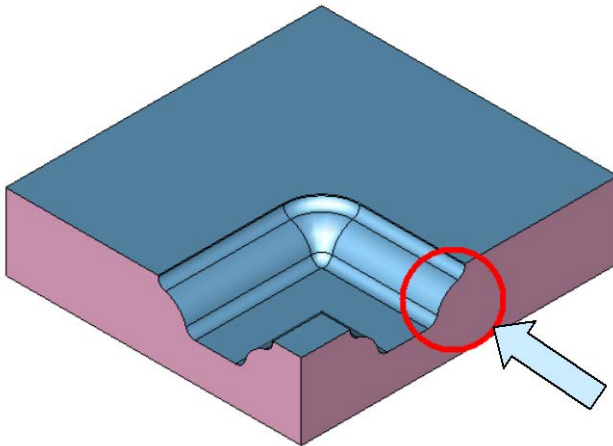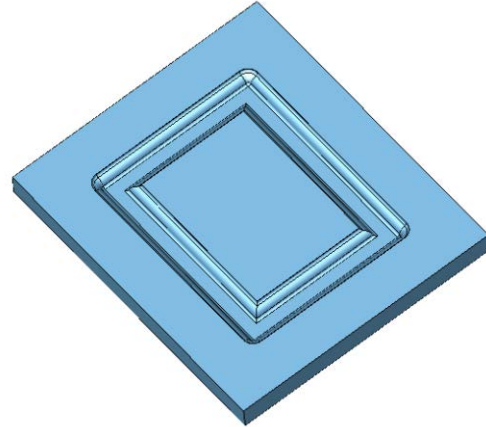# KEYCREATOR 3D Direct Modeling Software

KeyCreator Lesson KC8251

Furniture Panel- Machining Frames

In this lesson we'll review how to quickly create basic tool paths for machining a furniture panel like the one illustrated to the right.

This particular panel is machined out of one solid piece of cabinet grade-solid core plywood.

The fancy Roman Ogee Edge is created using simple 2D Profiling Tool Paths.

The secret is to use a special shaped cutter that has an effective major diameter equal to the stock Flat End Mill that you specify in your tool path.

Since your router or milling machine is simply following a tool centerline, it doesn't really matter that you swapped the fancy cutter for a straight one!

Let's start with a new file in View 1. (The Top View.) For purposes of this exercise, let's assume that we want to machine a panel that has overall dimensions of 14 x 12 inches.

Click on the CREATE RECTANGLE BY WIDTH HEIGHT Icon. Use the MidCtr Anchor Option.

Type 14 for the Width and 12 for the Height. Using the KeyIn Option, hit the ENTER Key three times to center the rectangle on the origin.

Click on the BACKUP Button. Type 7 for the Width and 5 for the Height. Center this also on the origin.

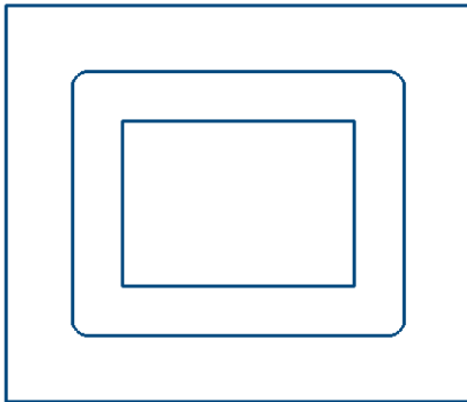**KUBOTEK Freedom and Precision www.kubotekusa.com**   1

KEYCREATOR 3D Direct Modeling Software

Next, click on the CREATE ROUNDED RECTANGLE BY WIDTH HEIGHT Icon. Use the MidCtr Anchor Option.

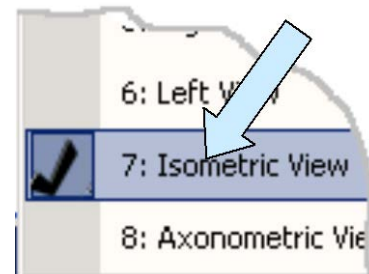Type 0.5 for the Radius.
Type 10 for the Width and 8 for the Height.

Using the KeyIn Option, hit the ENTER Key three times to center this also on the origin.

