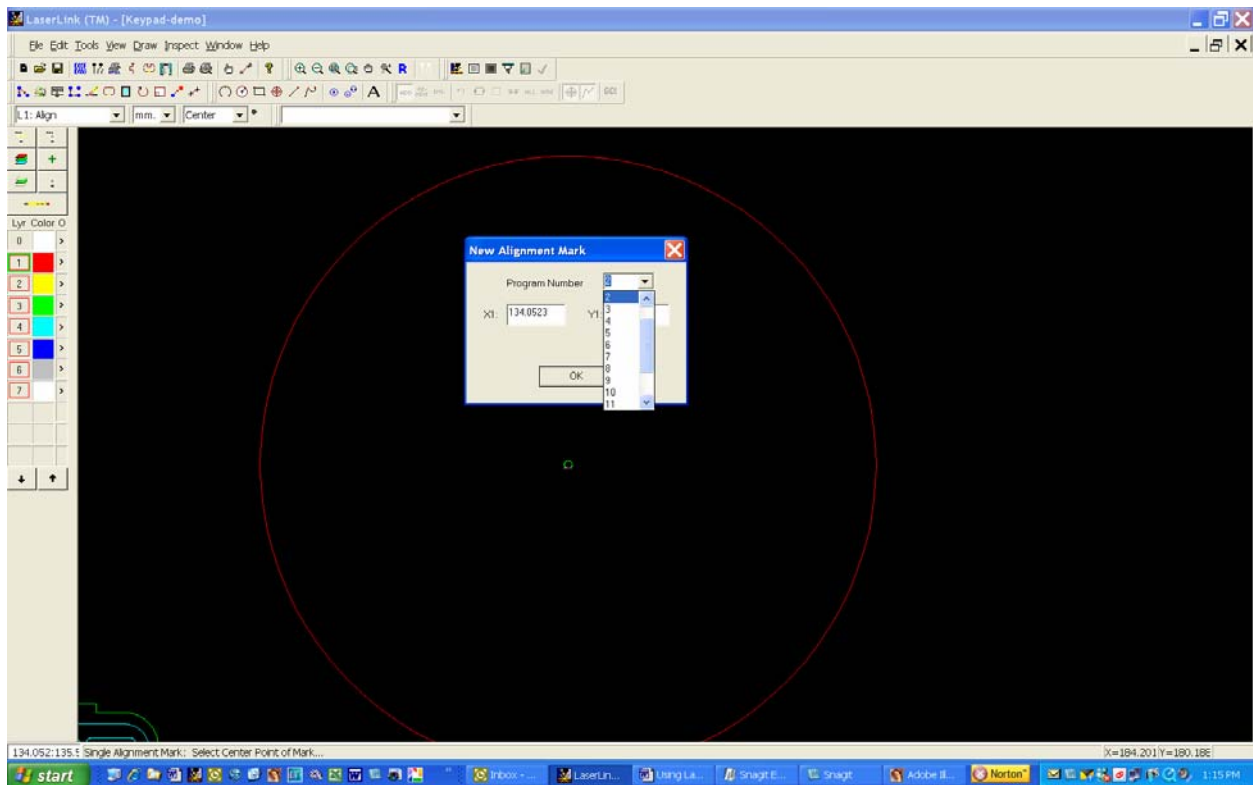
Left click “Draw” navigate to “Alignment Mark” and click “Single” to get the selection tool “+”. Turn on Object Snaps to “Center” and snap to the center of the disc. (See next page)





Draw Menu

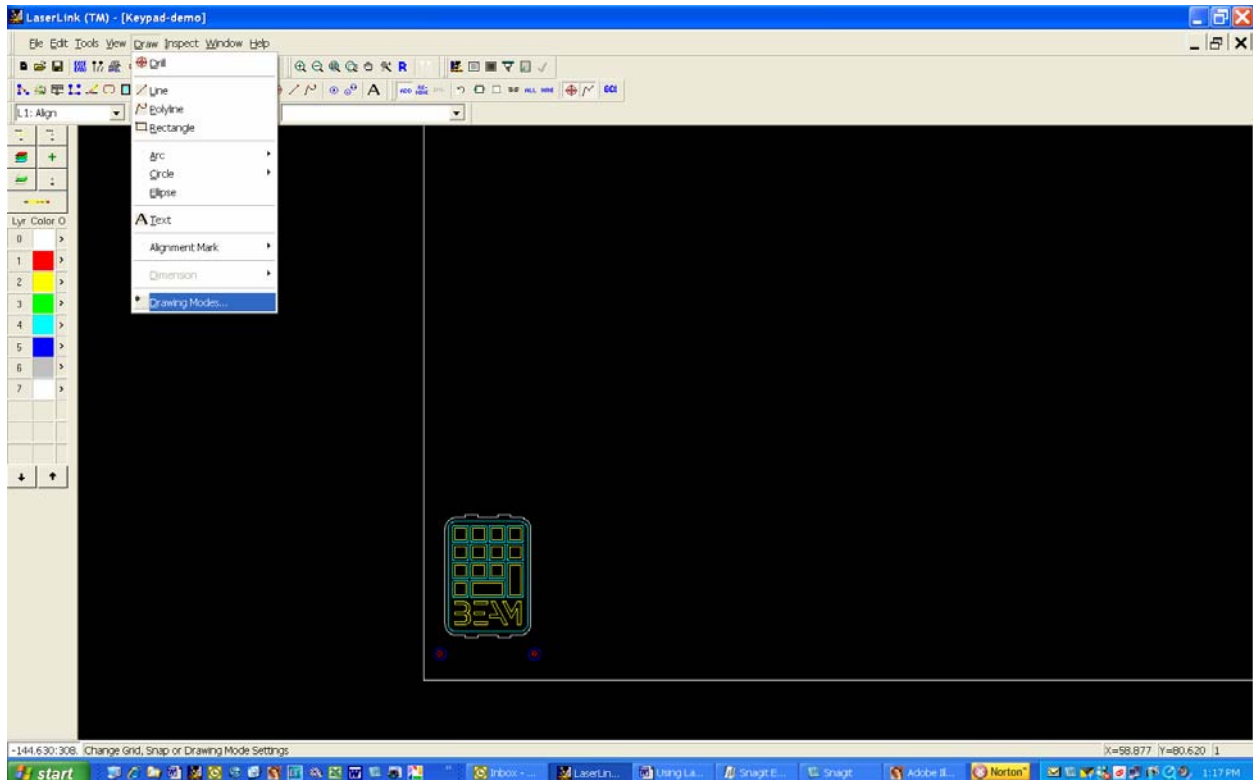
“**Alignment Mark - Single**”: continued. After left clicking the single alignment mark location a New Alignment Mark dialog box will appear. Select the Program Number to which the registration marking is stored on the vision system controller.





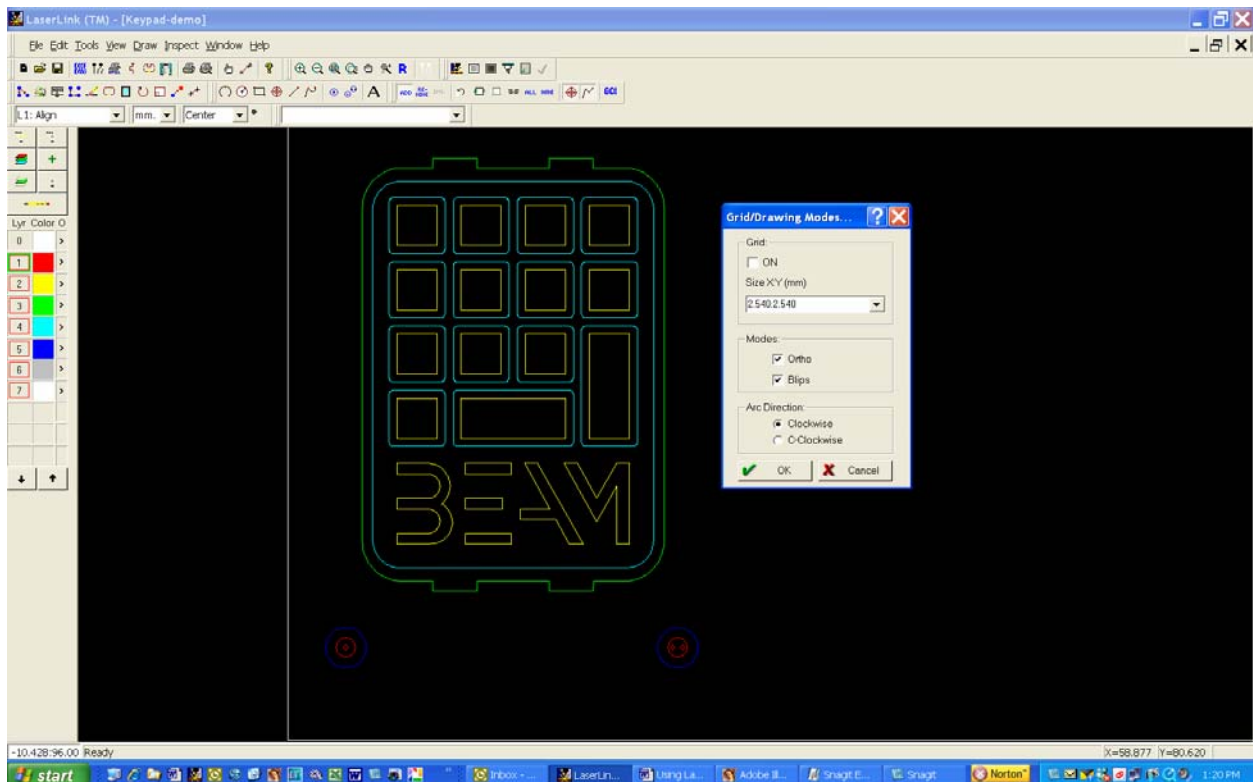
Draw Menu  (Drawing Modes Shortcut Key)

**“Drawing Modes”:** Left click “Draw” then “Drawing Modes” to get the drawing modes dialogue box.  
(See next page)



Draw Menu 

**“Drawing Modes”**: continued. Turning on Modes “Ortho” check box allow you to move or draw only in straight vertical or horizontal lines. (See next page)

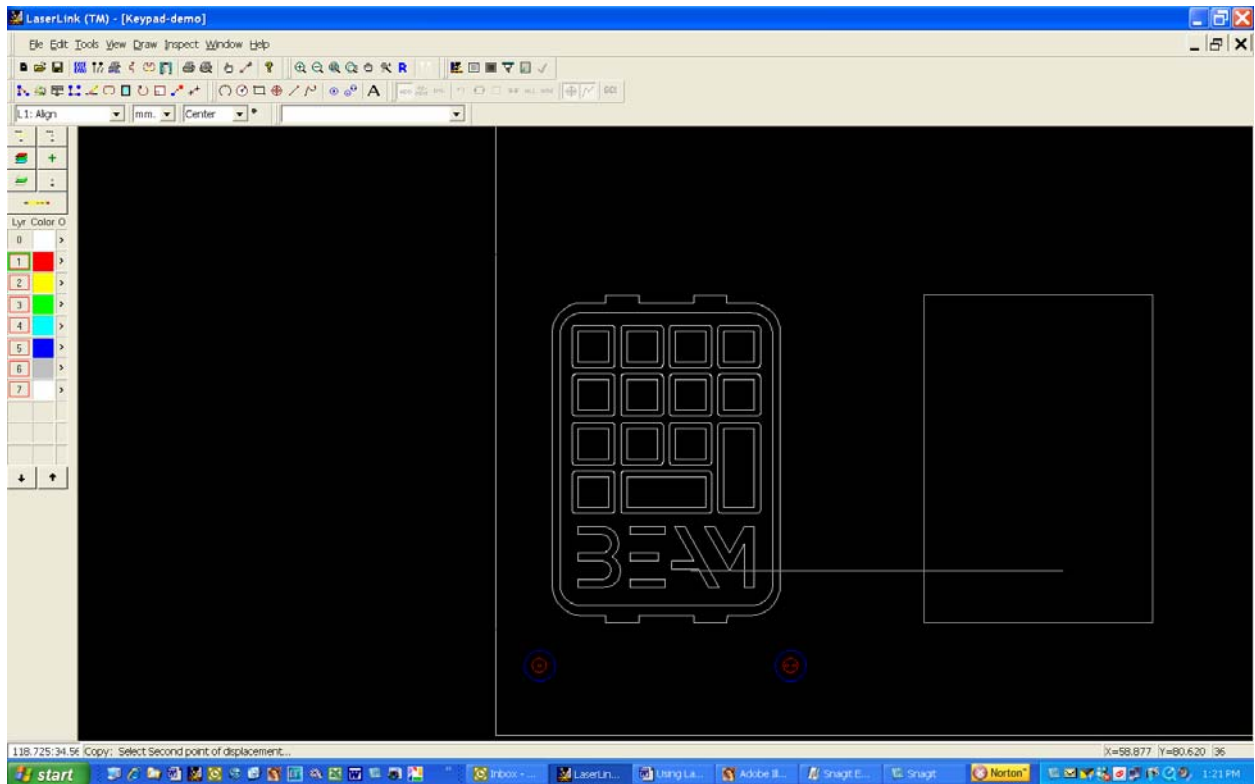






Draw Menu 

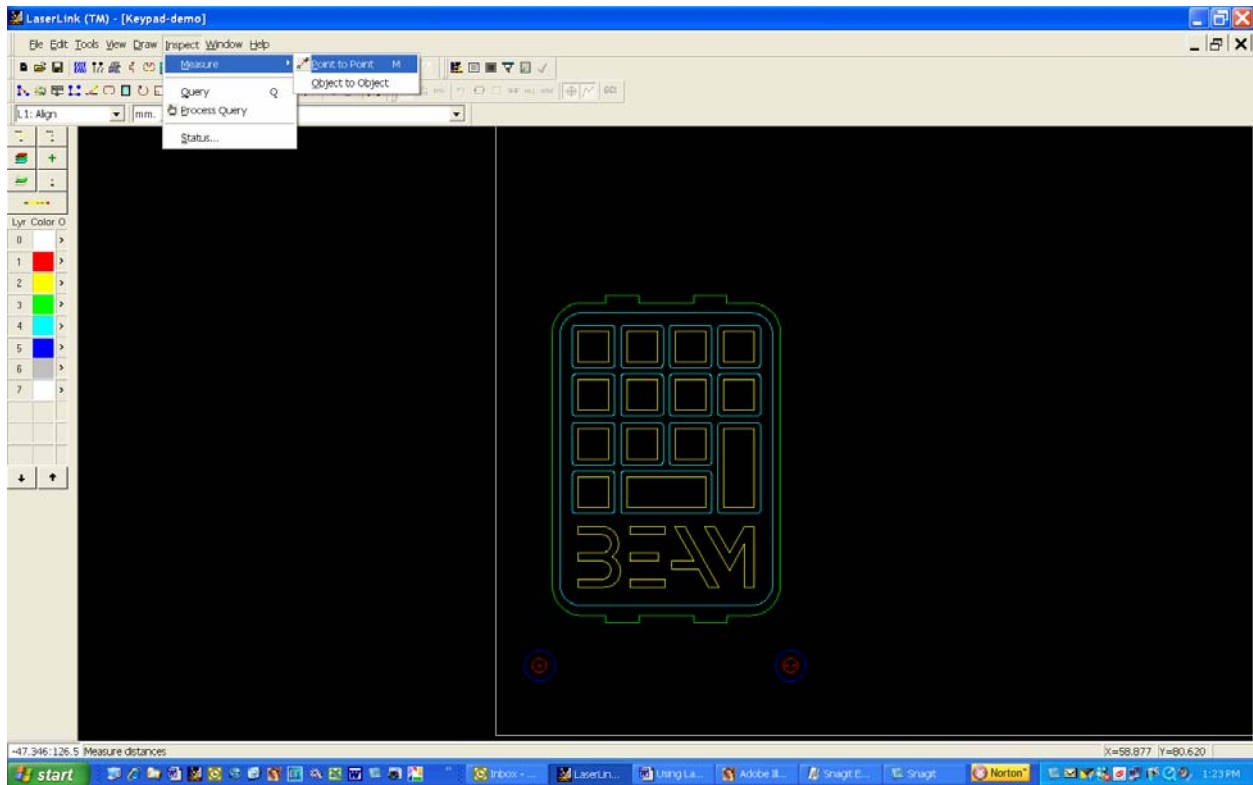
“Drawing Modes”: continued. Object selected and moved in straight horizontal line.





Inspect Menu (Measure Point to Point Shortcut Key)

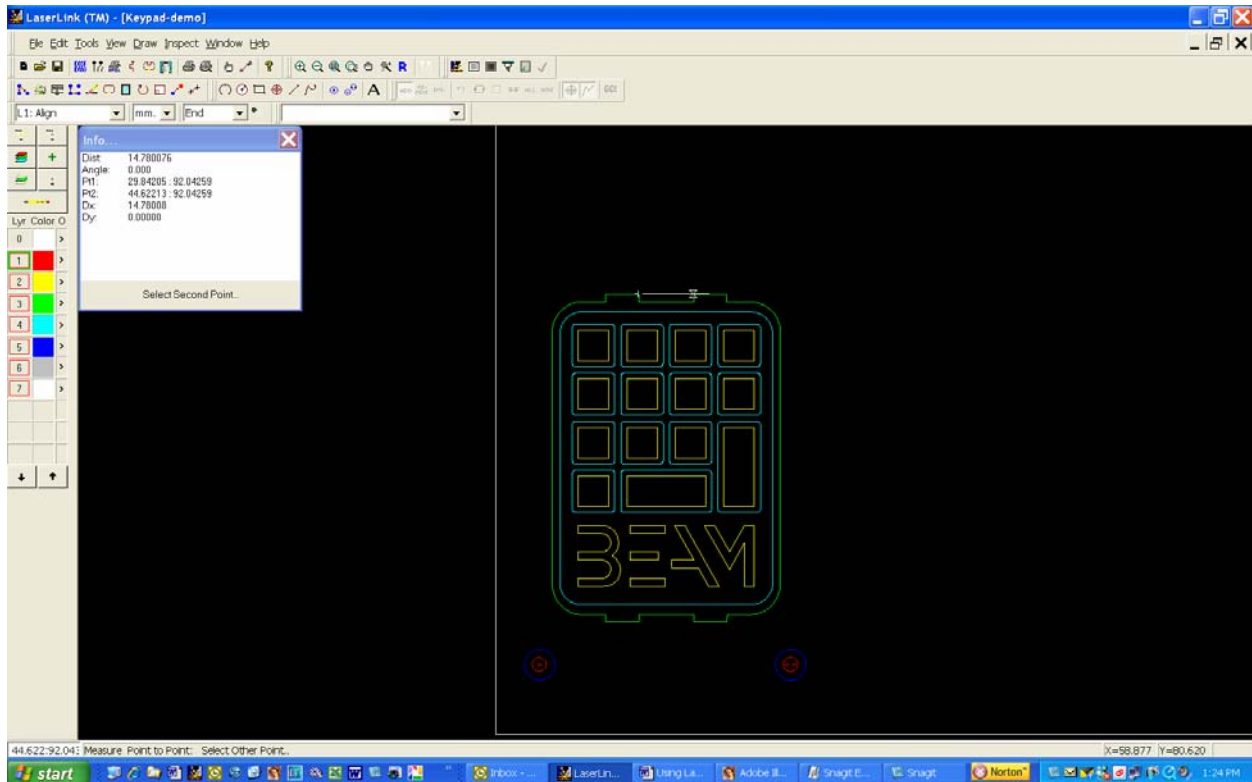
**“Measure Point to Point”:** Left click “Inspect” navigate to “Measure” and left click on “Point to Point” to get your selection tool “+”. Turn on Object Snaps so that you can snap to an exact position for the first measurement point. (See next page)





Inspect Menu


“*Measure Point to Point*”: continue. Snap to first and second points and review measurements on info dialogue box.

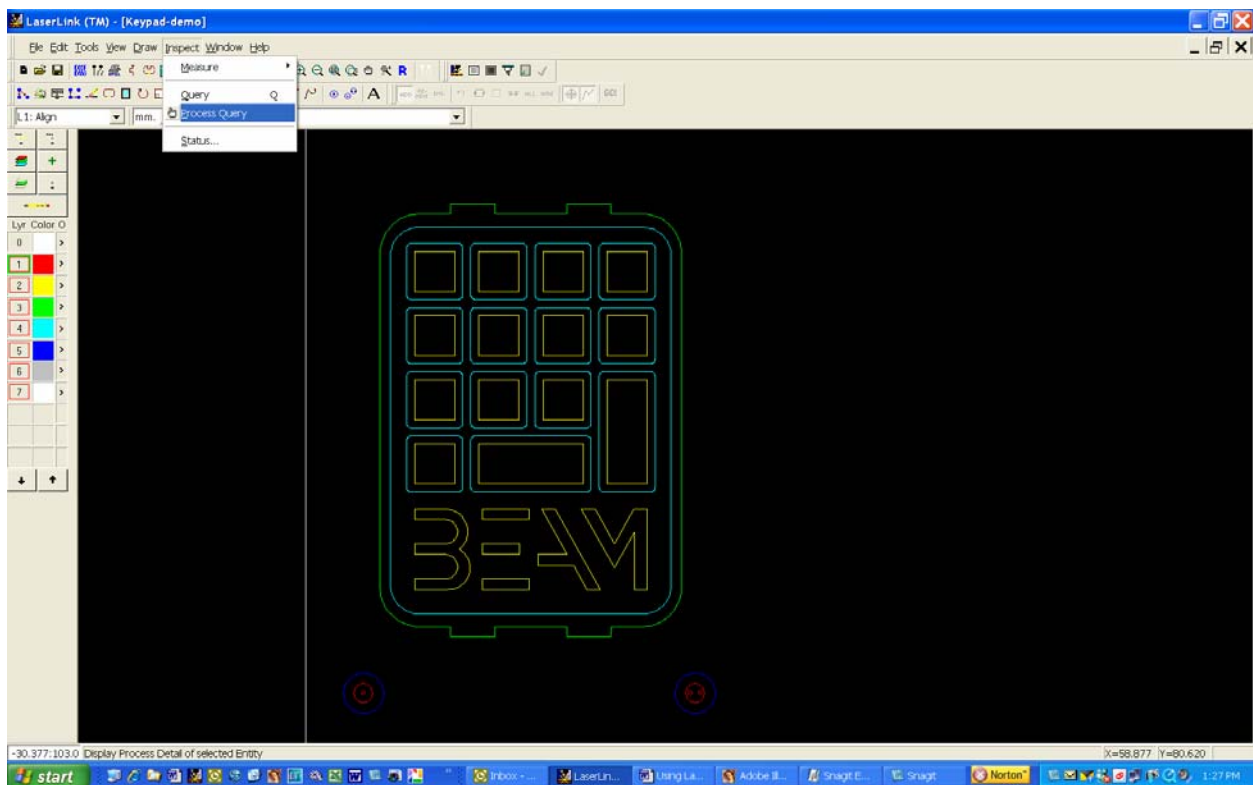




Inspect Menu (Process Query Shortcut Key)

**“Process Query”**: Process Query allows you to select a specific line to call up the specific process table for that layer.

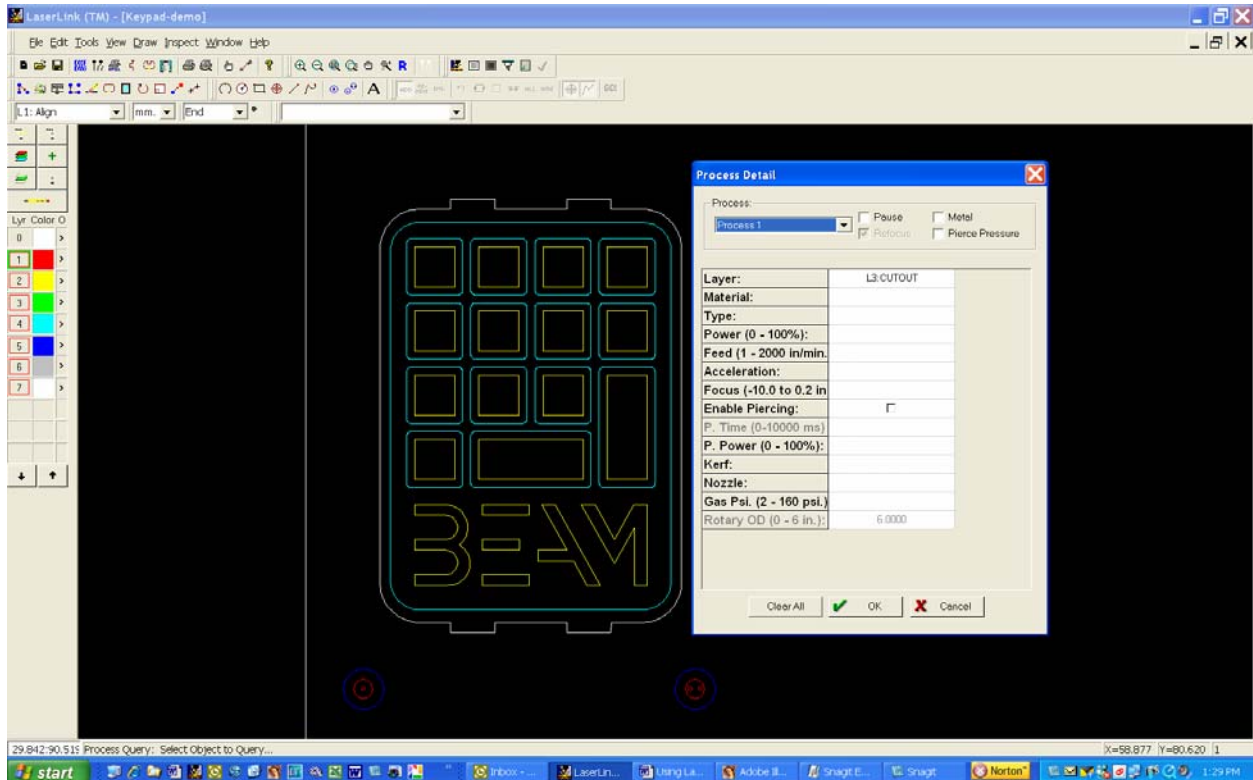
Left click “Inspect” then “Process Query” to get your selection tool “”. (See next page)






Inspect Menu

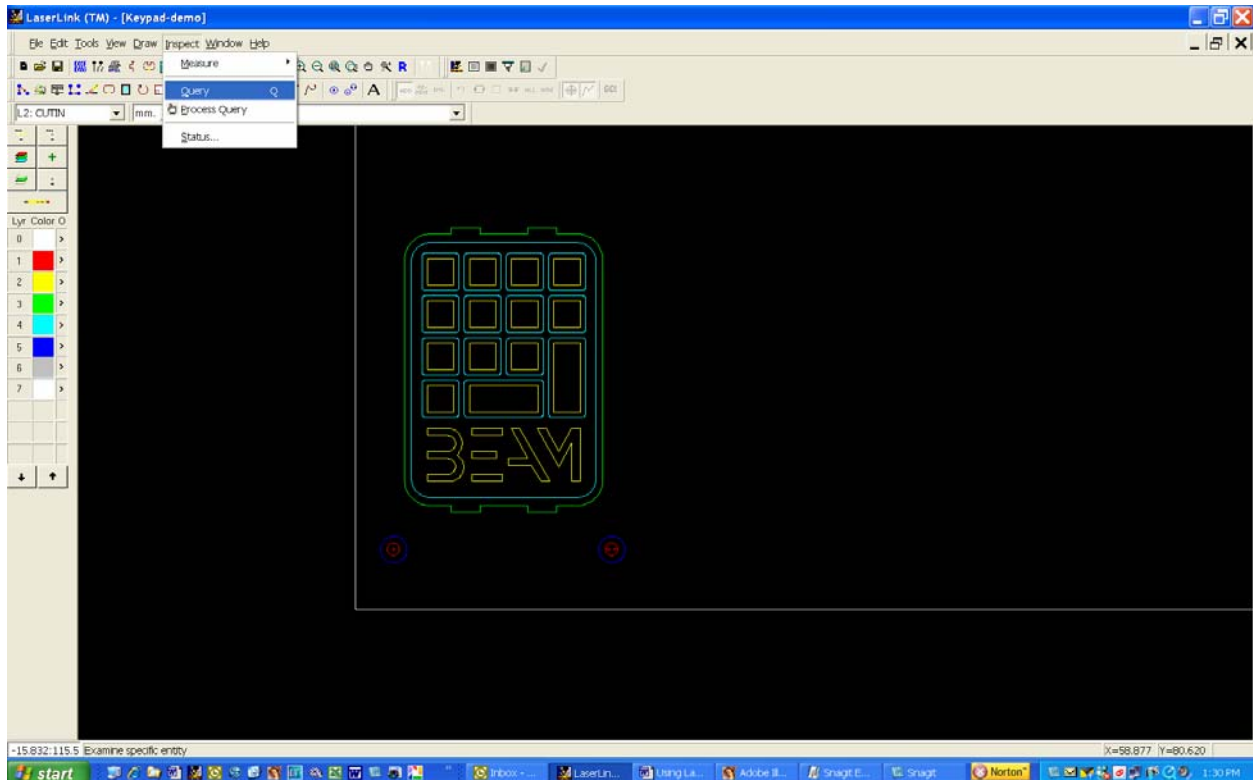
**“Process Query”**: After selecting the feature with the selection tool the Process Detail dialogue box will appear. The layer is indicated in the Layer field of the process table.





