

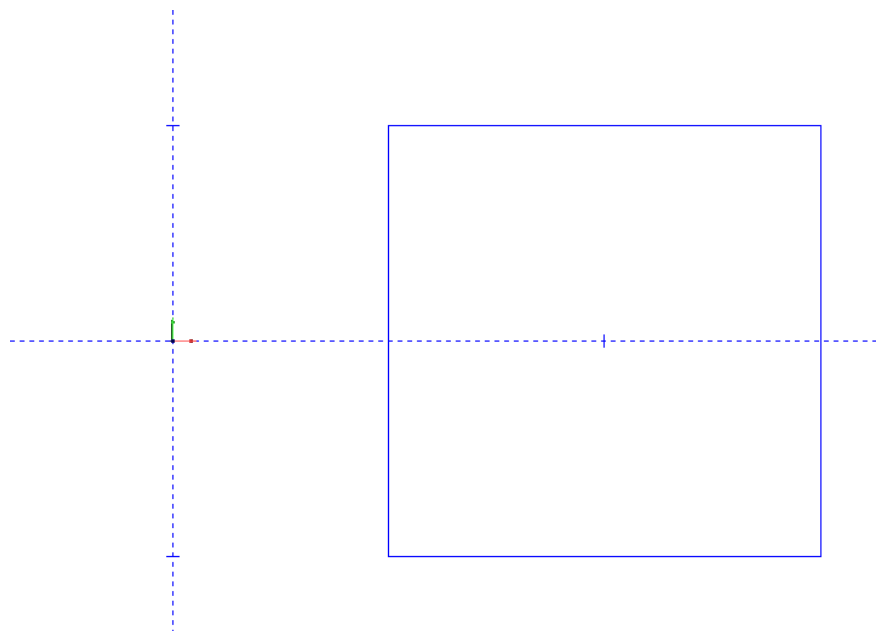
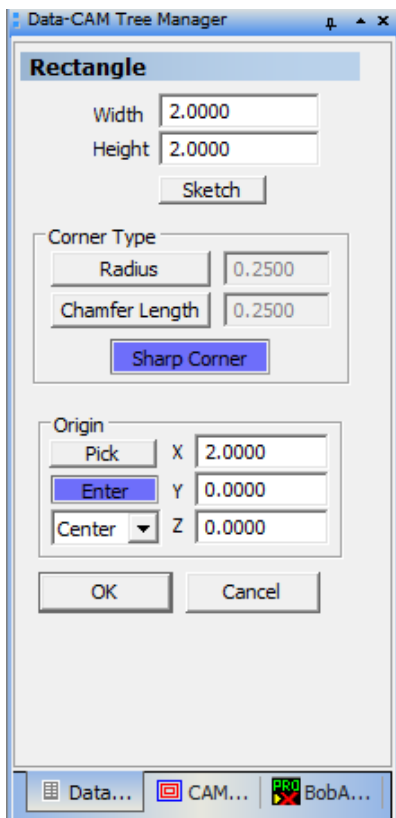
FAQ #32: How do I Index on the 4th Axis?

Q: I'm not sure how indexing on the 4th Axis in BobCAD-CAM works. Could I see an example?