Your screen should look like this:

NOTE: We can actually generate the tool paths for machining our fancy panel with just the geometry we have at present plus one additional reference point for the bottom corner of the machining volume. The next few steps will create a model that we can use for visualization purposes.

Now, switch to the Isometric View. (View 7.)

6: Left View
7: Isometric View
8: Axonometric Vie

Advanced Modeling ✕

Create
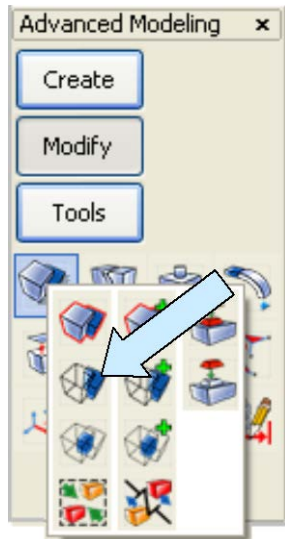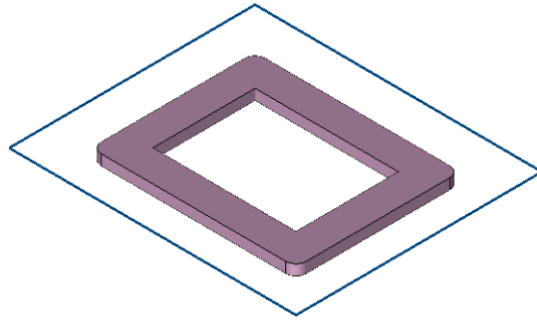Modify
Tools

Click on the EXTRUDE Icon.
A Dialog Box appears.

Type 0.5 for the Length and hit the ENTER Key.
Select the two smaller rectangles and hit the ENTER Key.

Click on the downward-facing vector.
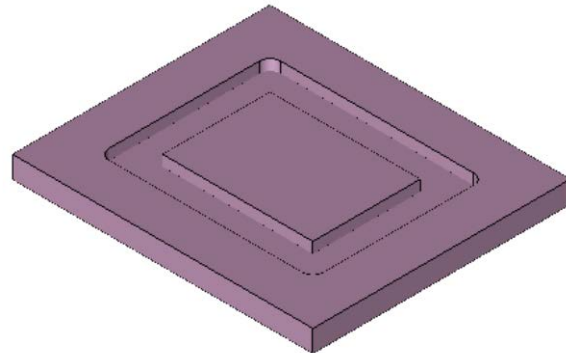
KEY**C**REATOR 3D Direct Modeling Software

Your screen should look like this:

Use the EXTRUDE Function again.
This time extrude the 14 x 12 rectangle
downward 1 inch.

Now, click on the BOOLEAN DIFFERENCE Icon.

Select the larger solid and then the small frame-shaped solid.
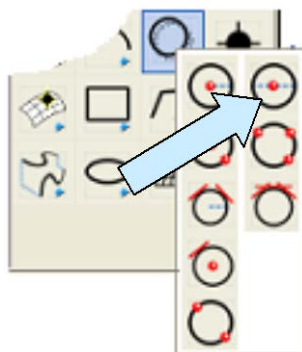Hit the ENTER Key.

You will now have a rough frame that
looks like this:

Creating the Roman Ogee edge treatments is easy. Click on the
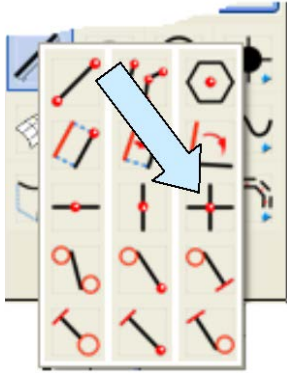CONSTRUCTION PLANE Icon and type 5 for the Cplane Number.

Select a new construction color.
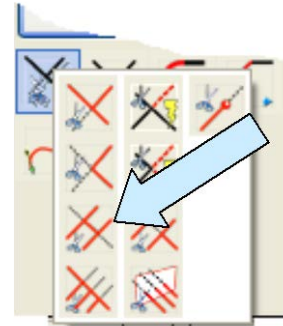
Next, click on the CREATE CIRCLE BY DIAMETER Icon.