## Inspect Menu

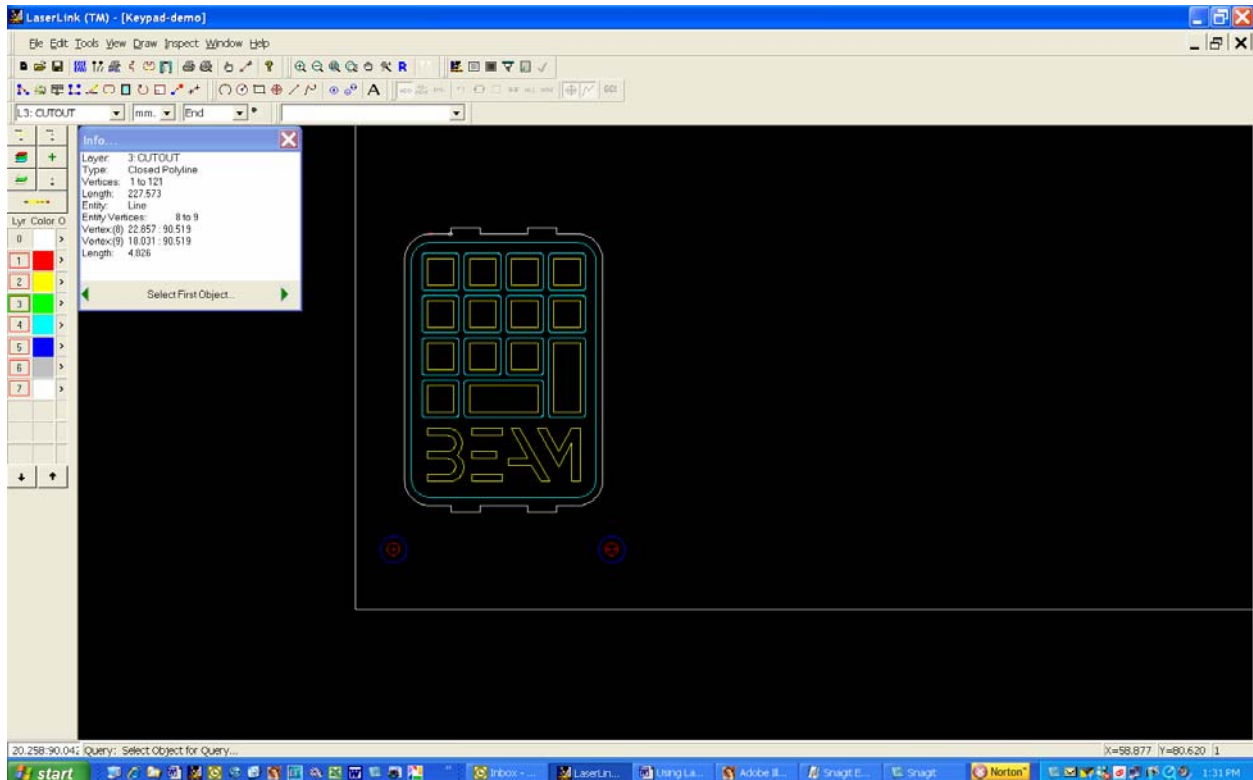
**“Query”**: Left click “Inspect” then “Query” to get the Query selection tool “”. Click on the line feature you wish to query and the query dialogue box will appear. (See next page)





## Inspect Menu

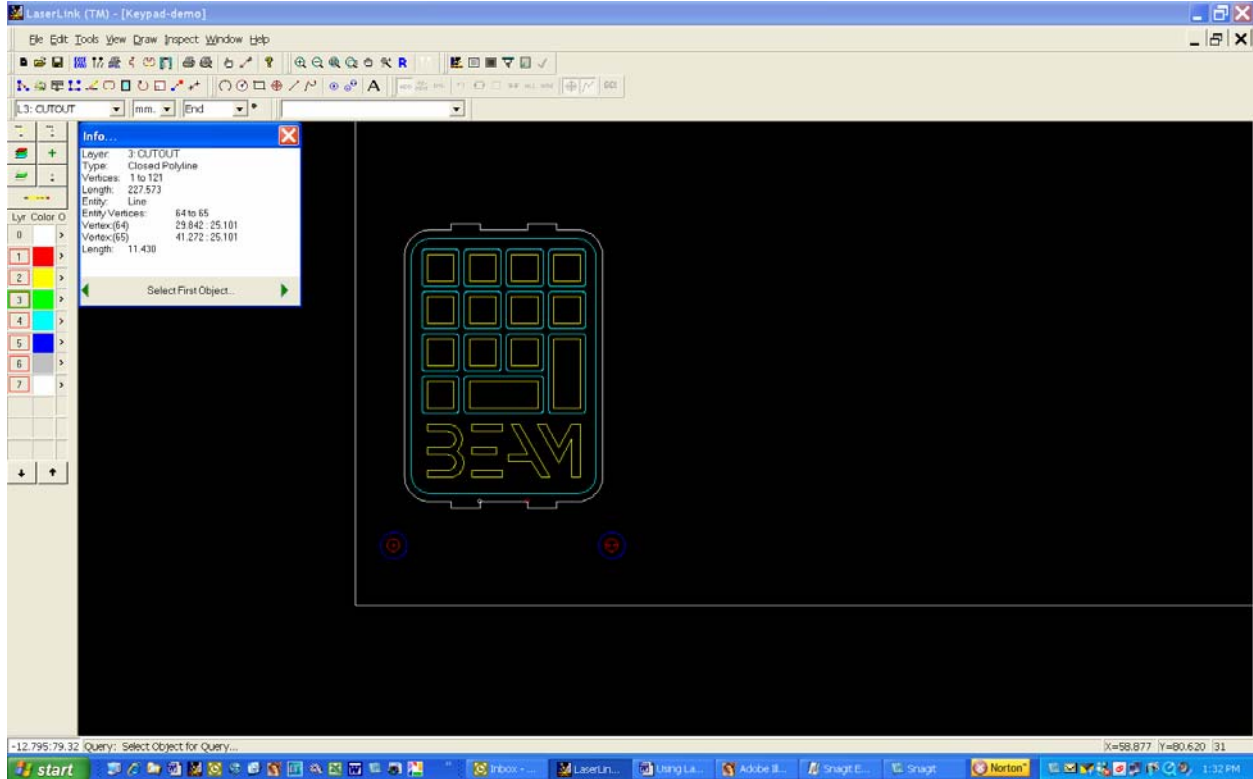
“*Query*”: continued. Used the “Select First Object” arrows to scroll through details of the feature. You will notice a small indicator that jumps from segment to segment being analyzed. (See next page)





## Inspect Menu

“Query”: continued. Small indicator moves to another section of line. To quit hit X out on dialogue box.



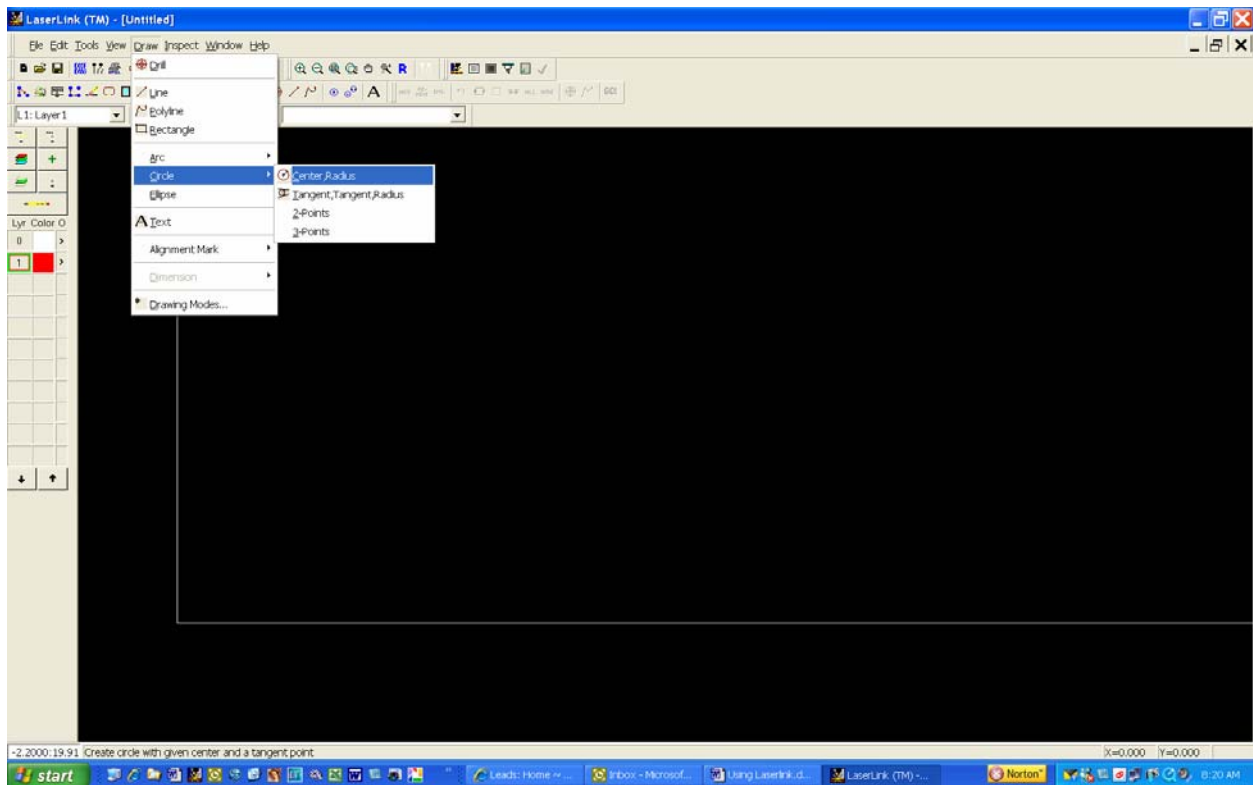




## Step by Step Sample 1 – Simple Part

Drawing a simple part in LaserLink and creating a .lmc cut file.

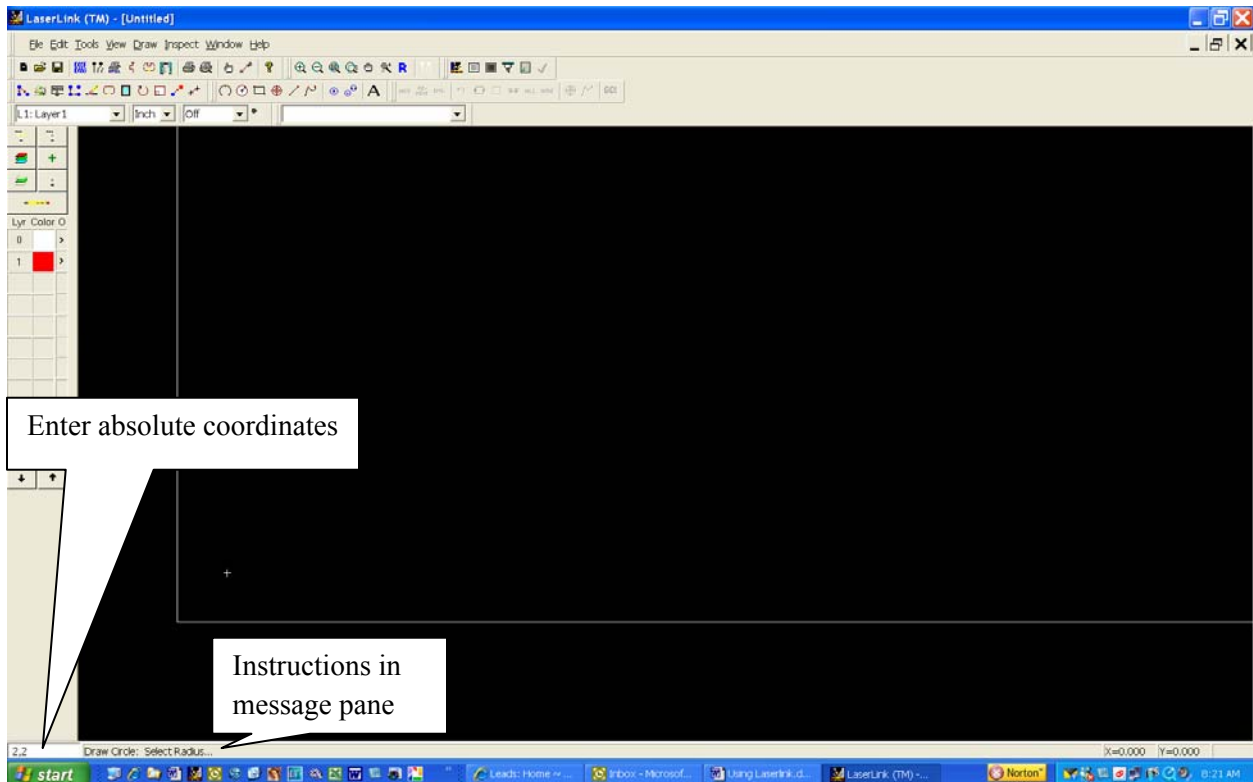
Left click “Draw” navigate to “Circle” and left click “Center, Radius”.





**Step by Step Sample 1 – continued.**

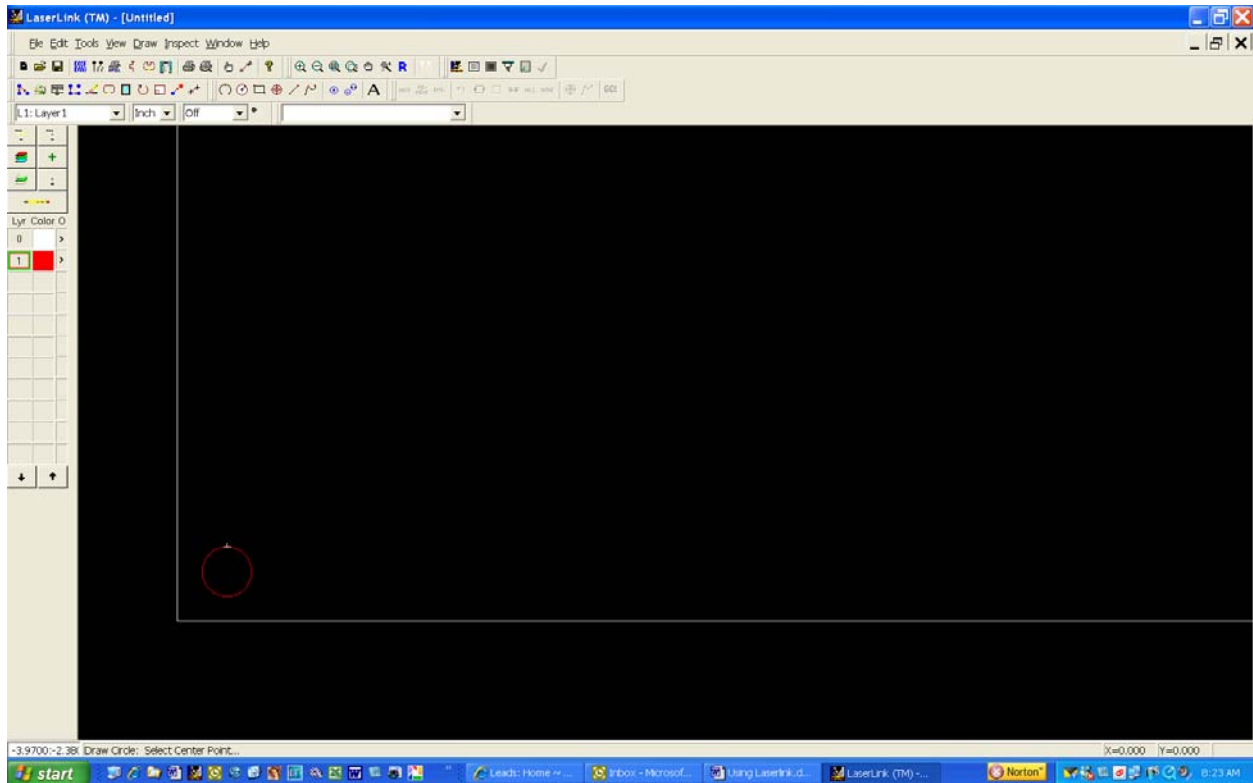
Follow instructions in Message Pane to select center point of Circle. In this case center of 2,2 has been entered in the coordinate box. After entering 2, 2 hit enter. Follow the message pane instructions to select Radius. Enter 2,3 then hit enter.





**Step by Step Sample 1 – continued.**

Circle completed.

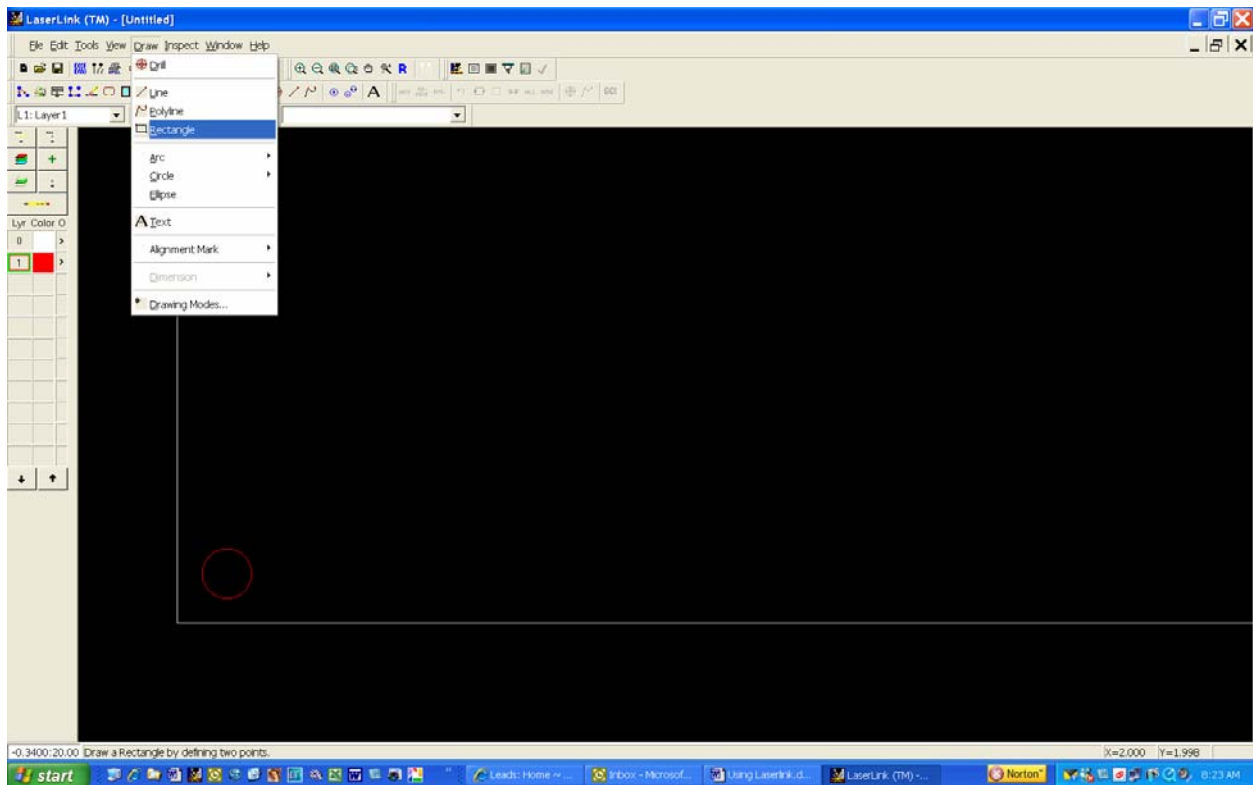




**Step by Step Sample 1 – continued.**

Draw Rectangle.

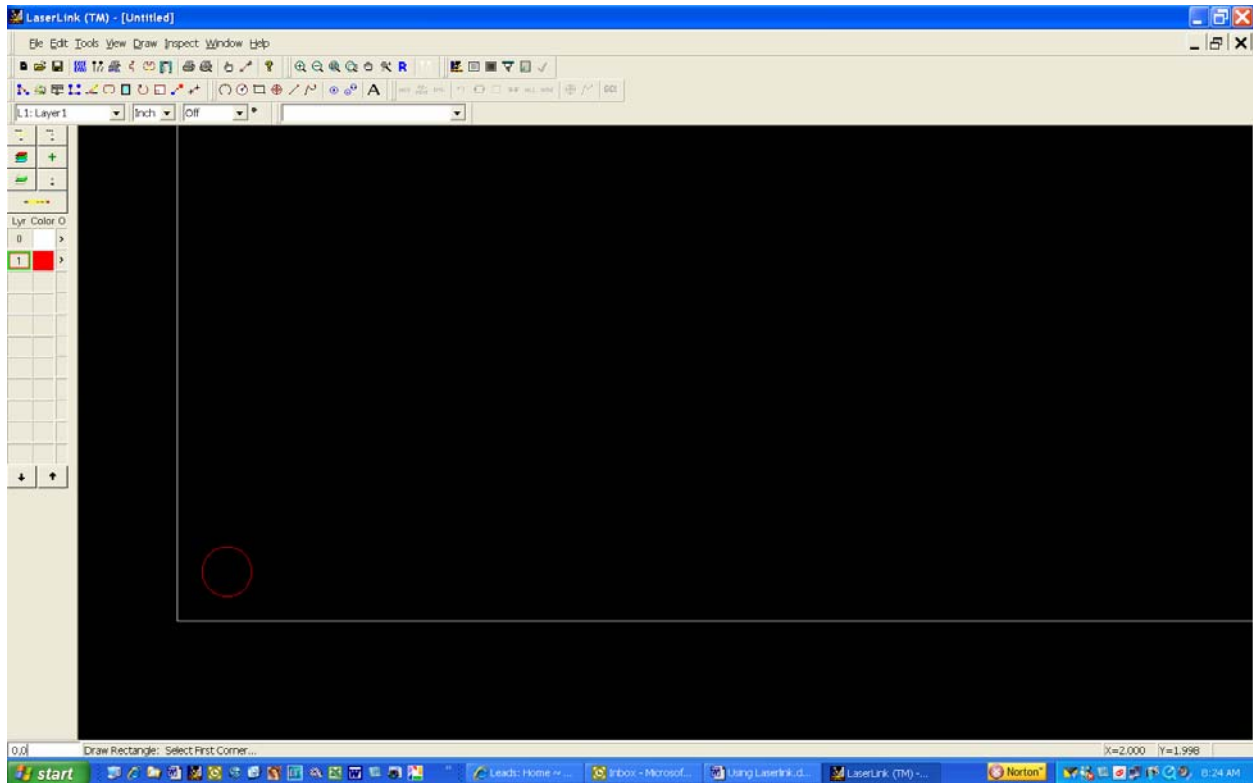
Left click “Draw” then “Rectangle”.





### Step by Step Sample 1 – continued.

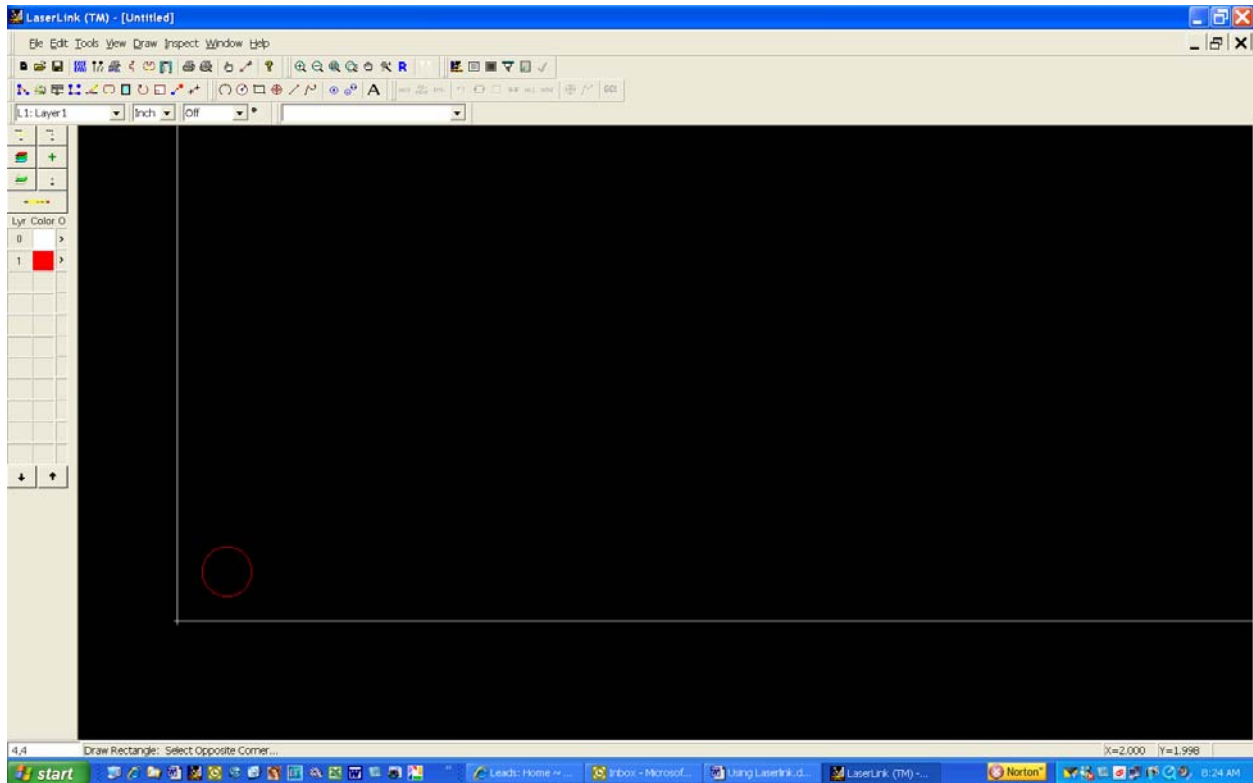
Follow instructions in Message Pane. Enter first corner of rectangle at 0,0 then hit enter.





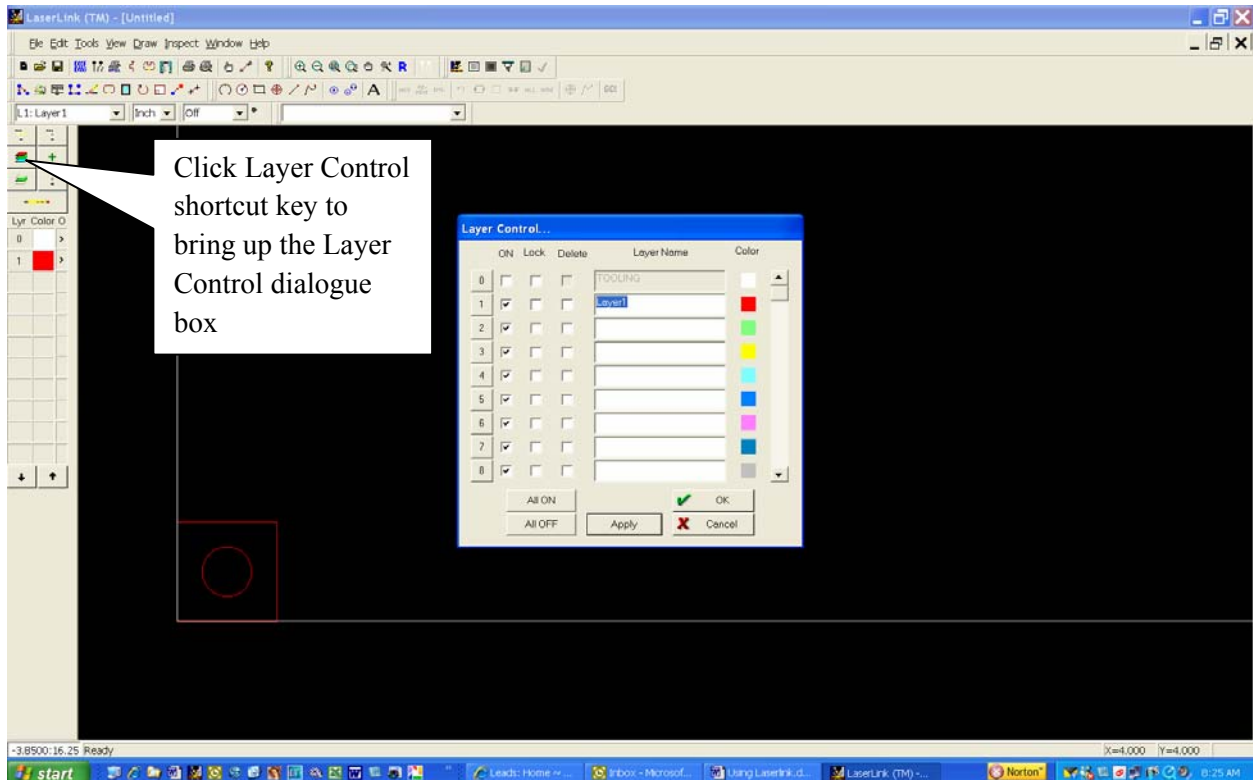
**Step by Step Sample 1 – continued.**

Enter opposite corner of rectangle at 4,4 then hit enter.



## Step by Step Sample 1 – continued.

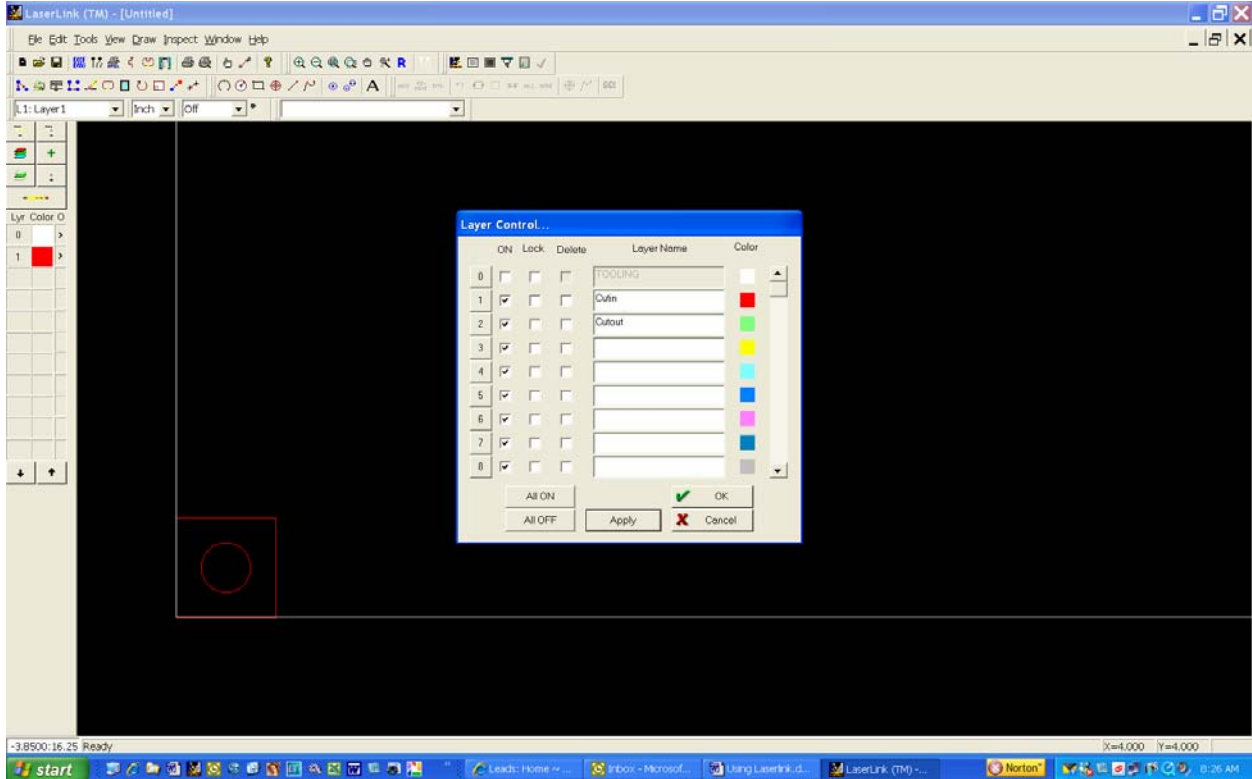
Simple part has been drawn. Open the Layer Control dialogue box to name layers. We will be applying different features of the drawing to different layers.