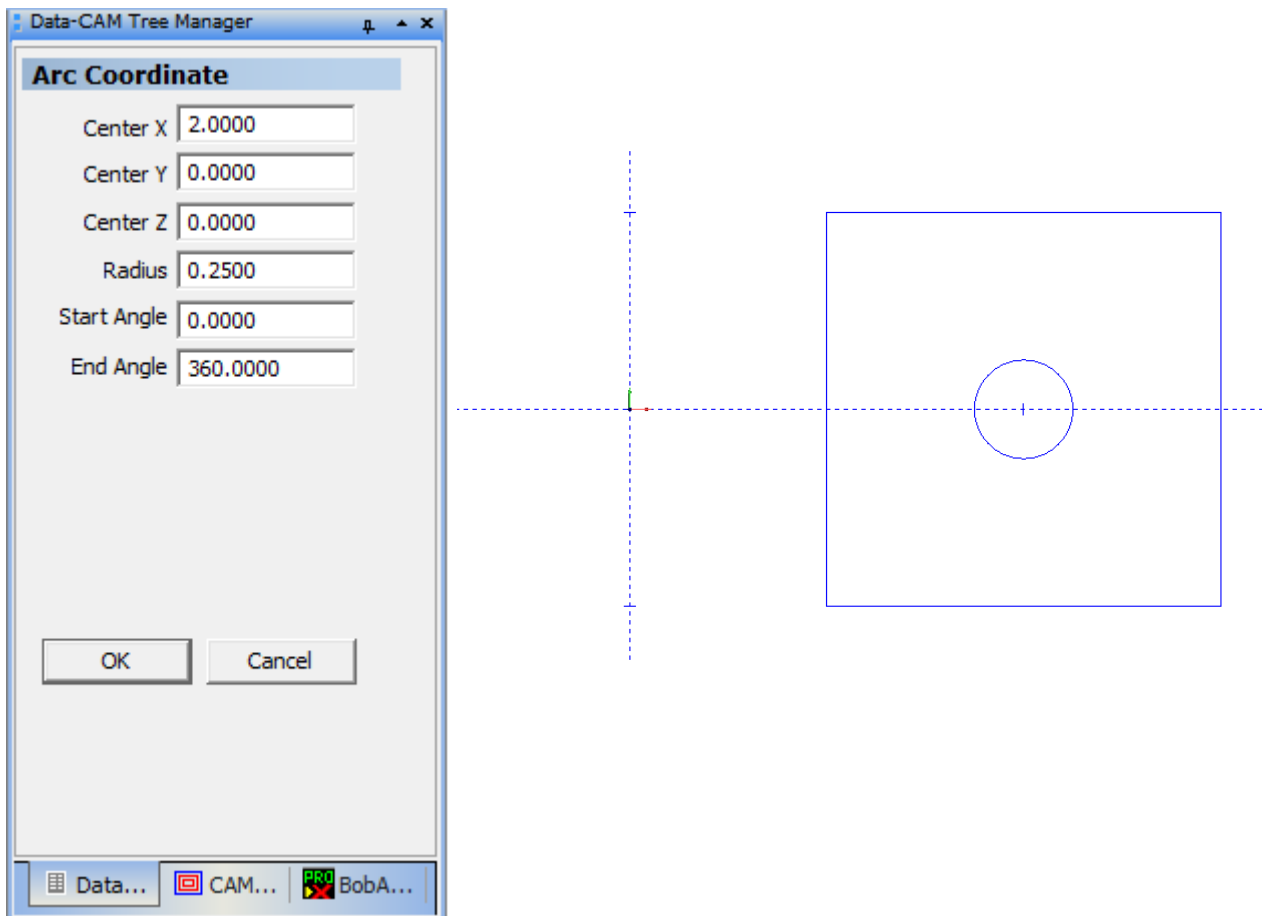
A: The following example will show the two options for 4th axis indexing. In this example we will create three pockets that we will cut at 0, 120, and 240 degrees around a cylinder. The first option is to draw one pocket and create three pocket features, manually editing the angle. The second option will discuss rotating the UCS (User Coordinate System) to get the angles needed.

As with any part in BobCAD-CAM, there needs to be a shape to cut. For this example we will draw a rectangle with a circular island in the middle.

Step 1: Click on the Other menu and select Rectangle.
We will leave the default 2 x 2 rectangle and place it at X 2, Y 0, Z 0.



Step 2: Click on the Arcs menu and select Coordinates.
Enter 2 for the Center X and a Radius of .25, leaving the other defaults set.

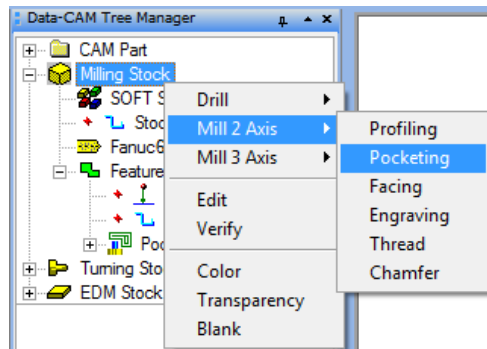


This completes the necessary drawing for this tutorial.

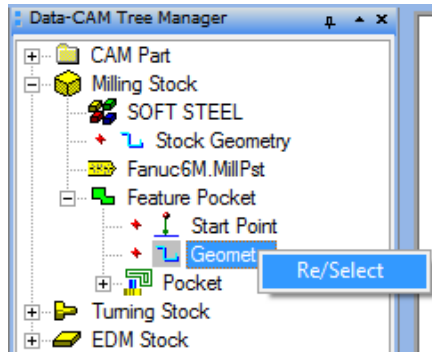
The next step is to begin creating our tool path for this shape placing it at 0, 120, and 240 degrees around the cylinder.