Type 0.75 for the Diameter and using the Cursor Option,
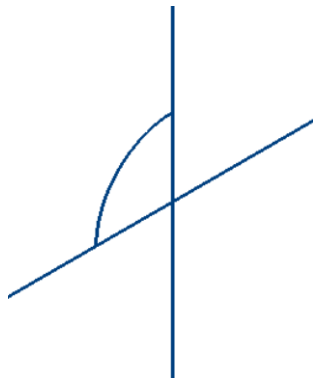click in an empty area of the screen.

Next, click on the CREATE HORIZONTAL/VERTICAL LINE Icon.
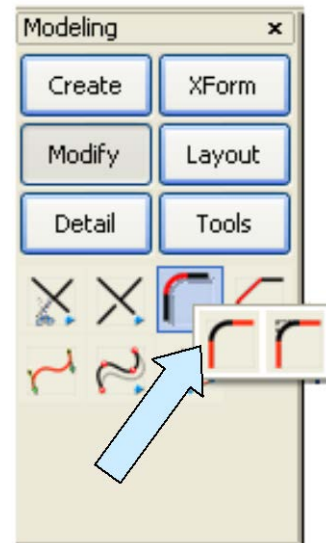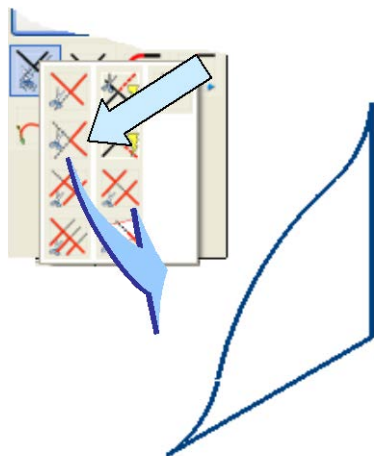
Using the CtrMid Option, click on the circle.

Now, click on the TRIM DOUBLE Icon. Click on the circle at the 11 O'Clock position and then on the horizontal and vertical line.

Your profile should now look like this:

Click on the FILLET WITH TRIM Icon and create fillets at the two points where the 90 degree arc meets the lines.

Then, use the TRIM BOTH Function to finish trimming the profile so it look like this:
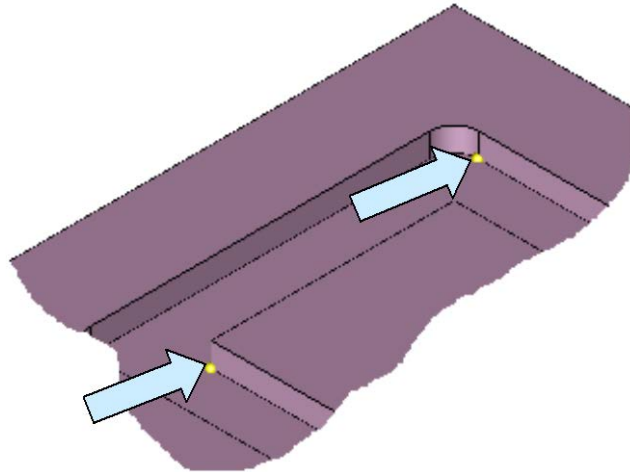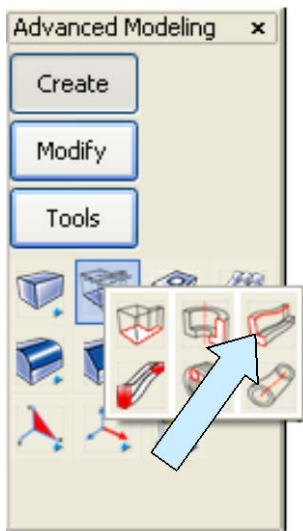
Click on the XFORM OLD-NEW COPY Icon.

Select the entire profile you just made and hit the ENTER Key. Type 1 for the Number of the Copies.

Using the EndEnt Option, click on the intersection of the two lines in the profile. Hit the ENTER Key.

Now, using the ENDENT Option, click at each of the positions indicated by arrows in the illustration to the right.

Now, click on the SWEEP Icon.

A Dialog Box appears. We're going to do a simple sweep so just hit the ENTER Key.