**Step by Step Sample 1 – continued.**

Type the names of the layers in the Layer Control dialogue box and assign colors to the layers.

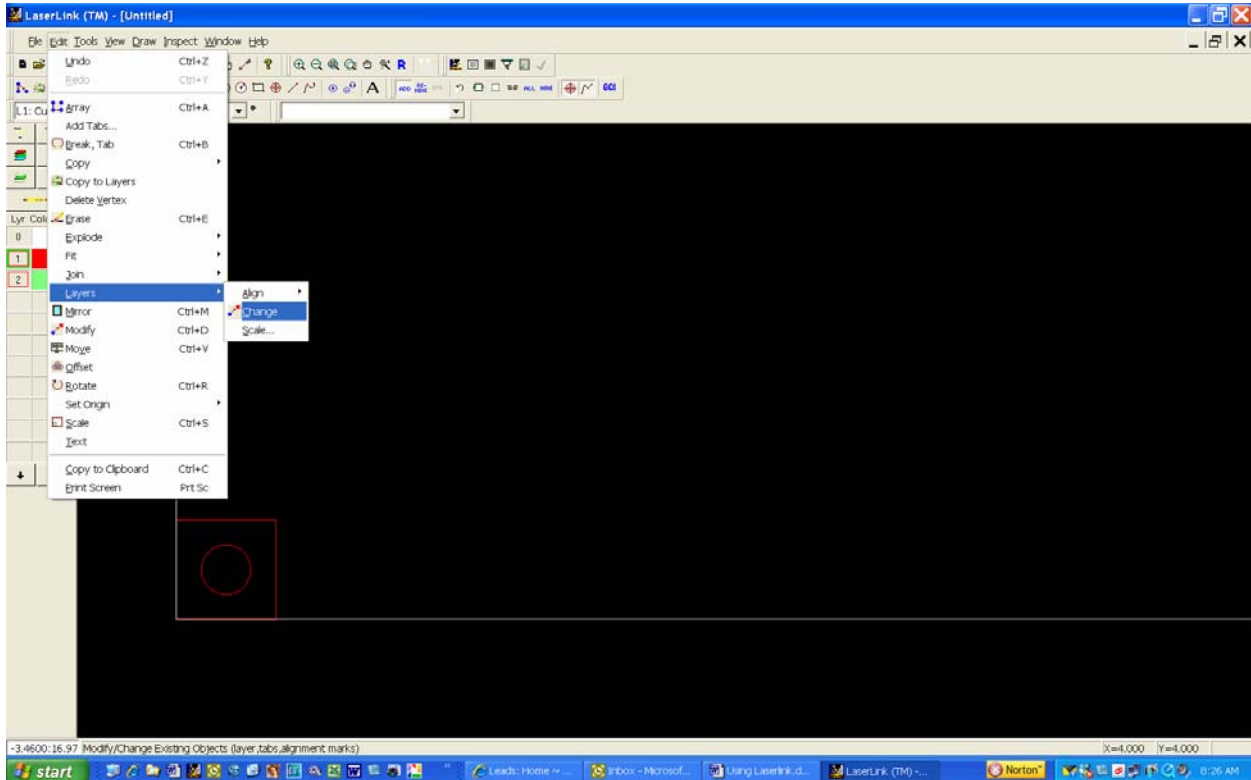






### Step by Step Sample 1 – continued.

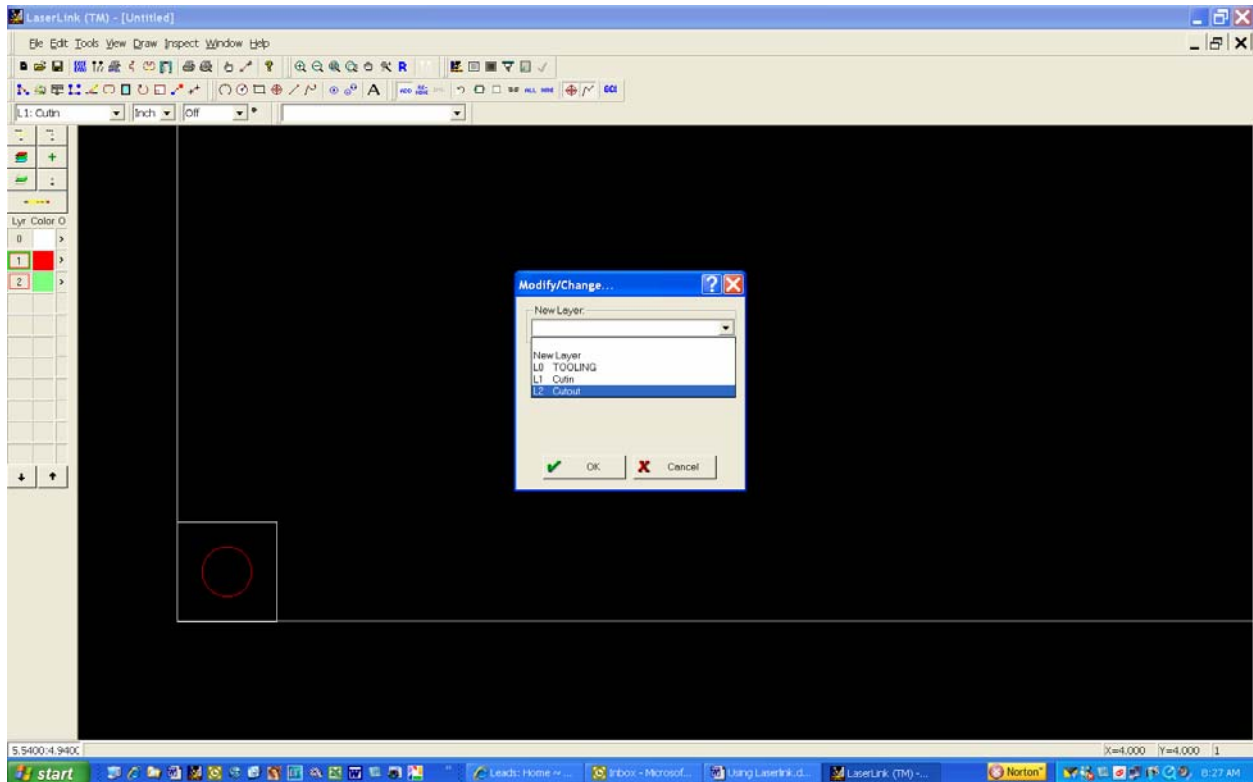
Left click “Edit” navigate to “Layers” then left click “Change” to get your selection tool “□”. Left click on the features you wish to assign to a new layer then right click.





**Step by Step Sample 1 – continued.**

Right clicking brings up the “Modify/Change” dialogue box. Use the drop down menu to select the layer you wish to assign the feature to then click “OK”.

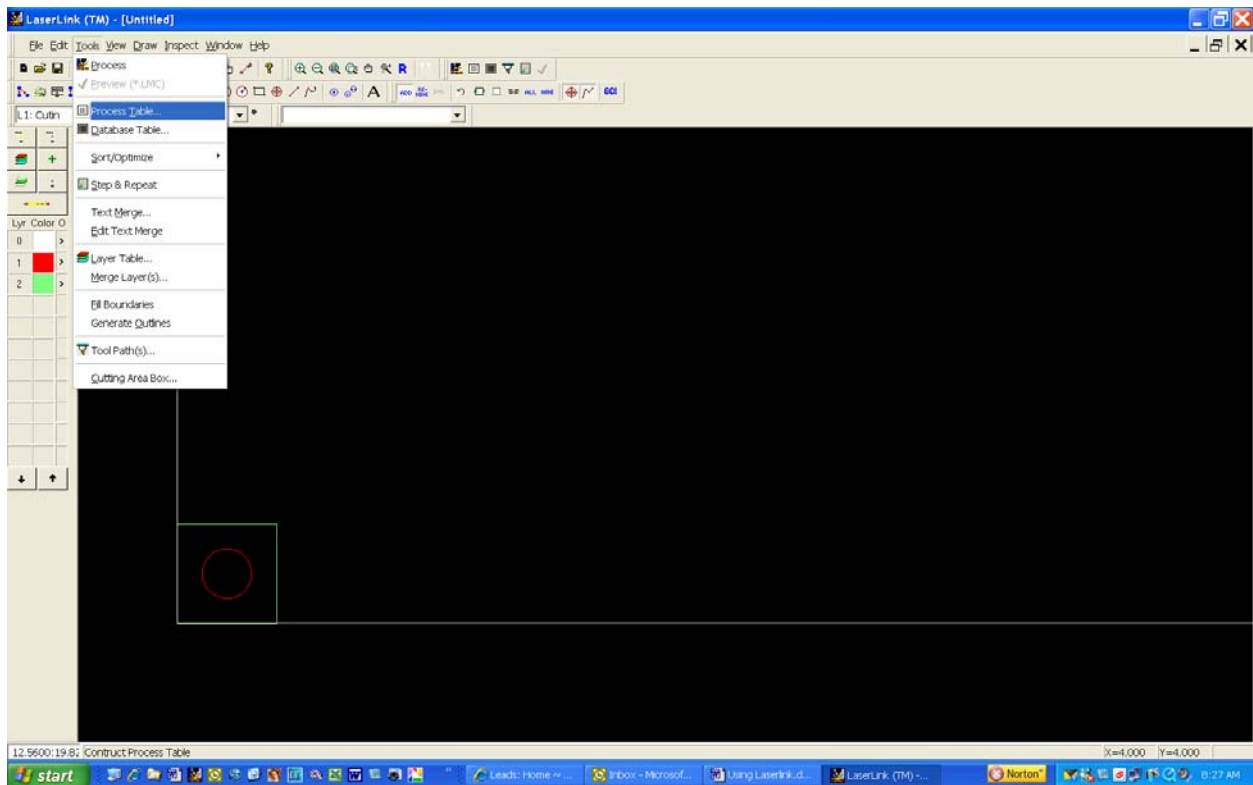





### Step by Step Sample 1 – continued.

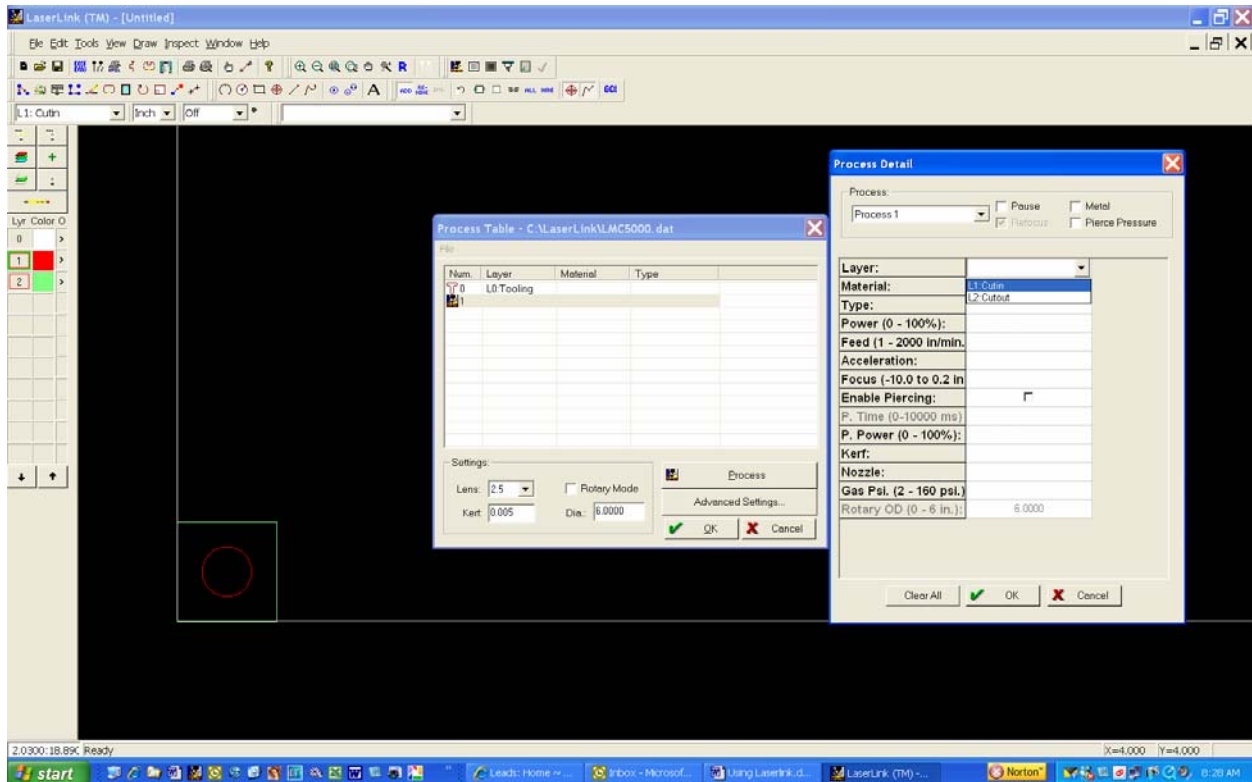
After layers have been assigned we can set up the “Process Table”.

Left click “Tools” then “Process Table” to get the Process Table dialogue box.



**Step by Step Sample 1 – continued.**

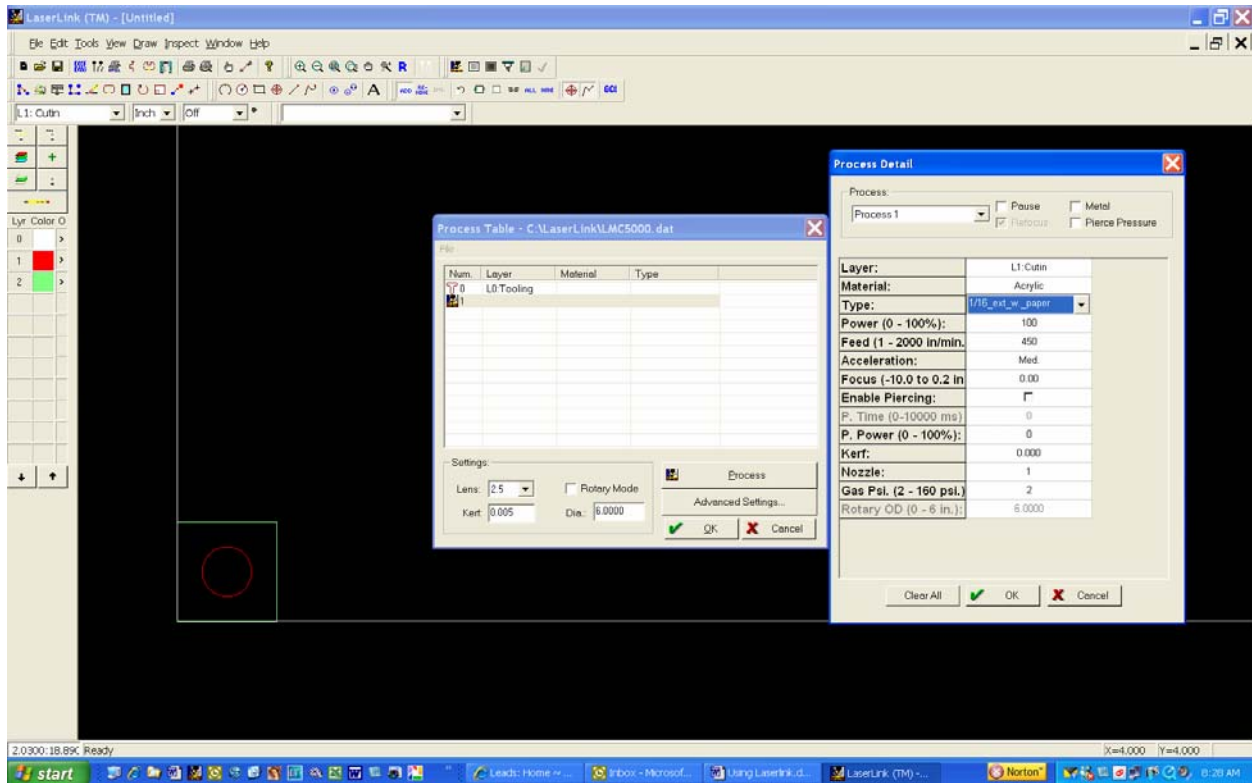
Double left click on the process num.  symbol to get the “Process Detail” dialogue box. Click the blank drop down menu for “Layer” and select the layer you wish to process first.






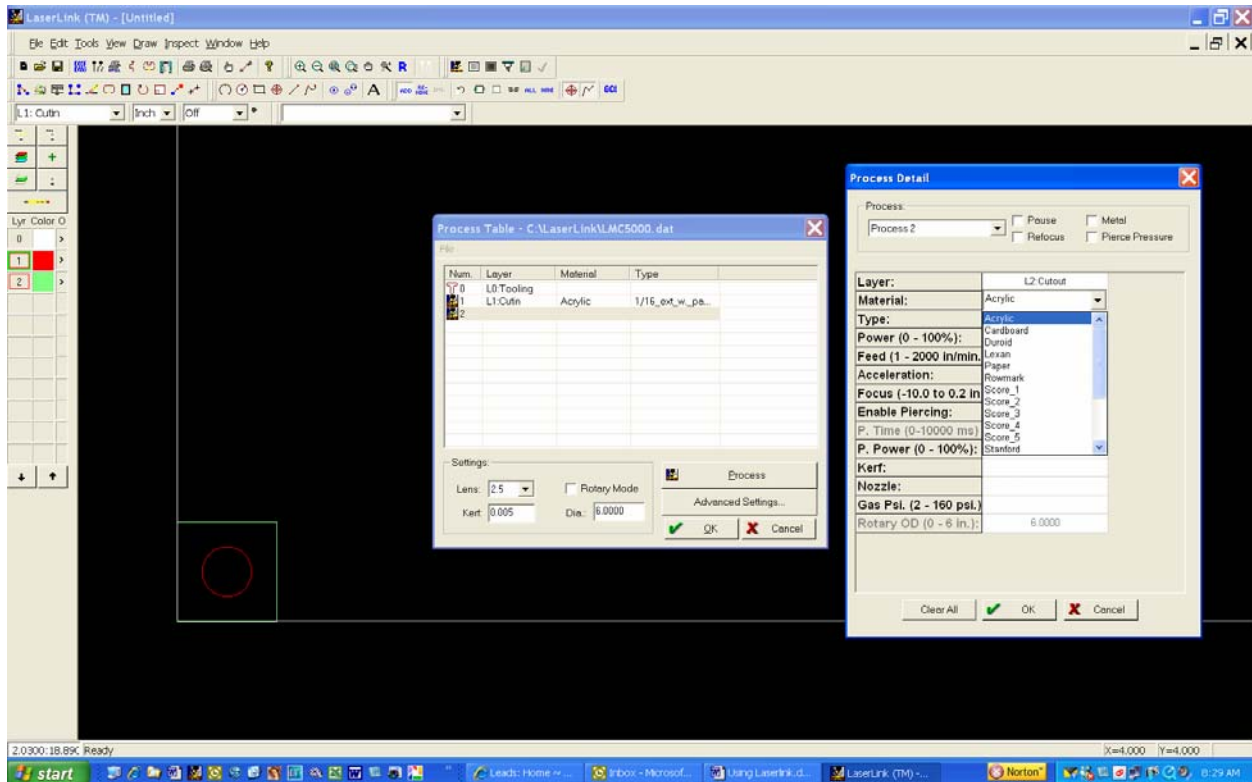
**Step by Step Sample 1 – continued.**

Complete selection of Material and Type drop down menus. After selecting “Type” the rest of the process detail for this material will complete automatically. Left click “OK” to complete Process number 1. Note that the process detail is pulling information from the Materials Database. Additional items can be added to the Materials Database.



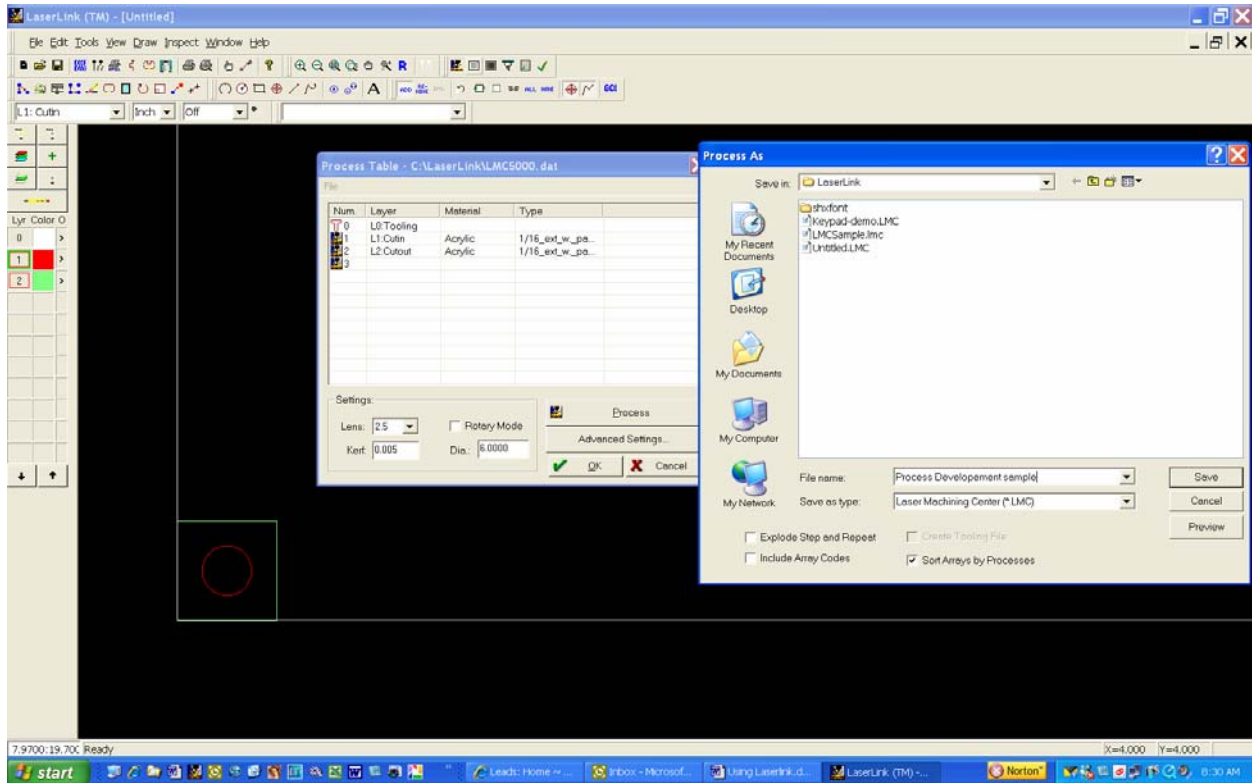
**Step by Step Sample 1 – continued.**

Double left click Num. 2 symbol  to get the Process 2 dialogue box. Complete process information as you did for the first then hit enter.



**Step by Step Sample 1 – continued.**

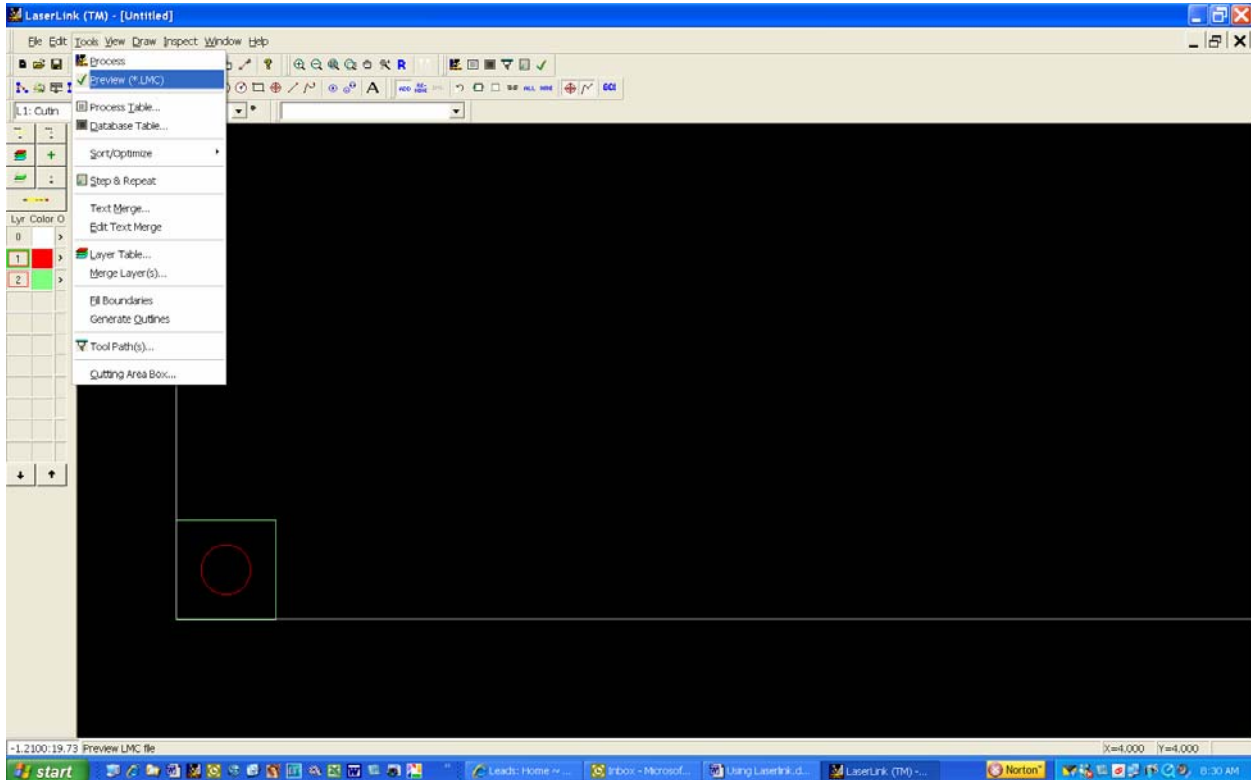
After you have entered processing information for all layers you are ready to process the file to create a .lmc laser machining center cut file. Left click  **Process** to get the “Process As” dialogue box. Name the file and save to the directory your Laser Machining Center is associated with.





### Step by Step Sample 1 – continued.

You should preview the file to ensure the file has been correctly set up. Left click “Tools” then “Preview” to see the “Preview” dialogue box and image of the .lmc file.

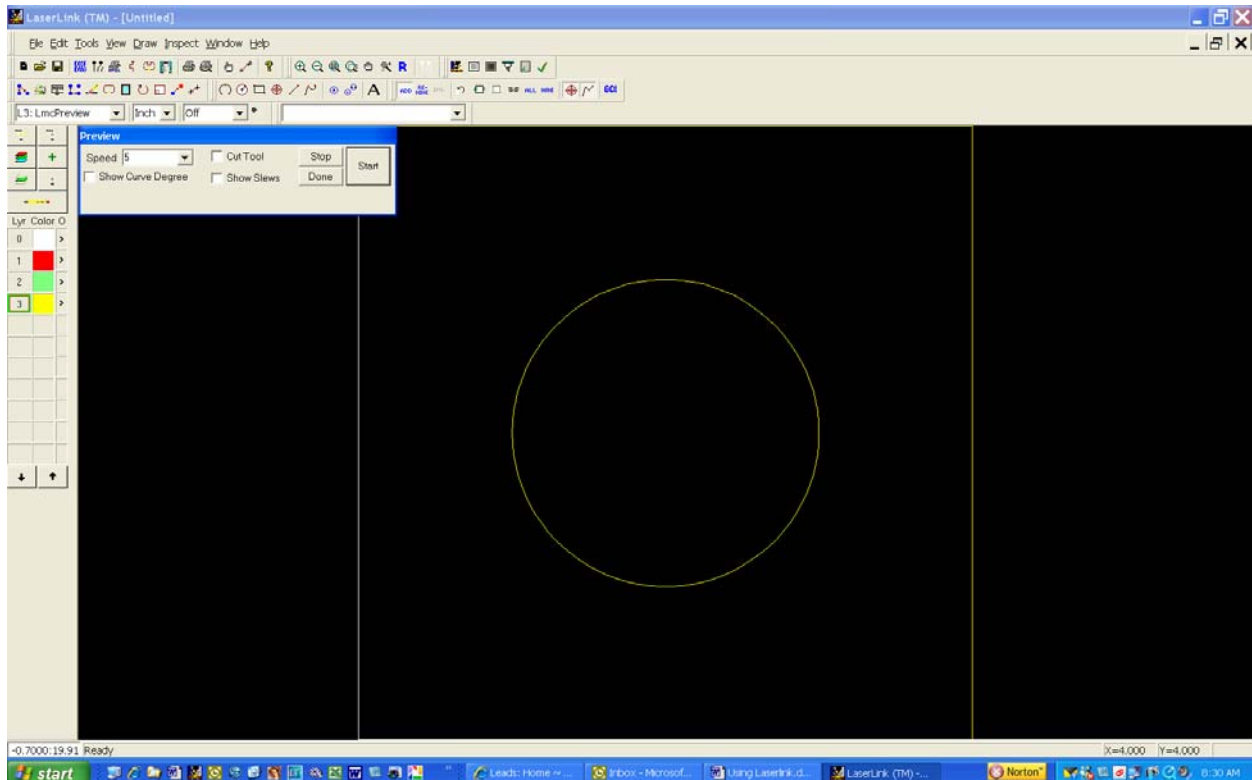






### Step by Step Sample 1 – continued.

.lmc displays in preview mode. If nothing is displayed you will know that you missed a step somewhere. Left click “Start” to watch the preview animation.