OPTION 1: This option demonstrates manually inputting a specific rotation angle into a feature. The input angle will be output in the posted program as a 4th Axis Rotary command.

Step 1: In the CAM Tree, right click Milling Stock, click Mill 2 Axis, and click Pocketing. This will add a Feature Pocket item to the CAM Tree.

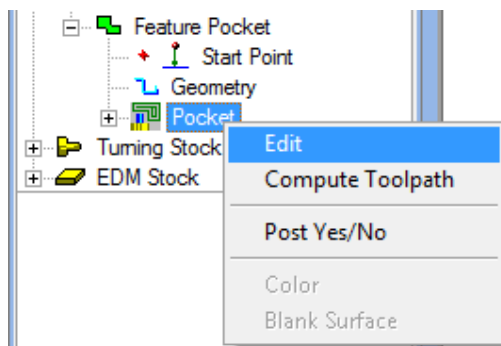


Step 2: In the pocketing feature right click Geometry and click Re/Select.

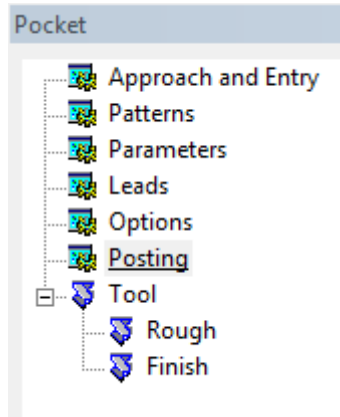


Step 3: Drag a window around the geometry so the rectangle and circle highlight. Next right click in the Workspace and select OK to end your selection.

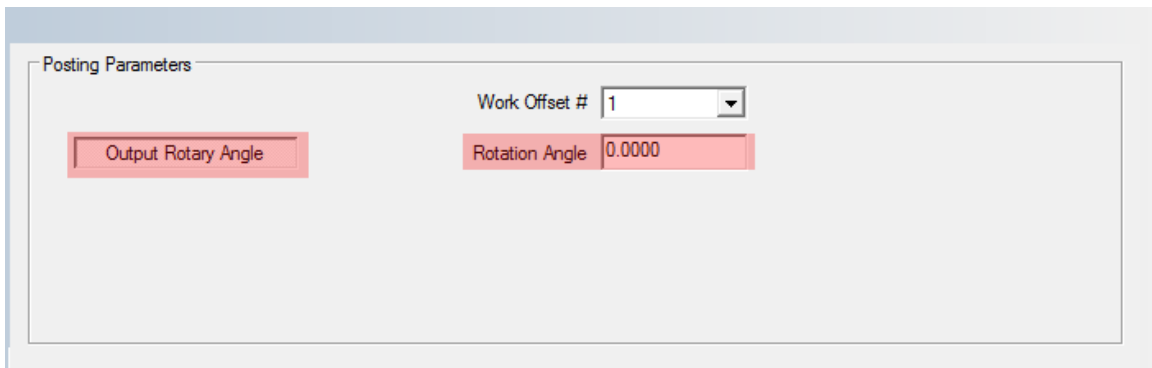
Step 4: Right click on Pocket in the CAM Tree and click Edit



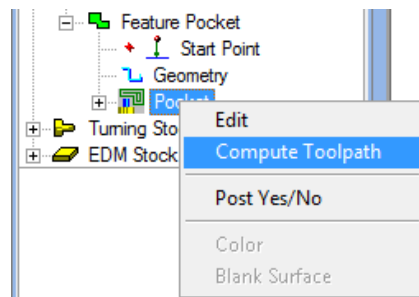
Step 5: Click on Posting in the left hand column of the Pocket dialog



