

Designing Mats in DeltaCad

We will begin with an assumption of a basic working knowledge of X and Y coordinates and an understanding of some high-school level geometry. You should also have a good grasp of Windows 95/98 operation and file management.

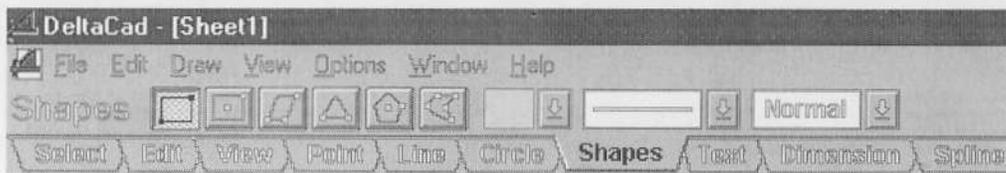
Our first example will be a standard, rectangular opening, double (layer), mat. This design can obviously be cut manually, or with the standard software of your computerized mat cutter, but it will help us to illustrate some of the basic principles you'll need to design more complex mats later.

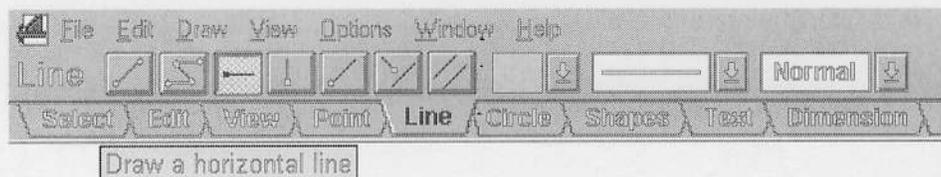
Our first step will be to select the "Shapes" tab in DeltaCad, and the default Shapes tool which is "Draw a Rectangle Using two Corners". We will start by drawing the outer dimensions of the mat which will be 11"W X14"H for this example.

Enter the coordinates 0,0 for the lower-left corner of the mat, or "origin" point. Press the Enter key after the second "0", and make sure you use a comma between the two numbers and not a decimal point. The command bar at the lower left portion of the screen will now prompt you to enter the second point of the rectangle.

Enter the numbers 11,14 for the width and height dimensions of the mat respectively, and press Enter again. Press the Ctrl+A keys to view the entire 11x14" rectangle.

The below rectangle should now be shown on screen: (The X,Y coordinates of the two corners we have designated will not be visible on your screen; they have been added for illustration purposes only.)





Now let's draw the actual mat openings for each layer of mat. We'll begin with the bottom, or inner layer of mat first, since we usually know the total width of mat borders. For our example, we'll use a mat border of 2.5" on each side.

Next we'll click on the "Line" tab on the toolbar, and select the "Draw a Horizontal Line" icon. Then, let's change our line color to red by clicking on the down arrow button (Choose a Color), just to the right of the black color block on the toolbar. Click on the red color block in the palette, your color block should now be red.

The command bar will now prompt you to "Select first point, or enter X,Y". The coordinates of our first point will be 2.5,2.5 ; this is the relative distance, in inches, from our origin point of the mat which is the lower-left corner (0,0). After entering these coordinates, a short red line segment should be visible at the lower portion of your rectangle. Move the mouse cursor in the direction which you want the line to be created, in this case to the right of the initial point.

The current instruction prompt will now be to "Enter length" of the line, which will be 6", representing the width of our mat opening. Press "6" and Enter now. A red, horizontal line should now be shown in the correct location.

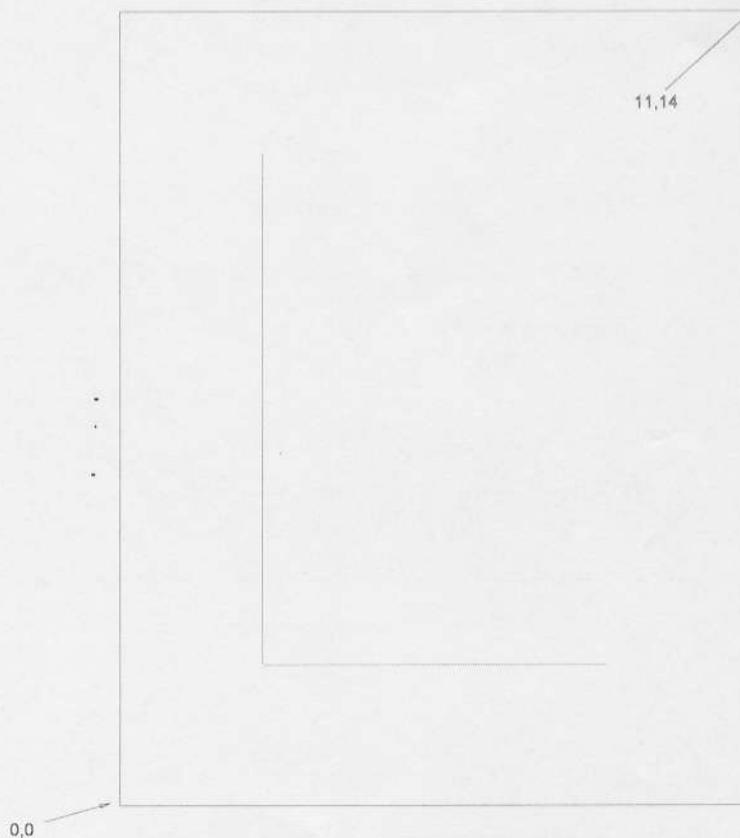
The next step will be to create the left, vertical edge of the mat opening. Click now on the "Draw a Vertical Line" icon on the same "Line" tab. Again we are prompted to "Enter first point" of the line, which we can do either with the mouse or by entering coordinate values as before. Since we already have the starting point of this line created, (the left end of our first, horizontal line), it's much easier to simply hold the mouse cursor over the left-endpoint of our first red line. When you do this, a small "crosshair" will be visible. This indicates that you can now "snap" precisely to this point by clicking with the mouse now.

After clicking on that point (2.5,2.5), the prompt will be once again to enter the length of the line, which will now be 9". Press "9" and "Enter" now to finish the vertical line.

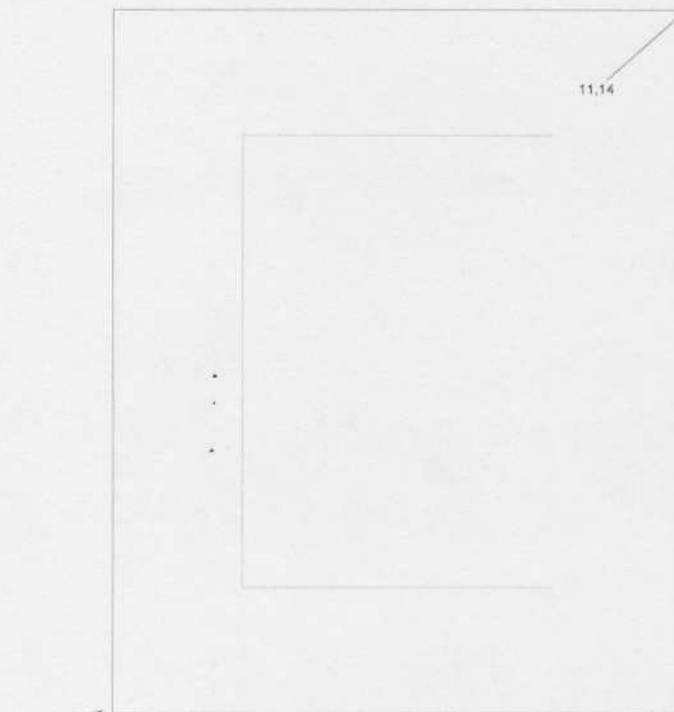
The drawing should now look like this:

At this point, there are several methods of completing the rectangular

opening. The one we'll use will give you a bit more practice using the "crosshair-snap" feature of DeltaCad.



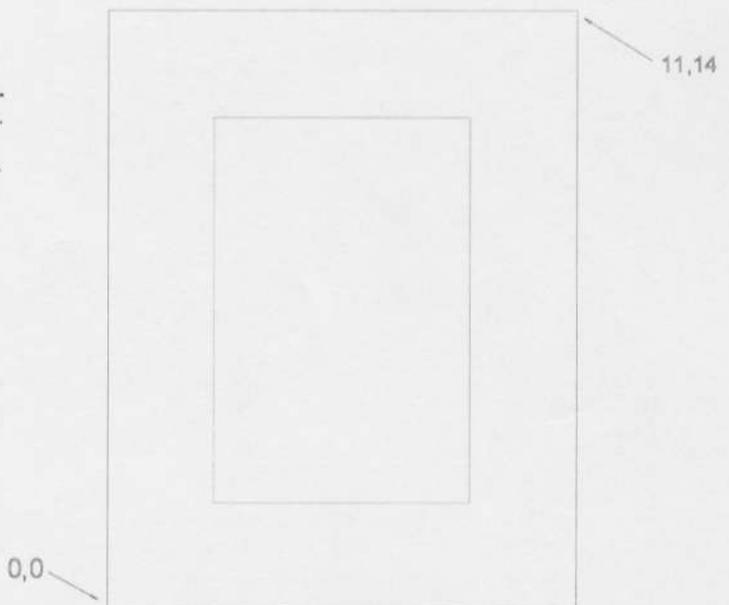
Select the "Draw a Parallel Line" icon from the "Line" toolbar. "Select a Line" is the command prompt. Click anywhere on the bottom, horizontal red line, and a parallel red line will appear, following the mouse cursor location. Move the cursor onto the top endpoint of the vertical red line and click when the crosshair appears. The top line will now be drawn, as below:



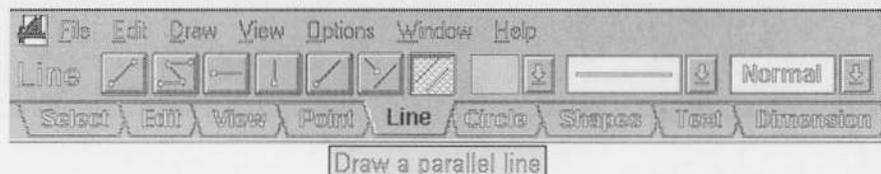
For the final line of the rectangle, click onto the left-vertical line and move the cursor to the right and onto the right endpoint of either the top or bottom red horizontal lines. Click the mouse when the crosshair appears as before, and your mat opening is now complete!

To draw the four lines of the outer, or top mat layer, we'll first change our line color back to black. If you've forgotten how to change colors, refer back to the instructions above.

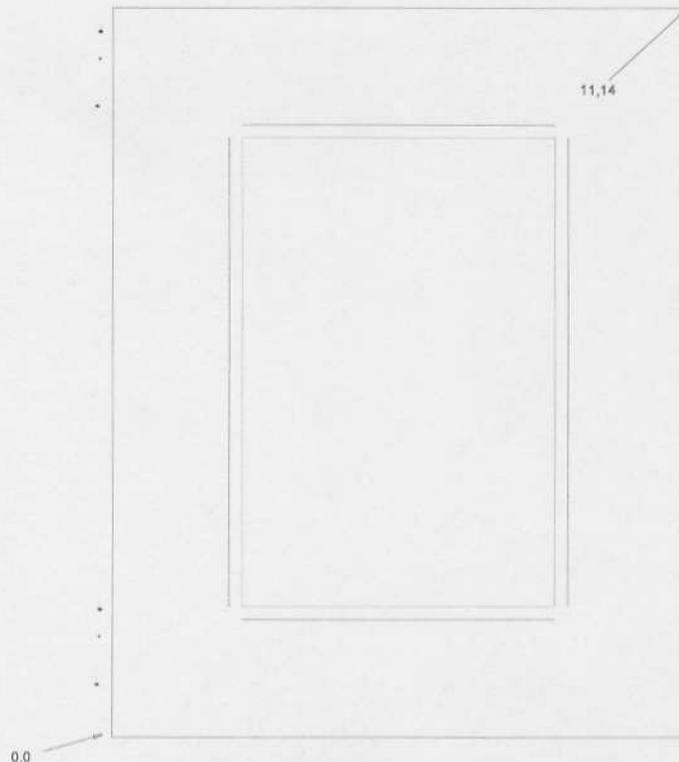
Re-select the "Draw a Parallel Line" tool icon from the "Line" tab. Click on and select any of the four red lines; the line will be "selected" when it lights up in a different color, usually red. (Red lines will show as selected in *magenta*). The prompt will now read: "Enter offset..." Move the mouse cursor to the outside of the red rectangle a short distance and enter an offset, or distance from our reference line of .25. (This will represent the width of the inner/ bottom mat reveal.)



Tip: If your new, black line appears on the wrong side of the red line you selected, simply press the "Ctrl + Z" keys. This is the keyboard shortcut command for "Undo", and can be used anytime you've made a mistake or would like to back up a step in your drawing.

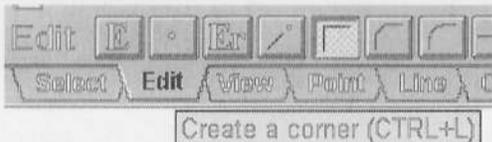


Repeat this step for each of the four red lines making up the red rectangle. A really neat speed feature of Deltacad is the ability to use the right mouse button instead of the Enter key. For the second, third and fourth lines all you need to do is click to select the line, move the cursor to the correct side of the line, and right-click. Cool, huh? Your drawing should now look like this:



Notice however, that the four new black lines are not joined at the corners. This is because they have retained the same length as the red lines they were created parallel to. To join these lines in precise corners, we first need to select the "Edit" tab from the toolbar. The various tools on the Edit tab allow you to change, or modify, many of the existing qualities of your drawing's entities (lines, arcs, etc.) You may move your cursor briefly over each edit tool to get an idea of what type of changes are possible with the Edit tab. Select the "Create a Corner" tool icon, which looks just like a right-angle corner. The command prompt will read: "Select first line or arc". Click on any of the four, un-joined black lines, and then an adjacent line you want to join it to (Select second line or arc). The two selected lines will now be joined in a precise 90-degree corner. Repeat the process for the other three corners and your double mat is now complete! If your drawing doesn't look like this:

then, well, you goofed *somewhere*. Go back and check each step again. Don't forget that trusty Undo command, (Ctrl + Z). It can really make your day.

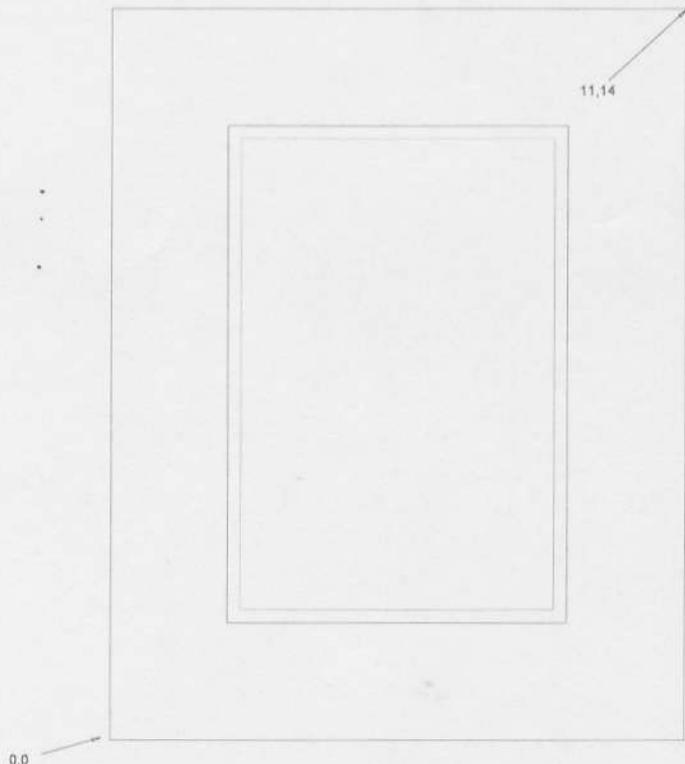


Edit tab and "Create a Corner" tool

Editing the Mat Drawing

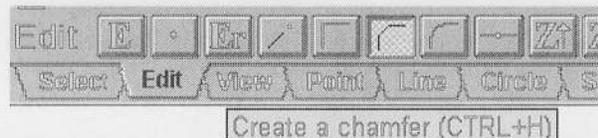
Here's where the fun begins, gang. We are now going to make some simple changes to the mat in order to create a unique design.

The first modification is going to be creating slanted, or *chamfered*, corners on two, diagonally opposite corners of the



mat. But first we're going to save the design as it is right now, as we may want to go back to it later. Save it as "Dblmat1" for now.

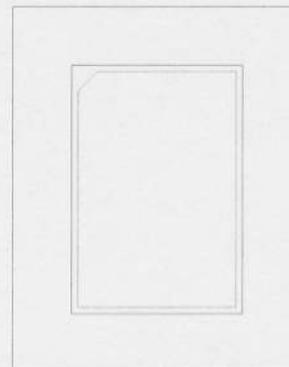
Click on the **Edit** tab on the toolbar, and select the "Create a Chamfer" tool icon, (it's just to the right of the "Create a Corner" icon we just used). The command prompt will read, as before, "Select first line or arc". Click



on the left side, vertical red line of the mat, and then the top, horizontal red line when prompted to select the second line. The prompt will now ask you "Enter chamfer length". For this example we will enter .75, for a 3/4" chamfer. (this is clumsily referred to as "Slant Point" in the F-6100 software.)

The upper-left corner of the red, or inner mat layer will now have an angled corner, as shown at right:

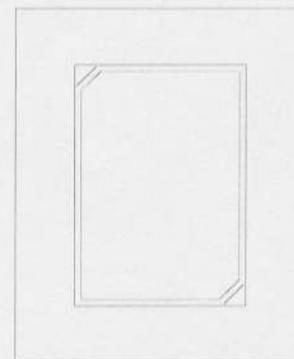
To repeat the operation in the lower-right corner, simply click on the right side red line, and then the bottom red line, and either press the Enter key or click the right mouse button to create another 3/4" chamfered corner. Easy, right? Yes, but we're only half way there.



We now want to create a corresponding chamfer on the top (black), layer of mat.

Click now on the "Line" tab, and select the "Draw a Parallel Line" tool icon. When prompted, select the upper left chamfer, or slanted red line of the design. Move the mouse cursor up and to the left slightly to correctly orient the new line, and enter .25 as the offset. (Since we used the same 1/4" as our previous offset, you should only need to press the Enter key or right-click the mouse.) Repeat this step for the lower-right corner as well now.

The drawing should now look like this:



Now all we need to do is create four corners where the two black chamfer lines will meet the four sides of the mat opening. If you are having difficulty clicking on the short chamfer lines, you may want to Zoom in to get a better view of that region of the drawing. To do that, click on the "View" tab, and use the default View tool (View objects within rectangle). Simply click once near the area you want to see more clearly. A view box will appear and follow the mouse cursor until you click a second time once you have enclosed the view area desired. Let's do this now for the upper-left corner, just for practice.

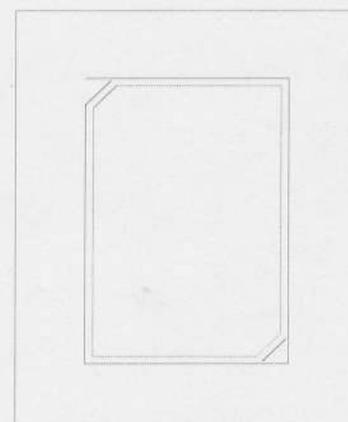
Ah, much better, non?

Click back to the **Edit** tab, and select the "Create a corner" tool. Click on the left vertical black line and then the chamfer we want it joined to.

This drawing should now look like this:

OK, the rest is easy. Click on the other three pairs of lines we want to join, and our new mat design is now complete!

Tip: Not sure how to use a certain DeltaCad tool? Simply press the F1 key at any time to display the Help screen for the tool that is currently selected.

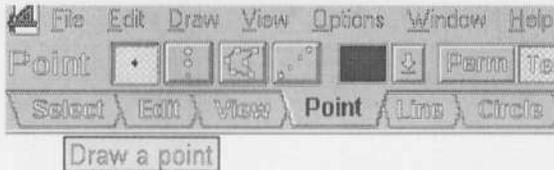


Drawing Inset Openings

Let's say you wanted to place two small "inset" openings in the borders of the two chamfered corners that were just created. Here's one way to do it.

Let's start with a zoomed in View of the lower-right corner area of the mat design. Get in fairly close, as we'll be working on some smaller details this time.

Click on the **Line** tab, and select the Parallel line drawing tool. Select the black (top mat) chamfer line, move the cursor to the right/down slightly, and enter an offset distance of .375, or 3/8".



Next, select the "Point" tab from the toolbar, and make sure the default Point tool icon "Draw a point" is selected. The prompt will be to "Select existing point, ... or enter X,Y" For this example, we will select the lower-right corner of the mat itself (the 11,0 point), as our starting reference

point. Make sure it is visible on your screen, and use the scroll-bar(s) to move the drawing image if you can't.

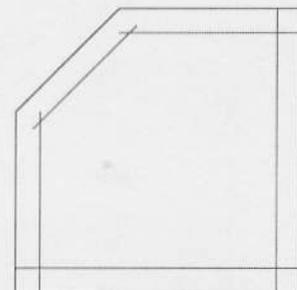
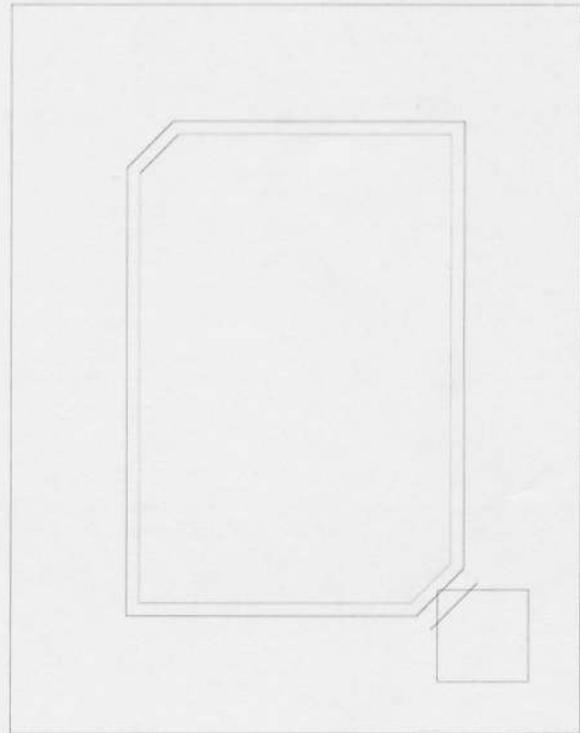
When the "crosshairs" of the corner point light up at the lower-right corner, click the mouse to select it. The prompt will now be much the same except the word "Offset" will appear below it. We will be creating a Temporary Point 1 inch to the left and 1 inch above this corner point. To do this, enter -1,1 as the offset. (Negative (-) distances are left (X) and down (Y), and positive (no plus + sign needed) distances are to the right (X) and up (Y).

A small red dot, or "temporary" point, will now be visible above and to the left of the corner reference point. We'll use this as the starting point of our inset opening.

Click on and select the "Line" tab now, and select the "Draw a horizontal line" tool. Select the red temporary point as the first point, move the cursor slightly to the left, and enter a line length of 1.75. Select the "Draw a Vertical Line" tool, and draw a vertical line up 1.75" from the same starting point. Now, with the same Vertical line tool active, draw another line up from the left endpoint of the bottom, horizontal inset line, also 1.75". For the last line, click back to the Horizontal line tool and draw a line to complete the 1.75" square. The drawing will now look like this:

OK, now click on the **Edit** tab, and again select the "Create a corner" tool. Trim the two upper left corners of the inset opening to form a clean chamfer just like we did with the corners of the main opening.

Next, let's draw the bottom mat layer, in red once again. Click the **Line** tab, change the line color to red, and select the "Draw a parallel line" tool. Select any of the lines of the inset opening, move the cursor toward the inside of the opening, and enter an offset of .15 or ~1/8". Repeat this for the other four lines of the inset opening until it looks like this:



Now select **Edit**, Create a corner, and trim up the five overlapping line intersections of the inset bottom mat layer. I know, you didn't think it was going to be this easy, right?

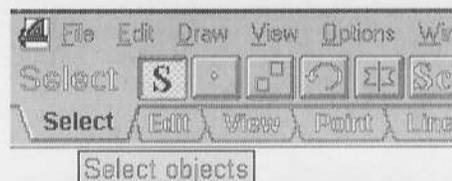
All that's left now is to place another inset in the diagonally opposite corner. We could redraw another one like we just did, but "Nah, way too much work!" There is a much easier, faster way to do it, using the "Select" tab, (see below), which we haven't covered yet.

Select "Select", and make sure the default "S" or Selection tool is active. This tab allows us to make modifications to any or all entities in our drawing, such as Move, Rotate, and Mirror. For this example we'll be using the Rotate tool, but not just yet.

First you'll need to select the entire inset opening; both layers- you are still zoomed in on it, right? Using the Select tool is much like using the "View objects in a rectangle" tool, in that you draw a box around the object(s) you would like to Select, rather than view closer.

Starting from below and to the right of the inset opening, click once, and then move the selection box around the entire inset opening, up and to the left, then click again. All of the lines in the inset should now have changed color; black lines became red, and red ones are now magenta. HOWEVER, depending how far up and to the left the cursor was when you clicked the second time, you may have inadvertently selected one or more lines from the main mat opening as well. To "Deselect" those lines (and you'll know which ones they are by their changed colors), hold down the Control (Ctrl) key as you click on each one and they will toggle back and forth between selected and unselected. Exciting stuff, eh?

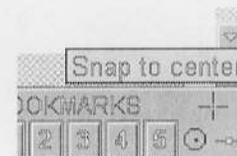
Once you have properly selected all of the lines from the inset opening only, click on the "Rotate" tool icon- it's the one that looks like a CCW arrow. The prompt is now "Enter rotation angle or press Enter for 90". Go ahead and press



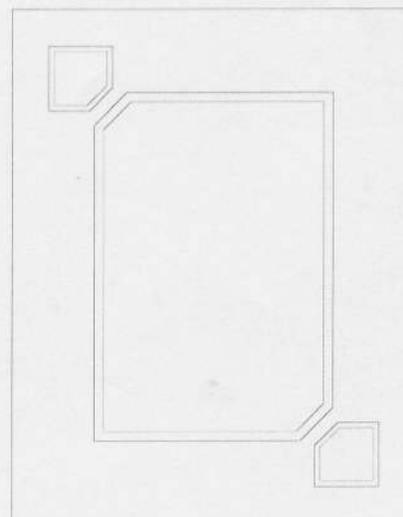
Enter now, just for kicks. The inset opening should now have rotated in place 90 degrees counter-clockwise. Press Enter 3 more times to complete a full 360 degrees of rotation to get the inset back to its original position. (Now you're thinking, "Yeah, so?")



Now we'll need to zoom out to view all of our drawing, the quickest way being the Ctrl + A keyboard shortcut. (A for view All). The inset opening should still be selected. Click now on the "Set the base point" tool, just to the right of the Select tool icon. This will allow us to rotate the selected entities around any point we designate, which in this case will be the absolute center of the entire mat itself.



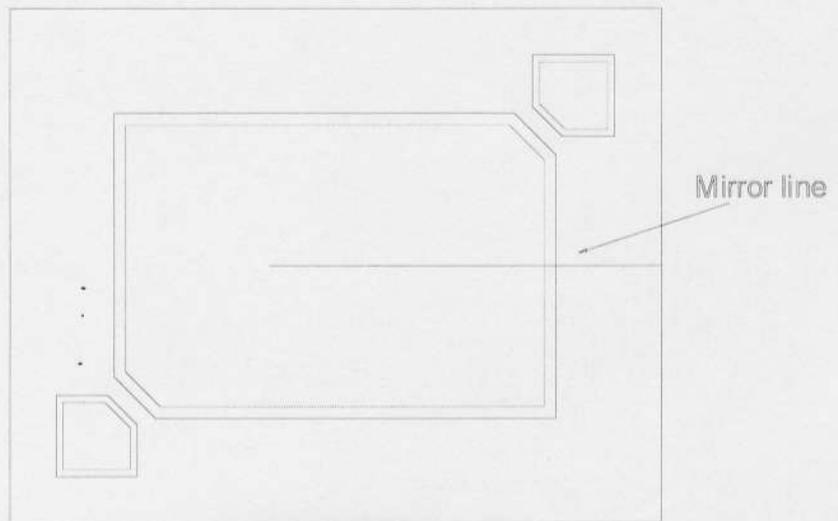
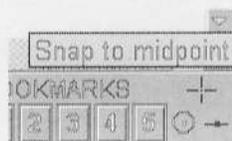
In the lower right corner of the screen, click on the little circle-with-a-dot-in-it thingie, (see above), which is the "Snap to center point" tool. Make sure it turns red when you click on it, then move the cursor to the edge of the outer rectangle of the mat. When a crosshair appears in the exact center of the mat, click the mouse. Now you can click the Rotate tool again, this time enter 180 as the rotation angle, and press Enter. Whoa! Now the inset is in the upper-left corner, but missing from the lower left where we also want one to stay, right? Don't panic, simply click the "Copy" button, just to the right of the color selector, and press Enter again. The drawing should now look like this:



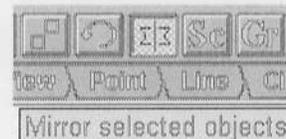
Now let's say you wanted to make this a horizontal image mat instead of vertical. Click the Edit on the main menu bar (NOT the Edit tab), and click on "Select all". This will highlight the entire drawing all at once. Select the Rotate tool again, (if it isn't still active), and enter a rotation angle of 90. The drawing should now be shown horizontally, as the base (rotation) point for a group of entities will always default to the center of the group itself. Right?!?

What if you wanted the inset openings to remain in the top-left and bottom-right corners as they were in the vertical design? No problem; All we have to do is break out the "Mirror" tool. Before using the Mirror tool, we have to create what's called a "mirror-line". This line will be the reference line that the entity or group of entities will be flipped, or mirrored, from.

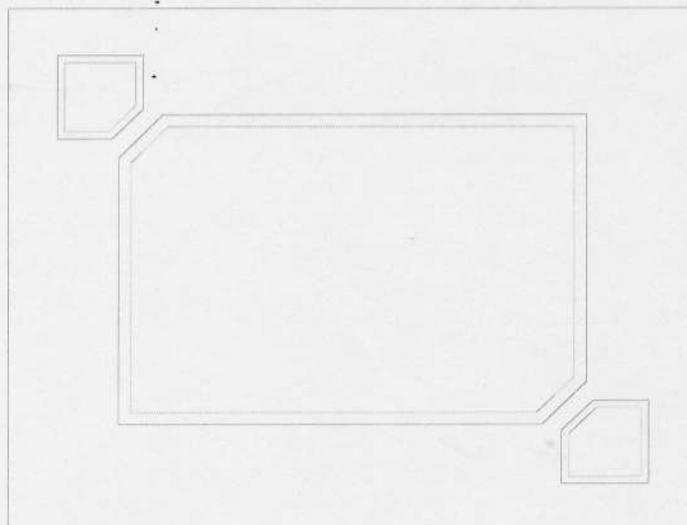
Click on the Line tab, and select "Draw a horizontal line" tool. In the lower right area of the screen, click on the "Snap to midpoint" icon. Then move the cursor to the center region of the right (or left) edge line of the mat drawing until you see a crosshair point appear. Click when the point appears and then draw just a short horizontal line from that midpoint until the drawing looks something like this: (The mirror line is shown here in blue, yours may be any color.)



Now click on the Select tab again, and draw a selecting box around the whole drawing. Click on the "Mirror selected objects" tool icon, and when prompted to "Select mirror line", click on the temporary mirror line we just created. The drawing should now be inverted vertically, with the inset openings back in the upper-left and lower right corners. Next, we need to move the drawing so that the lower-left corner is again aligned at the 0,0 point. Click the "Move selected entities" tool, and enter the offset distance of 1.5, -1.5. This will move the drawing both right and down 1.5"

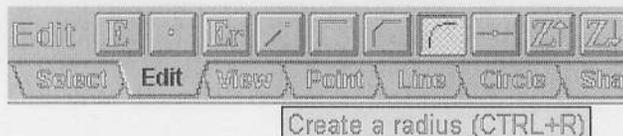


To remove the mirror line from the mat drawing, click on the "Edit" tab, (this will also de-select all entities), and select the Er, "Erase an object" tool. Then just click on the mirror line to erase it, and you're good to go!



Radius and Arcs

Remember the basic double mat design we saved (Dblemat1)? Lets save our current design first, close it, then re-open the double mat design.



The first thing we'll do is create rounded corners in two diagonally opposite corners just like we did with chamfers. Click on the "Edit" tab, and select the "Create a radius" tool, which looks like a rounded corner.

Create a rounded, or radius corner in the upper left corner of the red, or bottom mat layer. Do this the same way as the chamfer tool works, and enter 1 as the radius when prompted. Repeat the steps for the lower right corner as well. Your mat will look like the drawing (below-left):



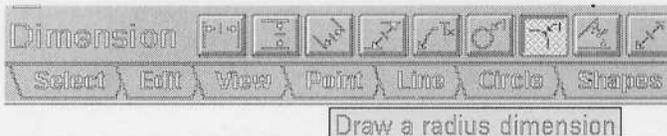
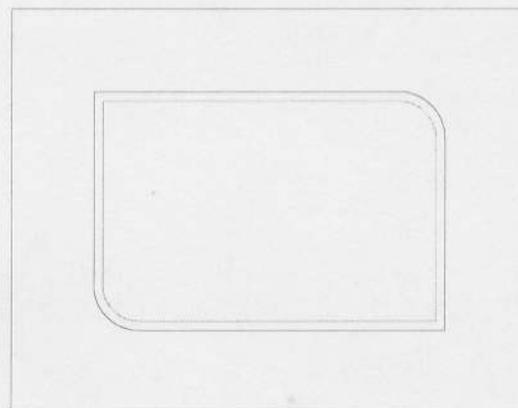
To create a corresponding radius in the top (black) mat layer, click on two of the lines you'll be joining and enter a radius that is $\frac{1}{4}$ " larger than the first one, or 1.25. Do this for just one of the two corners. (see above-right)

What if you didn't know how large the first radius was? The "Dimension" tab in Deltacad allows you to determine the dimensions of a variety of entity types that you have already drawn. Click on the Dimension tab now, select the "Draw a radius dimension" tool and click on the radius of the lower right corner. A small pointer-arrow will appear, designating where the dimension information will appear when you click again. You may make the arrow appear either inside or outside of the radius you've selected. It should now show as 1.00.

You may now complete the top mat radius corner with a 1.25" radius. Don't forget to erase the radius dimension of 1.00 before proceeding further.

For a review of "Rotate", let's rotate this design as we did previously and make it horizontal.

Refer to the last section if you need some help. The mat drawing should now look like this:



Dimension Tab and Radius drawing option

Before de-selecting the full drawing and proceeding further, click the "Move selected entities" tool. Enter the Offset of 1.5, -1.5 again to realign the drawing with the origin point of 0,0. This will be important when it becomes time to import the design into the F-6100 program.

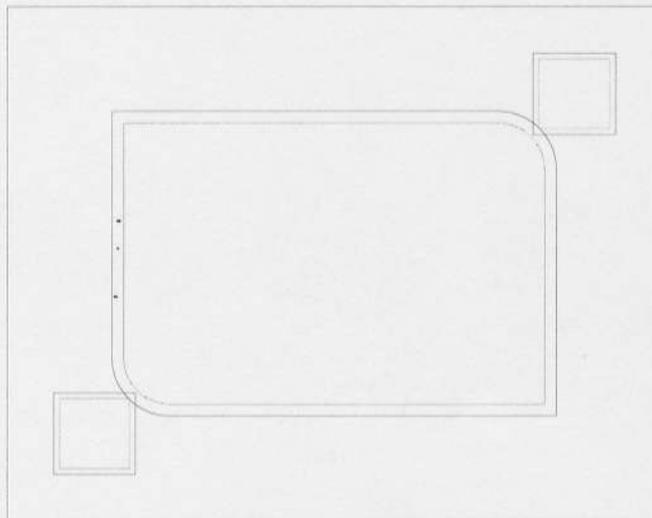
Now we'll add a couple of inset openings as we did before, but with a slight variation, just to make it interesting.

Start by selecting the **Point** tab, and select the lower-left corner of the mat as our reference point. Then enter an offset distance of 1,1. A small red temporary point will appear 1" to the right and 1" up from the corner, which will now be the origin point for the first inset opening. Select the **Line** tab, and draw a 1.75" X 1.75" square in the lower-left corner, in black. Change the line color to red, select the "Draw a parallel line" tool, and create a bottom mat layer for the inset opening. Make the offset, or inner mat reveal .125 (1/8").

Select the **Edit** tab, and the "Create a corner" tool, and clean up the line intersections of the newly drawn red square.

OK, remember how to use the "Rotate" function? Select "**Select**", and select the entire inset opening, being careful NOT to select any part of the main opening. (Hint: use the **Ctrl** key).

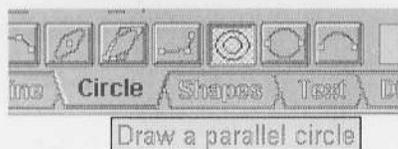
Then click on "Set the base point", click the "Snap to Center" icon in the lower right corner of the screen, and click anywhere on the *outer* edge of the mat. Click on "**Copy**", enter 180 as the rotation angle, and press **Enter** (or right click). Finally, click the **Edit** tab to de-select the new opening. Got all that? It should now look like this:



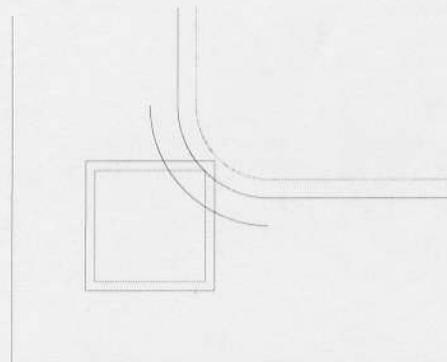
All right then, let's zoom in on the lower-left opening to get a better look at it. (**View** tab)

Select the "**Circle**" tab, and click on the "Draw a parallel circle" tool- it's the third one from the right, and looks like two concentric circles. Click on the black outer mat radius, and a parallel arc will now follow the cursor. The new arc will be .375" or 3/8" away from the main opening arc, so now enter an offset of .375.

The newly created arc should appear as below:



Parallel Arc and Circle tool



This new arc will become the top mat edge of the inset opening, which will be 3/8" from the edge of the main opening's top mat. To draw the inner mat radius, first change the drawing color to red.

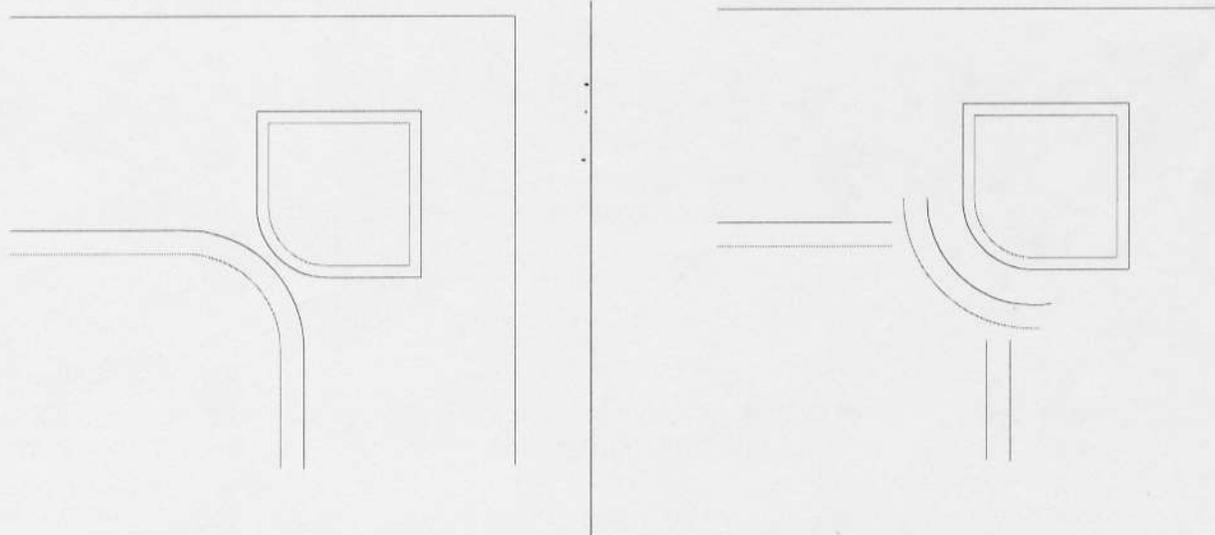
Then click on the new arc we just created, move the cursor left or down slightly, and enter an Offset of $.125$ ". Does it look like this? (below-left).



Looks kind of messy at this point, I know, but we can clean it up in a hurry with the "create a corner" tool. (Edit tab) When you're finished joining the new arcs to the existing lines, your opening should look exactly like the figure at above right. Right? Remember to always click on the portion of the line or arc that you want to *keep* when using this tool.

Let's scroll up and to the right, so we can get a close-up view of the other inset opening, which we're going to do something a bit different with.

Click on the "Create a radius" tool, and for the red inner layer of the inset, create a radius of $.625$ ($5/8$ "). For the outer mat (black line), give it a radius of $.75$ to maintain the $1/8$ " reveal width. See below left:

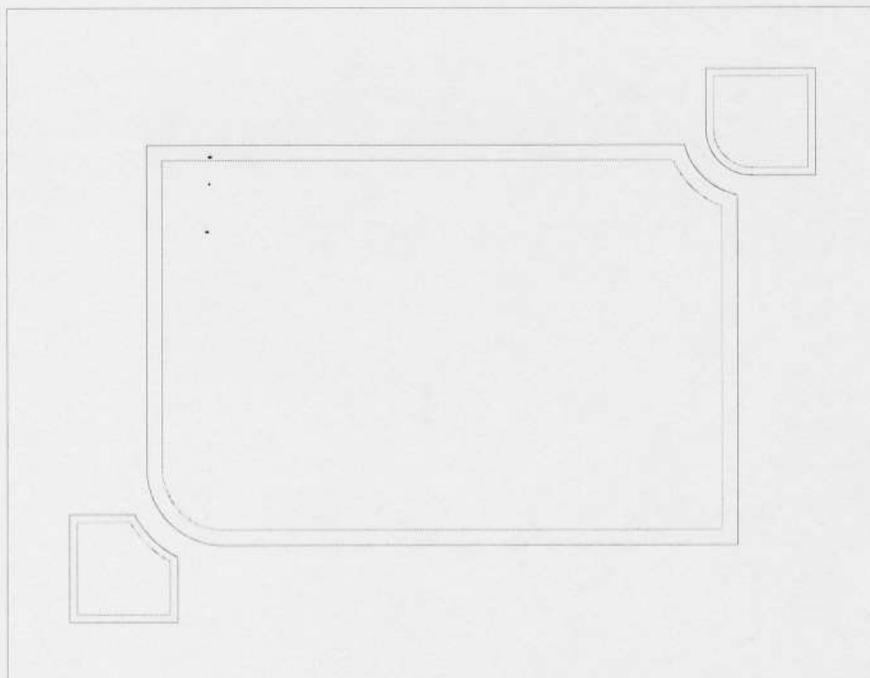


Click next on Erase, and get rid of the two arcs of the adjacent corner of the main opening. We won't be needing these anymore. Then click on the Circle tab, make sure the color is set to black, and again select the "Draw a parallel circle" tool. Click on the outer radius of the inset opening (black), move the mouse cursor left or down, and enter an offset of $.375$ ". Change your drawing color back to red again, click the last arc created, and enter an offset of $.25$ " (bottom mat reveal of our main opening). Your drawing should appear as above right.

Now all that's left is for you to create new corners. Click **Edit**, "Create a corner", and complete the drawing. The final product should look like this:

Just a few more easy steps, and we'll be ready to cut!

Note: Before you save your design, click back to the **Point** tab, and click on "Erase temp". This will remove any temporary points you created to aid in your drawing. If these points were brought into your cut file inadvertently, they could wreak havoc with the Cut file routine on the F-6100.



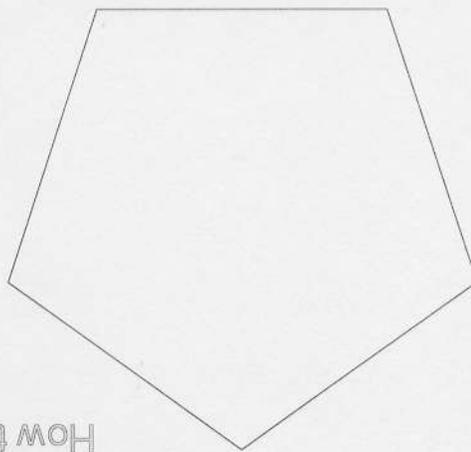
Cutting Your New Masterpiece

Now that your drawing is done, you can't wait to cut it on that dandy F-6100 CMC, can you?

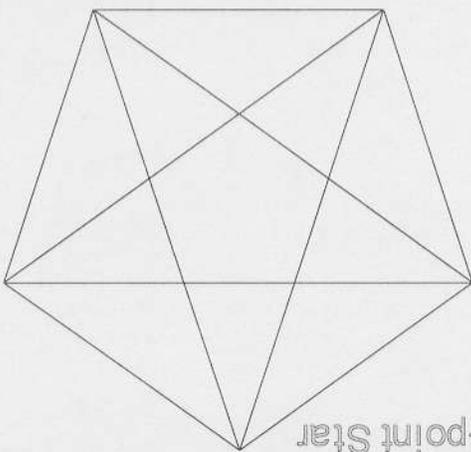
Here's how you do it:

1. Click **File**, **Save As** to give the design a final name. Click **File** again, select **Export**, and then "Drawing Interchange File (.DXF)", and click **Save**. On Version 5.0 of DeltaCad, this will bring up an option window, giving you a choice between "Entity Types" or "Line Weights". Choose the default option of Entity Types, and click the "Save as .DXF" button.
2. Open the F-6100 program, and click on the "Designer's Choice" button. In the Designer's Choice screen, Enter the mat size in the initial Setup box, Click **OK** and **Exit**. Then click **File**, **Import DXF**, and locate the DXF file that you've just converted. Click **Open**.
3. The design will first appear on your screen in white, or "fenced" (selected). If you don't want to alter your design in any way, press **Ctrl + F** to turn off the Fence feature. All lines/entities should now show in their correct color(s); i.e. black and red in this example.
4. Click "Cut", and follow the normal cutting procedure.

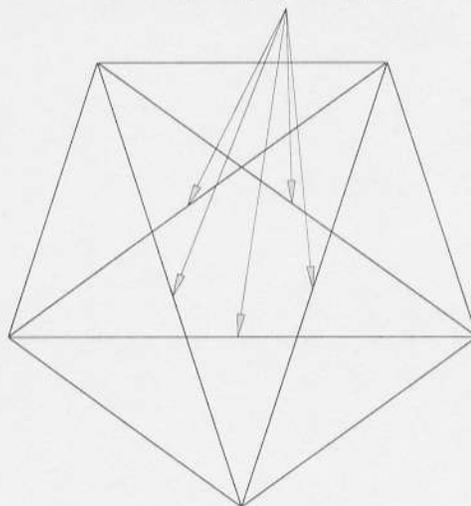
How to draw a 5-point Star



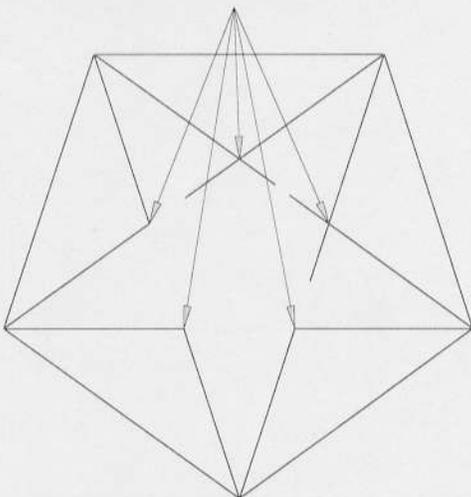
1. Draw a Pentagon



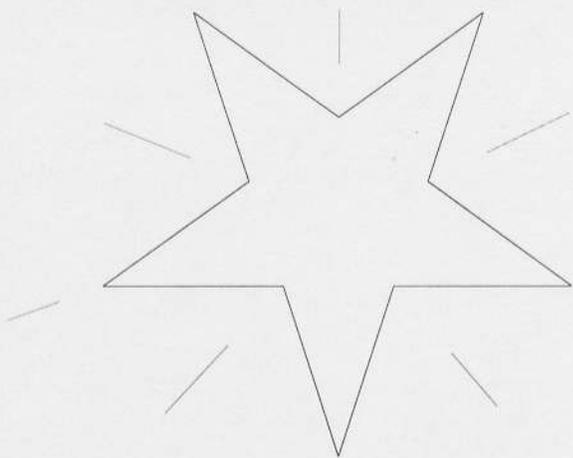
2. Connect the vertices



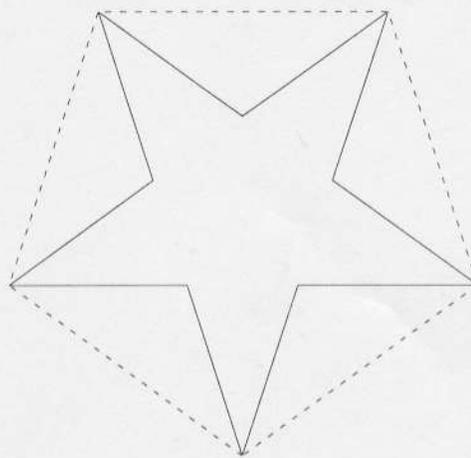
3. Break the lines here



4. Create new corners



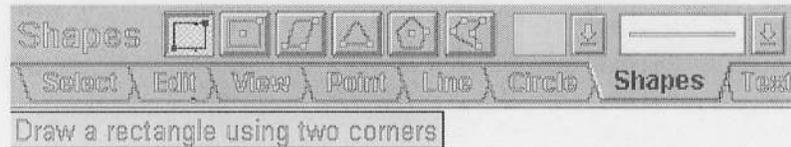
6. Voilà! A Star is born!



5. Erase the Pentagon

Drawing a 5-point Star in DeltaCad

1. Select the Shapes tab, and click on the "Draw a Rectangle using two corners" tool. Enter the coordinates 0,0 for the lower-left corner, then 10,10 for the top right corner. This rectangle will be the drawing area for the star.

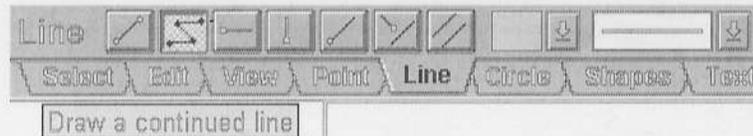


2. Now select the "Draw a triangle, square, pentagon, etc." tool. Then click the "Snap to Center" icon at the lower-right of the screen. Move the cursor to the edge of the rectangle you have just drawn, and click when you see the crosshair appear at the center of the rectangle.



Next, enter 5 as the number of corners, then enter the offset coordinates 0,3. This will result in a pentagon in the center of the rectangle.

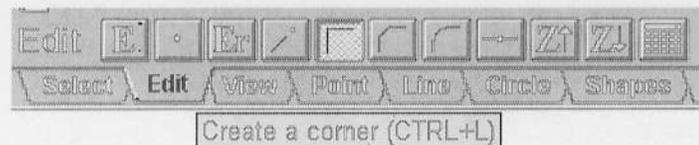
3. Select the Line tab, and the "Draw a continued line" tool. Starting from any of the vertices of the pentagon, draw a line to the opposite vertex, until you complete a star shape at the corner you began with. (See figure 2 above) Right click the mouse to end the continued line.



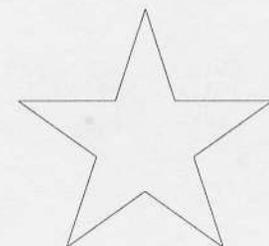
4. Select the Edit tab, and the "Split a line, circle, arc... etc." tool. Click once near the center of each of the five lines you have just drawn to form the star shape. (See figure 3 above). This will break each of the lines into 2 shorter line segments.



5. Select the "Create a Corner" tool also from the Edit tab. Click each pair of adjacent lines to create 5 new corner intersections. (see figure 4 above).



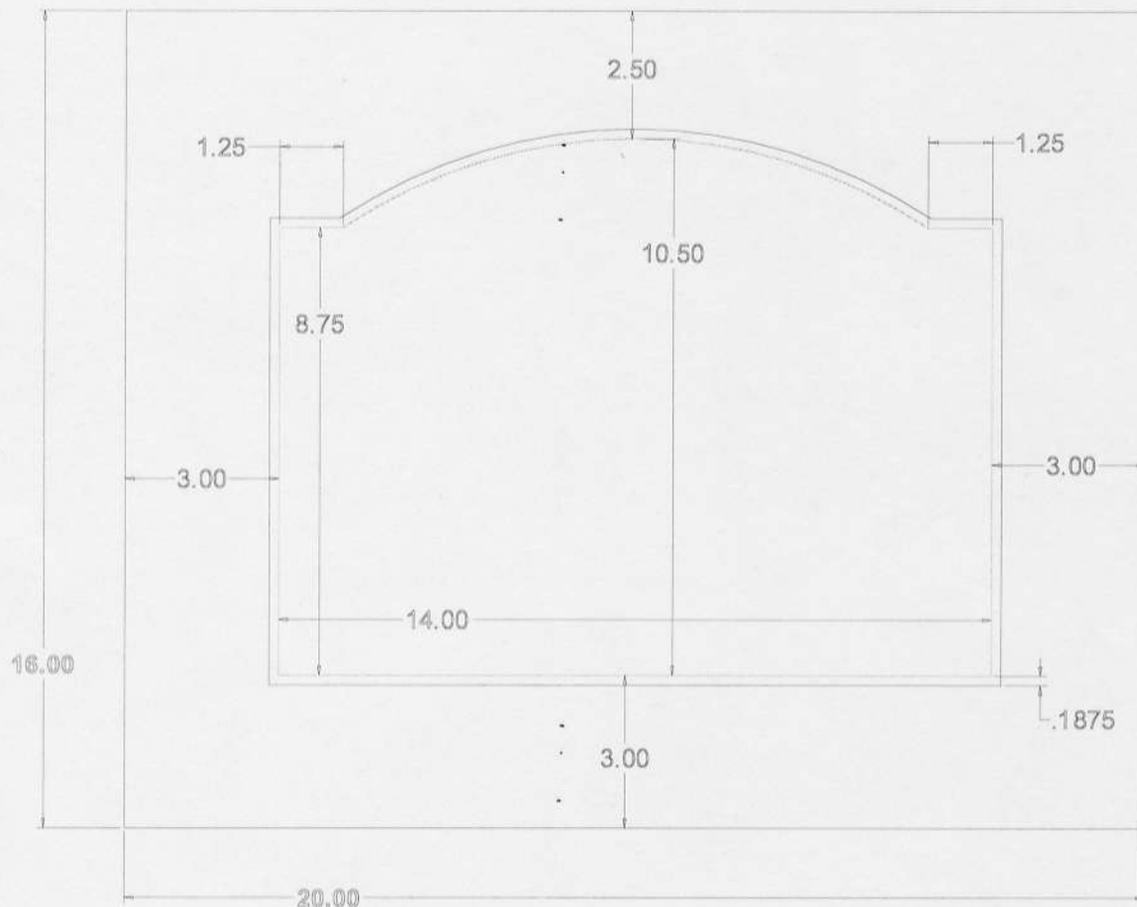
6. Select the "Erase an Object" tool, also from the Edit tab. Click on the pentagon to erase it. The 5-point star should now be complete.



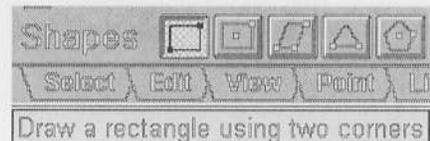
Drawing a Custom Arch

You may occasionally get requests to cut a mat for an unusual arch-shaped artwork, often a needlework piece. Since the F-6100 template (pattern #22), does not offer unlimited design flexibility, it may be necessary to draw these designs in CAD. Here is an example of such a design.

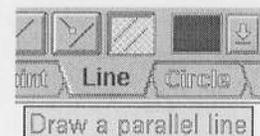
1. Begin by accurately measuring the artwork, and determining the dimensions shown in the diagram below.

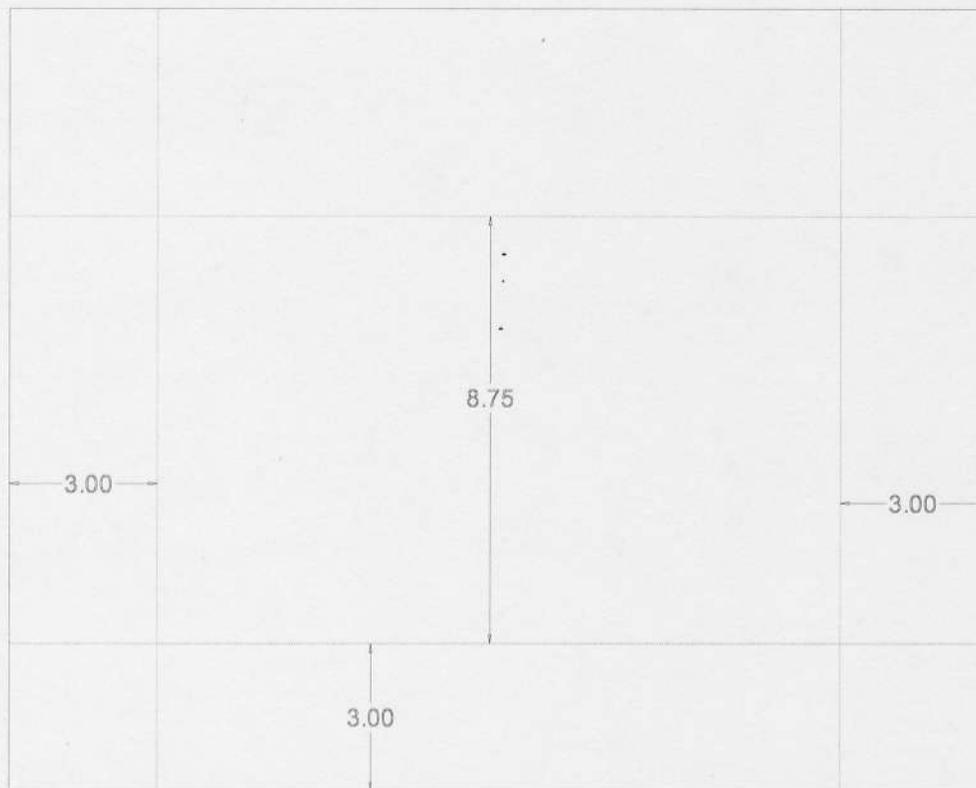


2. In DeltaCad, select the *Shapes* tab, and draw the mat size of 20" x 16". Enter the coordinates 0,0 for the first point, and 20,16 for the second point.

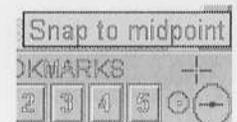
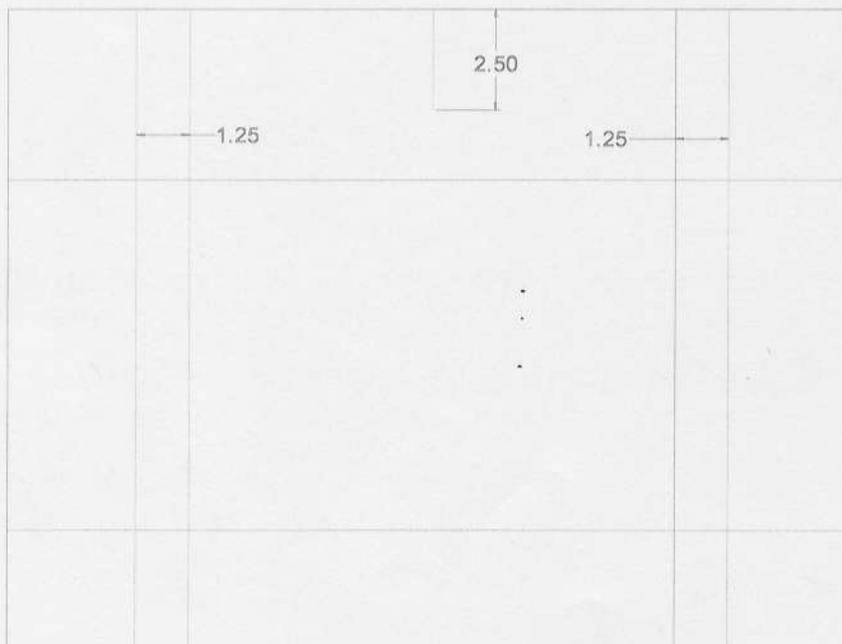
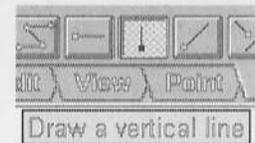


3. Select the *Line* tab, and change the drawing color to red. Create a parallel line 3" from the bottom and sides of the mat rectangle. Then make another line 8.75" above the line for the bottom mat border. This is the opening height to the "shoulders" of the arch opening. See diagram below.

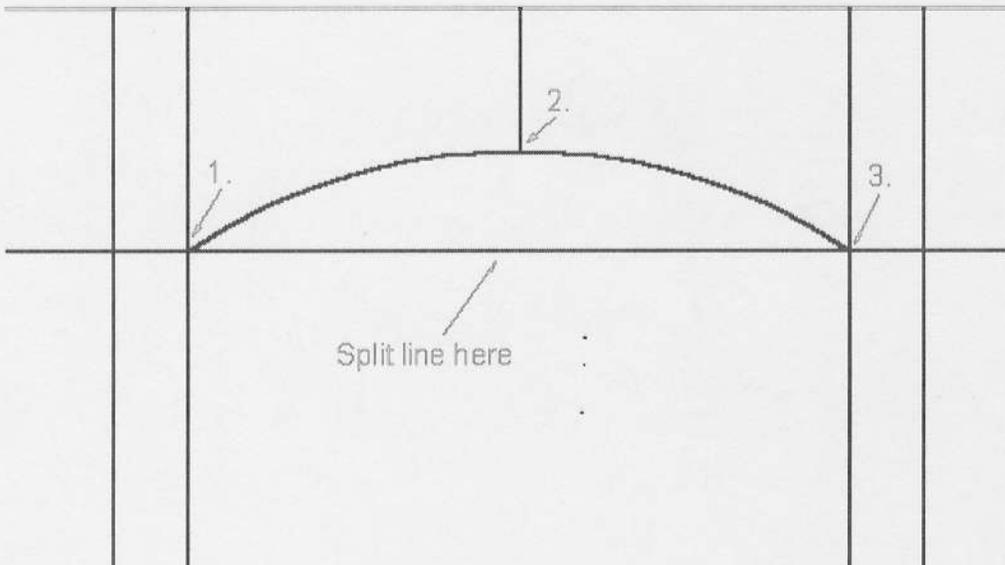




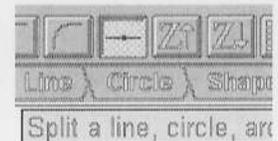
4. Now draw a parallel line 1.25" inside of both of the side borders of the mat opening. These will represent the width of the "shoulders" of the arched opening.
5. Select the "Draw a Vertical Line" tool from the Line tab, and click the "Snap to midpoint" tool in the lower right area of the screen. Move the cursor over the top line of the mat, and click when you see a crosshair appear at its midpoint. Move the cursor downward, and enter a line length of 2.5". Your drawing should now appear as below.



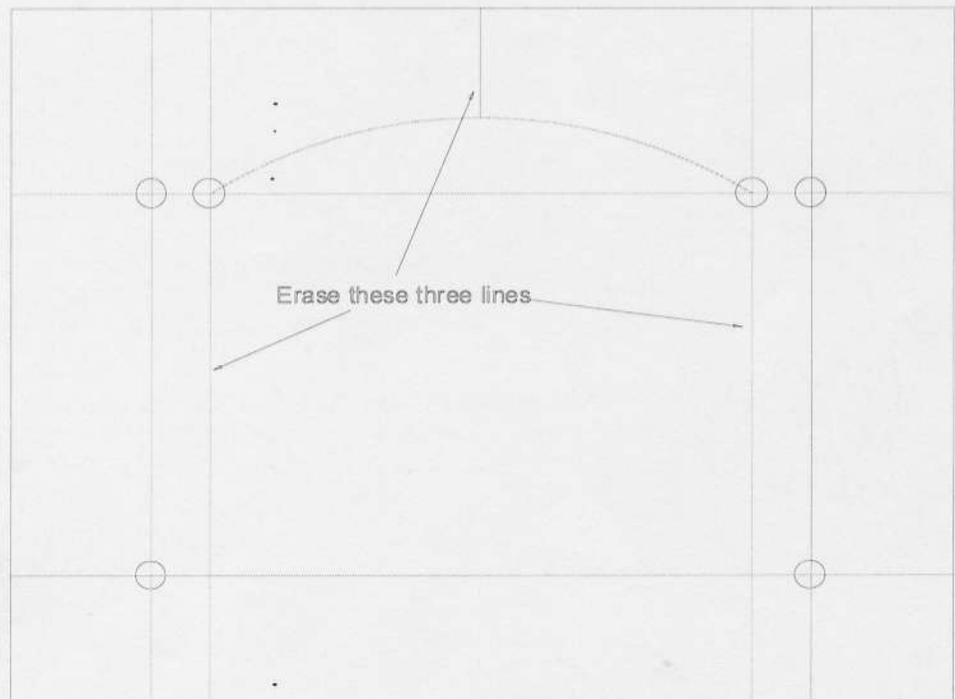
6. Select the Circle tab, and the "Draw a circular arc using three points" tool. (Make sure the drawing color is set to red). Draw an arc with 3 consecutive clicks using the three points shown below.



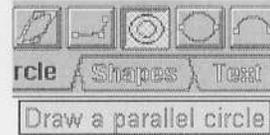
7. Now we just need to clean up the drawing by creating corners with the "Create a corner" tool. But first we'll have to split the horizontal line which will form the arch "shoulders" into two line segments. Select the *Edit* tab and the "Split a line..." tool, and click once in the area of the line shown above.



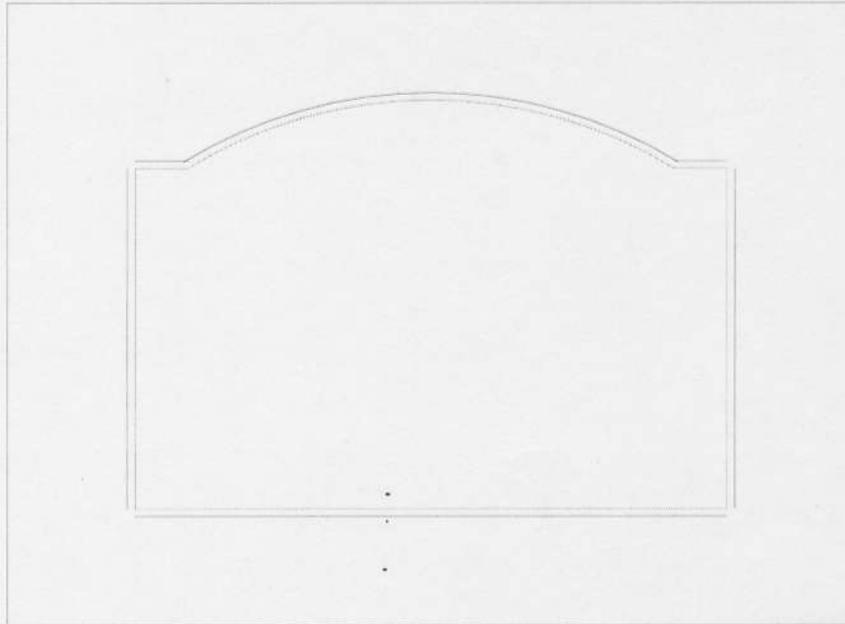
8. Select the "Create a corner" tool, and join the appropriate lines and arcs together at the points shown circled here. When finished, click the "Erase an object" tool, and delete the three vertical lines that are no longer needed.



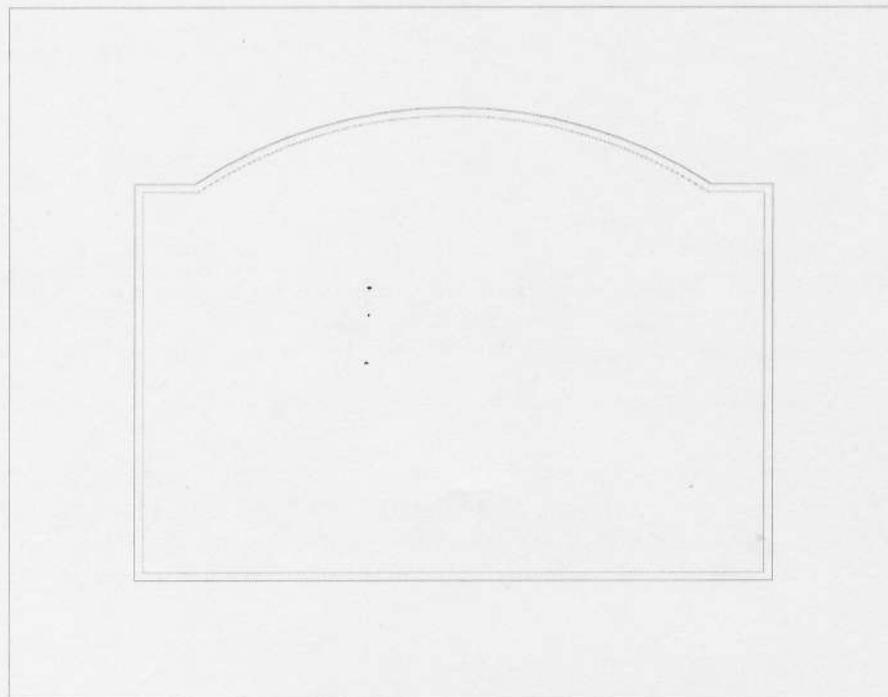
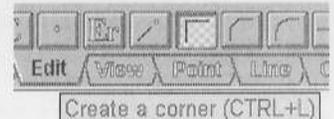
9. Now that the bottom mat layer of the drawing is complete, we simply create the top mat layer outside of the existing layer, at the designated distance (mat reveal) away. Select the *Line* tab, and the "Draw a parallel line" tool again. Change the drawing color to black, and create a line 3/16" (.1875) from each line.



10. Select the Circle tab, and the "Draw a parallel circle" tool. Change the drawing color to black here as well, and draw a parallel arc 3/16" above the existing red arc.

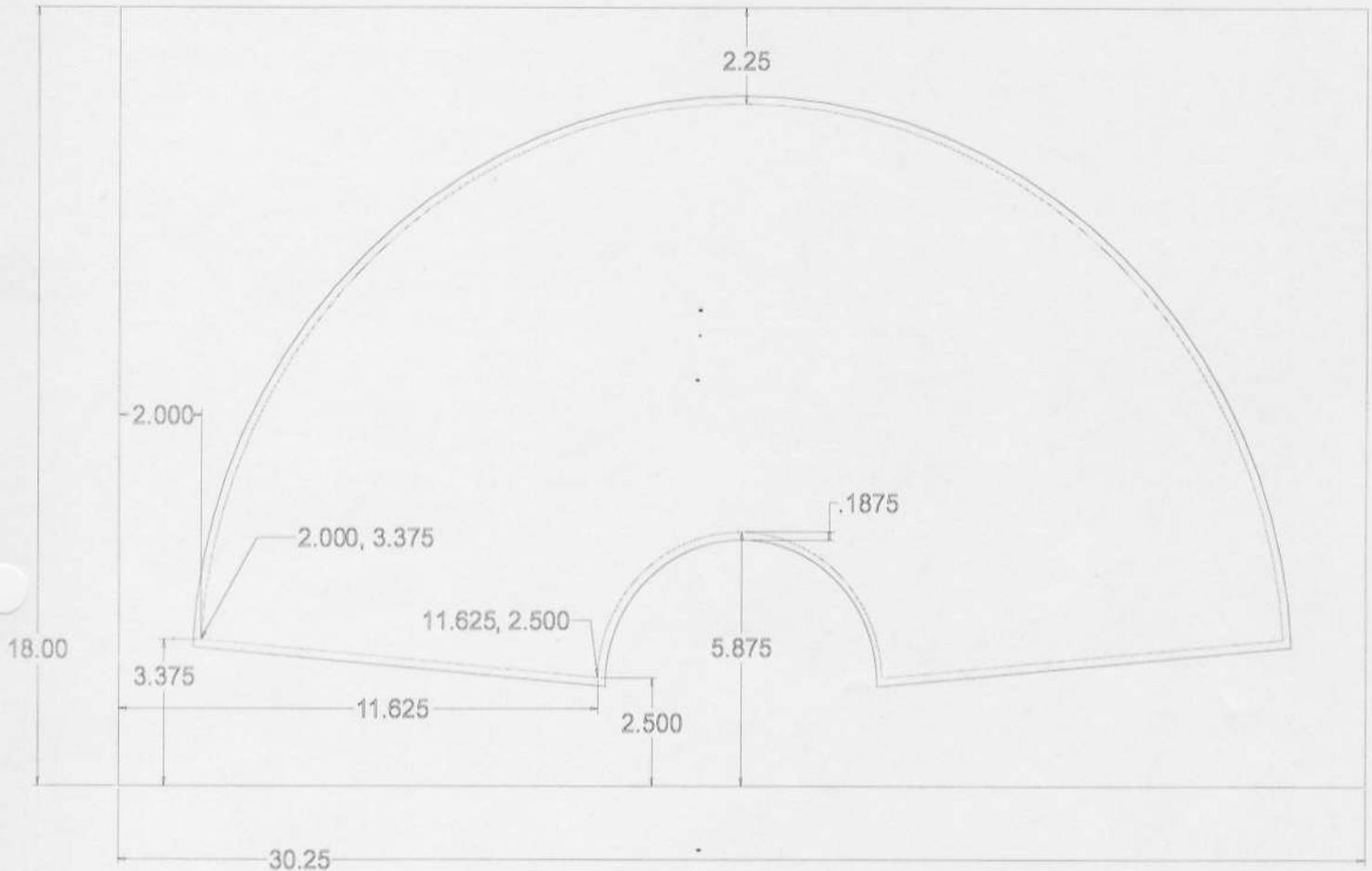


11. To finish the drawing, select the Edit tab, and the "Create a corner" tool. Join the appropriate lines and arcs together, and save the final version. The design is now ready to import into the F-6100 program and cut!



Drawing a Fan Design

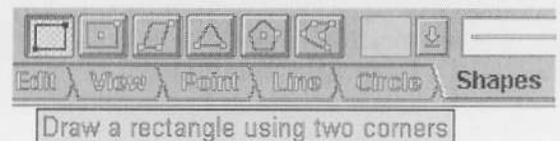
Drawing a fan shape is quite easy, but measuring the artwork or object is often the tricky part. You must determine, at the very least, the dimensions and coordinates shown in the drawing below.



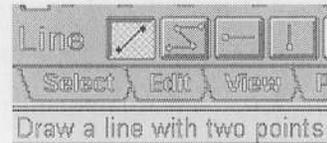
You will have initially measured the overall width and height of the fan-shaped artwork, and determined the desired margins in order to arrive at the mat/frame size. It is necessary, however, to know the coordinates of the line endpoints, and the arc midpoints relative to the outer mat edges as shown in the diagram.

Note: This design assumes that the artwork is symmetrical horizontally, however it is quite common to encounter pieces of fan shaped art which are not. If that is the case, you must obviously measure both sides of the fan and determine the line endpoint coordinates for each side.

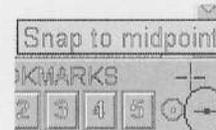
1. Begin with drawing the outer mat rectangle by selecting the *Shapes* tab and the "Draw a rectangle using two corners" tool. The first point will be 0,0 (as always), and the second point will be 30.25,18



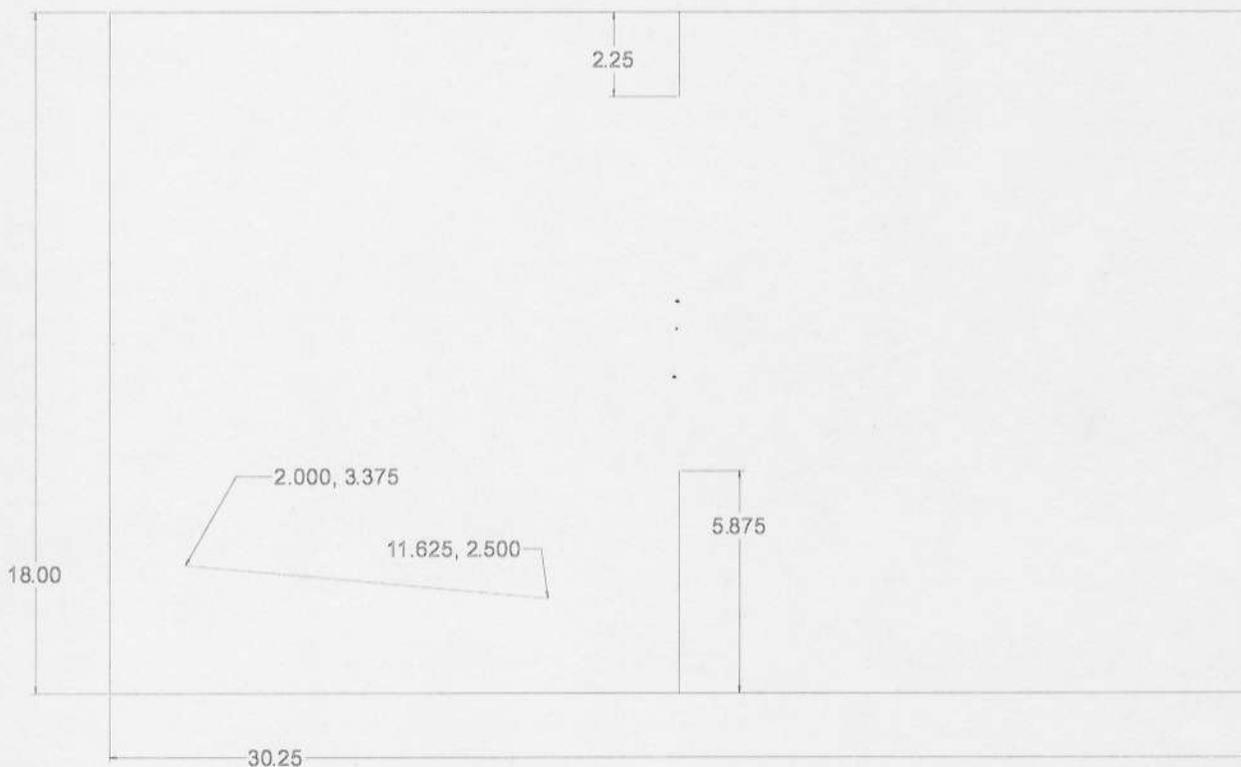
2. Select the *Line* tab, and the "Draw a line with two points tool". Click the "Choose a color" drop-down menu, and change the color to red. Enter the coordinates 2, 3.375 for the first point, and 11.625, 2.5 for the second point. This will draw the red, inner mat line as shown above.



3. Now select the "Draw a vertical line" tool, and click the "Snap to Midpoint" icon at the lower-right of the screen. Move the mouse cursor over the bottom horizontal line of the rectangle, and click when you see the crosshair appear at the line's midpoint. Move the mouse cursor up slightly, then enter a line length of 5.875".



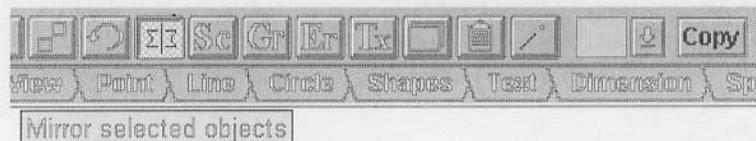
Click on the "Snap to midpoint" icon again, and then move the cursor over the top horizontal line of the rectangle. Click again when you see the crosshair appear, move the cursor down slightly, and enter a line length of 2.25". The draw should appear as below: (Dimensions are shown in this diagram)



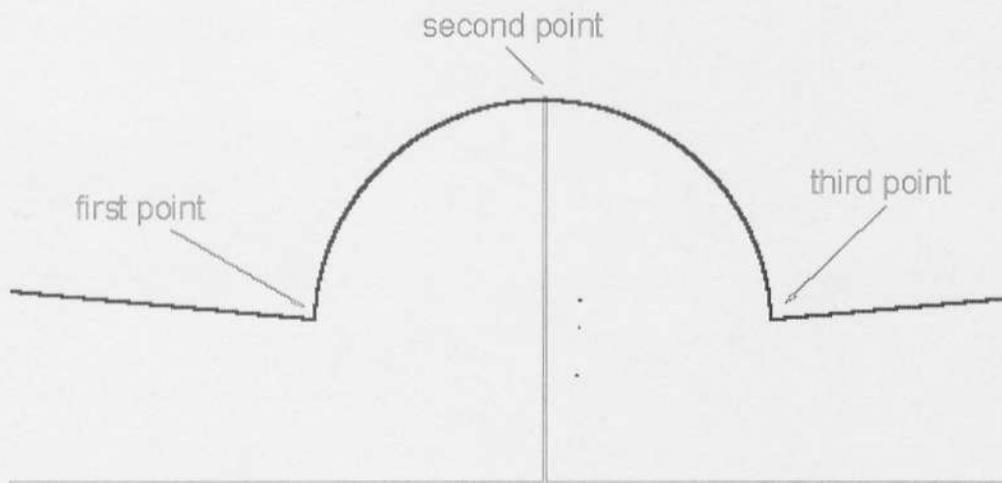
4. Select the *Select* tab, and the "S" selection tool. Click on the red line at the left of the drawing to select it. Then click the Mirror tool, and then the Copy button (also on the Select tab), and click on either of the vertical lines at the middle of the mat.



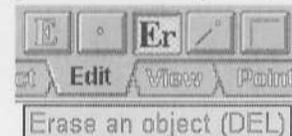
This will create a "mirror" copy of the red slanted line on the right side of the mat area.



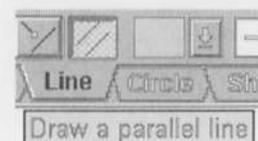
5. Select the *Circle* tab, and the "Draw a circular arc using three points" tool. Click the "Choose a color" drop-down menu, and change the color to red. Draw the lower arc with the 3 line endpoints as shown below:
(the bottom-center portion of the design is shown)



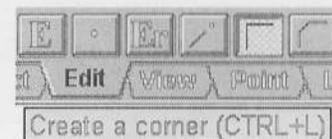
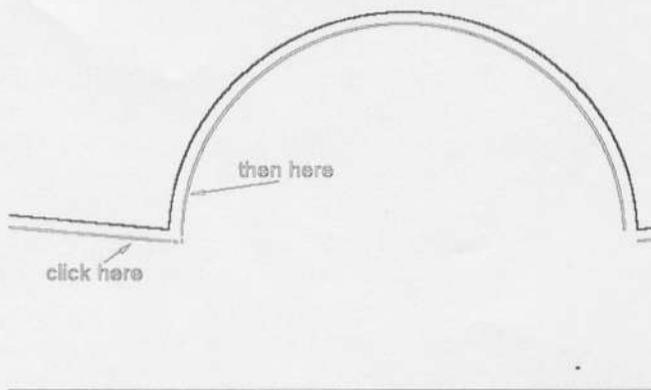
Draw the larger, top arc of the fan in the same manner, using the lower endpoint of the top vertical line as the arc midpoint. The bottom mat layer of the design is now complete; now we simply need to create a top mat around it with a 3/16" reveal.



6. Select the *Edit* tab, and the "Erase an object" tool. Click on each of the short vertical lines to erase them. Next, select the *Line* tab, and the "Draw a parallel line" tool. Click on either of the red angled lines to select it, move the mouse cursor downward slightly, then enter an offset distance of .1875 (3/16"). Repeat this for the other red angled line as well.



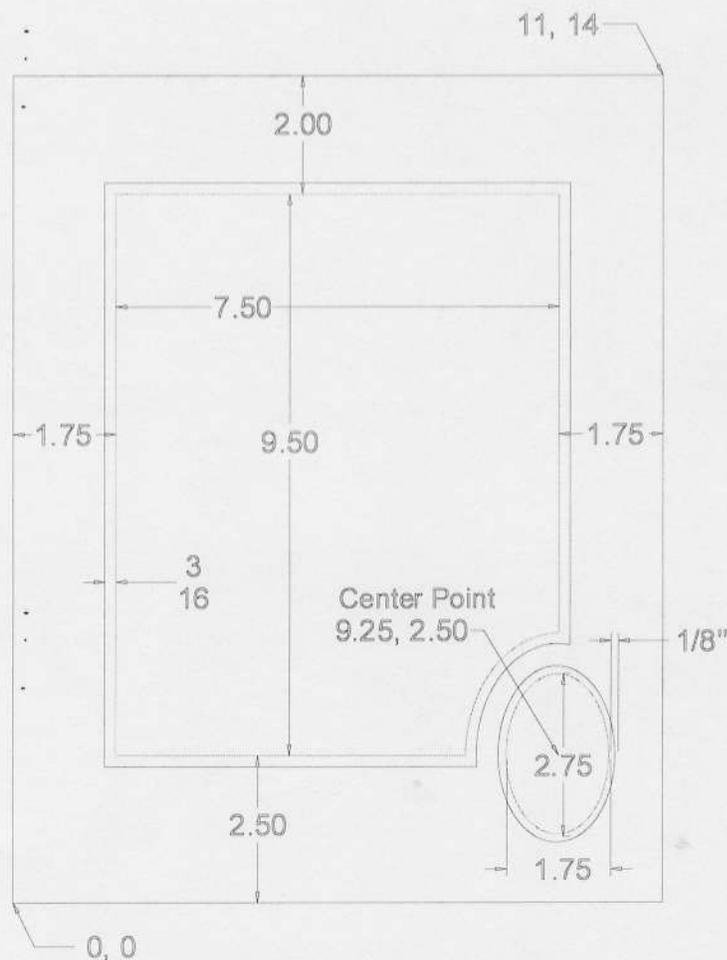
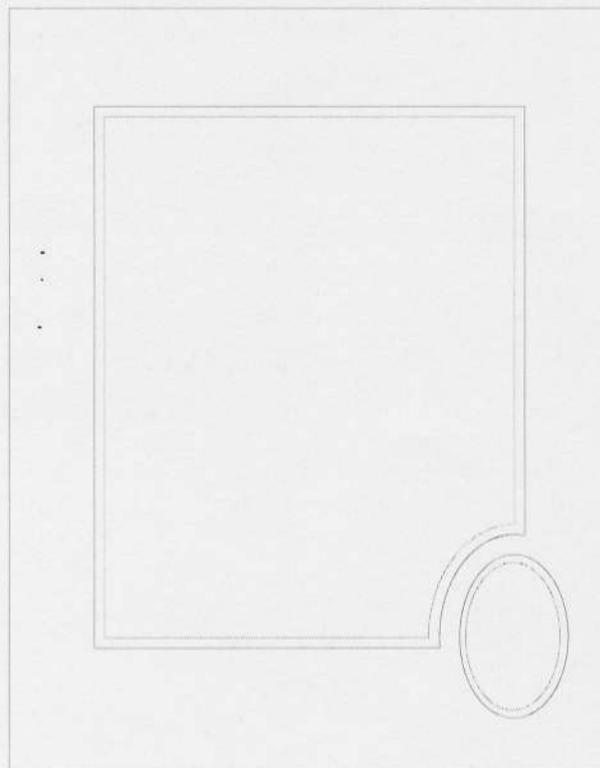
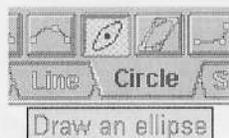
7. Select the *Edit* tab again, and the "Create a corner" tool. Join each of the four incomplete line-to-arc intersections to finish the drawing.



Drawing an Inset Oval Design

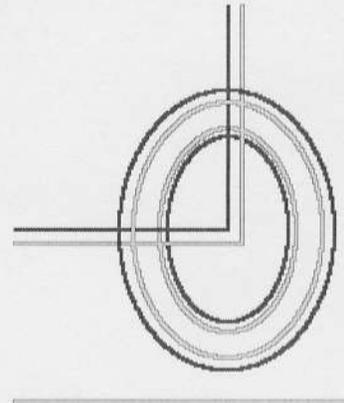
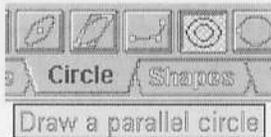
Mat designs with one or more "inset" oval openings have become quite popular, especially for arrangements of portrait photographs. These designs do require drawing in a CAD program, and can be especially tricky to draw and import correctly. Part of the reason they are so difficult to import from most CAD programs is that the .dxf format does not support ellipses (ovals) or elliptical arcs. There is a way to "trick" the program into importing such designs, however, as covered in this simplified example.

1. Begin by drawing a rectangle (*Shapes* tab, "Rectangle with 2 corners tool"), to represent the mat size of 11"X 14". The lower-left coordinate of the rectangle is 0,0 and the upper-right is 11,14.
2. Click on the *Line* tab, and select the "Draw a parallel line" tool. Change the line color to red in the "Choose a color" drop-down menu. Create a parallel line from each side, 2" from the top, 1.75" sides, and 2.5" from the bottom of the rectangle. (See diagram below-right)
3. Change the line color back to Black, and then create a parallel line .1875" (3/16), from each of the red lines. Then click the *Edit* tab, and select the "Create a Corner" tool. Join each of the four corners of the rectangular mat opening, on both the red and black layers.
4. Click the *Circle* tab, and the "Draw an Ellipse" tool. Follow the prompts on the instruction line in the lower left of the screen to draw the ellipse (oval). (See step 5 below)

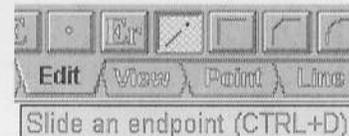
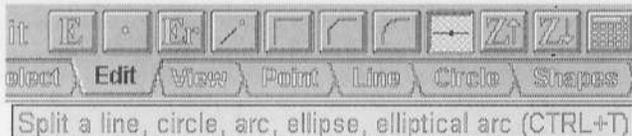


- Begin by drawing the red, bottom layer oval opening with the center point coordinates of 9.25, 2.5, which is the intersection point of the lower-right corner of the red, bottom mat opening. You may select the center point with the mouse, or by manually entering the coordinate points. Enter 0 as the angle, .875" as the first radius, and 1.375" as the second radius.
- Change the color to black, and use the same center point for the top mat ellipse. Enter 0 as the angle, 1" as the first radius, and 1.5" as the second radius. (The oval will have a 1/8" reveal; the main, rectangular opening will have a 3/16" reveal)

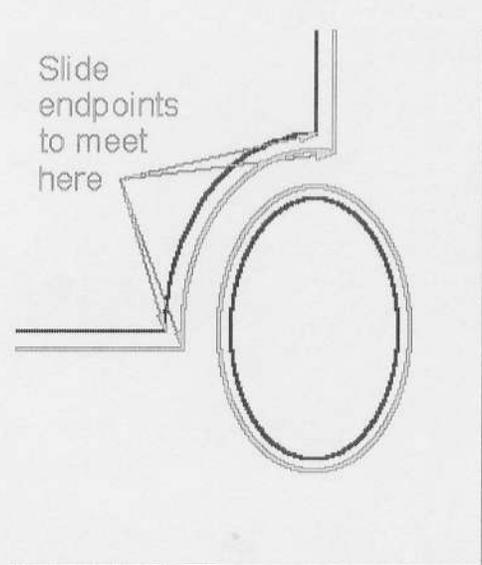
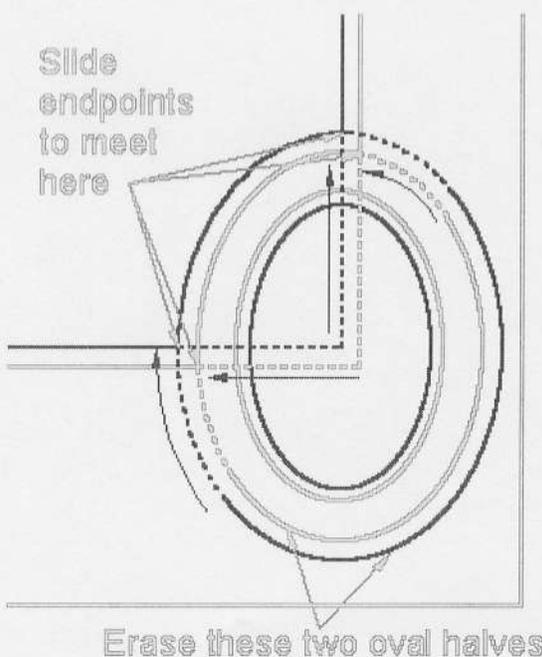
- Select the "Draw a parallel circle" tool, also from the *Circle* tab. Click on the outer (black) oval, and enter an offset of .375". Change the color to red, click on the new larger black oval, and enter an offset distance of .1875 (3/16"). The lower-right portion of the drawing should appear like this:



- Click on the *Edit* tab, and select the "Split a line, circle, arc, ellipse, elliptical arc" tool. Click once on each of the two larger ovals you have just created, preferably at about the 2:00 o'clock position. This will break each of the ovals into two equal halves. Do NOT split the smaller two ovals.



- Select the "Slide an endpoint" tool, also from the *Edit* tab. Slide the line and elliptical arc endpoints so that they meet at their intended intersection points. Make sure that the red and black layers are joining to their respective colors. Then select the Erase tool, and click on the unused portions of the larger ovals to delete them. See below:



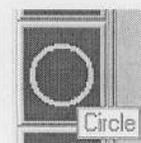
10. Before going any further, it's now necessary to record the important data about the complete, inset ovals. The easiest way to do this is to select the "E" for Edit tool from the Edit tab. Then click on either of the complete ovals to access its "vital statistics". Write down the Center Point and both radius dimensions for each layer, as shown at right. This information will be needed later when the oval is re-created in Designer's Choice. If you haven't saved the design yet, do it now.

	X	Y
End A	10.1250	2.5000
End B	10.1250	2.5000
Center	9.2500	2.5000
Radius	0.8750	1.3750
Angle	0.0000	
Length	7.1550	
Area	3.7797	

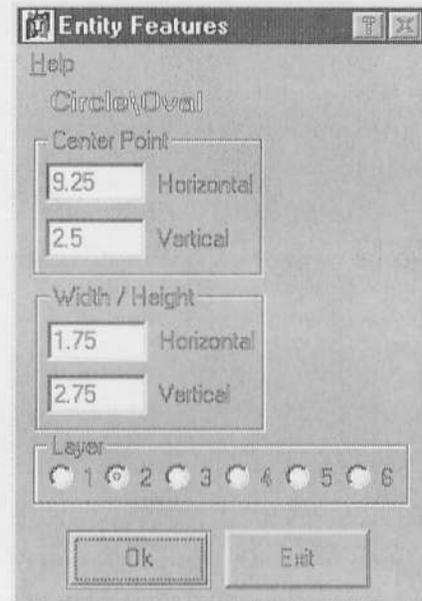
11. Click back to the Erase tool, and delete both layers of the inset ovals. (Yes, really!) Save the design again, this time with "NBO" at the end of the file name for "no bottom oval". Now click File > Export > Drawing Interchange File (.DXF), and click Save. When the "DXF options" window appears, select the "Line Weights" option and click Save again.
12. Now close the DeltaCad (.dc) file, and open the .dxf file you just created. Make sure you choose "DXF file" from the "Files of Type" drop-down options. The drawing will appear the same at first, but if you move the mouse cursor over either of the remaining elliptical arcs, you'll notice that they have been converted to a series of shorter, radial (circular) arcs instead. This is how the .dxf format allows drawings created with elliptical arcs to be transferred from one CAD program to another, and still produce acceptable quality in the final product, usually a printed copy.
13. You may now use the "Create a corner" tool to confirm that the line-to-arc intersections that you drew previously are actually clean. This is easy to do in a simple example such as this, but for more complex designs with 3 or more partial ellipses, there will be a whole lot more "cleaning up" to do. When you have finished cleaning up any sloppy intersections, save the design again as a DeltaCad (.dc) file, once again with a slightly different file name. Ex: "1 inset oval NBO-B"
14. Now do another Save as .dxf with the current file, but this time select "Entity Types" from the "DXF Options" dialog box. This .dxf file is now ready to import into the Designer's Choice program.

Designer's Choice Importing

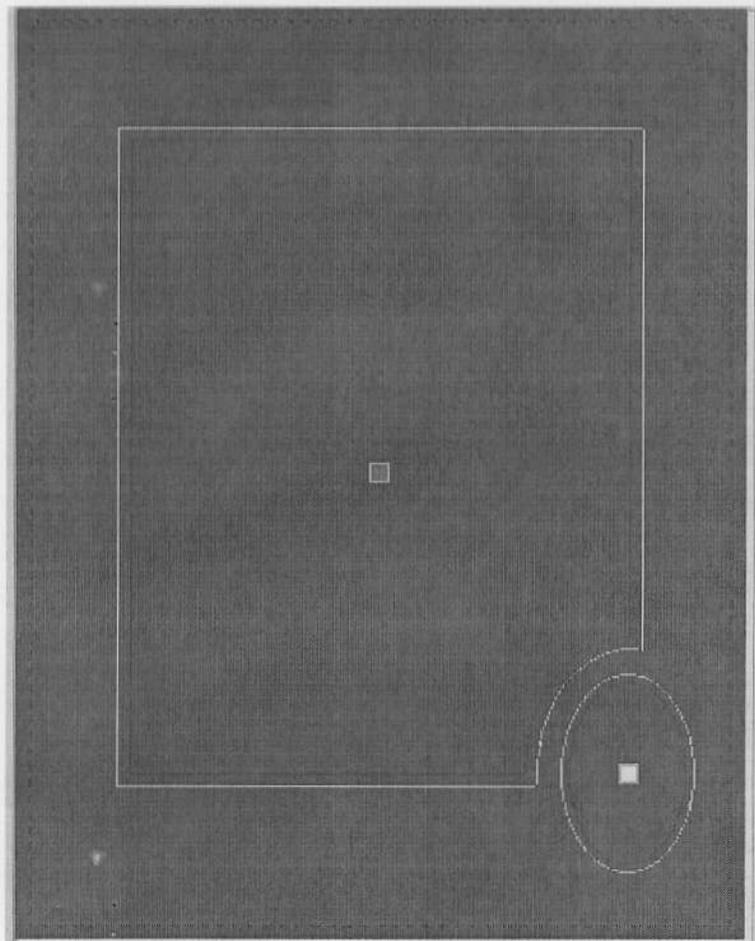
- From the Designer's Choice screen, click File > DXF Import, and open the last .dxf file created. Turn off the white-highlighted Fence by pressing the Ctrl + F keys. Save the imported design as a Designer's Choice file now.
- Click the Circle/ Oval tool at the left side of the screen to bring up the Oval entry box. Remember the inset oval dimensions you wrote down earlier from the DeltaCad drawing? You'll need them now. Begin with the red, bottom mat oval, and enter a width of 1.75 (.875" radius X 2) and height of 2.75 (1.375" radius x 2). Click OK to close the entry box.



3. Click the mouse once in the *approximate* location where you want the oval to draw. An oval will appear centered on the point you have clicked on, shown in black. Click now on the Entity Features button, which will allow you to move the oval to the precise, desired location. Enter the Center Point coordinates of 9.25 (Horizontal) and 2.5 (vertical) and select 2 as the mat layer. The oval will move to the correct location and change from black to red. Click OK and Exit.
4. Click the Circle/Oval tool again to create the top oval opening. Enter 2 as the Width and 3 for the Height. Click again in the approximate desired location, and then click Entity Features. Place the oval with the same Center Point of 9.25, 2.5 as the bottom oval layer. Leave the layer button set to 1.
5. Re-Save the file again. The design is now ready to cut, at last! Tip: Change the Angular Tolerance value in Designer's Choice Setup to 5 or higher when cutting these type of designs. This will help smooth the cut when there are minor .dxf importing errors.



Note: It is possible to import a complete ellipse from a CAD program as a fragmented series of radial arcs, however it will not cut smoothly the way ovals do in the F-6100 program. The oval cut will begin and end cutting at the lowest arc intersection point, usually leaving a visible blade-plunge mark.



Importing and Tracing a Scanned Image

Creating a mat design from a scanned image can also be accomplished, but must first be traced in your CAD program prior to importing it into the F-6100 software for cutting. This example covers the basic procedure for doing this with most scanners and DeltaCad.

1. Begin by scanning the actual piece that you wish to copy. If the original image you are scanning is very small, i.e., a logo from a business card, you may not have enough fine detail in the outline of the image when you are attempting to trace it later. Conversely, if the original that you are scanning is larger than the scanner bed itself, you may need to make more than one scan and "splice" the two images back together later. This can make the process quite tricky, especially when maintaining accurate scale and proportion is important.

Note: Pay special attention to placing your original as precisely aligned on the scanner bed as possible, since it is not possible to rotate a bitmap image once it is imported into DeltaCad.

2. The scanned image will usually export directly to either the scanner's own graphic software, or to another program which you have previously designated. For this example, we will send the scan to Microsoft Paint, since it comes with all Windows-based computers anyway and is fairly easy to use. Save the scanned design in Paint in order to create a "bit map" (.bmp) file, so that it can be imported into DeltaCad directly.

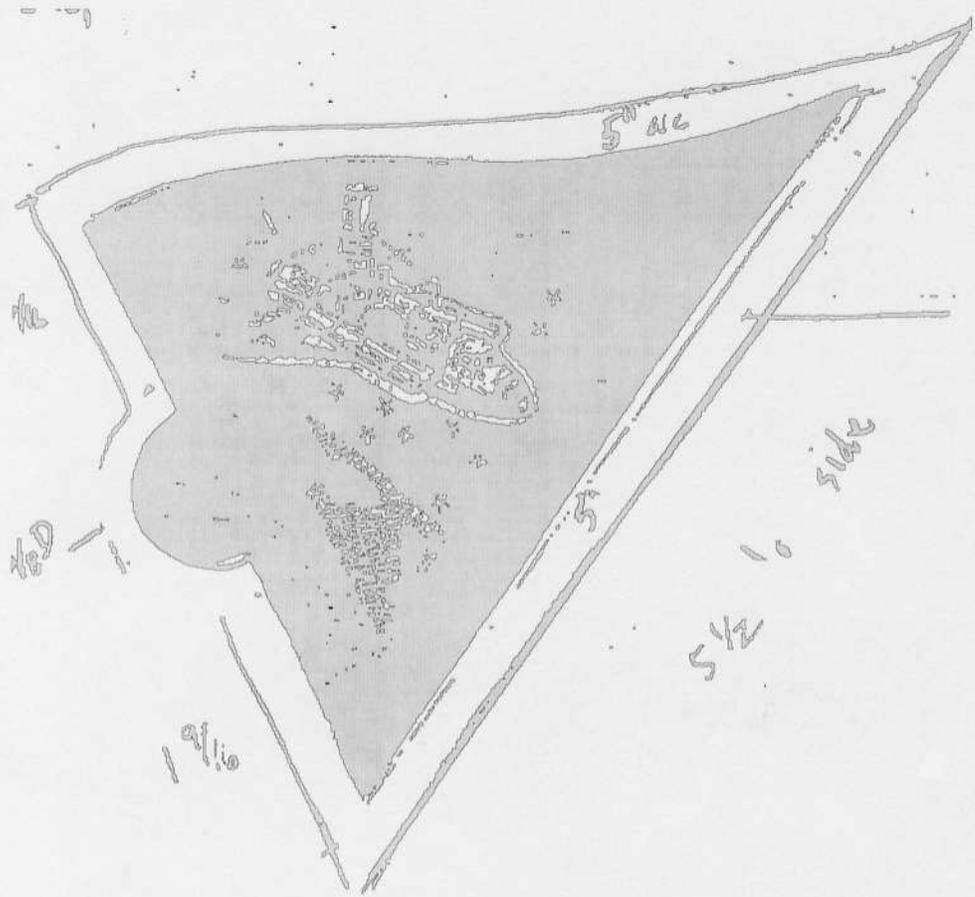
3. If you want to import only a portion of the scan for tracing, use the Selection tool in Paint to crop out the area that you want to import into DeltaCad. This will help simplify the tracing process by eliminating extraneous parts of the image that you don't need anyway. You may re-Save the selected portion of the design, or simply click Edit > Copy to place it on the Windows "Clipboard" so that you can paste it into DeltaCad directly.



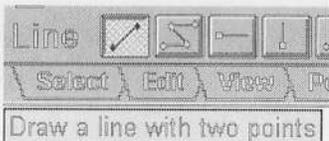
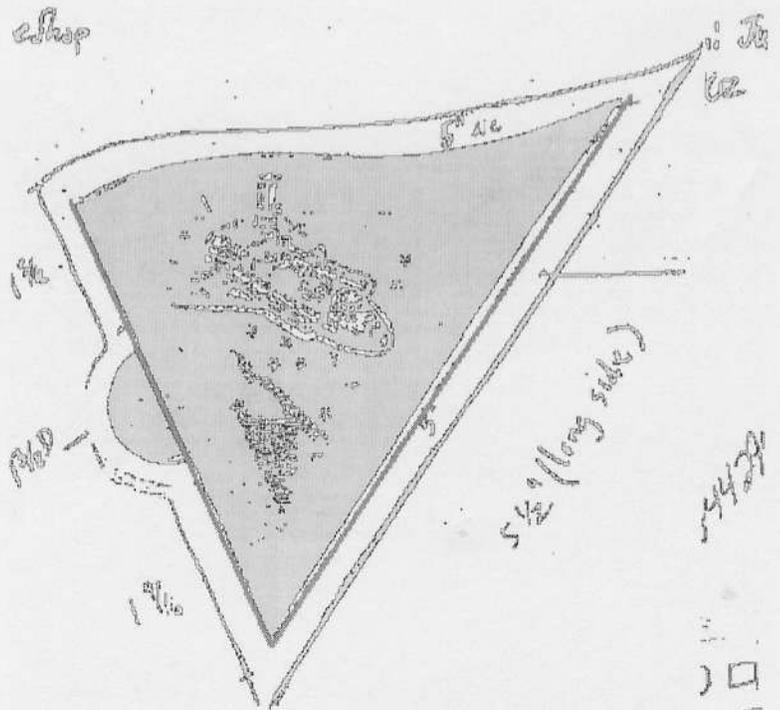
4. Open DeltaCad, and then either a) click File, Import > Bitmap File or b) click Edit, Paste if you have copied the scan to the Clipboard. In either option a rectangular area with a diagonal "X" will appear, designating the imported bitmap image. Clicking once anywhere on the screen will place the image in the DeltaCad drawing area. If you have already drawn a rectangle representing the final mat size you will need, you can place it anywhere within that rectangle just by clicking in that location. You may place the scan exactly in the center of the rectangular region by clicking the "Snap to Center" tool in the lower-right, then clicking again after bringing the cursor to any edge of the rectangle. Then click the Edit tab to complete the placement of the bitmap on the screen. Note: if you click more than once in the screen area before clicking the Edit tab, you will import multiple copies of the bitmap into DeltaCad, which is a BAD thing.
5. For this example, we will be tracing an image of a Space Shuttle commemorative patch. The patch may be scanned directly if you have the original, or you may scan a life-size photocopy of it. (See next page)

Once you have placed the image into the CAD program, it's simply a matter of tracing the outline and/or portions of the design which you want to be cut with the appropriate lines and arcs. Since you will usually be tracing a high-contrast black and

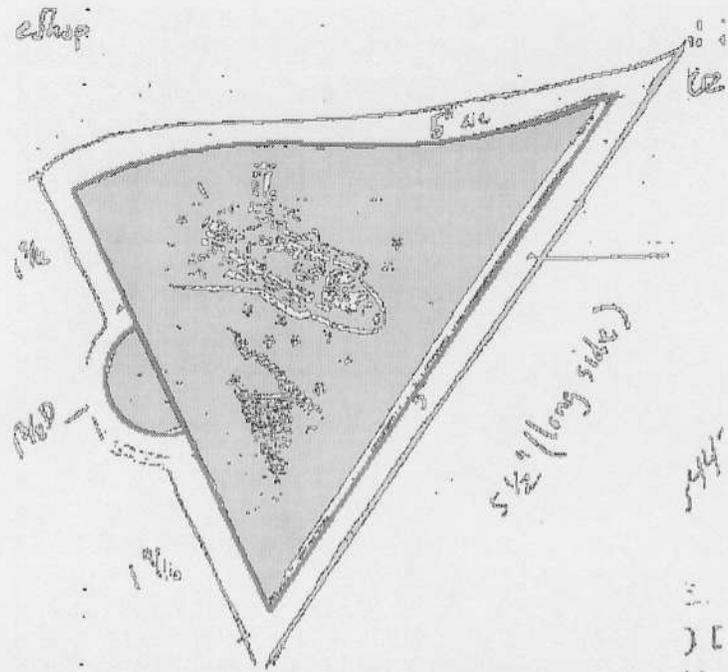
white scan, it is often easier to draw initially in a color other than black so that you can more easily see what you have traced.



6. Begin by selecting the Line tab, and the "Draw a Line with two Points" tool. Change the drawing color to bright green for ease of tracing. Create a line matching each of the straight lines of the patch outline. Don't worry too much about the exact placement of the line endpoints just yet. (See diagram)

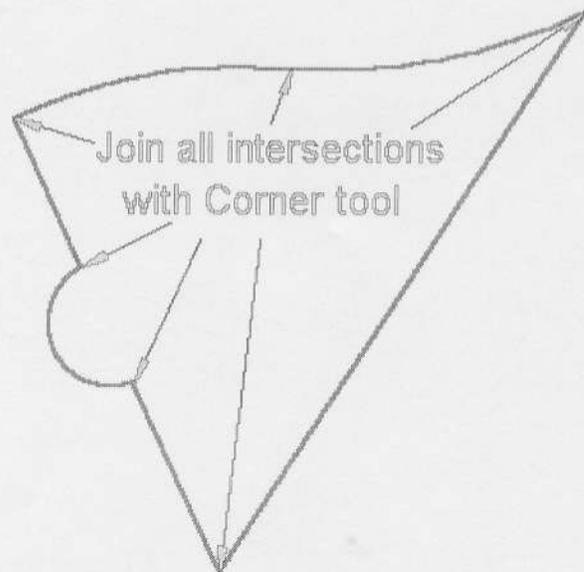
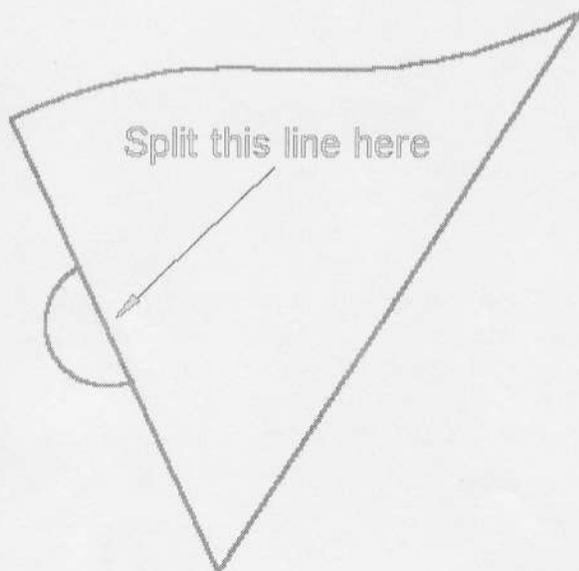
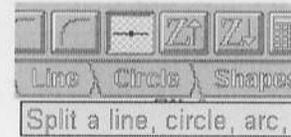


7. Now select the Circle tab, and the "Draw an Arc using 3 Points" tool. Trace the small arc at the left side of the patch, then the gradual "S" curve along the top portion using two arcs. (This part may take a few tries before it looks right!)



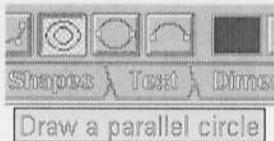
8. At this point, you have traced all of the pertinent elements of the scanned image, and can now remove it from the drawing area. Before you erase the bitmap, Save the design as something like "patch scan trace 1" to preserve what you've done so far. Then select the Edit tab, and the "Erase" tool, and erase the bitmap by clicking when you see the large "X" cross light up. Save again, this time as "patch trace 1".

9. The next step is to split the line along the left side of the design into two shorter lines. Select the "Split a line, arc, etc." tool from the Edit tab, and click at about the mid-portion of the line to split it. Then select the "create a corner" tool, and join each line-to-line and line-to-arc intersection cleanly. (See below)



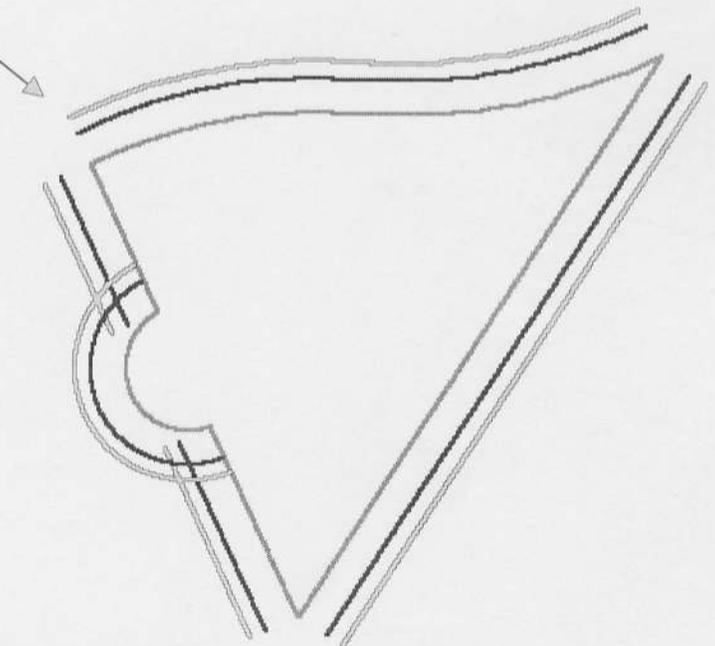
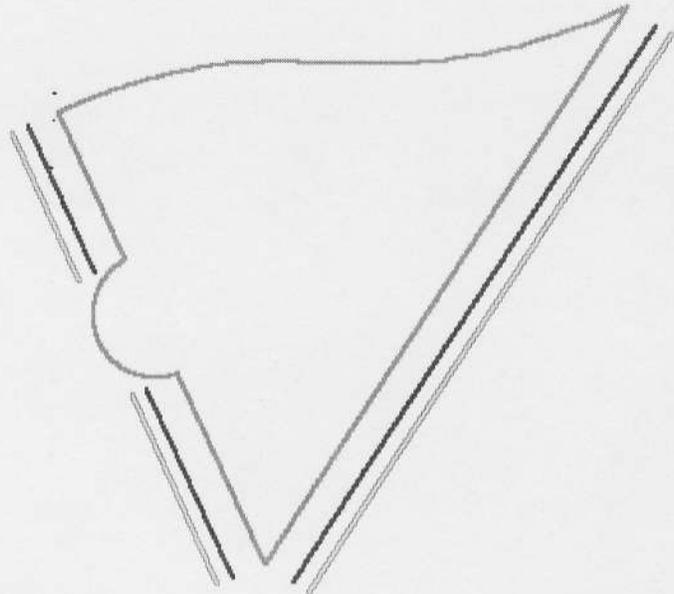
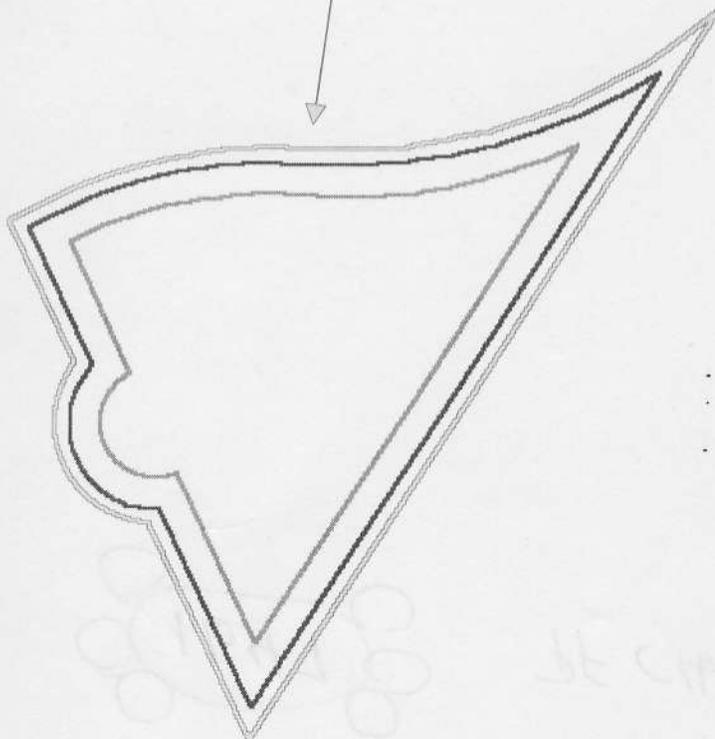
10. Now that we've completed the outline of the patch itself, we need to draw the mat layers that will actually be cut. To do this, simply create a line or arc parallel to the traced outline at the desired distance(s). For this example, the patch will be floated on a mat with $\frac{1}{4}$ " space around to the inner mat, and a $\frac{1}{8}$ " inner mat exposure. Start with the Line tab and the Parallel Line tool. Change the color to red to represent the inner mat layer, and draw a line $.25$ " from each of the 3 lines in the design. Change the color to black for the top mat, and draw 3 new parallel lines $.125$ " outside of the red lines, as shown here.

11. Next select the Circle tab and the "Draw a parallel circle" tool. Change the draw color to red, and create a parallel arc $.25$ " from the three existing green arcs. Change the color to black, and draw three more parallel arcs $.125$ " from the red arcs.



arcs. Change the color to black, and draw three more parallel arcs $.125$ " from the red arcs.

12. To complete the design, simply connect each intersection on both new mat layers with the "Create a Corner" tool.



Place the design within the mat area with the "Move" tool. Save the final design, then create a $.dxf$ file. The green layer can be deleted or left in the design for visual reference. Your mat is now ready to cut!