### Step by Step Sample 1 – continued.

This is the information in the .lmc file we just created. These are the instructions for the machine telling it where to go, when to turn the laser on and off and what path to follow.

```
Process Development sample.LMC - WordPad
File Edit View Insert Format Help

Created By: LaserLink Version 4.0b38
BDGFile Name:
LMCFile Name: C:\LaserLink\Process Development sample.LMC
LMCFile Post: Lumen
Date: 2/11/2009
Time: 8:30:28

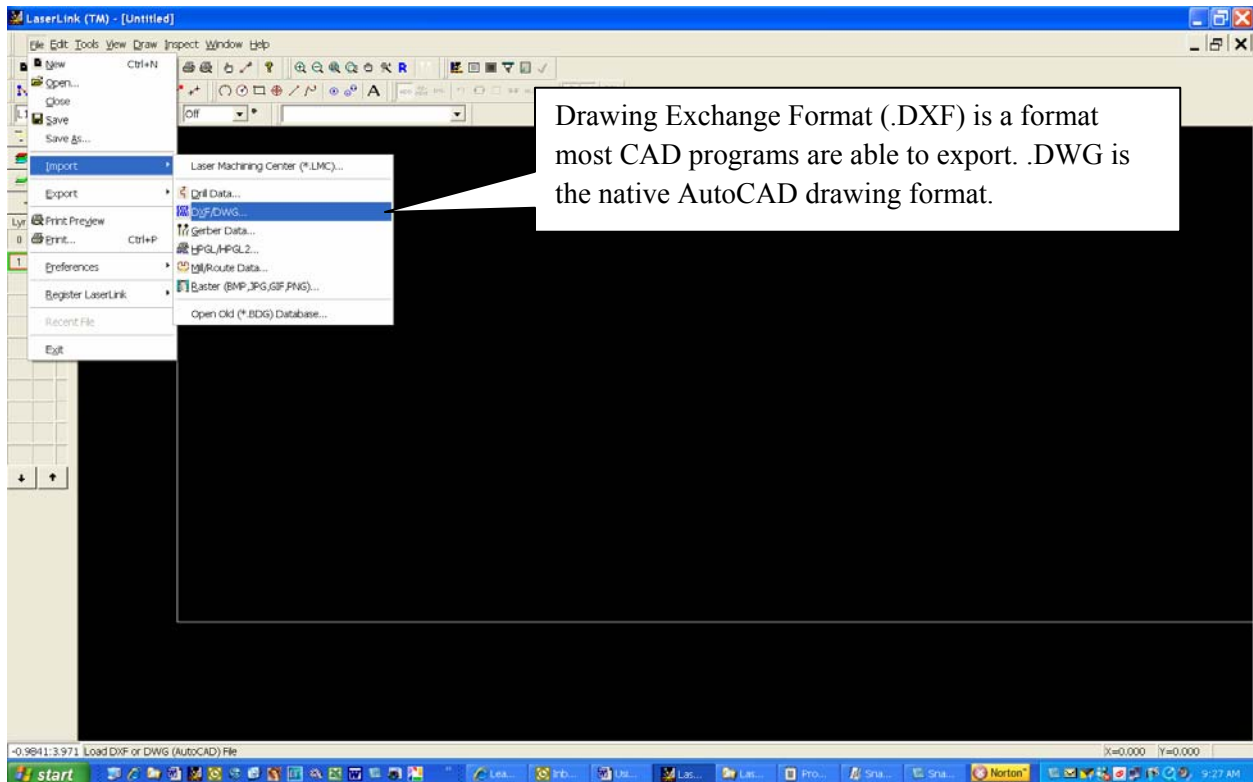
4.01 VBR
6.0000 2 1 2 0 0 0.00 450 100 ~ 1/16_ext_w_paper~ ~ Acrylic~ ~ L1:Cutin~ 0 1 Process_Table
6.0000 2 1 2 0 0 0.00 450 100 ~ 1/16_ext_w_paper~ ~ Acrylic~ ~ L2:Cutout~ 0 2 Process_Table
4.000 4.000 Bounding_Box
CYCLE_START
1 PROCESS
3.0000 2.0000 AF
LD
3.000000 2.000000 MA
LE
2.0000 2.0000 1.0000 0.000 360.000 Ac
LD
2 PROCESS
LD
0.000000 0.000000 MA
LE
0.000000 4.000000 PA
4.000000 4.000000 PA
4.000000 0.000000 PA
0.000000 0.000000 PA
LD
end_plot
```



## Step by Step Sample 2 – Simple Import of file into LaserLink

Importing a drawing created in another program into LaserLink and creating a .lmc cut file.

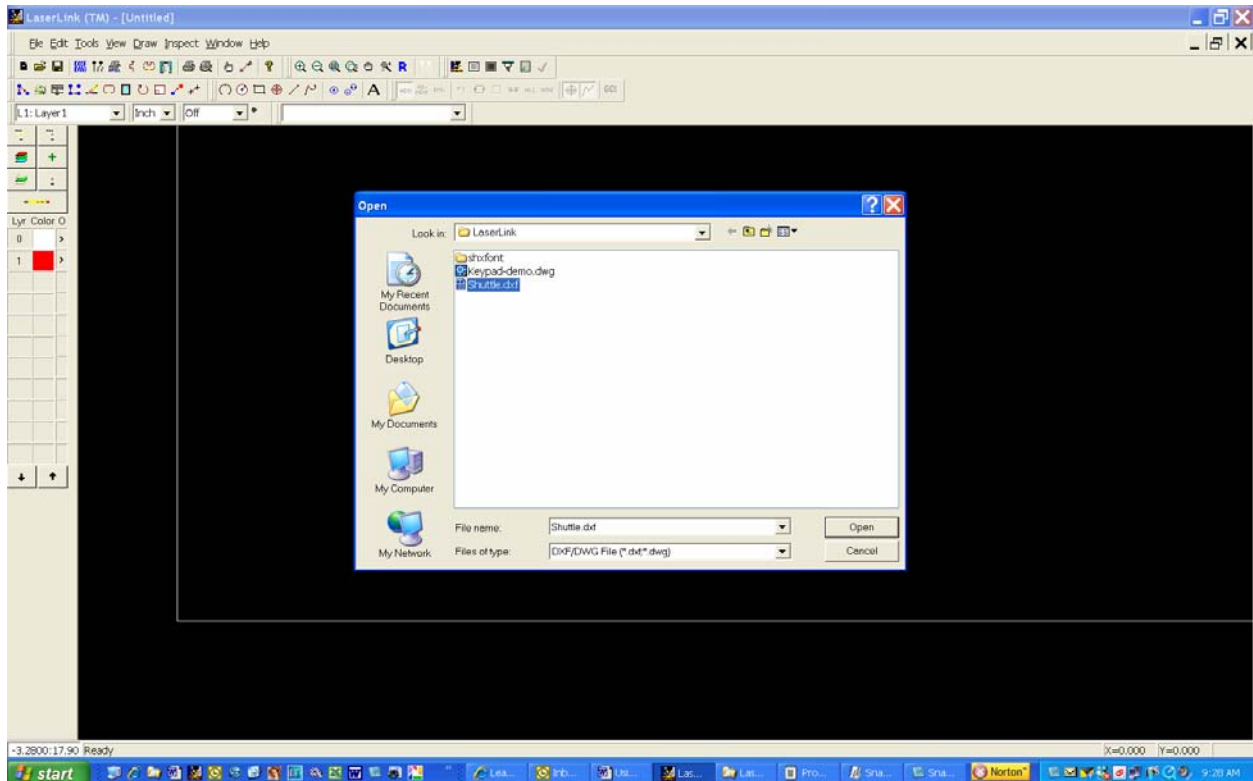
Left click “File” navigate to “Import” then left click “DXF/DWG” to get the “Open” dialogue box.





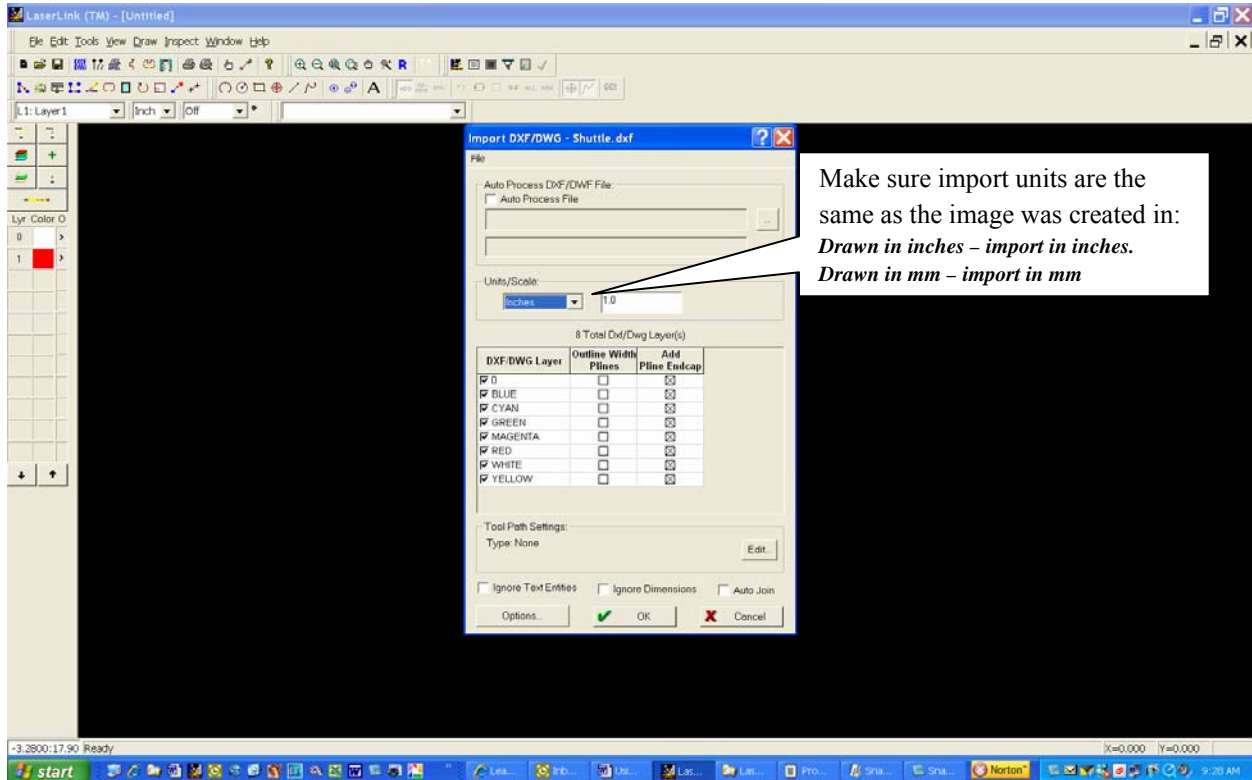
## Step by Step Sample 2 – continued

Select the .dxf or .dwg file you wish to import and left click “Open”



## Step by Step Sample 2 – continued

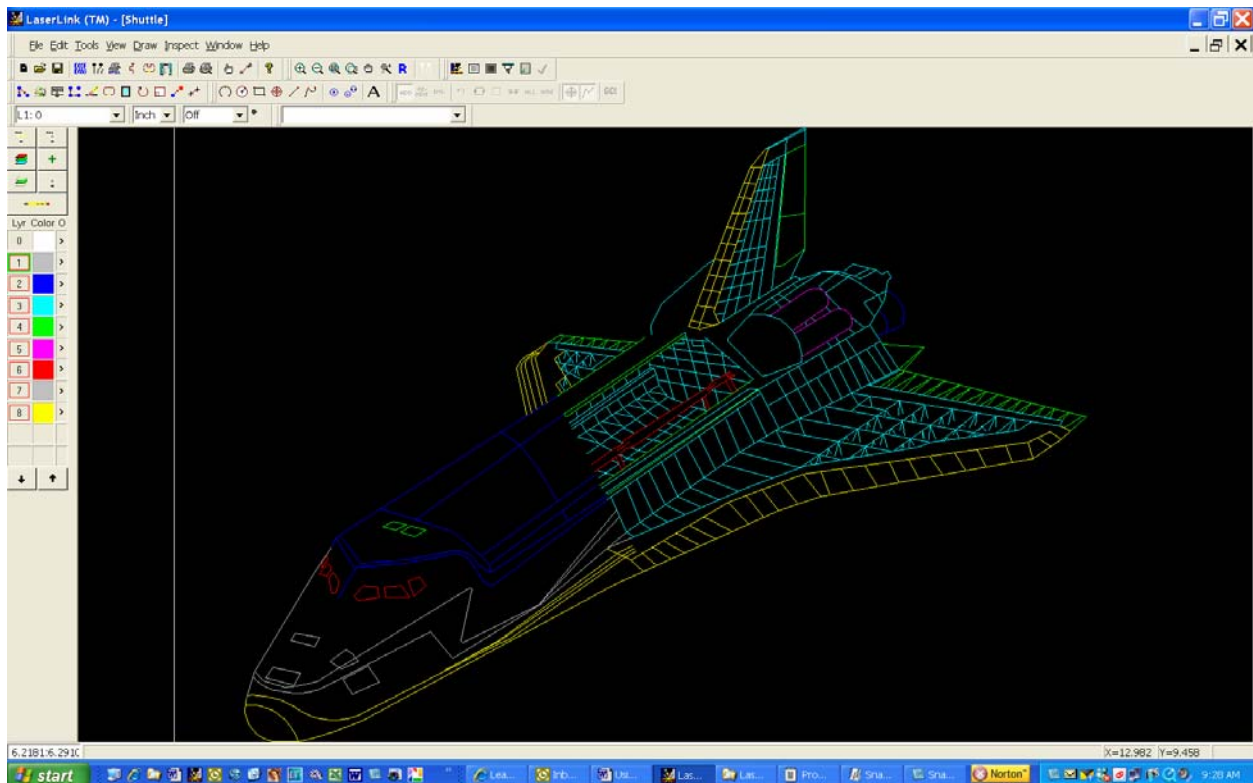
After selecting the file to open the “Import DXF/DWG” dialogue box will appear. In this simple example we will not perform any file set-up automation like Auto-Process or Tool Paths. Left click OK to import.






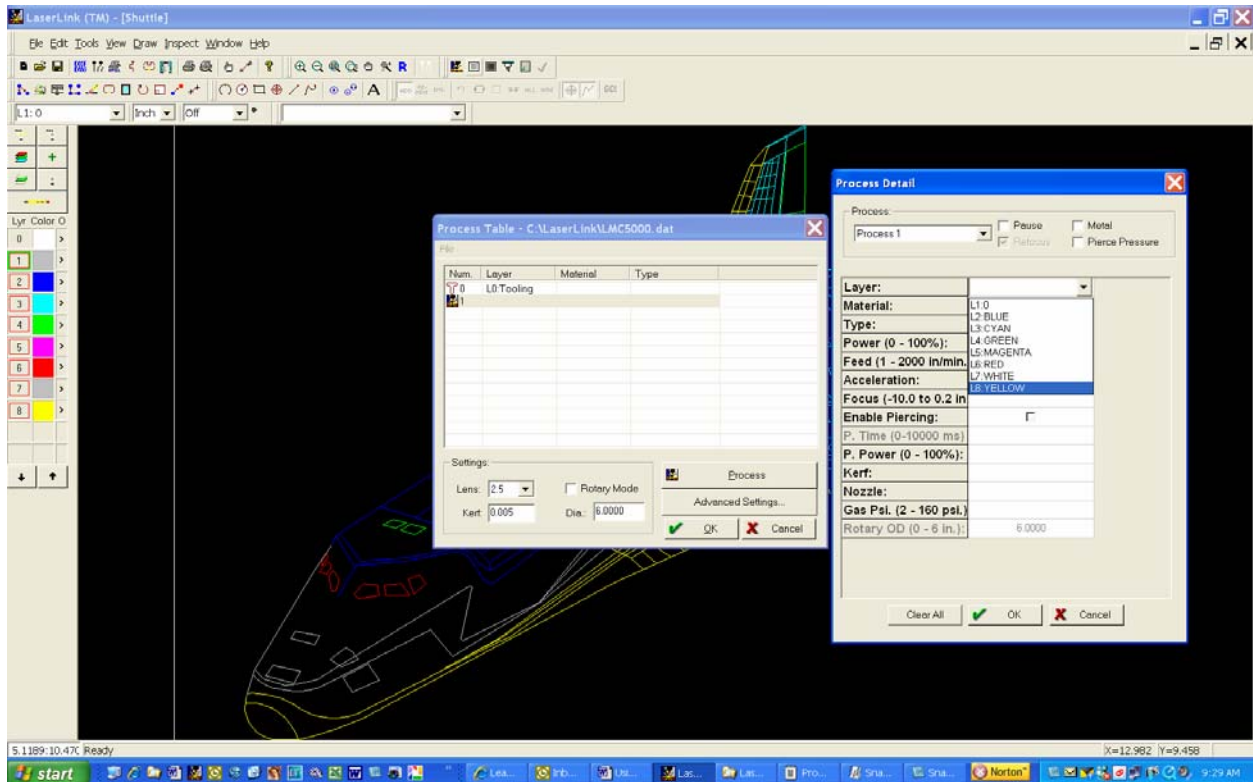
## Step by Step Sample 2 – continued

File has been imported into LaserLink.



### Step by Step Sample 2 – continued

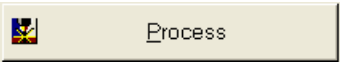
Left click “Tools” then “Process Table”. Double left click on the Num. 1 symbol “ 1 ”. Left click the drop down Layer field and select first layer to process.

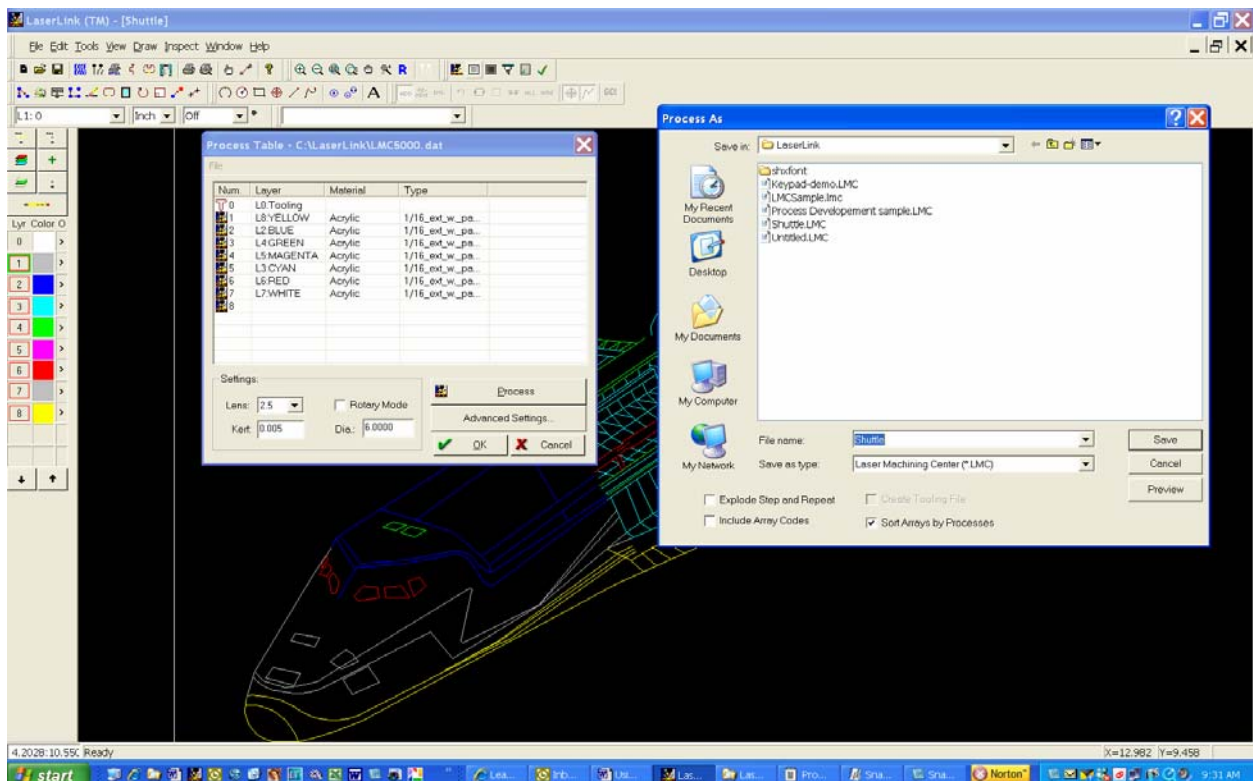




## Step by Step Sample 2 – continued

Continue to complete process table with all layers you wish to process. When complete left click the

“Process” tab  to bring up the “Process As” dialogue box. Name and save the laser machining center .lmc file to the location on your network that the Laser Machining Center is directed to.



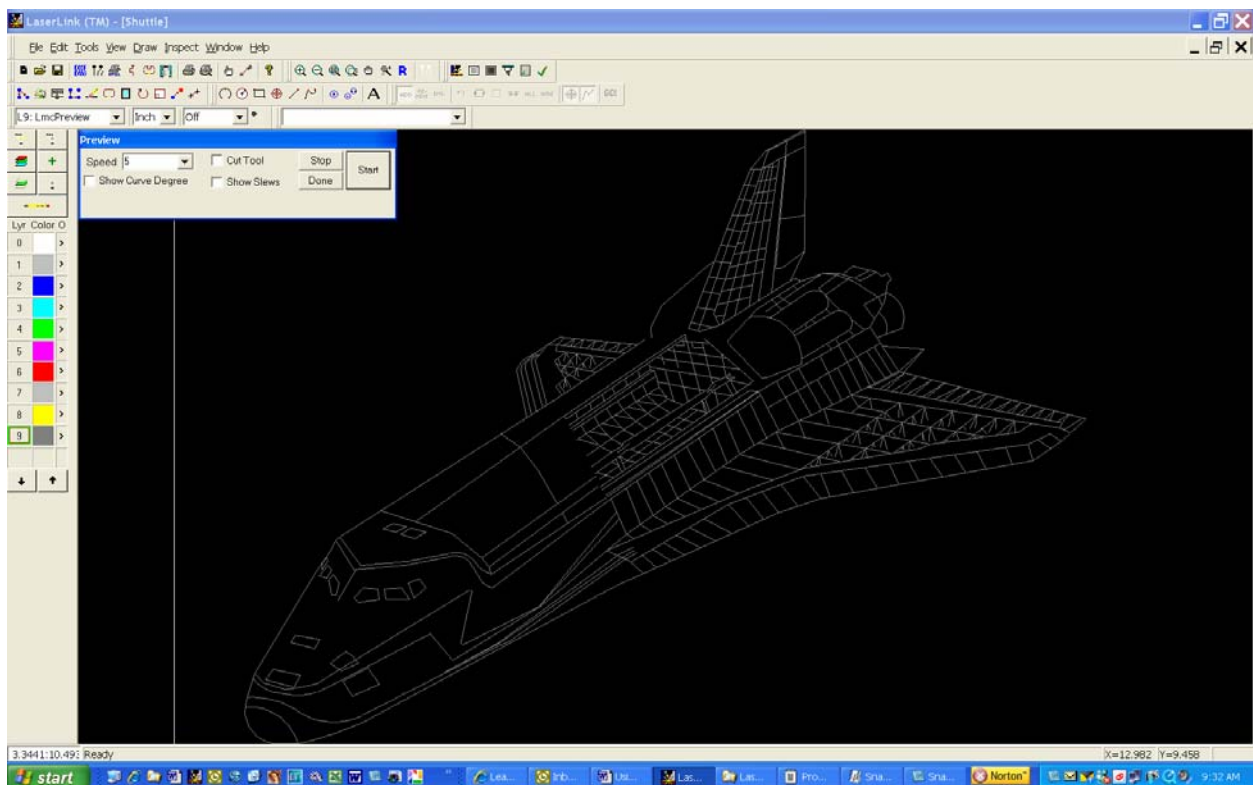




## Step by Step Sample 2 – continued

To double check that the file has been correctly processed run a Preview. Left click “Tools” then “Preview” to bring up the .lmc animation and Preview dialogue box. Left click the “Start” button to begin animation of cut. Lowering the “Speed” number will increase the speed at which the animation takes place.

Click Done.

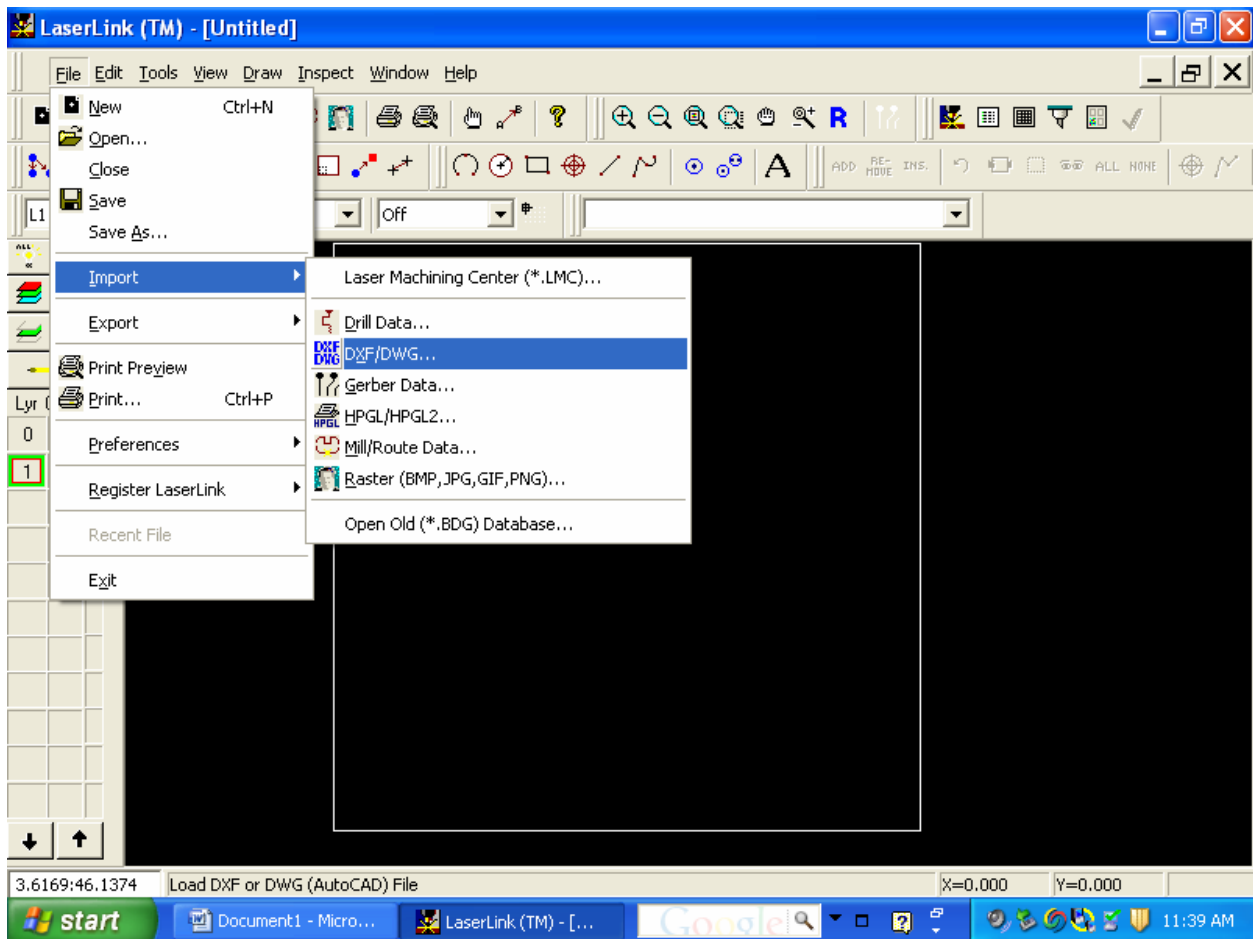




### Step by Step Sample 3 – Import into LaserLink using set-up automation and machine vision.

Import a drawing created in another program into LaserLink. Create an .lmc cut file using import set-up automation during import.

Left click “File” navigate to “Import” then Left click on “DXF/DWG” to bring up the “Open” dialogue box. Select the file you wish to import and left click Open to get the “Import DXF/DWG” dialogue box.






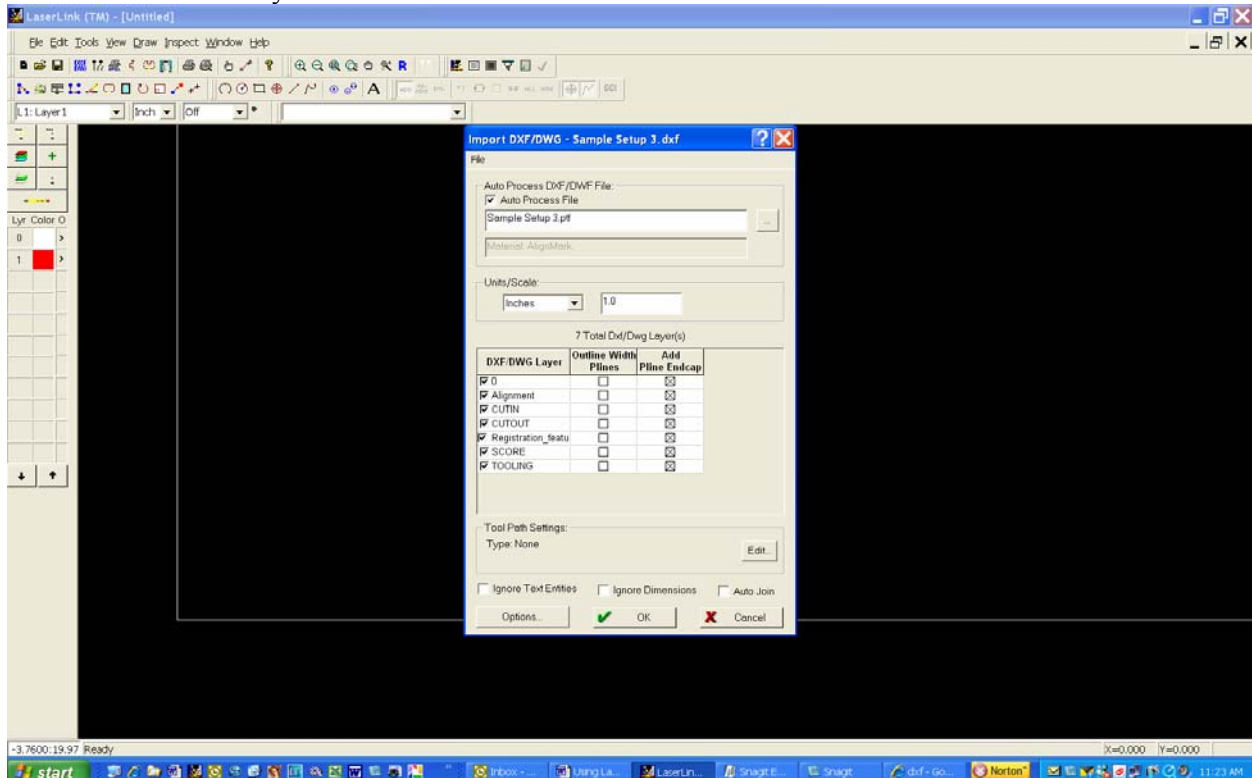
### Step by Step Sample 3 – continued.