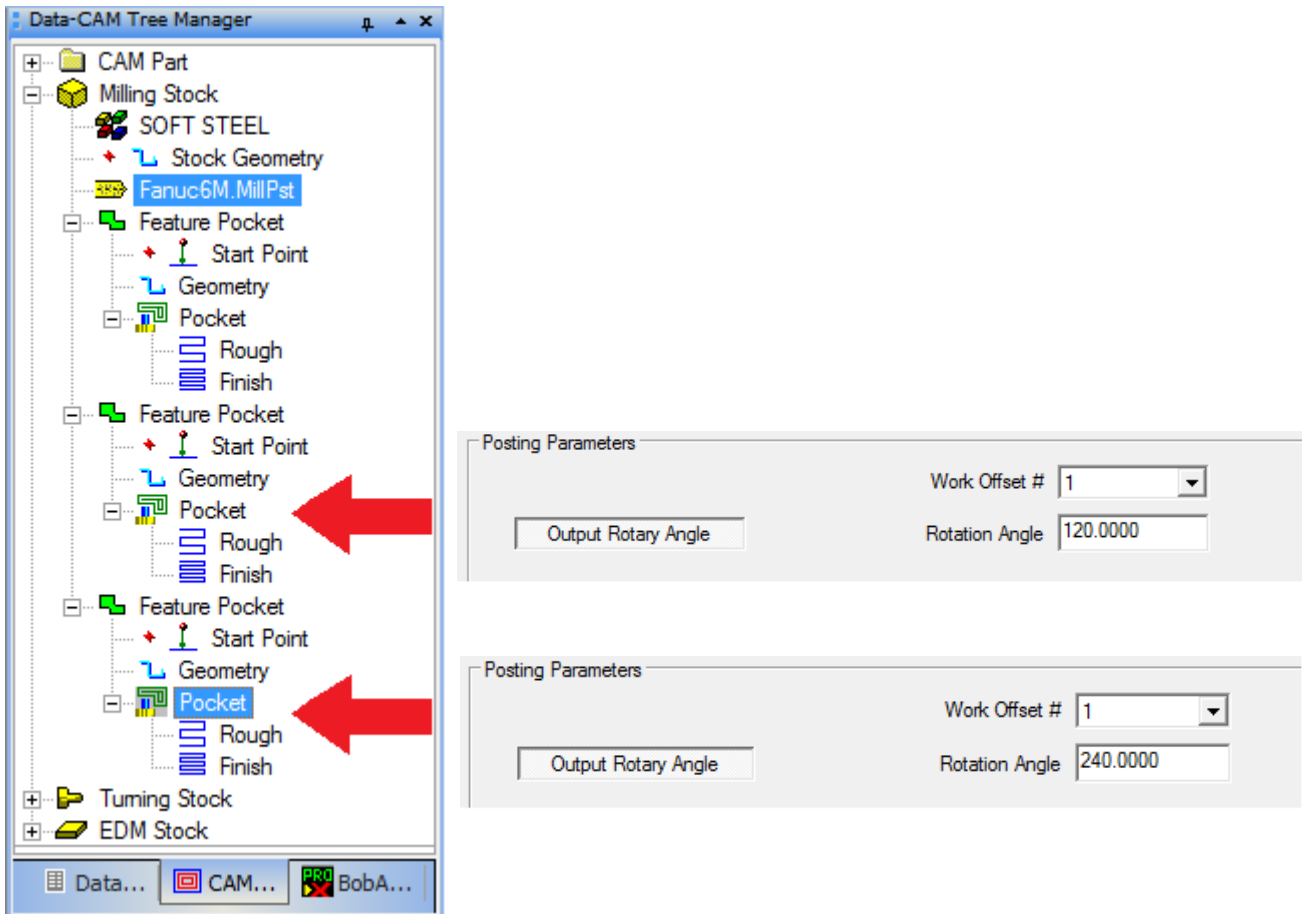
Step 6: To activate the 4th axis indexing option click the Output Rotary Angle button. The button should now appear depressed. For the first feature we will leave the rotation angle set to 0.0. Selecting this button is what tells the system to output the rotary codes in the posted program.



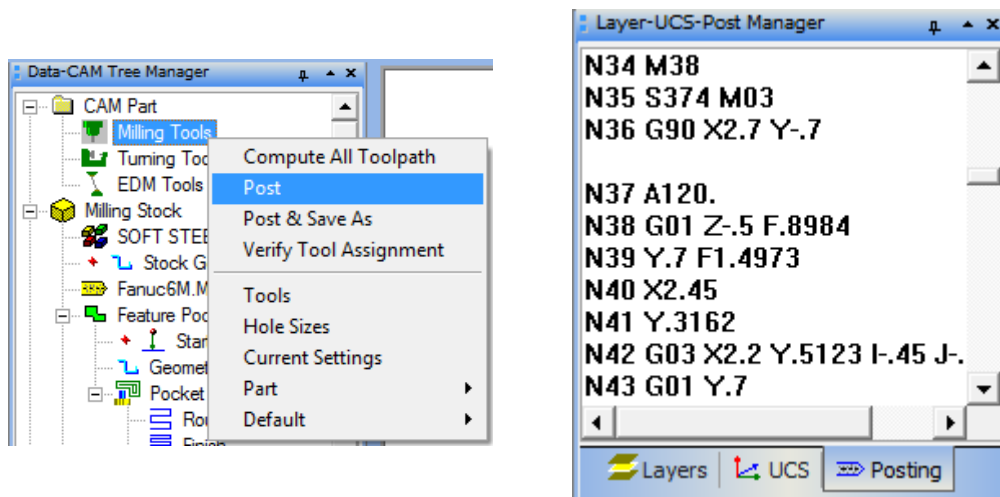
Step 7: Click OK on the dialog. Right click on the Pocket feature in the CAM tree and click Compute Toolpath. This will display the tool path for the feature.