Note: For the next operations, you should have the Restrict Chain Select and Enable Quick Chain Options selected in TOOLS/OPTIONS/SELECT.

Click on the CONSTRUCTION PLANE Icon. Then, type 1 for the construction plane number.

Select the profile that you just copied to the outer wall of the recess. (Hint: The easy way to do this is to window select while using the MASK Function. The Hot Key for masking is CTRL+E in Windows-based Keyboards and ALT + M in DOS-based keyboards. When the mask Dialog appears, select the color that you used for the profile. Then, hit the ENTER Key.)

Next, click on the Chain Option on the Conversation Bar and then on the Curve Option. Use the Masking Hot Key to access the Mask Dialog and clear the previous mask.
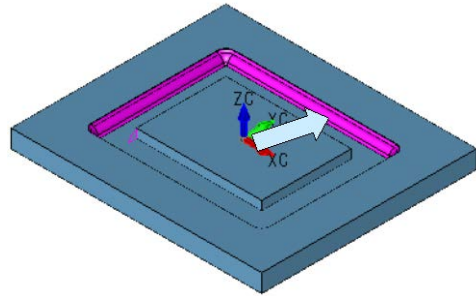
Then, just move the cursor over the top edge of the outer wall of the recess. Click on it when it highlights. Notice that the entire outer perimeter of the recess rebuilds as a fancy edge.
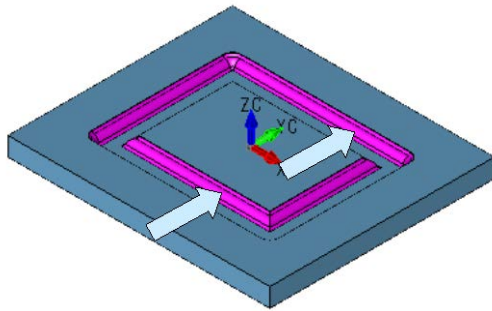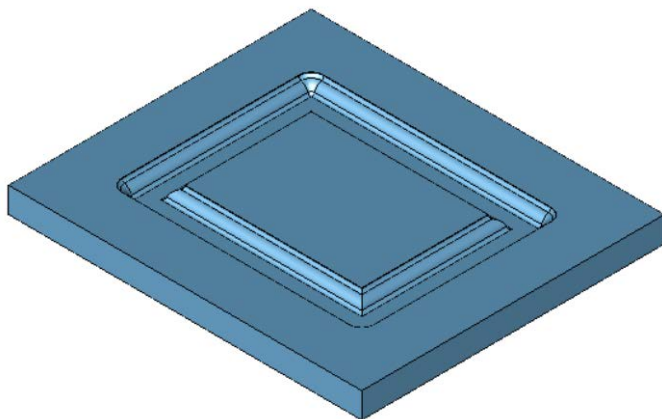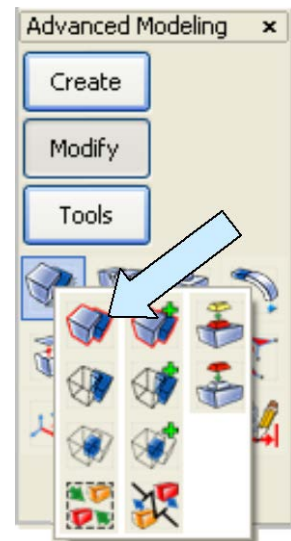
Follow the same procedure to sweep the profile that is positioned at the inner wall of the recess around the four edges.

When you are done, your panel will look like this:

Click on the BOOLEAN UNION Icon.

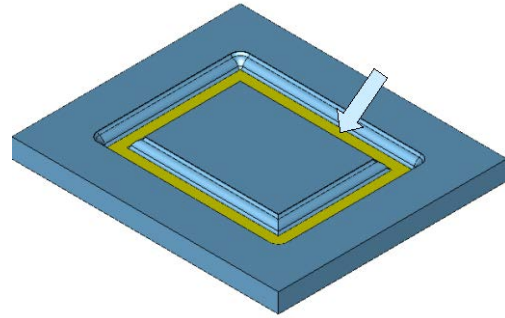Click on the main panel and then on the two swept solids and hit the ENTER Key.

Your finished part should look like this:

Creating the Tool Paths

There are two separate procedures involved to create the finished panel.