Import DXF/DWG dialogue box will appear allowing you to choose whether to Auto-Process (layers must match exactly or it won't work); select units (mm or inches) and scale of image to import; select which layers to import; choose whether to create tool paths on import; check boxes for ignoring text on import, ignoring dimensions on import and joining features on import.

Auto-Process allows you to create a standard “process table” for a particular material and type of job. For example, the process table can have “Alignment”, “Cutin” and “Cutout” with all process parameters completed. If the file being imported has the same layer names you can assign the process table on import saving that step. The process table only needs to be save once in the “Process Table Format” .ptf.

Left click to check “Auto Process DXF/DWG File” check box. Click  button to navigate to the .ptf file you wish to use. Highlight the .ptf and click “Open”.

Select the Units/Scale you wish to use

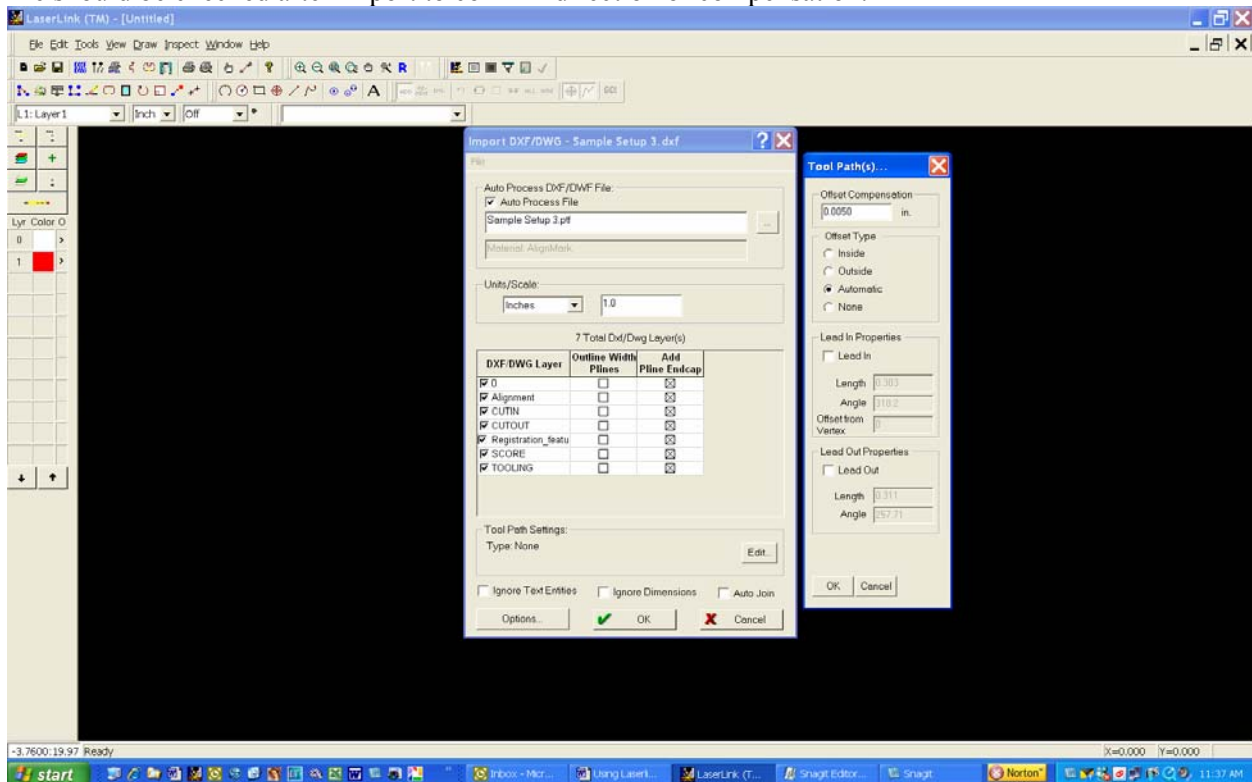




### Step by Step Sample 3 – continued.

Left Click “Edit” to bring up the “Tool Paths” dialogue box. Choose the Offset Compensation distance and “Automatic” Offset Type. Auto-Lead ins and Auto-Lead outs will not be used in this instance. Click OK to accept.

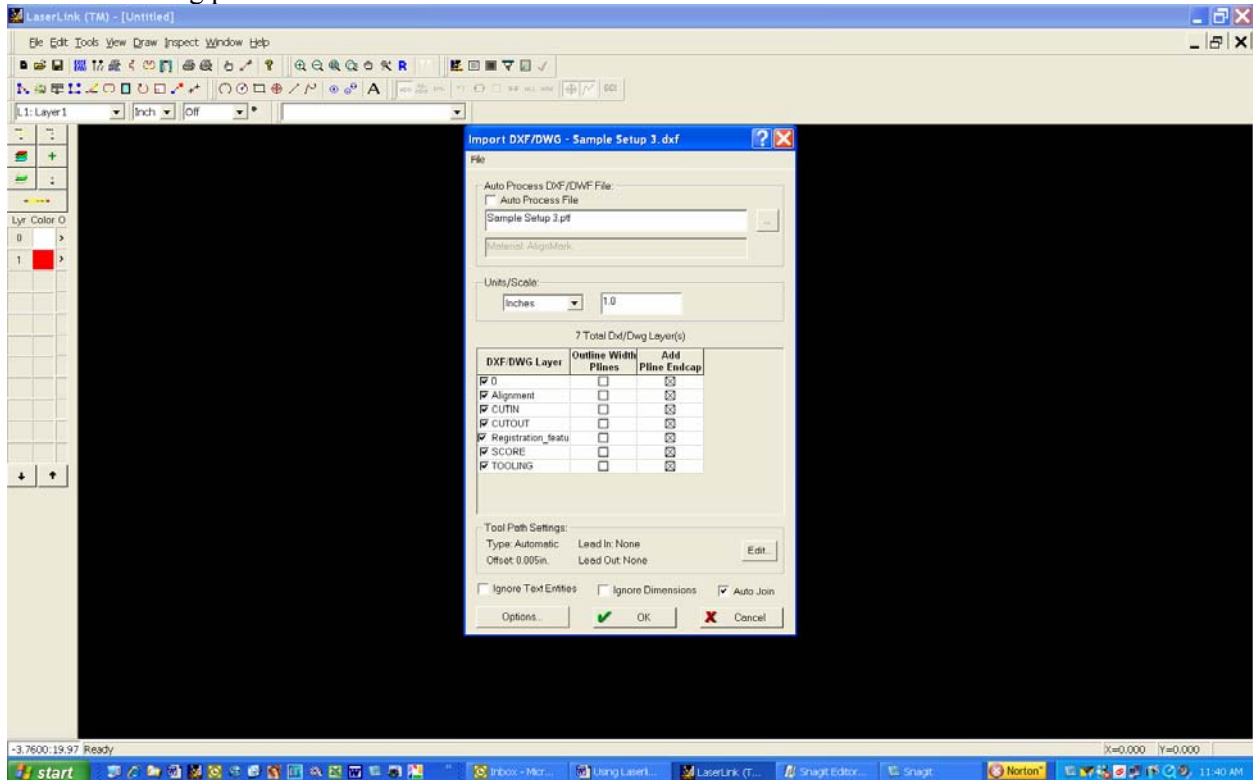
On import you can compensate for the width of the laser beam (typically the kerf of the laser is .006” to .008” so to get a correct size part the kerf compensation should be half that number – use trial and error to narrow in on the correct compensation number). By selecting “Automatic” the software will attempt to determine what is an inside or outside feature and compensate automatically in the correct direction. The file should be checked after import to confirm direction of compensation.





### Step by Step Sample 3 – continued.

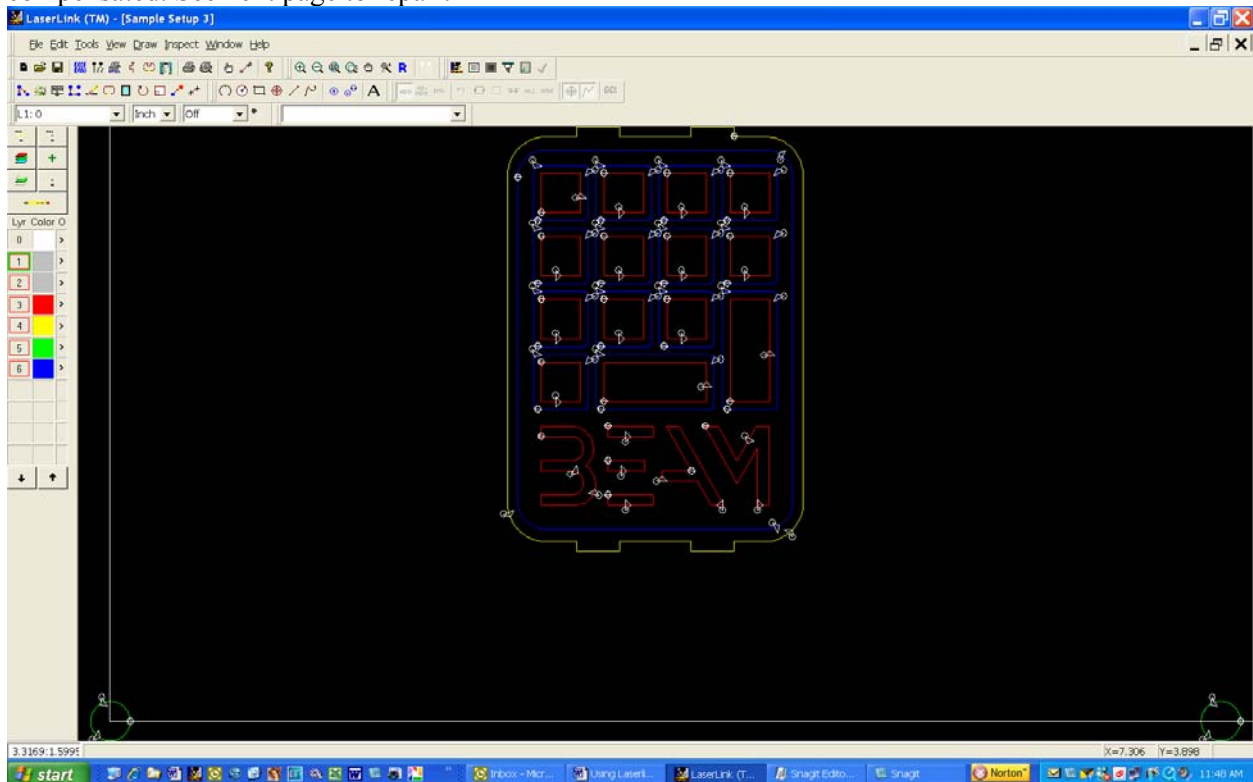
Left click “Auto Join” check box. LaserLink will attempt to automatically join lines to create continuous features. Often parts are drawn with line segments that are not mathematically connected which can slow down the cutting process.





### Step by Step Sample 3 – continued.

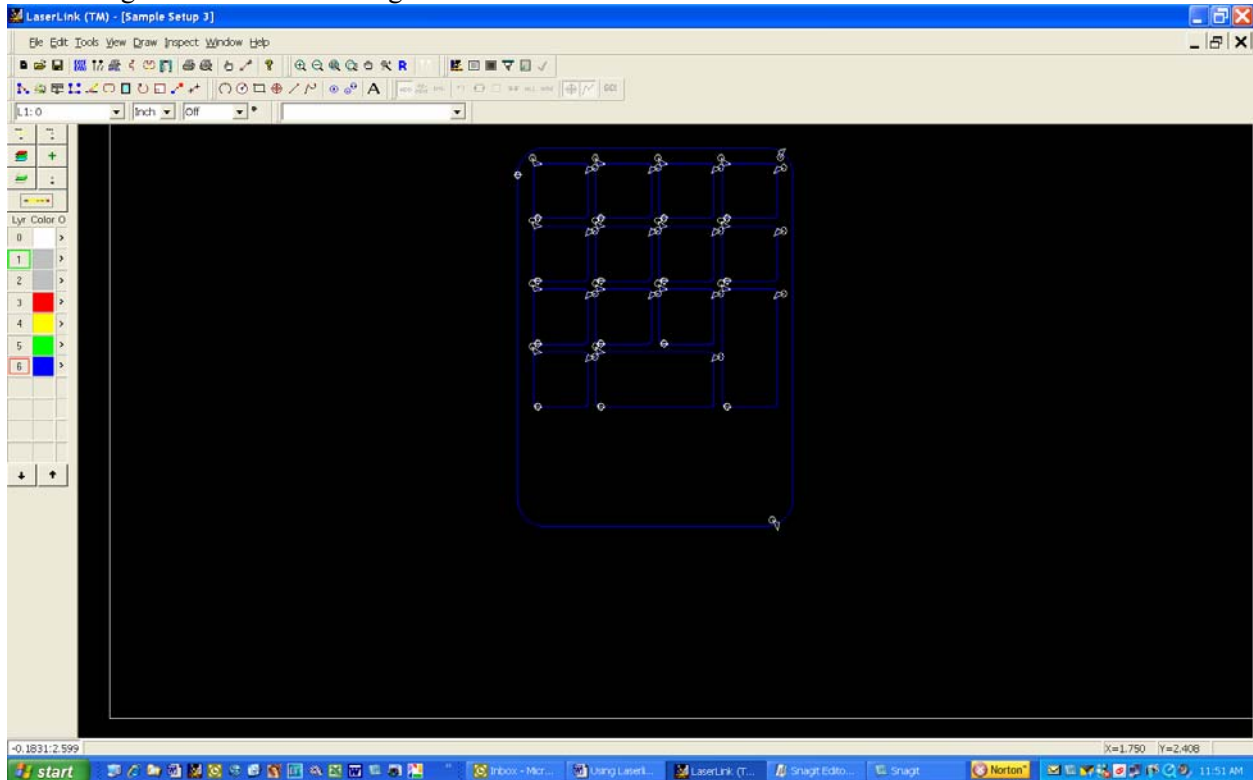
File after import. The Automatic Tool Path feature has made several mistakes that need to be fixed. The Auto Tool Path feature has been confused by the “Score” features which do not need to be kerf compensated. See next page to repair.





### Step by Step Sample 3 – continued.

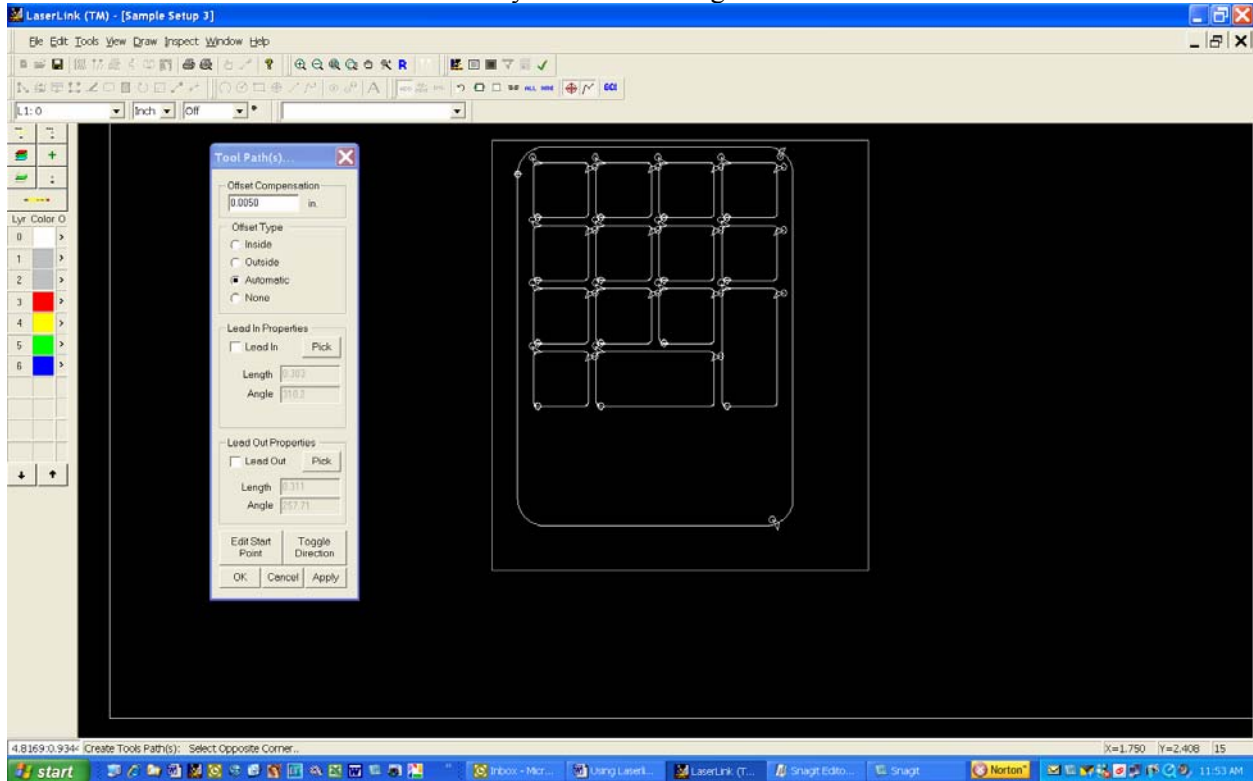
Turn off all layers you don't want to change using the Layer Control Table. Left click "Tools" then "Tool Paths" to get the Tool Path dialogue box.





### Step by Step Sample 3 – continued.

Use the area select tool to box the features you wish to change.

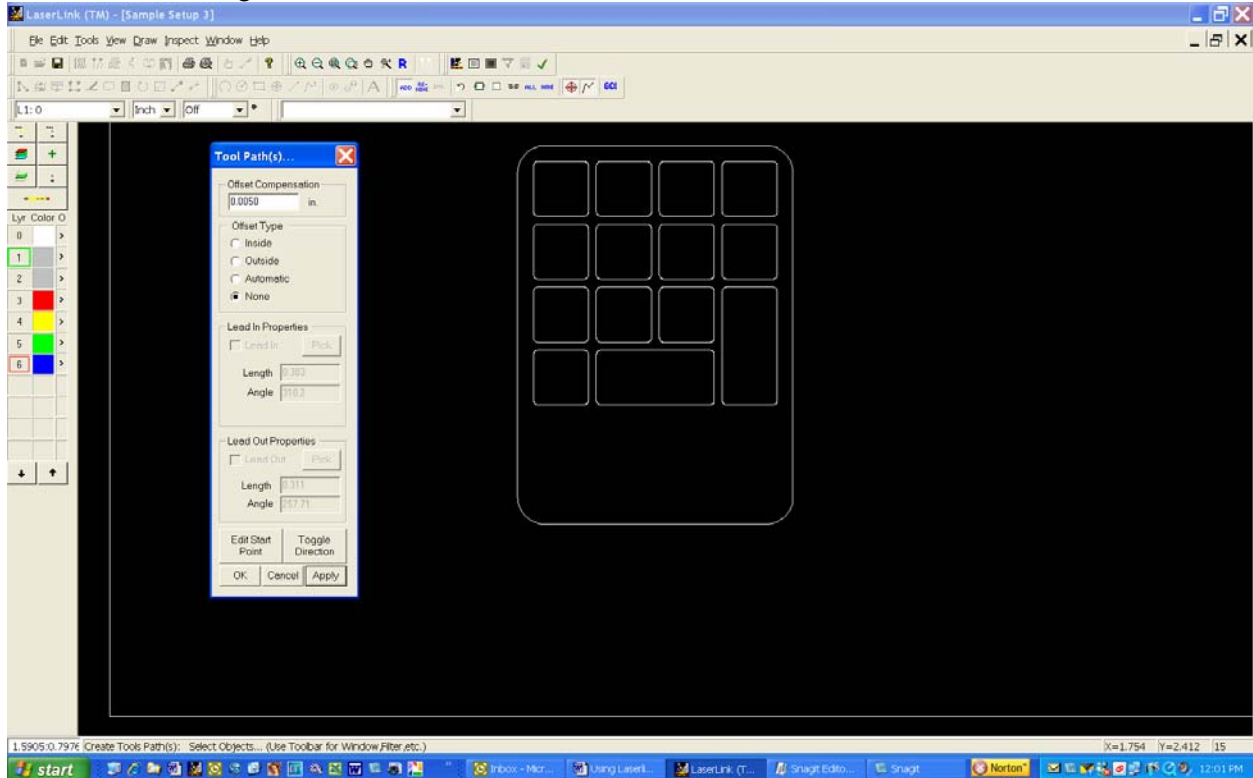






### Step by Step Sample 3 – continued.

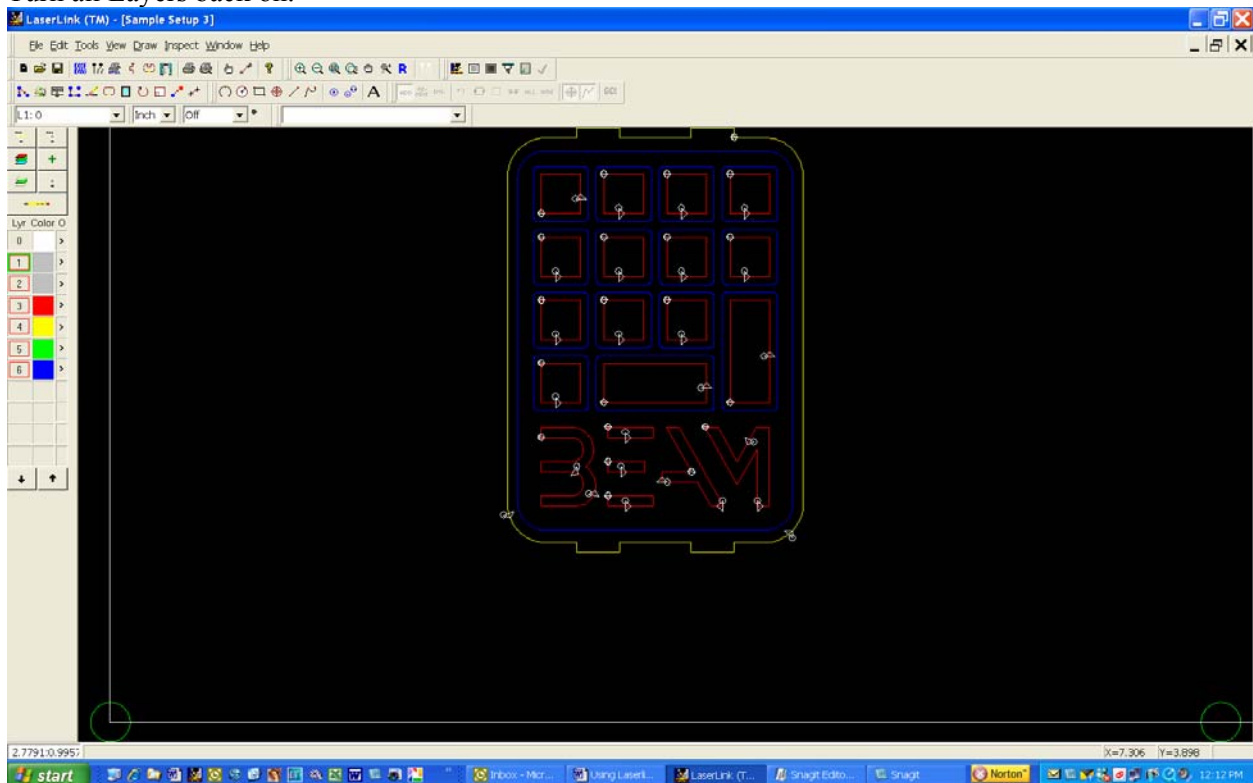
Change “Offset Type” to “None” and left click apply. Tool paths will be removed. Click “OK” to remove the Tool Path Dialogue box.





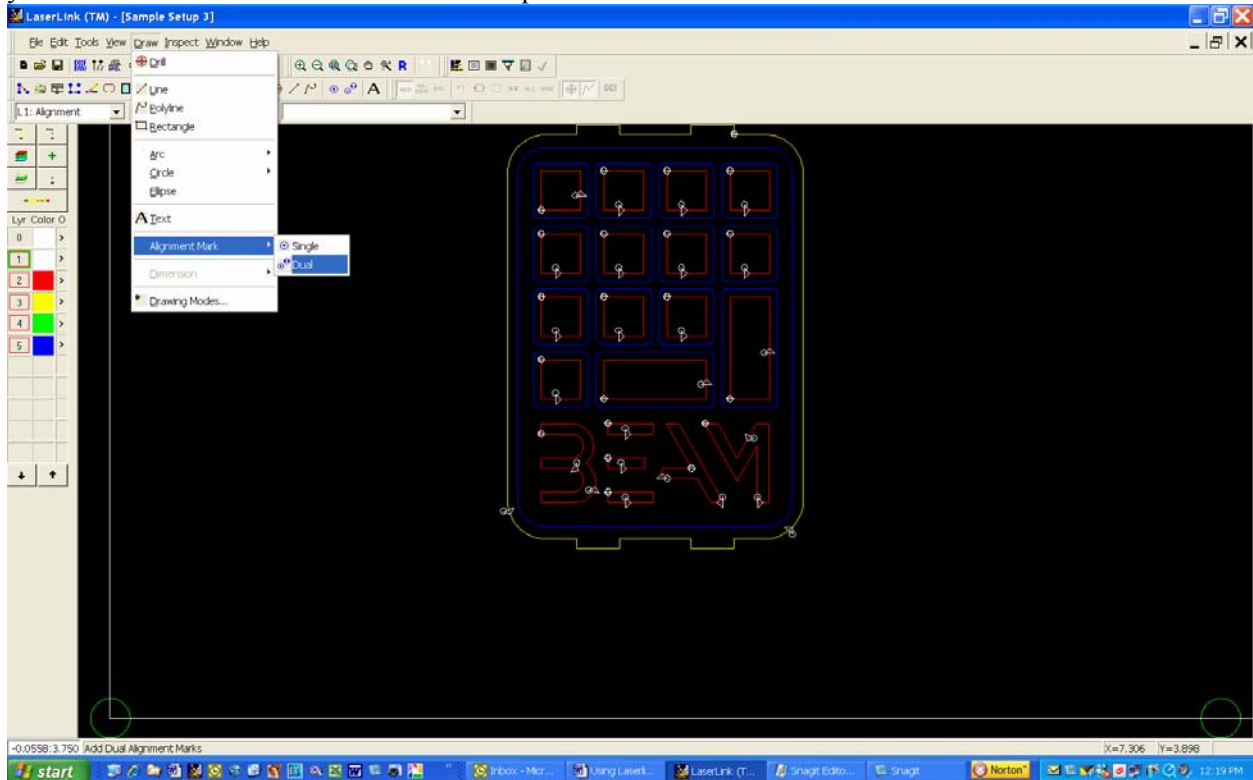
**Step by Step Sample 3 – continued.**

Turn all Layers back on.



## Step by Step Sample 3 – continued.

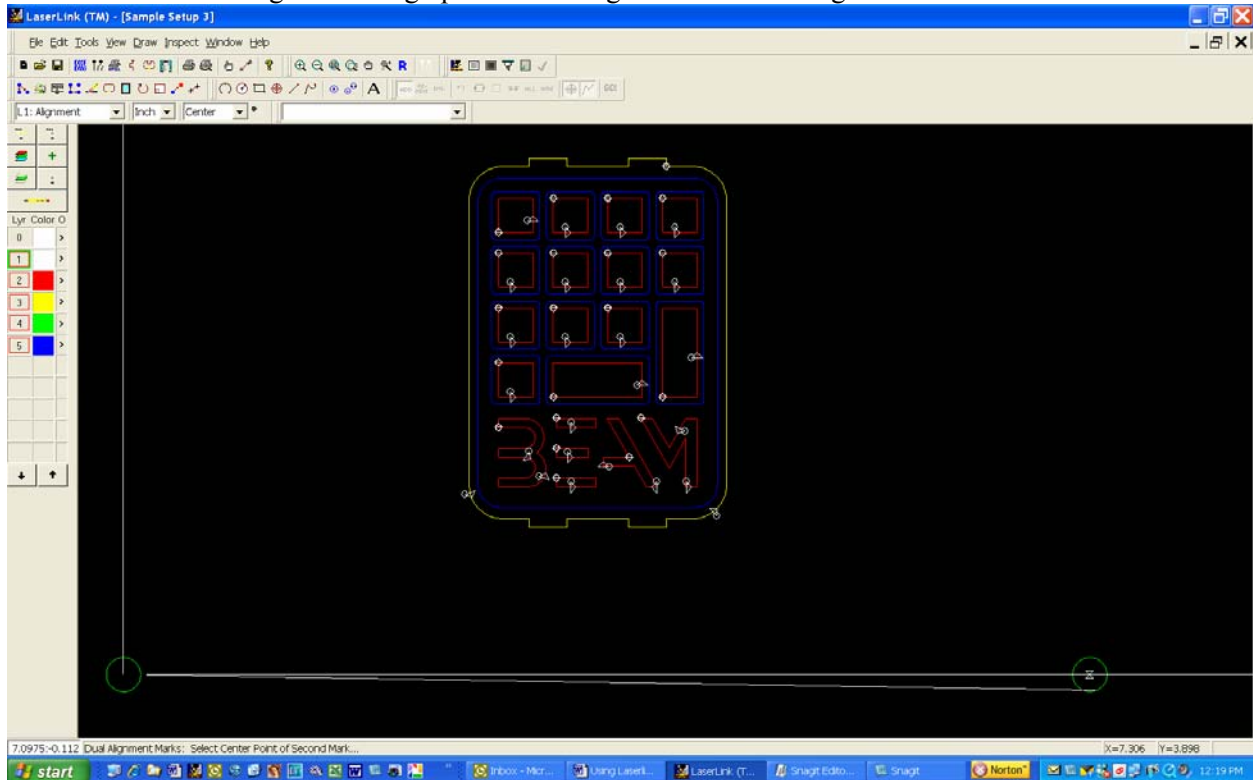
Set up vision system process. Left click “Draw” navigate to “Alignment Mark” then left click Dual to get your selection tool “□”. Turn on Center Snaps.