Step 8: Repeat steps 1-7 twice to create two new pocketing features selecting the same geometry we used for the first feature. The only difference will be in Step 6. For the second feature enter 120 into the Rotation Angle field and for the third feature enter 240 into the Rotation Angle field.

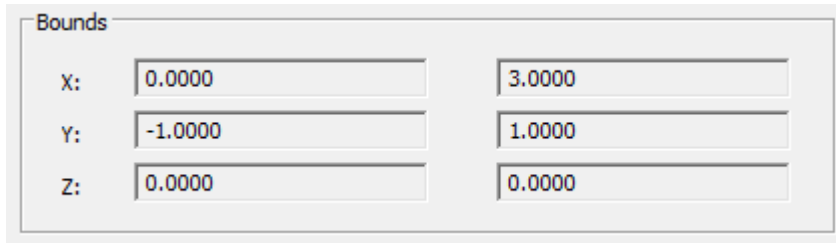


Step 9: Click the plus sign [+] next to CAM Part in the CAM tree. Right click on Milling Tools and click Post. This will post the program with the necessary rotation codes.

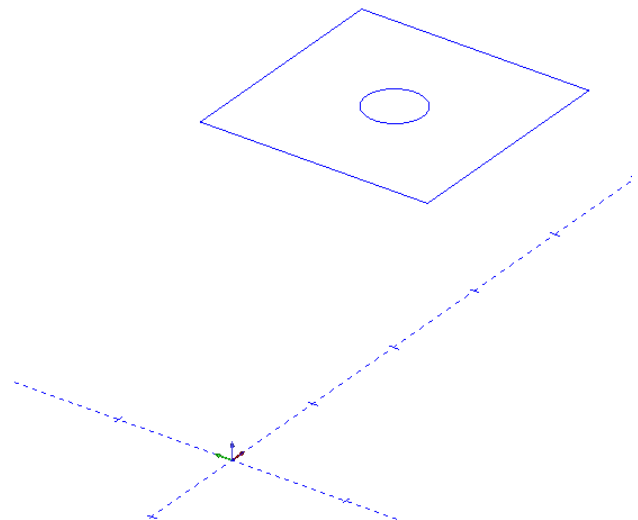
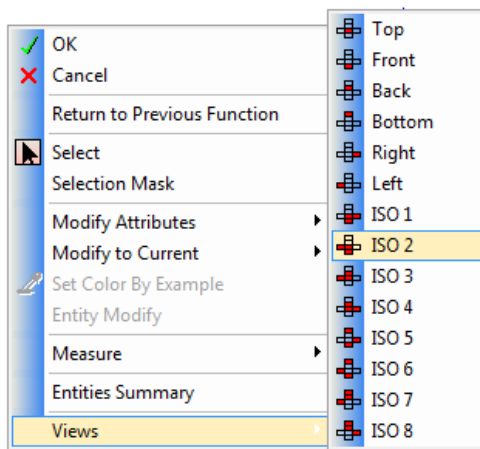
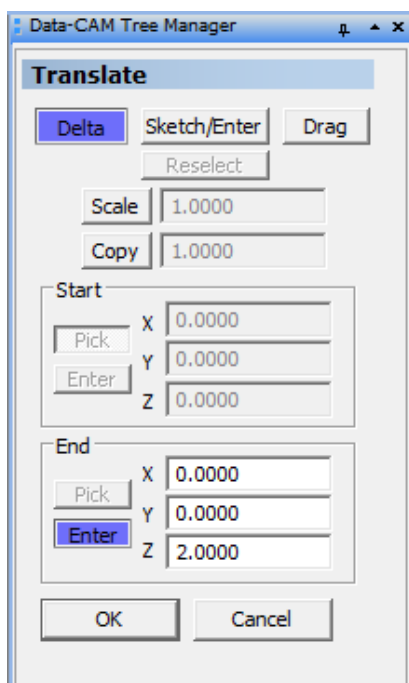


OPTION 2: Sometimes the exact value for rotation may be unknown to programmer. This example will demonstrate how the user can utilize the UCS (User Coordinate System) to determine the angle of rotation.