First, we'll use a 0.375 diameter Flat End Mill to machine away the panel material that lies between the tow base curves in the recess.

This area is highlighted in yellow in the illustration to the right. (We'll use the 2D POCKET Function for this.)

Then, well use a special profile cutter that has an effective minor diameter of 0.250 to create the fancy edges. (We'll use the 2D PROFILE Function for this.)
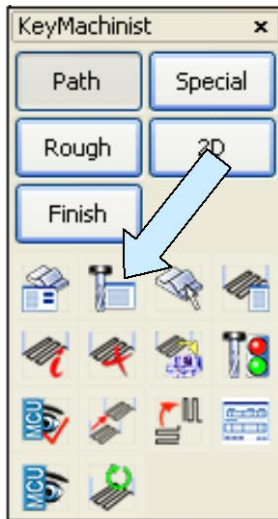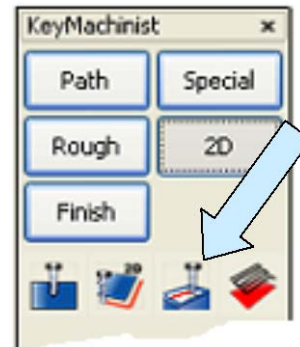
Start by clicking on the TOOL LIST Icon.

A Dialog Box appears.

Click on the Define New Button and create two tools.
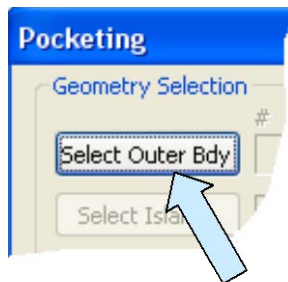The first one is a 0.375 diameter Flat End Mill and the second one is a 0.250 diameter Flat End Mill.

When you are done, select the 0.375 diameter Flat End Mill as the active one.

Click on the 2D POCKET Icon.
The first sheet of the Pocketing Dialog Box appears.
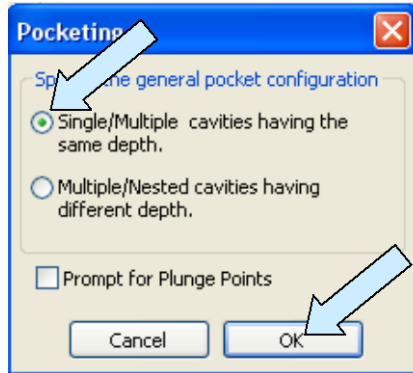Our tool is already selected so click on the NEXT Button.

The second sheet appears.
Click on the Select Outer Bdy Button.

Note: For the next operations, you should have the Restrict Chain Select and Enable Quick Chain Options selected in TOOLS/OPTIONS/SELECT.

KEYCREATOR 3D Direct Modeling Software

Click on the Single/Multiple Cavities Having the Same Depth Option in the small Dialog Box that appears. Then, click on the OK Button.

Click on the Chain Option on the Conversation Bar. Then, click on the Curve Option. Since you still have the Construction Plane equal to 1, when you move the cursor over the outside bottom edge of the recess, the entire perimeter highlights. Click on the highlighted perimeter and hit the ENTER Key.

You are returned to the main Dialog Box. Now, click on the Select Islands Button.

Use the Chain select to pick the entire bottom edge at the inner wall of the recess. Then, hit the ENTER Key.

We'll use a spiral pocketing style. Select the Expand Inside Outward Option. Make sure that there is NO check on the First Contour on Boundary Option.
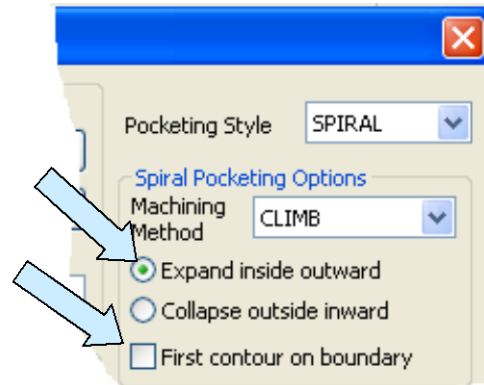
Click on the NEXT Button. The third sheet of the Dialog Box appears.

Click on the Cursor Select Button next to the Z-Surf Field.
Using the EndEnt Option, click on one of the top, outside corners of the panel.

Next, click on the Cursor Select Button next to the Z-Floor Field.
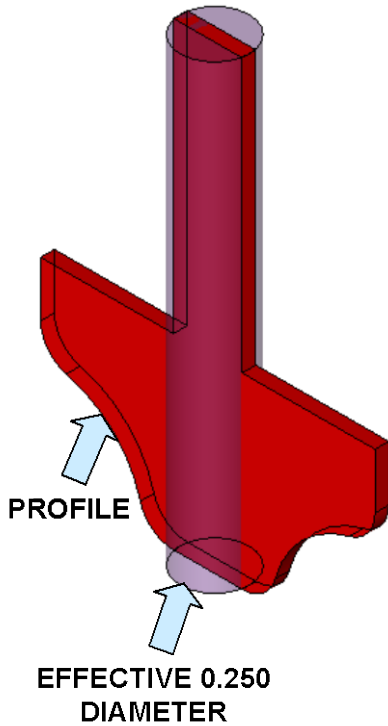Using the EndEnt Option, click on any bottom edge of the recess.
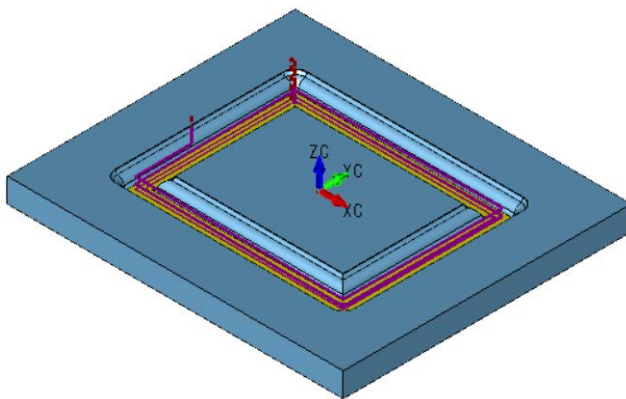
We'll use 1 for the Number of Passes.

Click on the Create Path Button. Type Rough1 for the Tool Path name and click on the CREATE Button.

You will now have your first tool path.

Take a moment to move the tool path to a specific level. Rename the level "Rough1 TP" and remove the level from the display.

Now, click on the TOOL LIST Icon and select the 0.250 Diameter Flat End Mill that you defined earlier. (We are going to use this tool in the creation of our tool path. However, when we actually machine the panel, we'll insert a special profile cutter in our machine that has a pilot diameter of 0.250 and a custom curved profile that will make our fancy edge.)

PROFILE

EFFECTIVE 0.250
DIAMETER

Click on the 2D PROFILE Icon.

The first sheet of the Profile Milling Dialog Box appears. Since we have already selected our cutter, click on the NEXT Button.
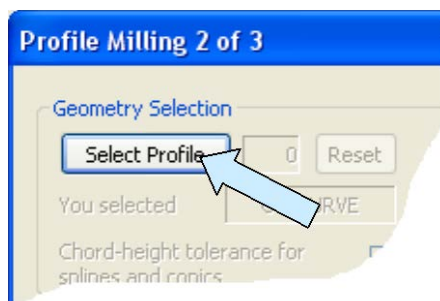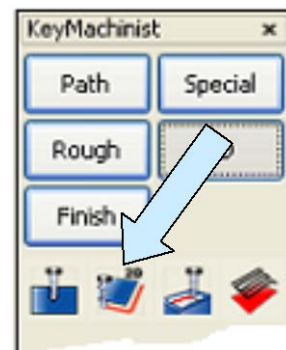
The second sheet of the Dialog Box appears. Click on the Select Profile Button.

Click on the Chain Option on the Conversation Bar and then on the Curve Option.

Move the cursor over the same bottom, edge of the outer wall of the recess that you selected in the previous 2D Pocket operation. When the entire profile highlights (Four lines and four corner fillets), click on it.

You are asked if you want to reverse the machining direction. Click on the NO Option.

Then, you need to select Left, On-Curve, or Right. Click on Right so the cutter symbol positions in the recess as illustrated to the right.
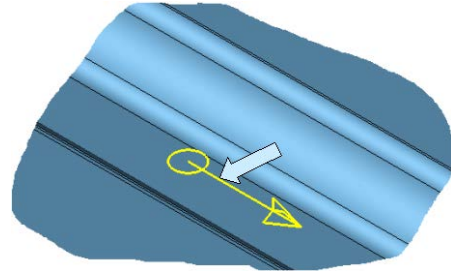
Click on the Mid Option.

You are asked to select another profile.
Repeat these steps to select the entire profile (Four Lines) at the bottom of the inside edge of the recess. When you are done, hit the ENTER Key.

Use the No Option for cutter compensation and click on the Output non-offset profile. Option. Select the Straight Line Tangent Option for Lead In/Lead Out and use the default 0.275value.
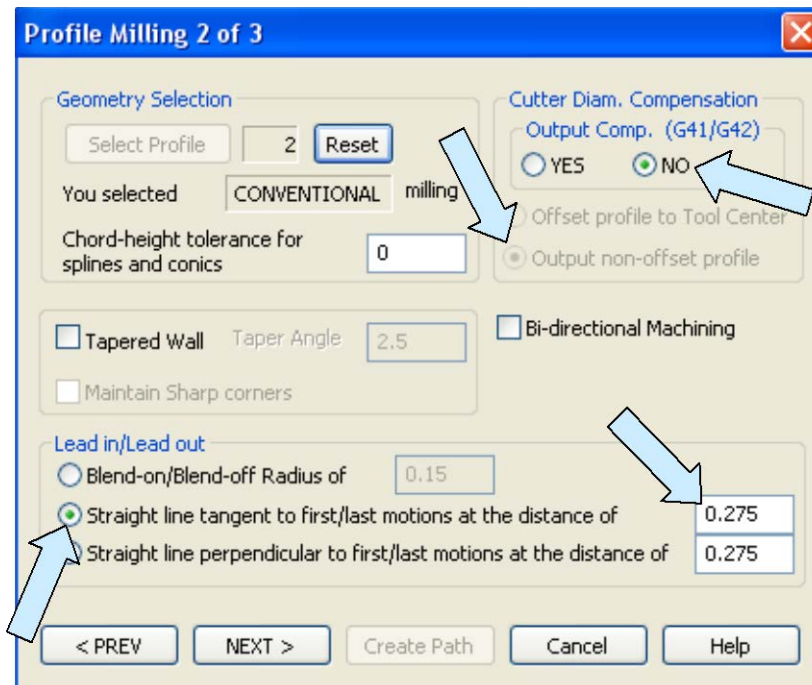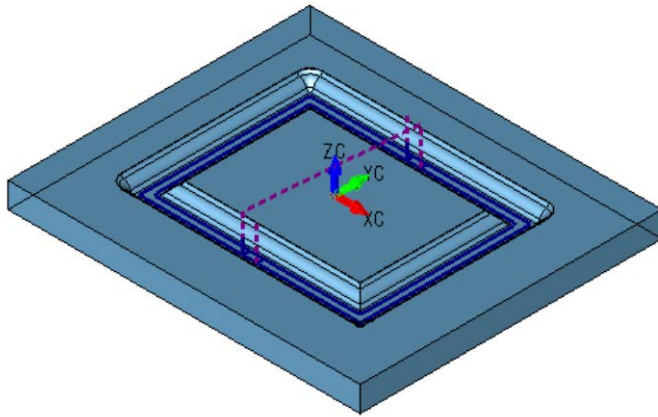
Note: The recess is relatively narrow and the profile cutter is reasonably large in overall diameter. If we used a blend on/ off radius, we would nick the opposing wall of the recess.

Click on the Next Button. Sheet 3 of the Dialog Box appears.
Click on the Cursor Select Button next to the Z-Floor Button.
Using the EndEnt Option, click on any edge at the bottom of the recess.

Click on the Create Path Button, Type "Fancy Edge" for the tool path name and click on the Create Button.

Your tool path should look like this:

Note: If you run the MetaCut utilities to verify your tool path, you won't get a fancy edge in the simulation since the verifying is being done with a straight 0.250 diameter cutter. The edge produced, however, should coincide with the bottom dimension of the fancy edge profile created by the ogee cutter.