### Step by Step Sample 3 – continued.

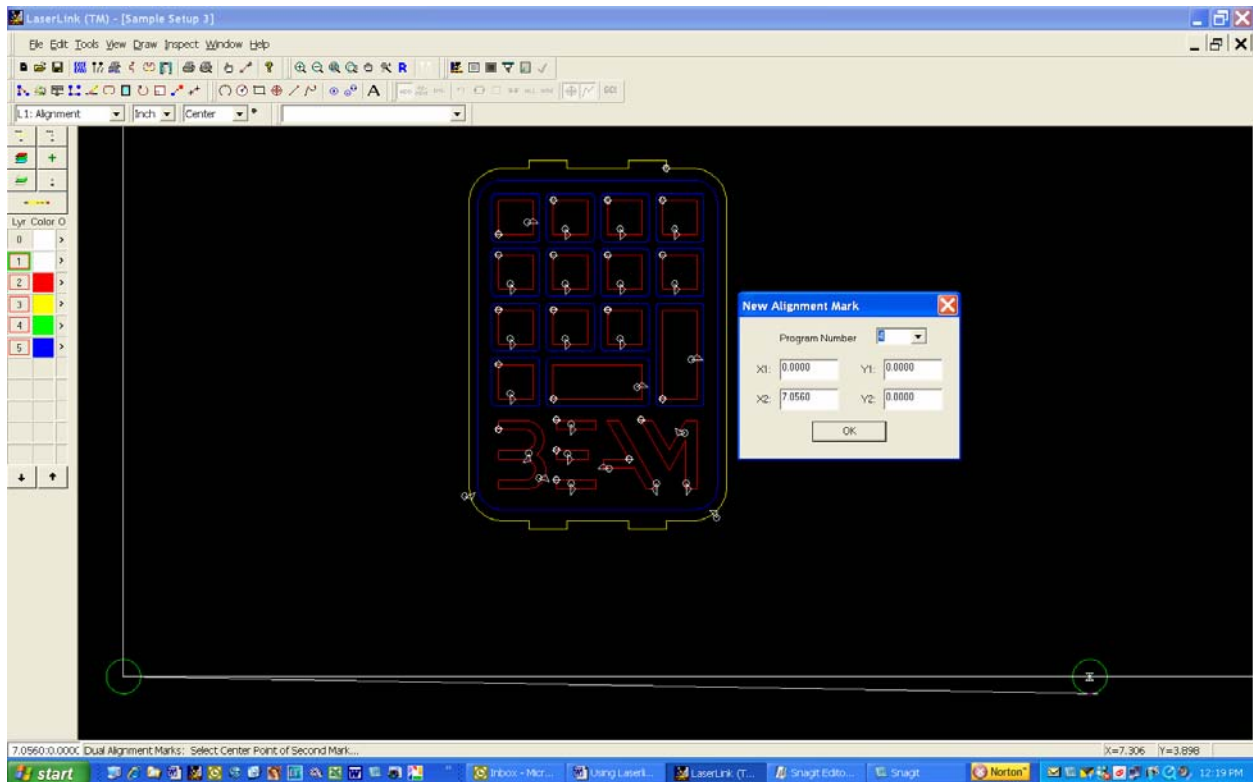
Snap to the center of the first registration point and left click. Move selection tool to second registration feature and left click again to bring up the New Alignment Mark dialog box.





### Step by Step Sample 3 – continued.

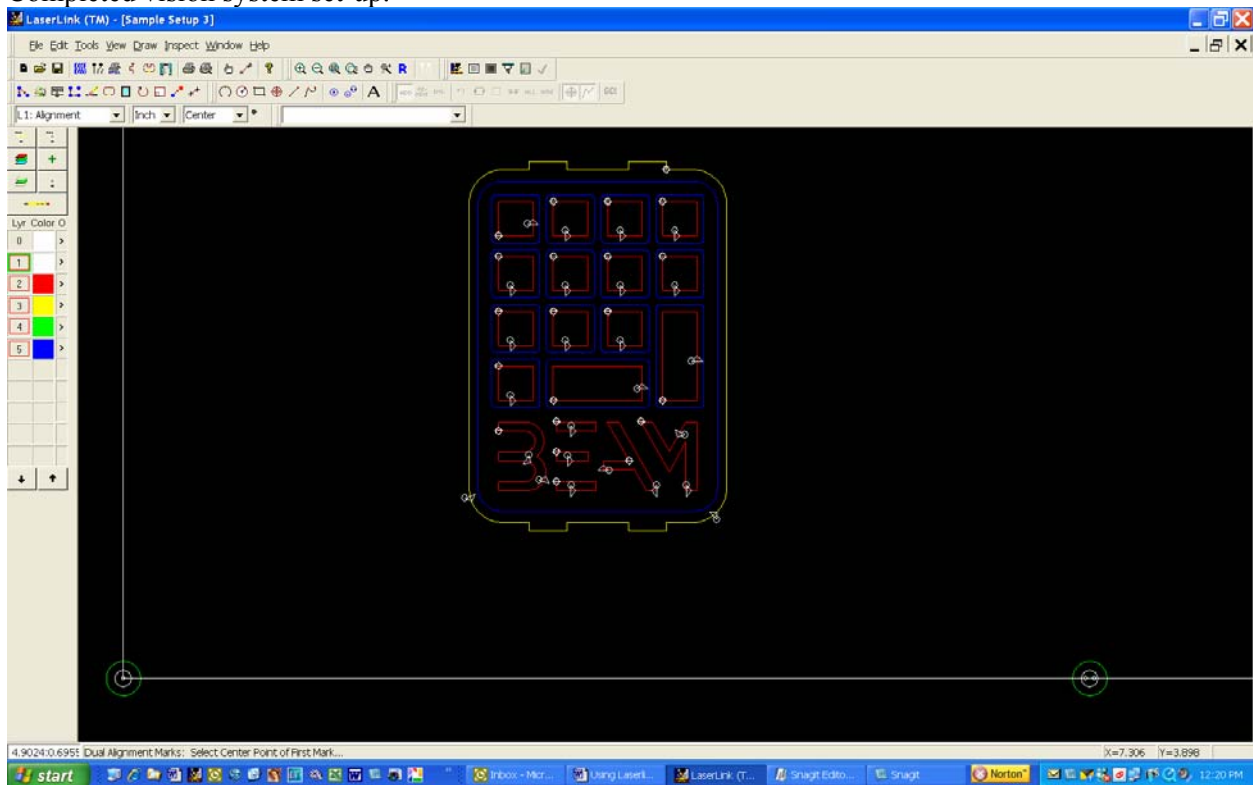
Enter the Program Number where the Registration feature is stored on the vision system controller and click OK.





## Step by Step Sample 3 – continued.

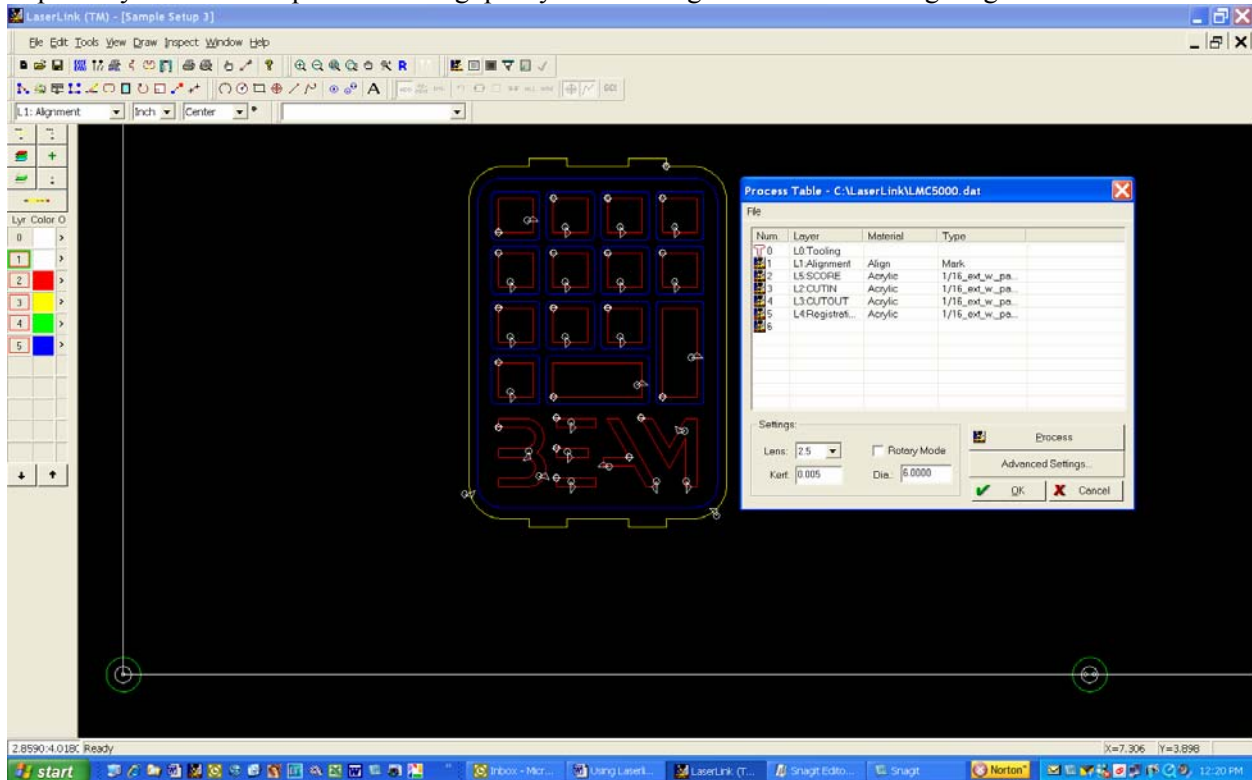
Completed vision system set-up.





**Step by Step Sample 3 – continued.**

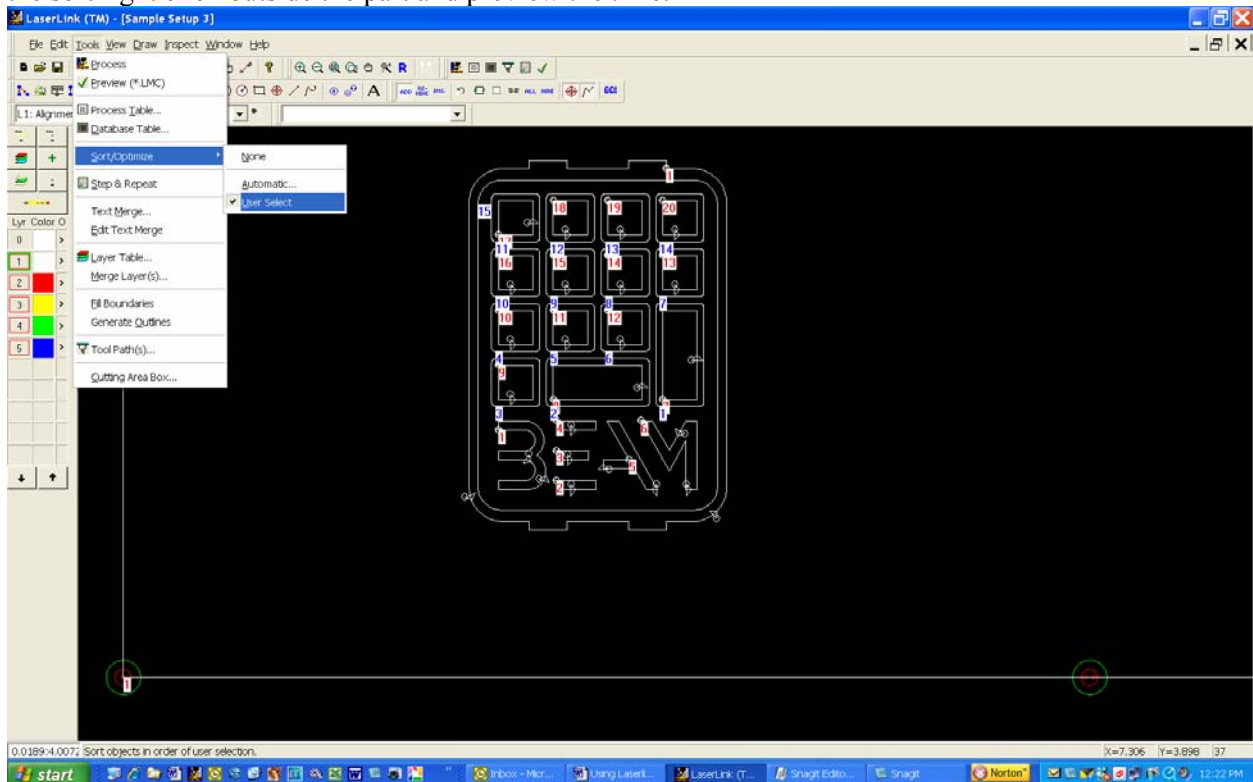
Open Process Table dialogue box to confirm that Process Table File .ptf was correctly imported. If not imported you can now open an existing .ptf by left clicking on “File” and navigating to the file.





### Step by Step Sample 3 – continued.

The part can be further optimized for cutting by creating a manual sort order. Left click “Tools” navigate to “Sort/Optimize” and left click “User Select” to get your selection tool “□”. Left click on the features in the optimum sort order keeping in mind that the part will be processed layer by layer. When finished with the sort right click outside the part and preview the .lmc.

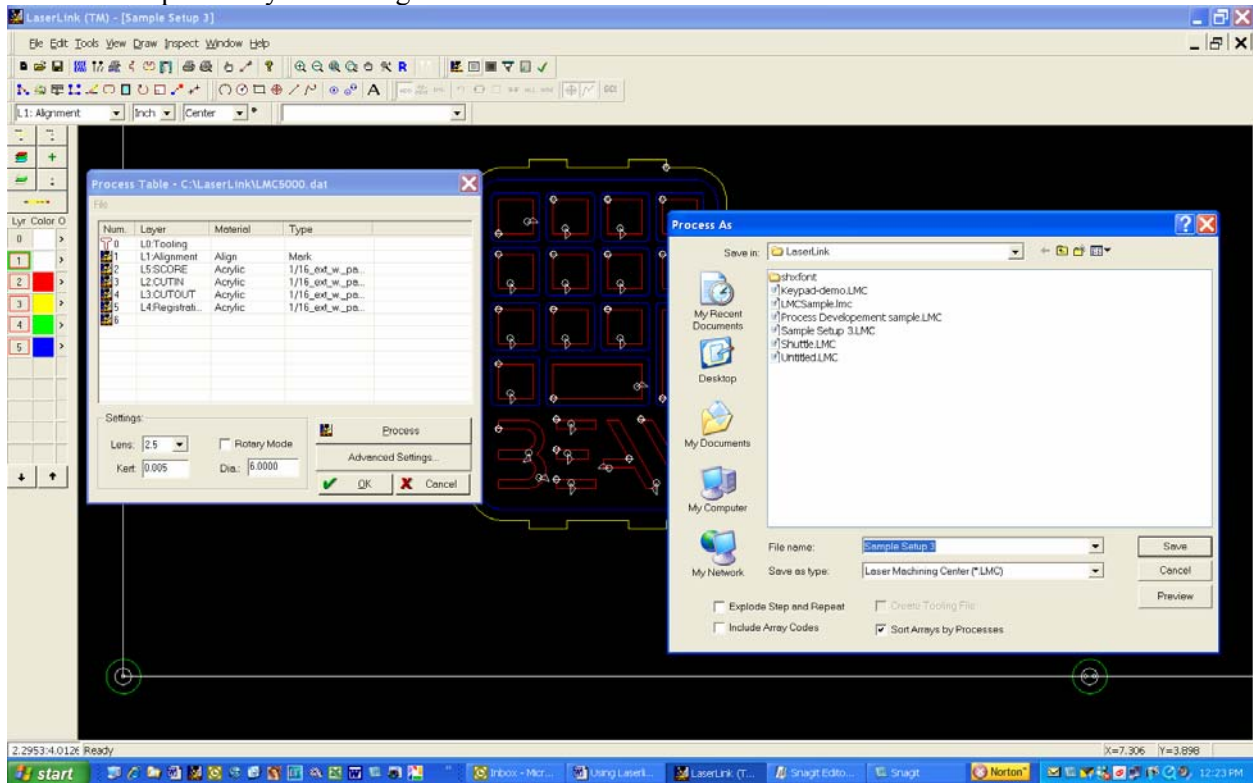






### Step by Step Sample 3 – continued.

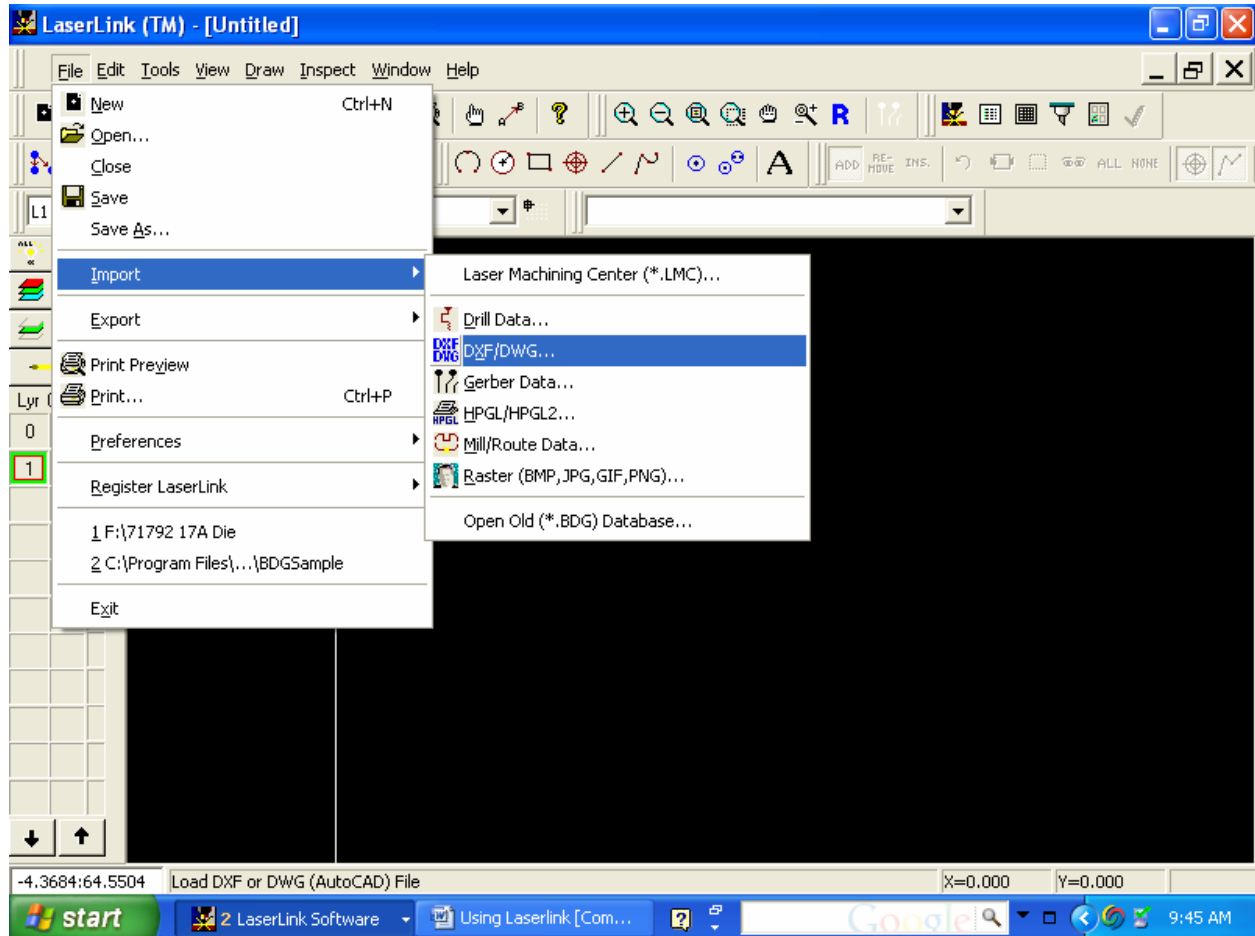
Save .lmc of part ready for cutting.





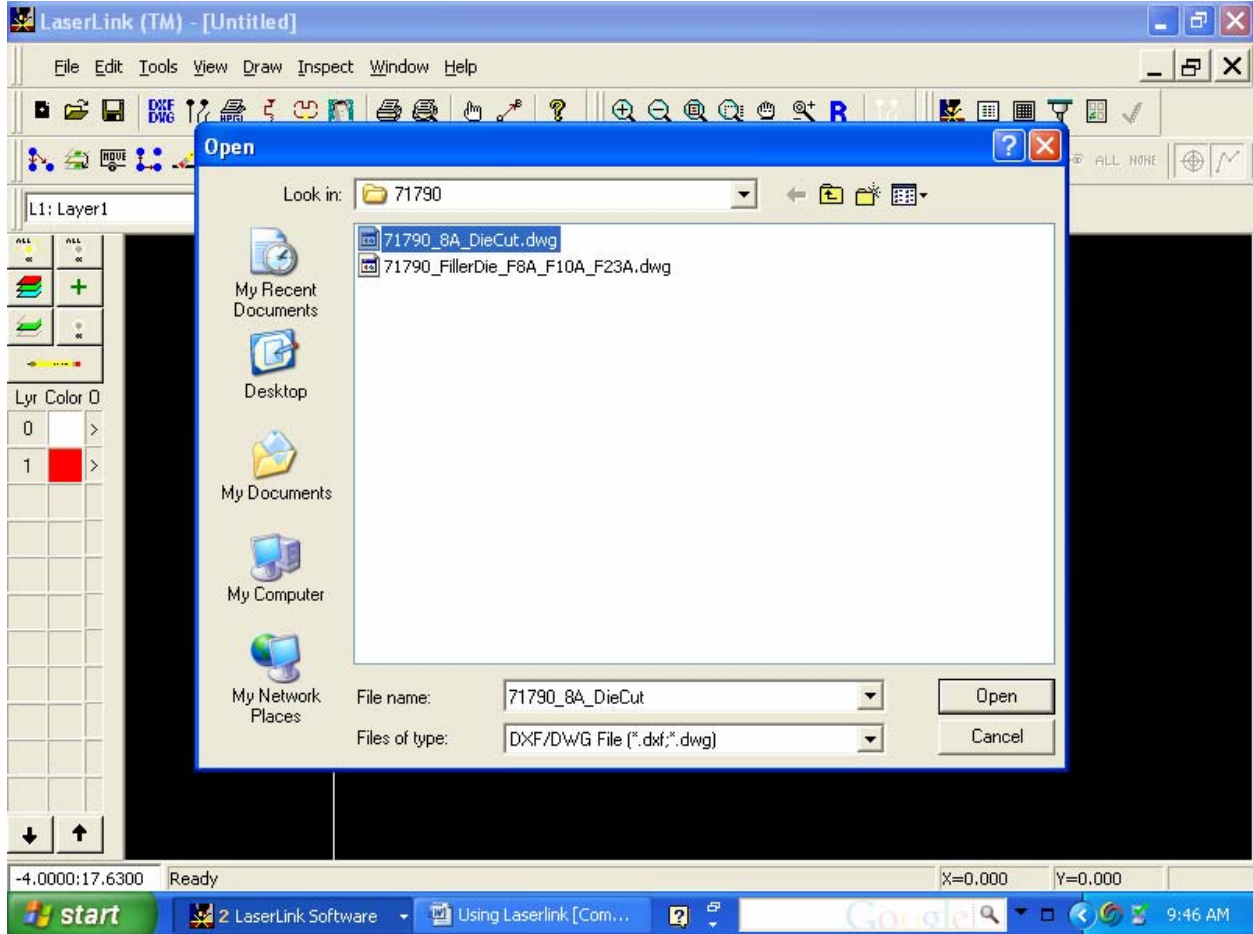
## Step by Step Sample 4 – Advanced - Import of multiple files and vision system job.

Import dxf for part – you can import multiple files into a single session of LaserLink.



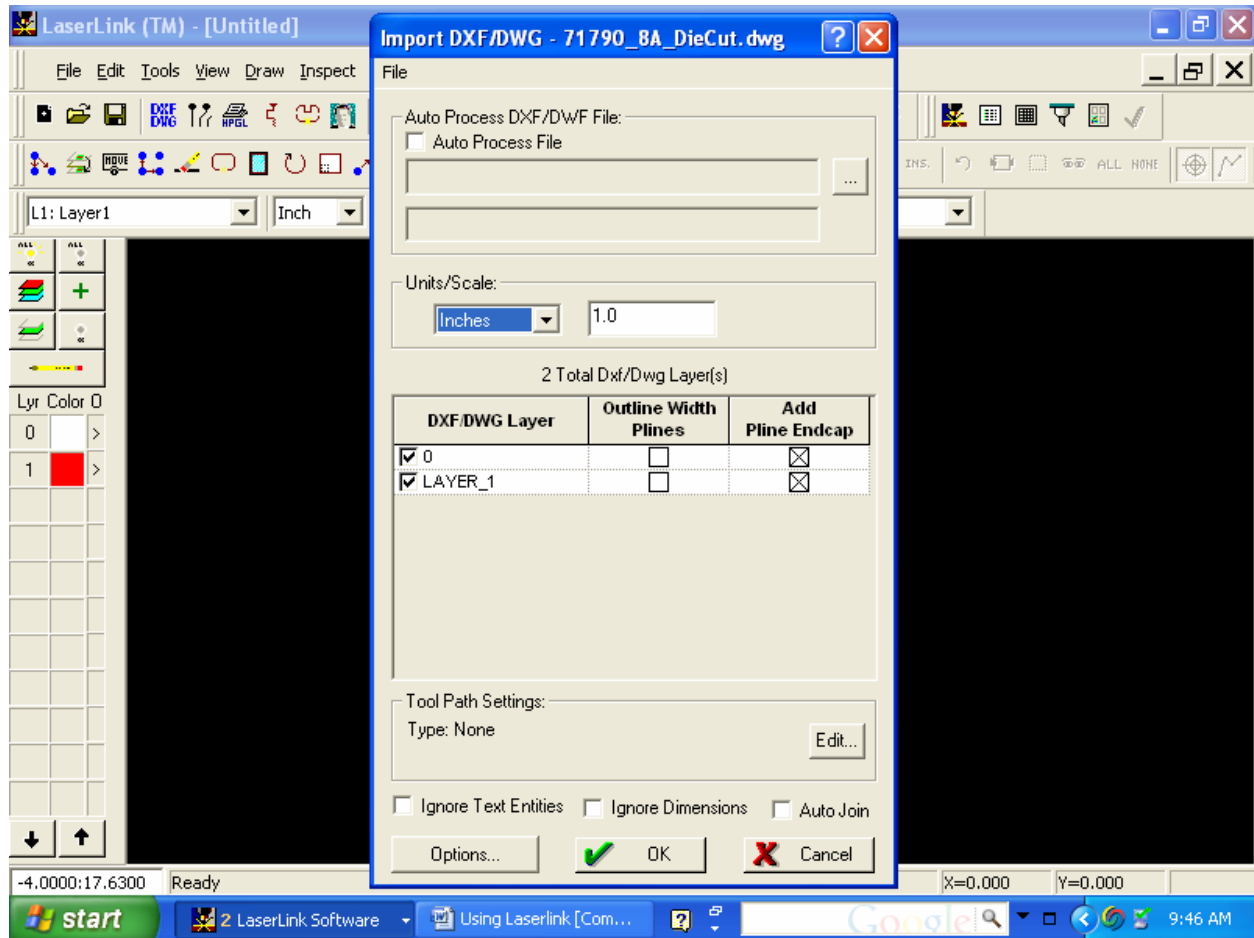
## Step by Step Sample 4 - continued

In this case import DieCut.dwg and FillerDie.dwg



## Step by Step Sample 4 - continued

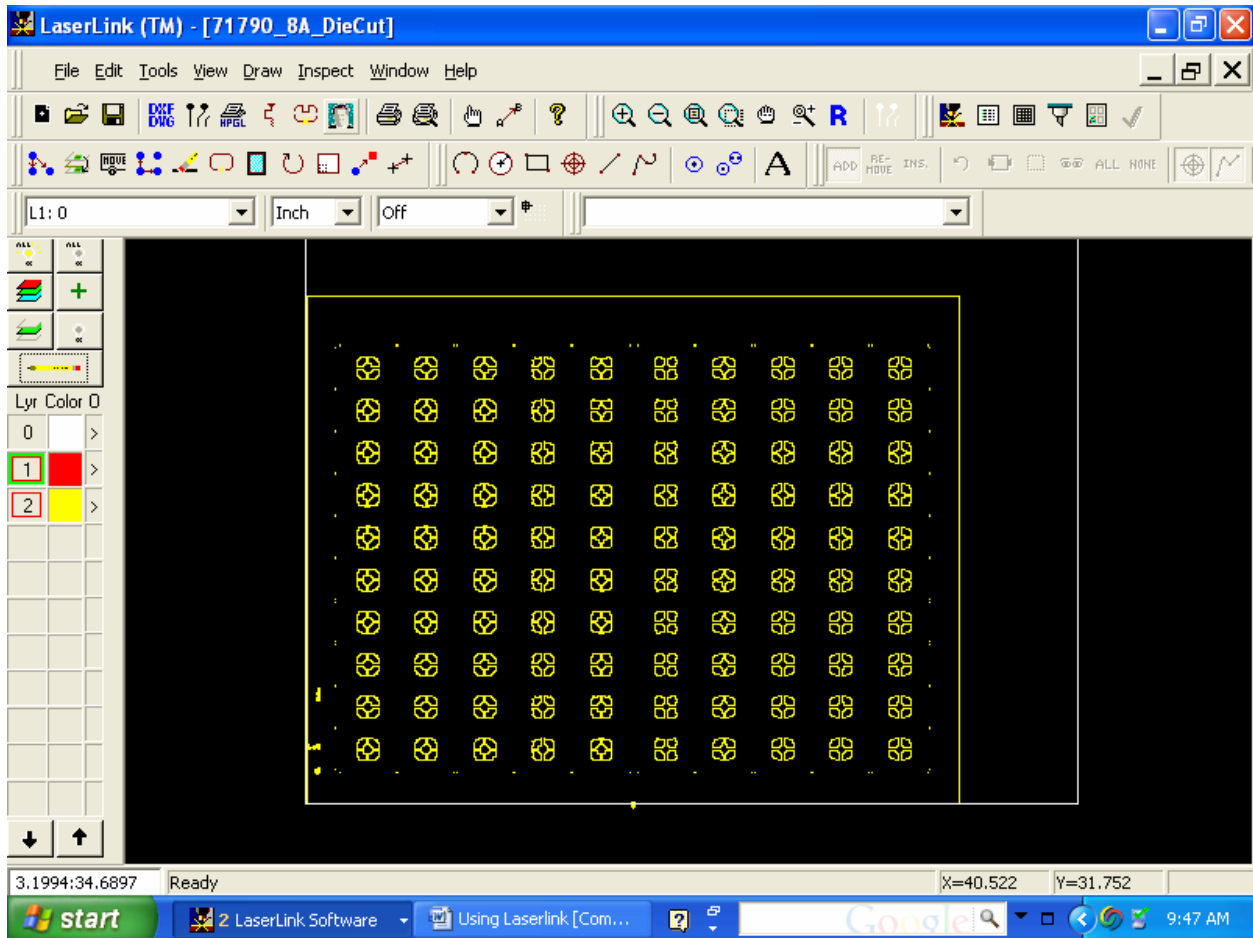
Dialogue box on import





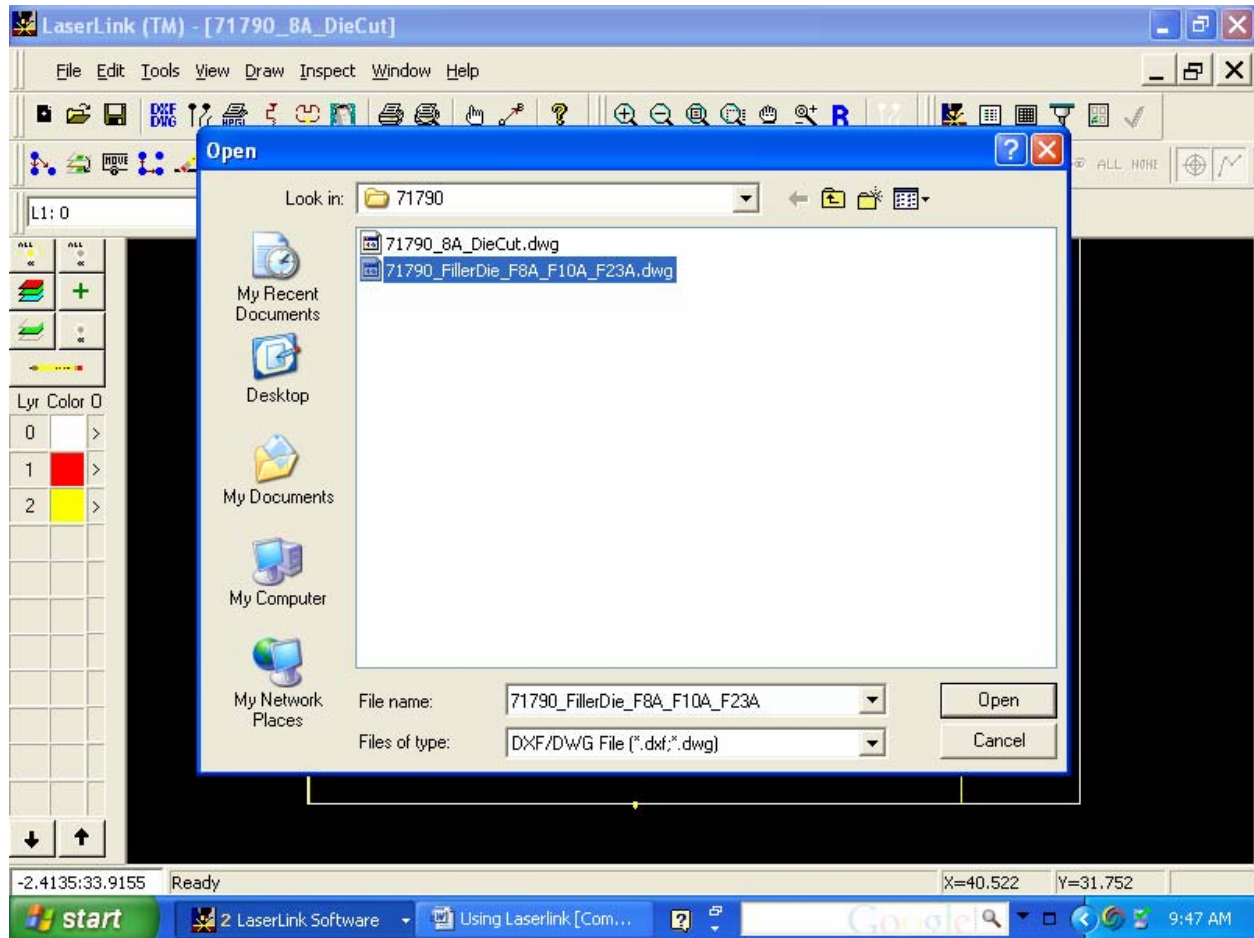
## Step by Step Sample 4 - continued

Import of dieCut



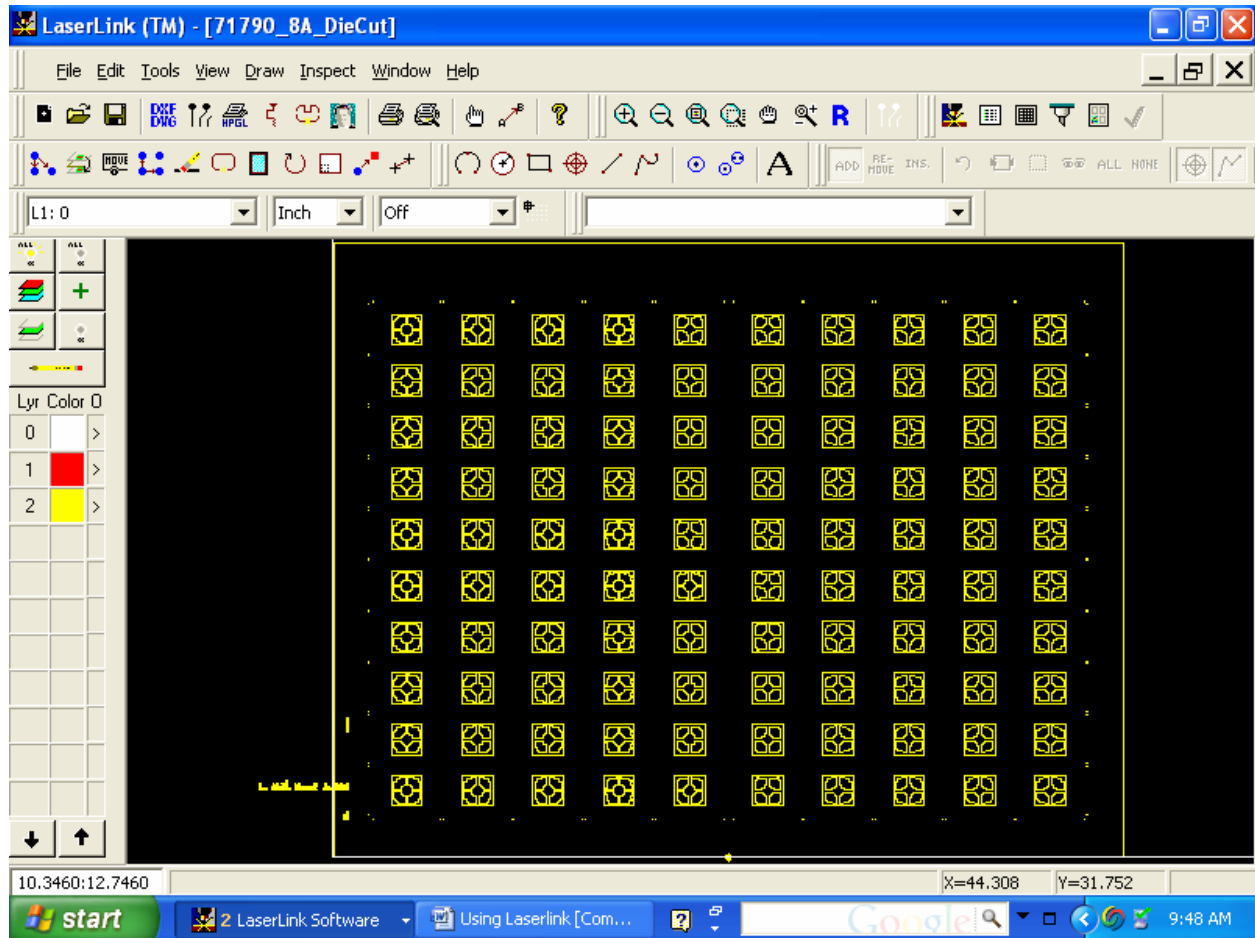
## Step by Step Sample 4 - continued

Follow the same steps to import FillerDie



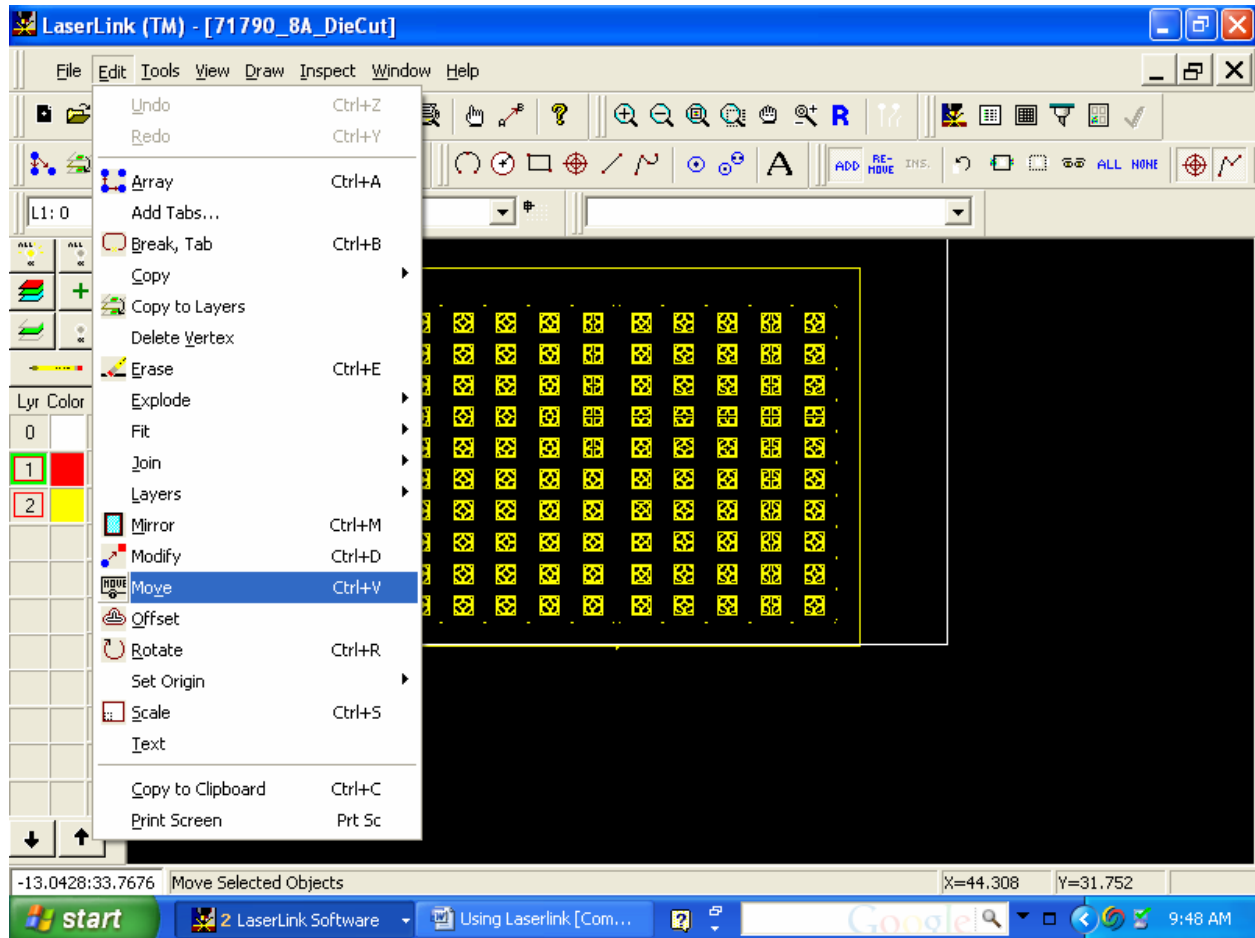
## Step by Step Sample 4 - continued

Image of both filler and cut dies



## Step by Step Sample 4 - continued

Move the image to the desired cutting bed position

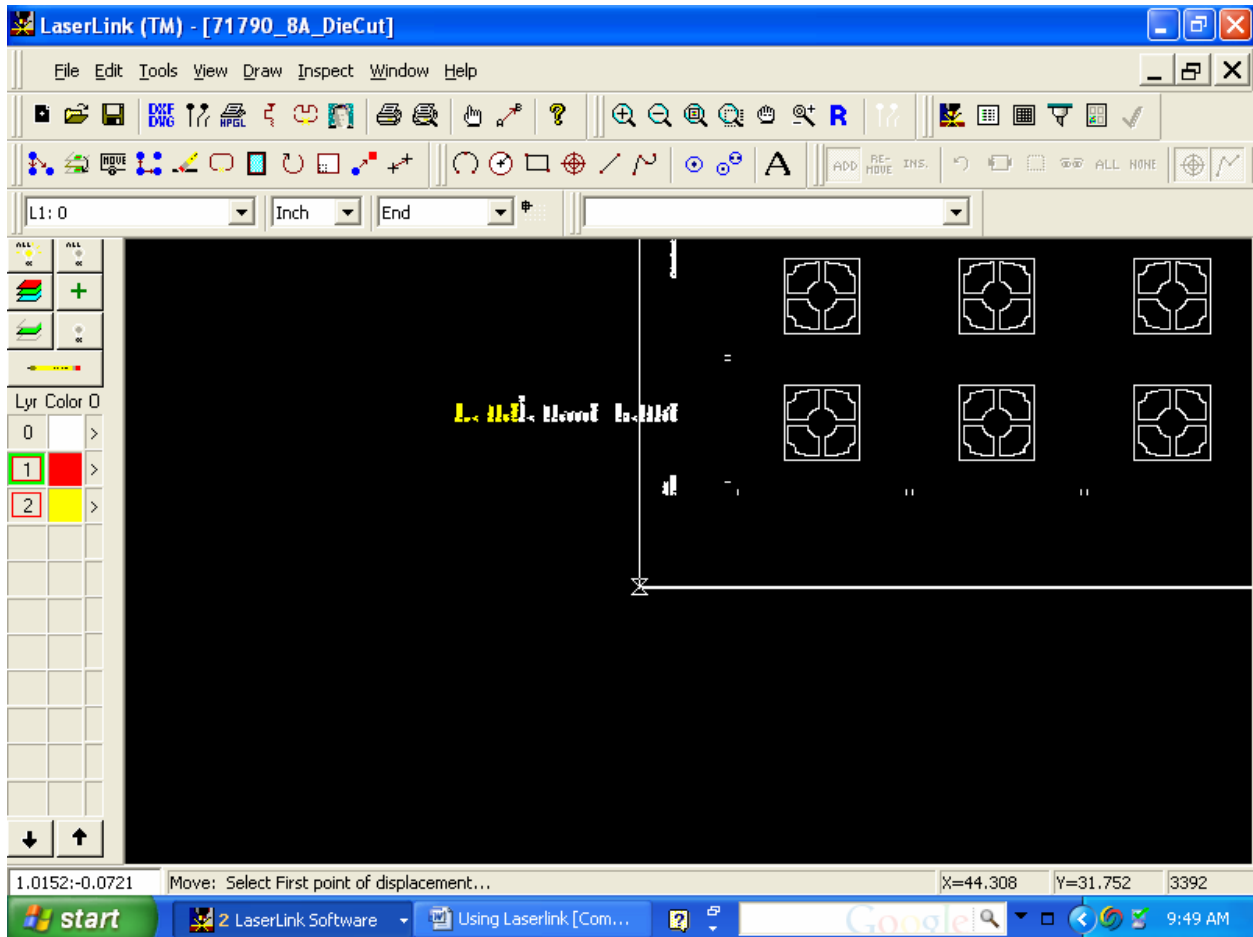






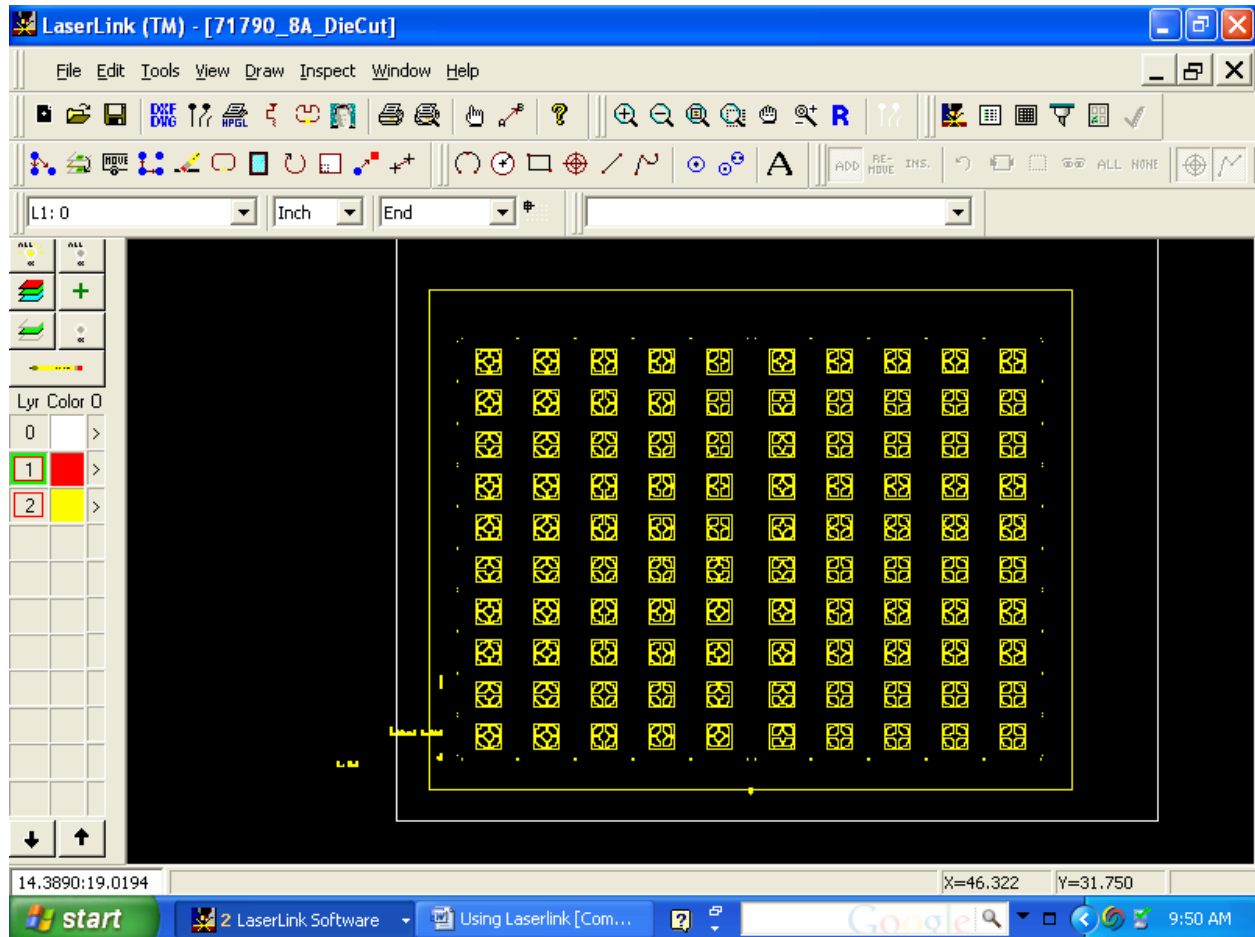
### Step by Step Sample 4 - continued

In this case, use the snap tool to snap to the bottom left corner of the sheet to select the first point of displacement.



## Step by Step Sample 4 - continued

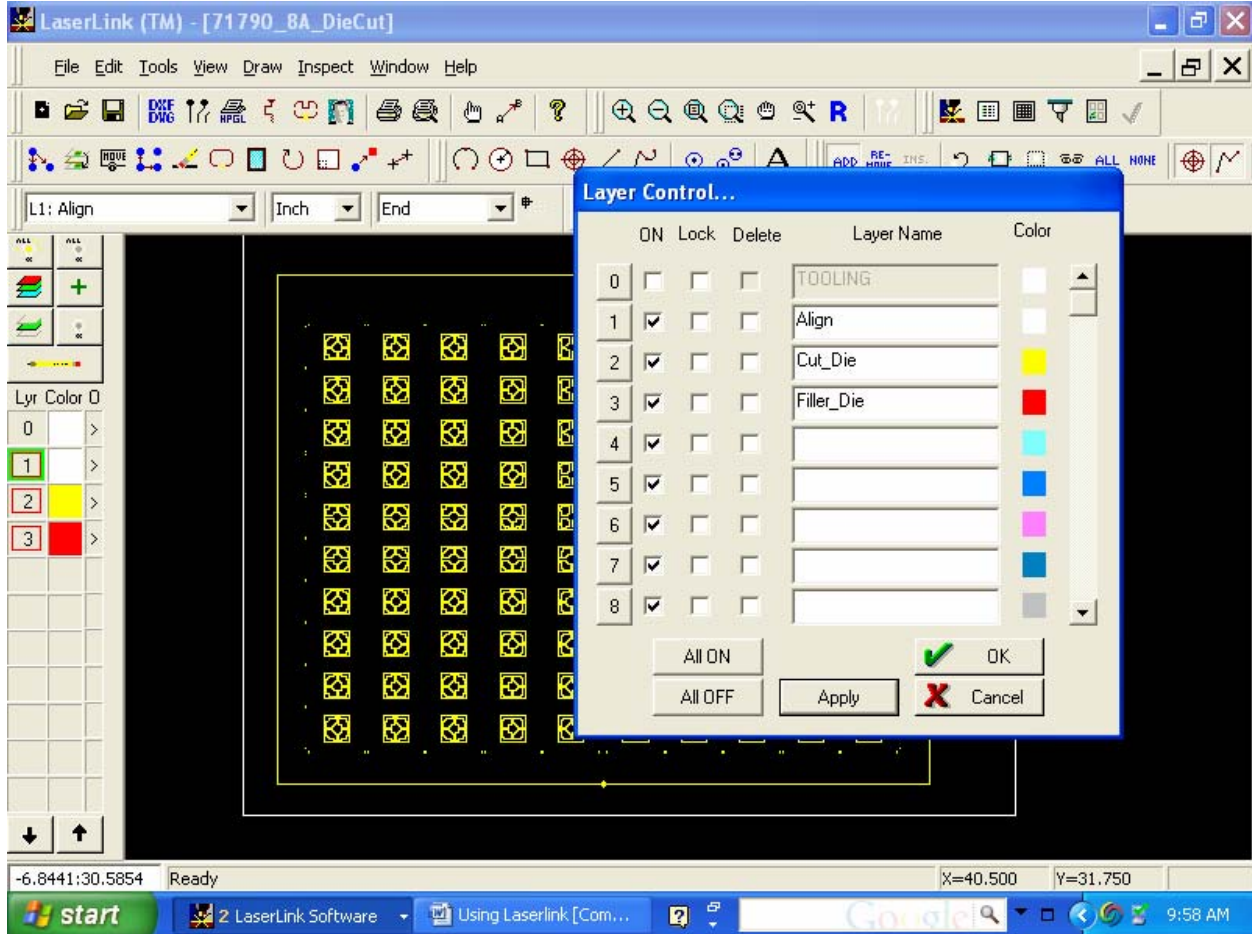
Use the coordinates box to enter the exact position of the second point of displacement – in this case,  $x=2.014$  and  $y= 1.965$





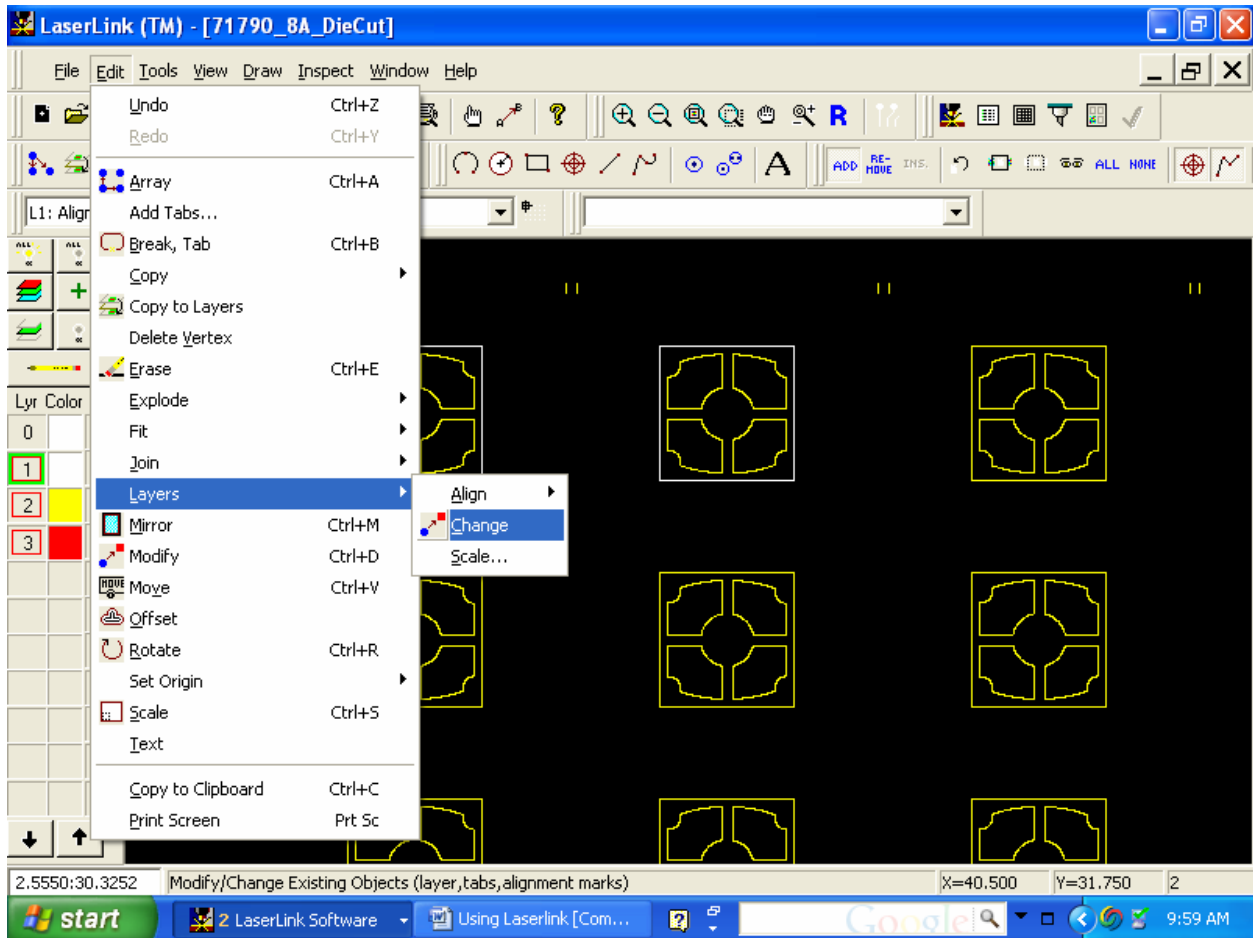
### Step by Step Sample 4 - continued

Assign layers – in this case, there will only be three layers – Align, Cut Die and Filler Die.



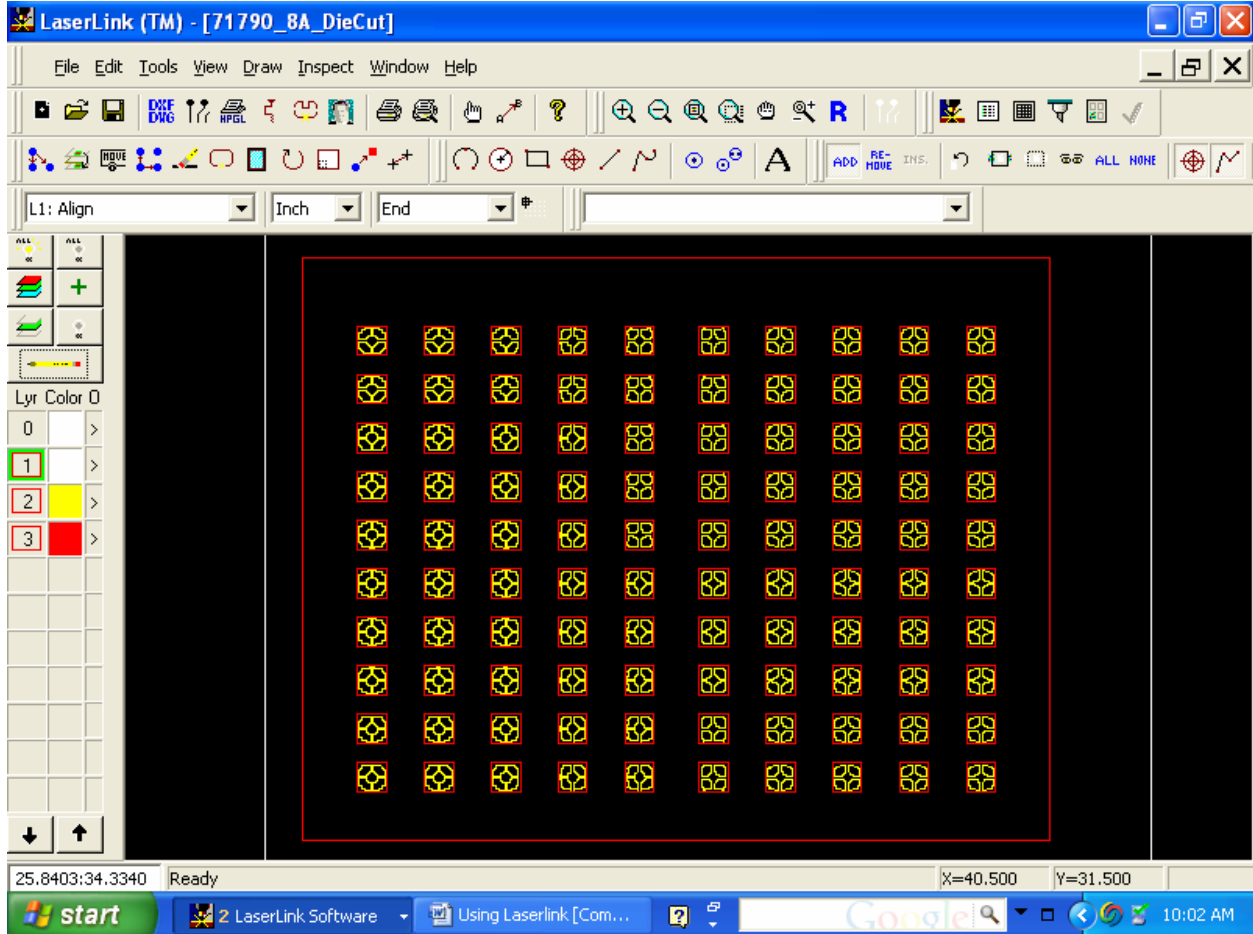
### Step by Step Sample 4 - continued

Use the "EDIT" "LAYERS" "CHANGE" tool to place features on correct layers



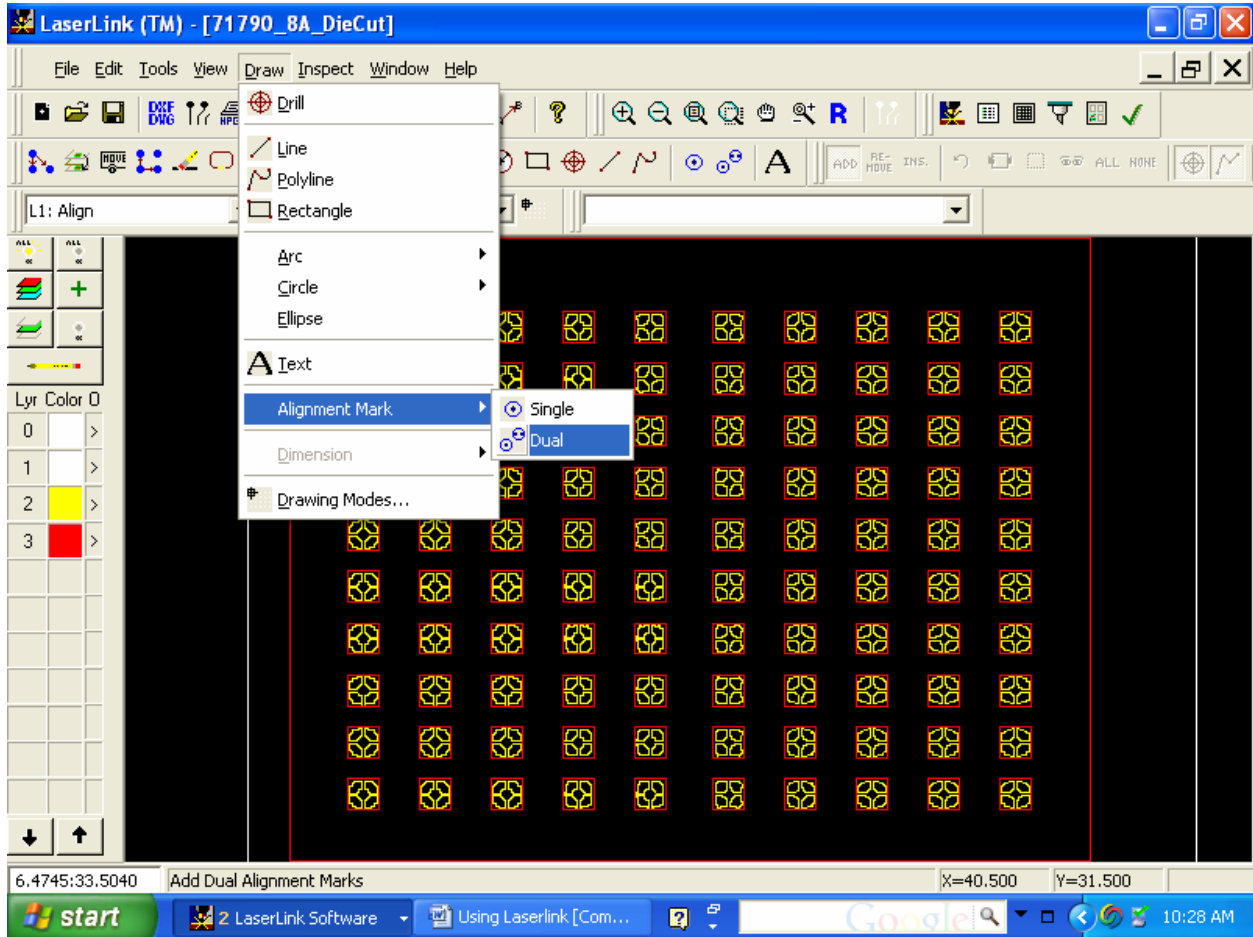
## Step by Step Sample 4 - continued

Features have been placed on correct layers



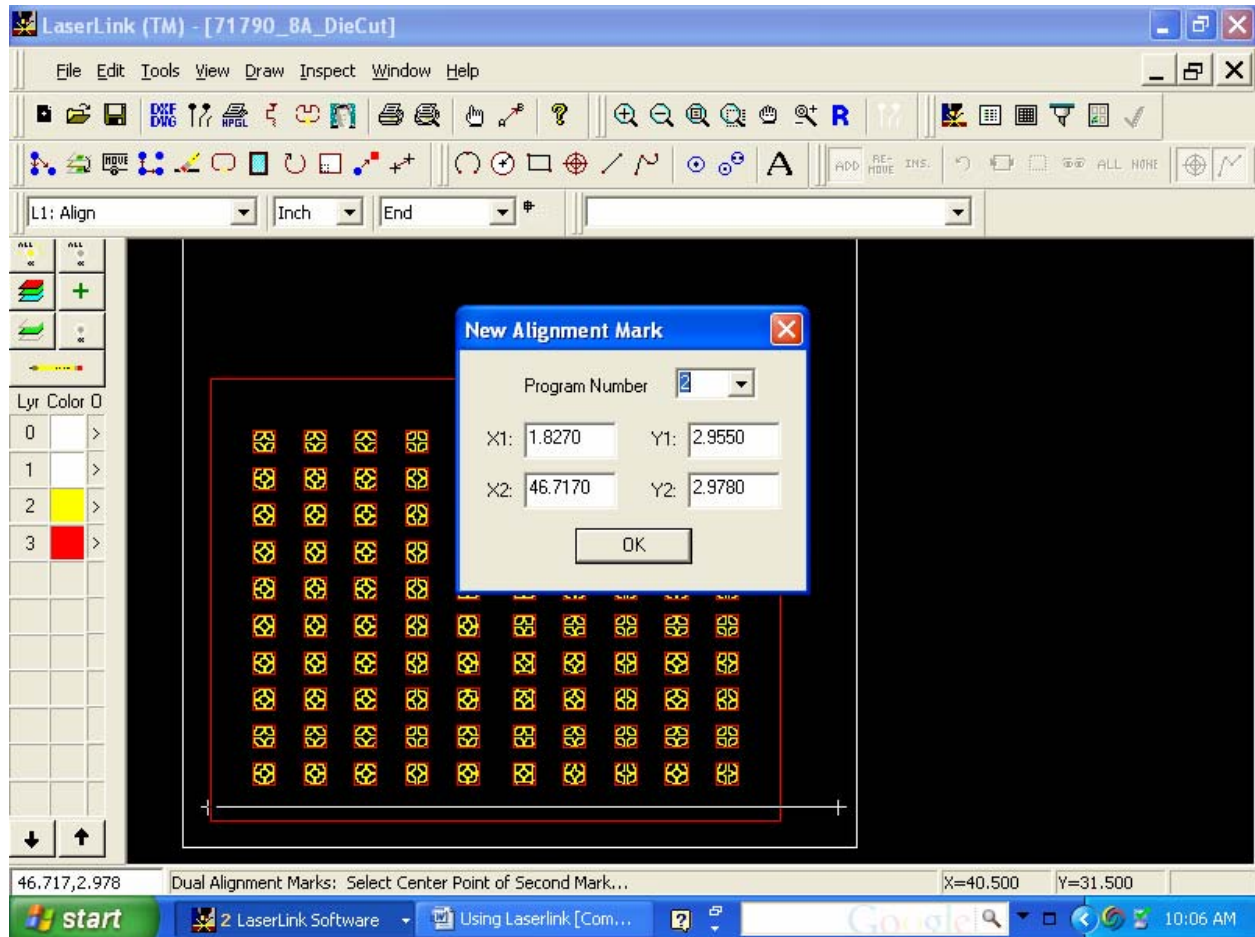
## Step by Step Sample 4 - continued

Use Snap tool to snap alignment marks to correct locations – in this case we are using alignment point one at  $x1.827$   $y2.955$  and alignment point two at  $x46.717$   $y2.978$



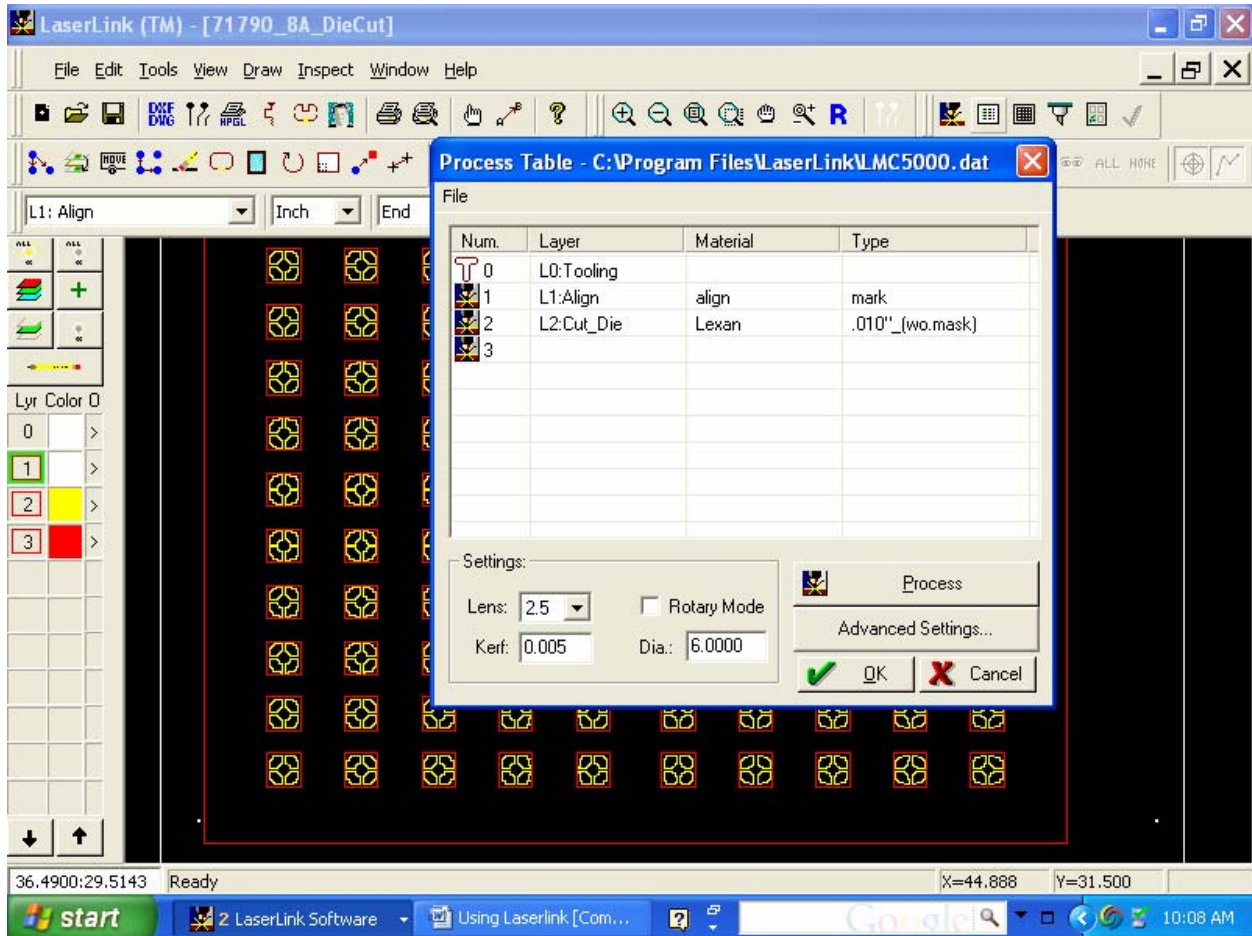
## Step by Step Sample 4 - continued

When the second alignment point is entered you will get the modify dialogue box. Enter the correct alignment mark that is stored in the vision controller – in this case we are selecting program number “2”



### Step by Step Sample 4 - continued

Create the process table and process the file to create the .lmc file. In this case, we are only using two processes. The first is to align the sheet and the second is to cut the die features. Although the filler die information is there we are not processing that layer hence it won't be cut.

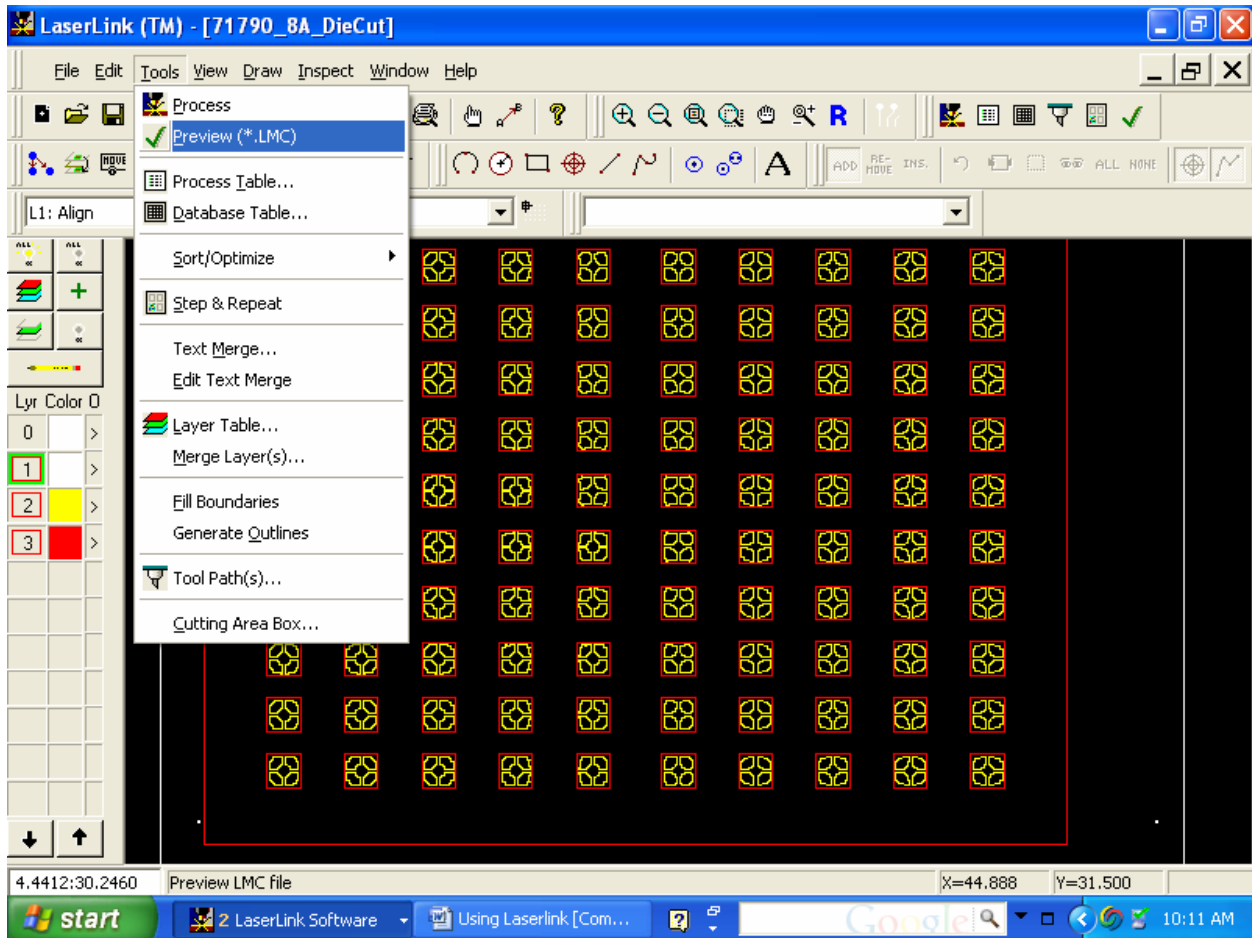






### Step by Step Sample 4 - continued

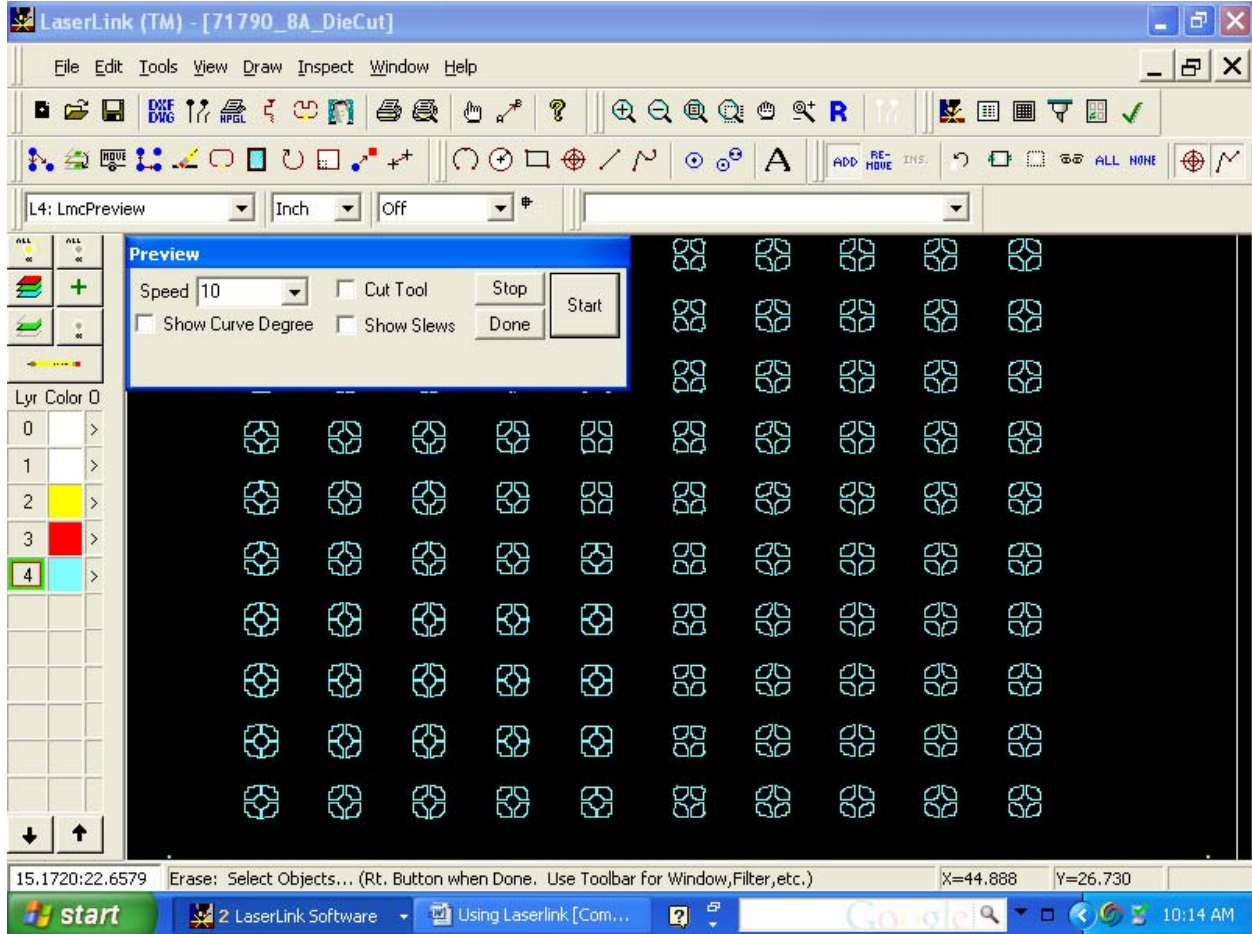
Preview the .lmc by selecting “TOOLS” “PREVIEW”





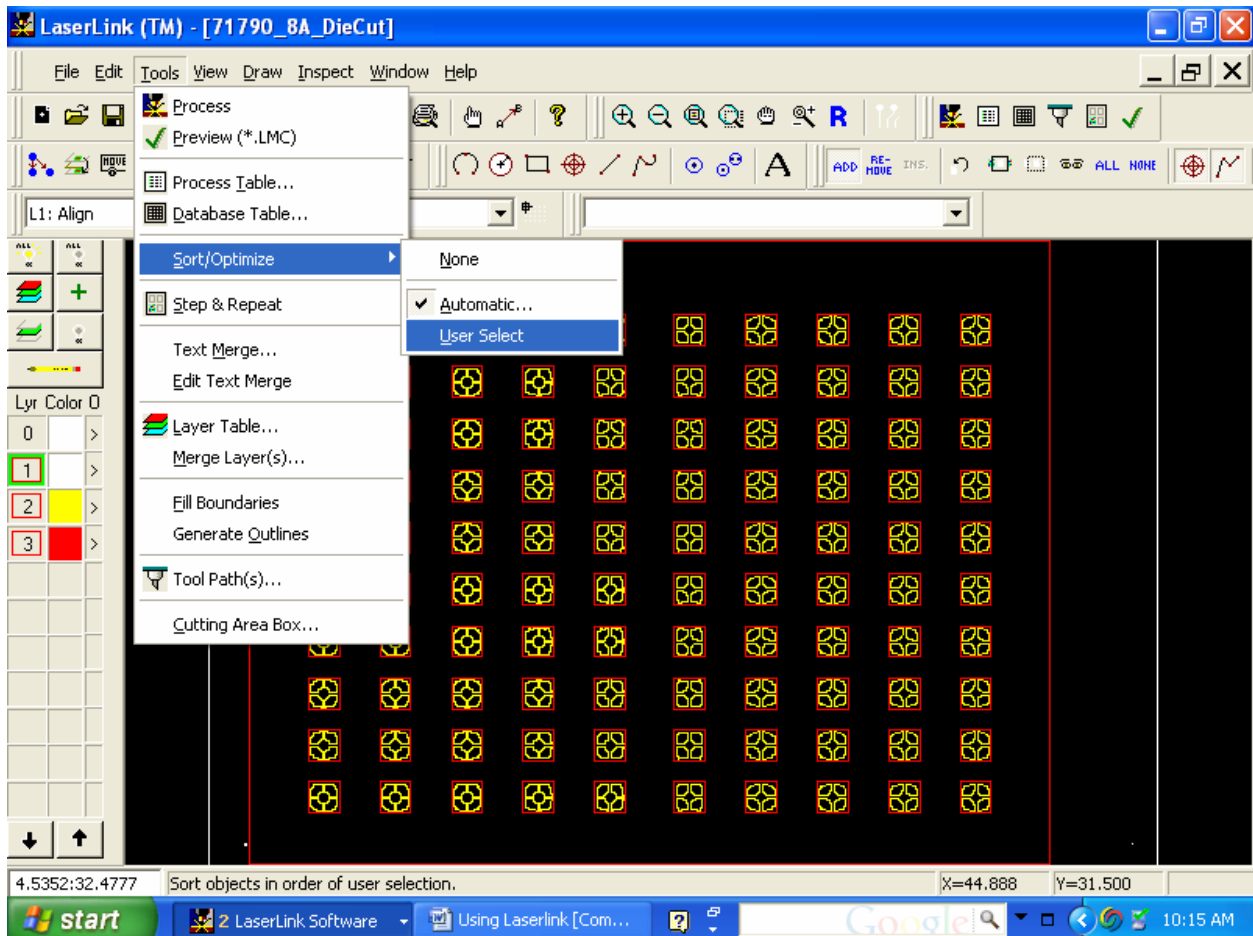
### Step by Step Sample 4 - continued

Select a lower number to refresh slower



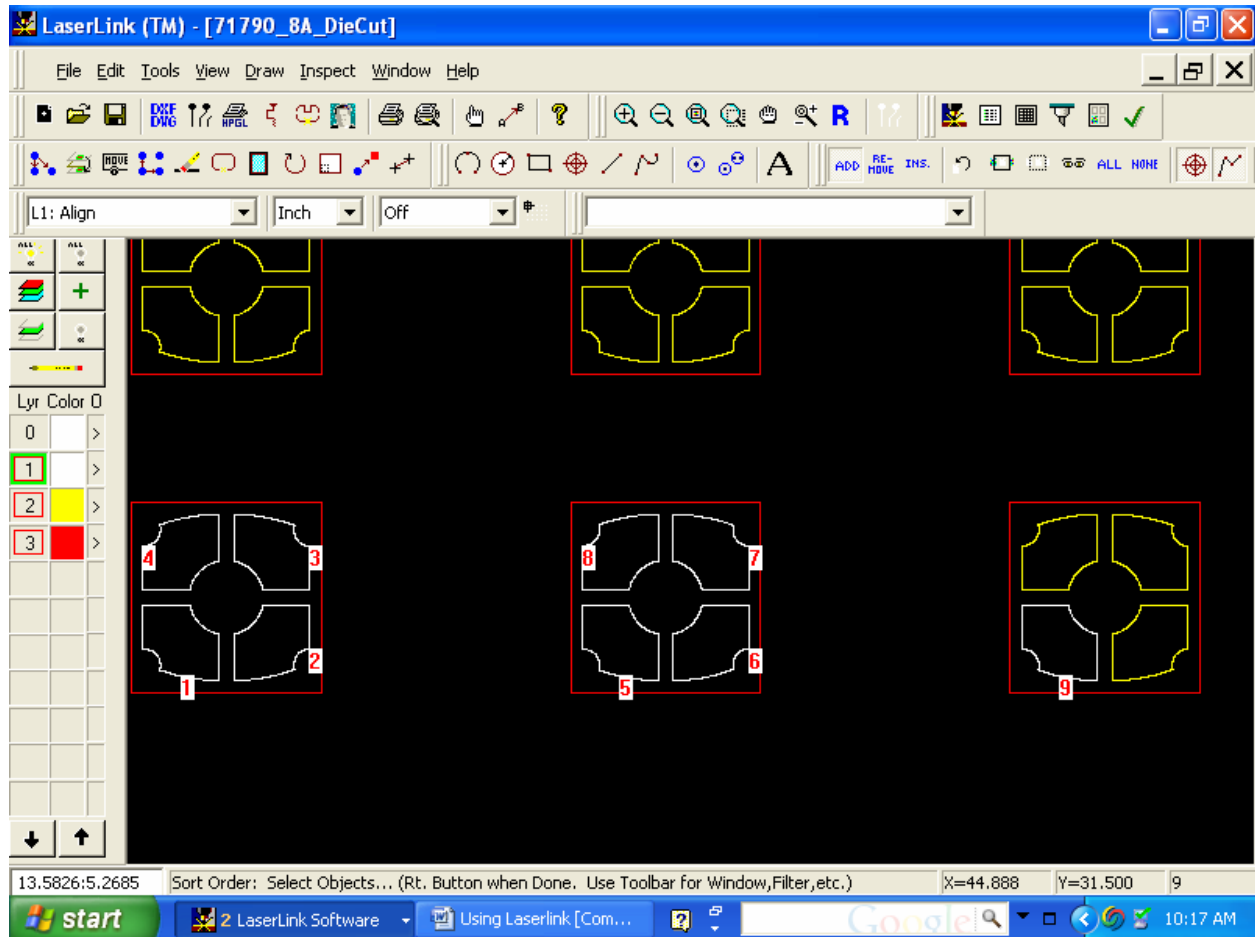
## Step by Step Sample 4 - continued

If you are not satisfied with the sort order you can either change the Automatic sort box size or use “TOOLS” “SORT/OPTIMIZE” “USER SELECT” to choose the exact order in which the parts are to be cut.



## Step by Step Sample 4 - continued

If you make a mistake and wish to ADD, REMOVE OR INSERT into the sort order use the shortcut tools.



## Step by Step Sample 4 - continued

Process issues – blemish at the cut start point. You may notice there is a small blemish on the top of the part at the cut start point for each feature. This is generally caused by the fact that there is no place for the waste gasses to go until the part is completely pierced. The waste gasses can just deposit on the top of the part. One way to avoid a blemished part is to use the “TOOLS” “TOOL PATHS” tool to create lead ins from waste areas. That way the blemish is on a waste area.