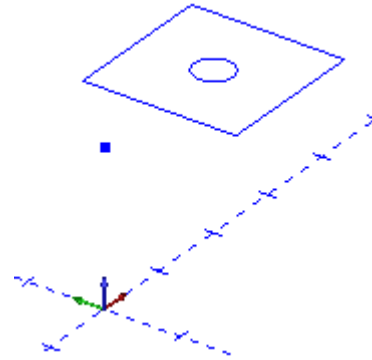
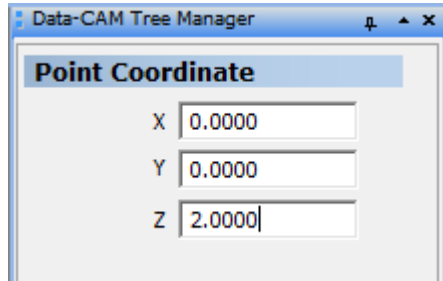
Step 1: Start with the drawing we created at the beginning of this document. Right click in the CAD window and click Entity Summary. Verify that the bounds fields match the image below.



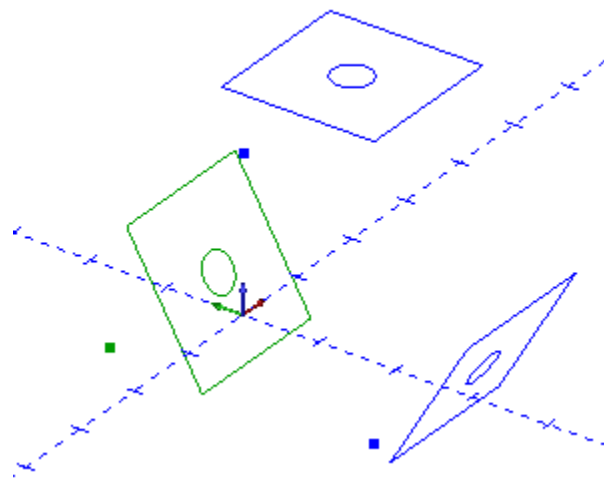
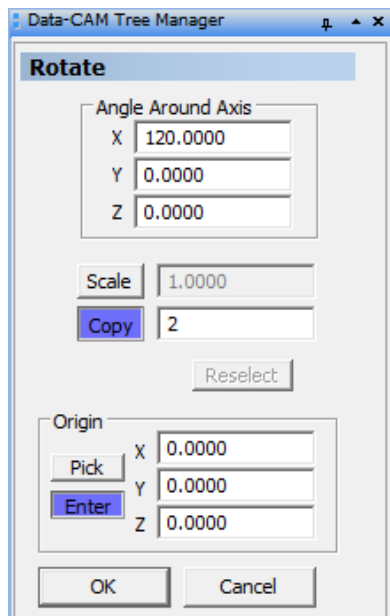
Step 2: Click the Utilities menu and click Translate. Make sure that Delta is selected and enter 2 into your Z End field. Drag a window around the geometry in the CAD window and right click and select OK. This will move your part up 2 inches in Z. If this is not apparent switch into an isometric view by right clicking in the CAD window, selecting Views and clicking ISO 2.



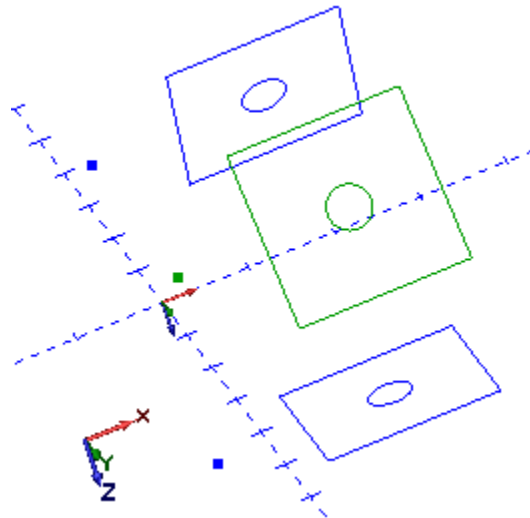
Step 3: Next we will draw a point to symbolize our zero point that we will utilize when moving our UCS to a different location. Click the Points menu and select Coordinates. Enter X0, Y0, Z2 and click OK.



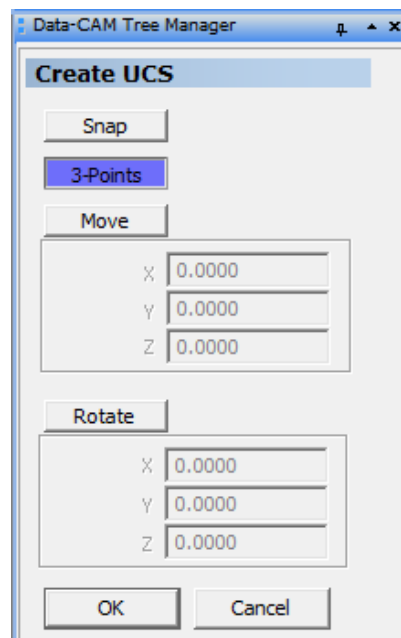
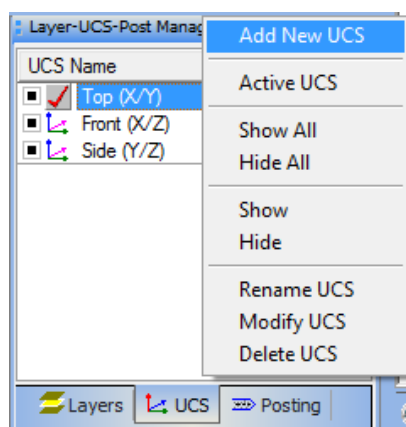
Step 4: Click the Utilities menu and select Rotate. In the Angle Around Axis enter 120 for X and leave Y and Z set to 0. Click the Copy button and enter 2 to make two copies. Under origin click the Enter button and leave X, Y, and Z set to 0. Click and drag a box around the point, the rectangle and the circle to select everything in the CAD window. Right click in the CAD window and click OK to finish your selection. Click OK in the Data tree to perform the rotate operation. After this operation the CAD screen should resemble the following (the colors have been modified to make the explanation of the following steps clearer.):

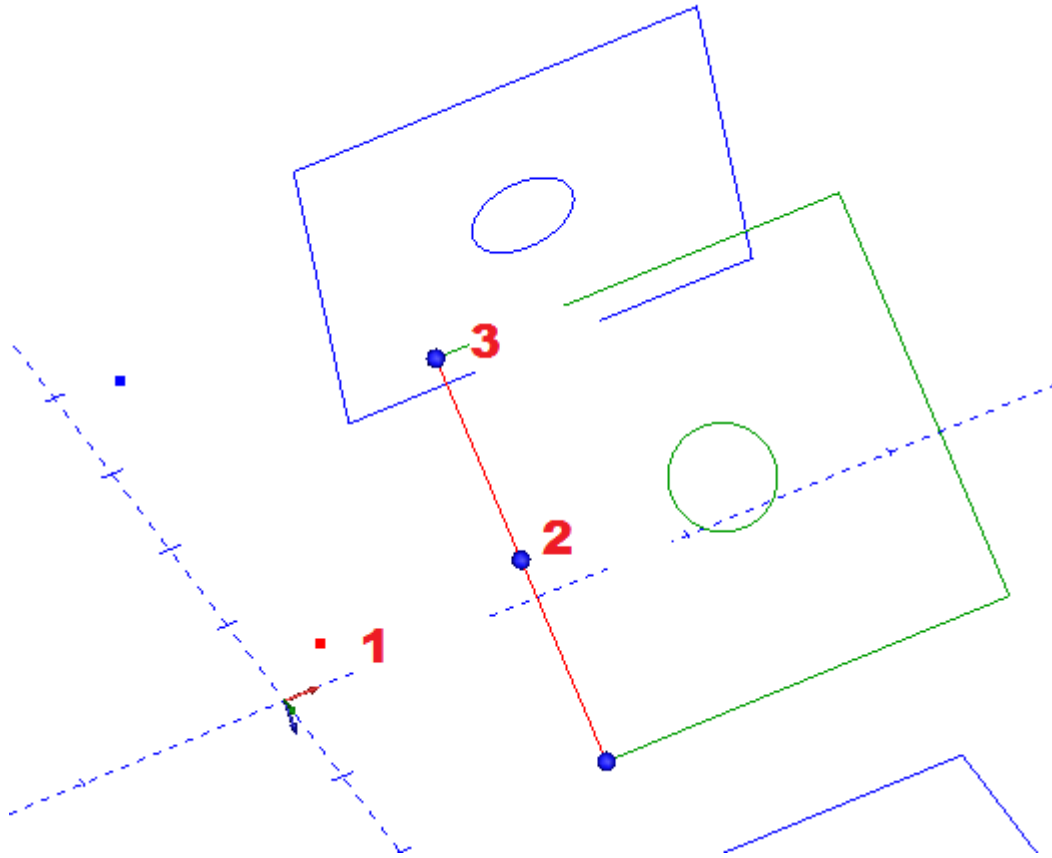


Step 5: Click the View menu and select Rotate. Rotate your view so that the green geometry (located at 120 degrees) is rotated up as if you were looking straight down at it.

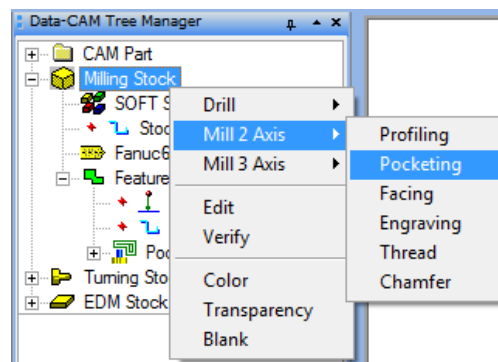


Step 6: Click the UCS tab in the Layer-UCS-Post manager. Right click in the UCS manager and click Add New UCS. Click the 3-Points button in the Data Tree to enable the creation by 3 snap points. This is why we drew the point earlier so we can reference this point as our zero location. The order of selection goes as follows: first click the origin point, next the positive X direction, then the positive Y direction. First click the point to left of the pocket we are going to be machining to define our zero location. Next hold the Shift key down and click the line closest to the point. This displays our snap points. Click the dot in the middle of the line to determine our positive X direction. Finally Shift + click the same line again and click the top dot to determine our positive Y direction. After this step you should see the new UCS displayed.



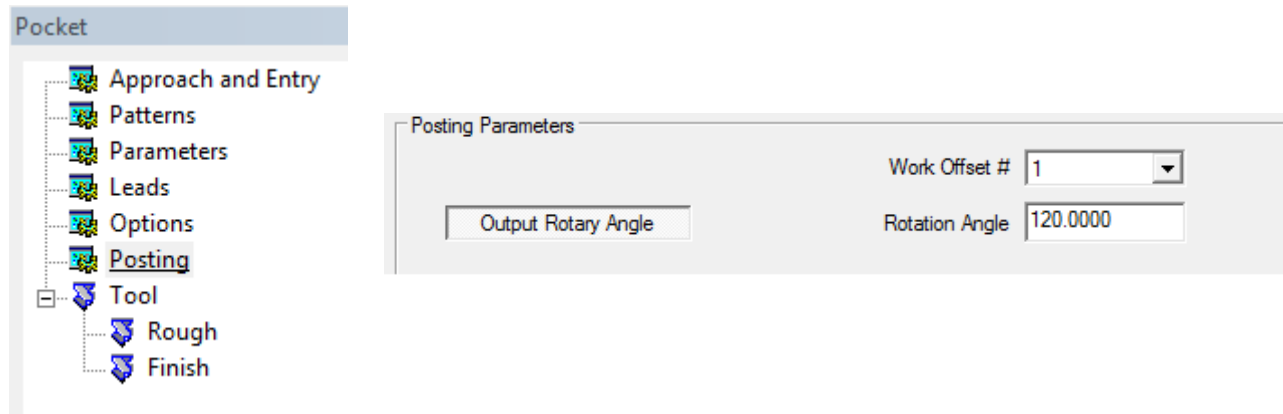


Step 7: Right click Milling Stock in the CAM tree, select Mill 2 Axis, and click Pocket. This adds a pocketing feature to the CAM tree. Right click Geometry and click Re/Select and select the green rectangle and circular island. Right click in the CAD window and click OK to finish the selection.



Step 8: Right click on Pocket in the new pocket feature and click Edit.

Step 9: In the Pocket Dialog click on Posting in the left hand column. Notice that the Output Rotary Angle button is all ready pressed and the Rotation Angle has automatically been calculated by the system.



Step 10: Click OK in the dialog. Right click on Pocket in the CAM tree and click Compute Toolpath.

Step 11: Repeat Steps 5-10 creating a new UCS and pocketing routine for each pocket.

Step 12: After the three pocket routines are created and computed. The next step would be to click the plus sign next to CAM Part in the CAM tree. Right click Milling Tools and click Post. The rotary codes will be output into the program.

The final part should look as follows:

