

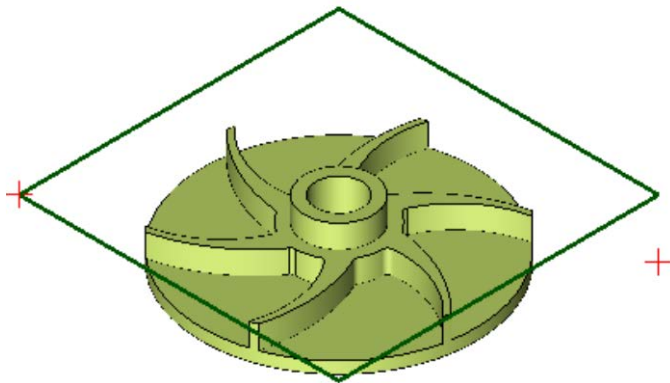
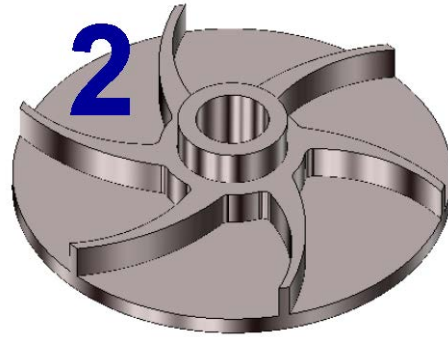
# KEYCREATOR 3D Direct Modeling Software

## KeyCreator Lesson KC8217

### 2D Machining an Impeller- Part2

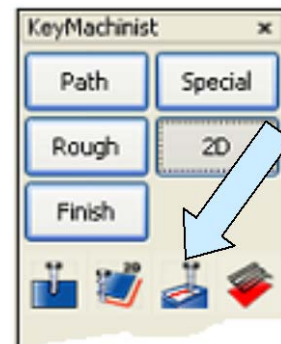
In this exercise we'll continue creating tool paths to machine the spiral impeller illustrated to the right.

The initial model and first two roughing tool paths were done in lesson KC8216.



Start by loading the file KC8216 that you saved at the end of that lesson. The first two tool paths were placed on levels 10 and 20 and should currently be removed from your display.

Your screen should look like this:

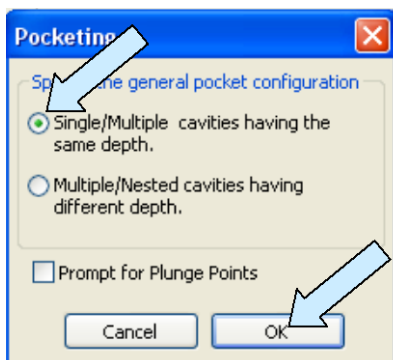


### Creating the Rough3 Tool Path

Click on the 2D POCKET Icon.

The Pocketing Dialog Box appears. We'll use the same 0.5 diameter flat end mill so click on the NEXT Button.

Sheet 2 of the Pocketing Dialog Box appears.



Click on the RESET Button to the right of the Select Outer Bdy Button. Then, click on the Select Outer Bdy Button.

A small Dialog Box appears. Select the Single/Multiple Cavities having the Same Depth Option and hit the ENTER Key.

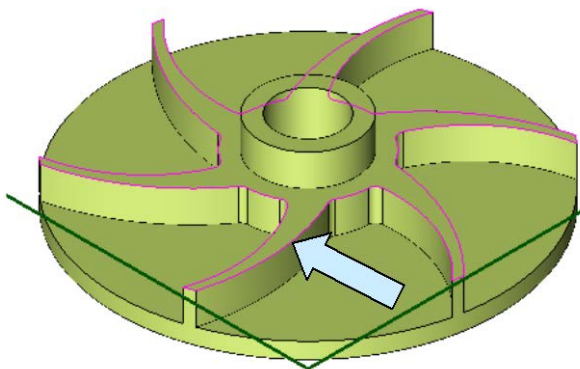
Using the Single Option, click on the bottom outer circular edge of the part. Then, hit the ENTER Key twice.

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You are returned to the main Dialog Box.

Click on the RESET Button to the right of the Select Islands Button.

Click on the Select Islands Button.



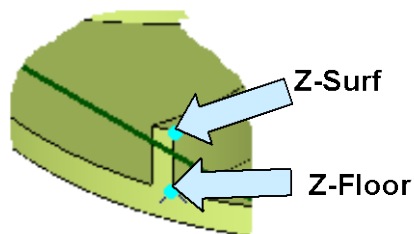
**Note: For the next operations, you should have the Restrict Chain Select and Enable Quick Chain Options selected in TOOLS/OPTIONS/SELECT.**

Move the cursor over the top edge of one of the arms and click when the entire perimeter profile highlights. Then, hit the ENTER Key.

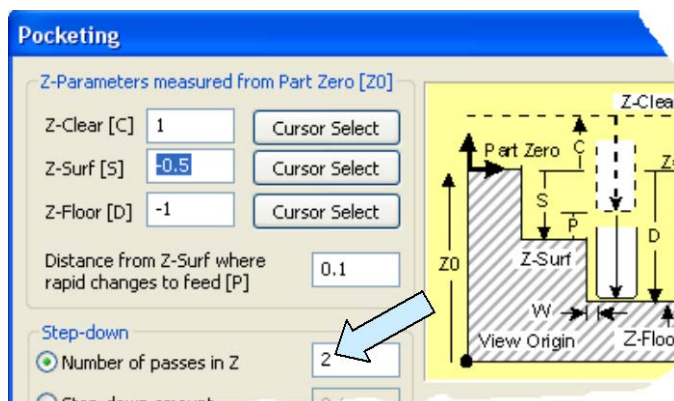
You are returned to the Dialog Box.

Click on the Collapse Outside Inward Option. Click to place a check on the First Contour on Boundary Option. Then, click on the NEXT Button.

The next sheet of the Pocketing Dialog Box appears. Click on the Cursor Select Button to the Right of the Z-Surf Button. Using the EndEnt Option, click on a top corner of one of the arm ends.



Next, click on the Cursor Select Button to the Right of the Z-Floor Button. Using the EndEnt Option, click on a bottom corner of one of the arm ends.



Select the Number of Passes in Z Option and type 2.

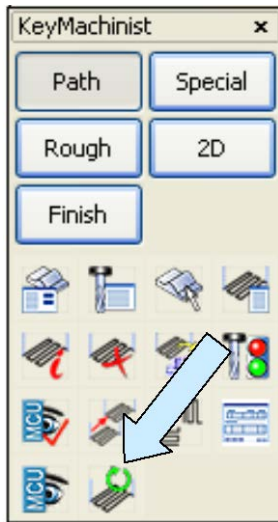
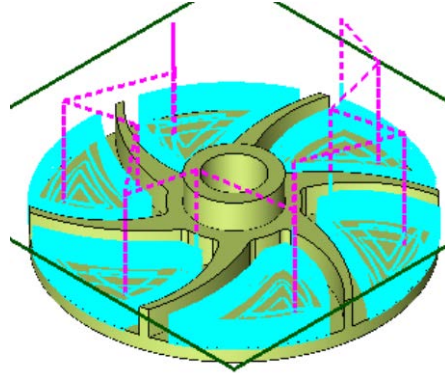
Then, click on the CREATE PATH Button.

A small Dialog Box appears. Type "Rough3" for the tool path name and hit the ENTER Key.

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Your tool path should look like this:

Now, there's one thing we didn't take into account when making this tool path. (I left this out on purpose to show you how to go back and make changes to a tool path that is already created.)



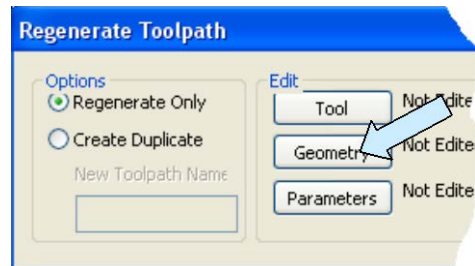
We are going to create a special finishing pass called "Arm Clean" in just a bit, so we really should leave some stock on the vertical walls of the arms.

We can do this right now or at any time during the setup of the job. To modify the tool path, click on the REGENERATE TOOL PATH Icon.

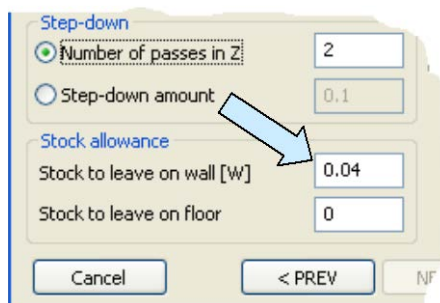
Select the tool path that you just created and hit the ENTER Key.

You are asked if you want to automatically reconstruct the tool path. Click on the NO Option. (If you had modified the solid by, for instance, thickening the arms, the tool path would automatically rebuild to the new surface positions.)

A Dialog Box appears.  
Click on the Geometry Button.



The Pocketing Dialog Box appears.  
Click on the Next Button twice to index to the last sheet of the Dialog Box.



Type 0.040 in the field next to the Stock to leave on Wall Option. Click on the CREATE PATH Button. The small Dialog Box with the Rough3 Name reappears. Click on the CREATE Button.

You are returned to the Regenerate Tool Path Dialog Box. Click on the OK Button. You will see the tool path adjust to leave the extra stock on the wall.

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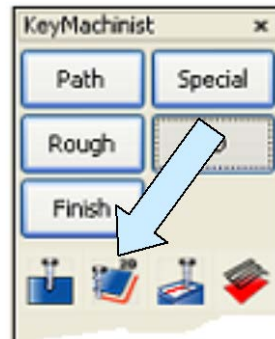
Take a moment to move the Rough3 tool path to level 30 and remove level 30 from the display.



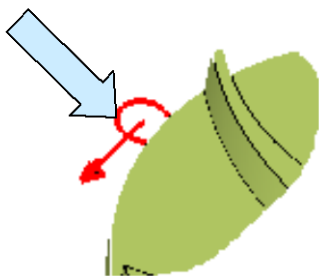
## Creating the Diameter Clean Tool Path

Click on the 2D PROFILE Icon.

The first sheet of the Profile Milling Dialog Box appears. We'll use the same 0.5 Flat End Mill so click on the NEXT Button.



Click on the Select Profile Button. Then, using the Single Option, click on the bottom, outer circular edge of the part. Hit the ENTER Key.



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

Then, click on the RIGHT Option. You want the cutter to be on the outside of the part as illustrated to the left. Hit the ENTER Key.

You are now asked where you want to engage the profile. Click on the Mid Option. Hit the ENTER Key.

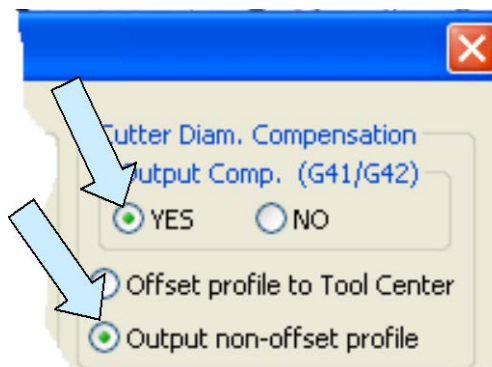
You want to use the first option for Lead-In-Lead Out with a blend off radius of 0.3

Then, click on the YES for Cutter Compensation and select the Output non-offset profile Option.

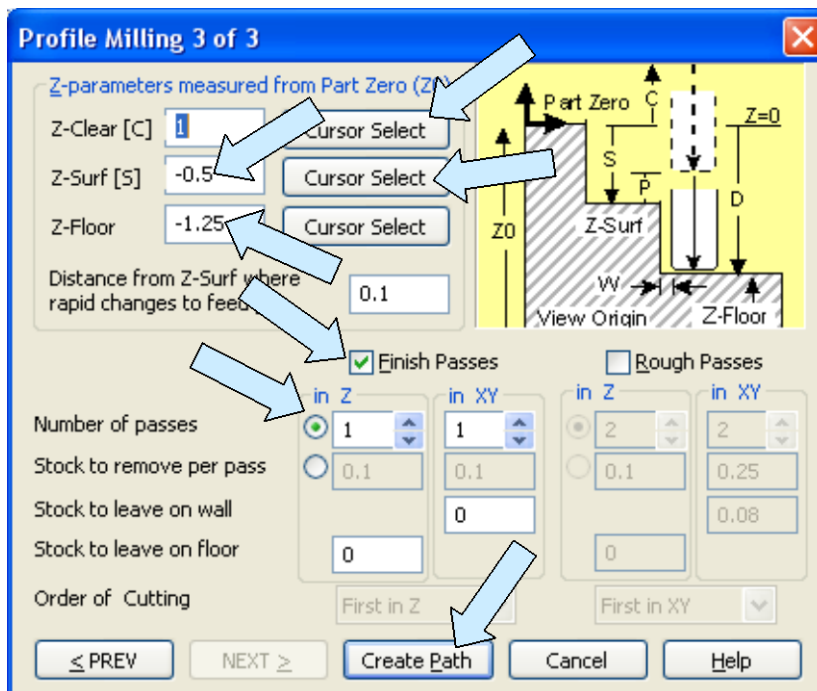
Click on the NEXT Button. The third sheet of the Profile Milling Dialog Box appears.

Place a check on Finish Passes and type 1 for the Number of Passes.

Click on the Cursor Select Button to the right of the Z-Surf Button. Then, using the EndEnt Option, click on the top end of one of the arms. Next, click on the Cursor Select Button to the right of the Z-Floor Button. Then, using the EndEnt Option, click on the bottom circular edge of the part.



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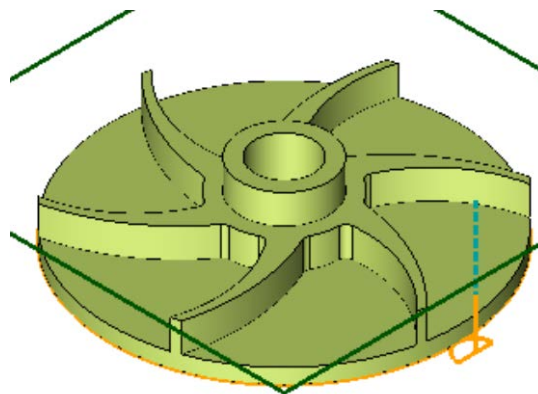


You will now see a -0.5 value in the Z-Surf field and a -1.25 value in the Z-Floor Field.

Click on the CREATE PATH Button.

A small Dialog Box appears. Type “DiameterClean” for the path name and click on the CREATE Button.

Your tool path should look like this:



Take a moment to move the DiameterClean tool path to level 40, rename the level “Diameter Clean TP” and remove level 40 from the display.

### A Note About Level Management

Because there are six distinct tool paths used in this exercise, we’re taking the time to move them to unique levels to illustrate how you can manage more complex machining projects. On a more complicated part requiring dozens of tool paths, this becomes invaluable. You’ll find that you can also move things like containment geometry to sublevels within the level a tool path is on. This makes it easier to manage the supporting data. Take the few seconds to name each level, it makes life much simpler, especially if you return to a file after a reasonable absence!



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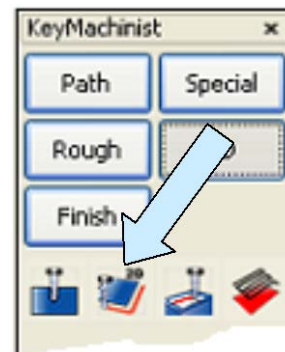
## Creating the ArmClean Tool Path

Our next task is to create the tool path for finishing the side faces of the impeller arms.

Click on the 2D PROFILE Icon.

Sheet 1 of the Profile Milling Dialog Box appears.

Click on the Select a New Tool Button and pick the 0.250 Flat End Mill. Then, click on the DONE Button.

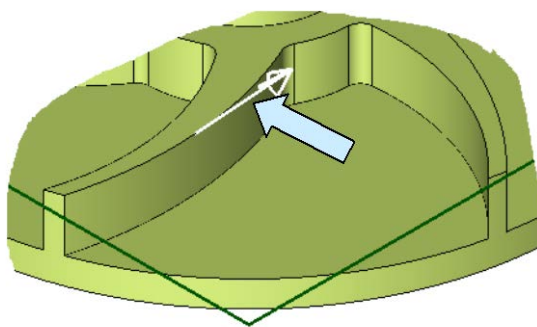
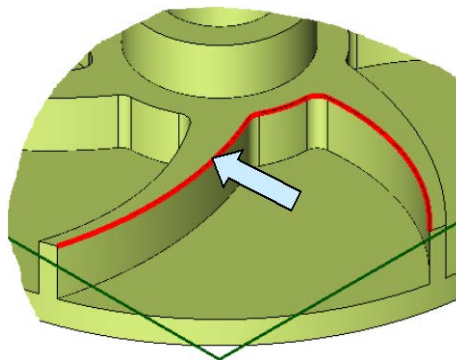


Now, click on the NEXT Button to advance to sheet 2.

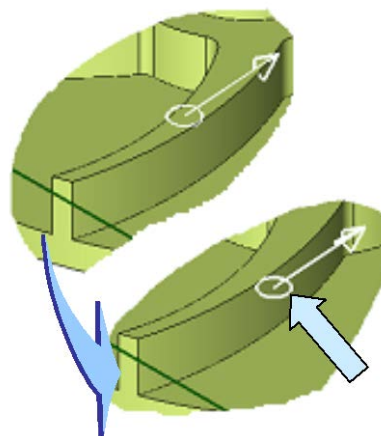
Click on the RESET Button to the right of the Select Profile Button. Then, click on the Select Profile Button.

Click on the Single Option on the Conversation Bar.

Then, select the five arcs highlighted in red in the illustration to the right.  
Hit the ENTER Key.



An arrow appears indicating the machining direction. Click on the NO Option when asked if you want to reverse this.



Click on the Right Option to properly position the cutter outside of the arm and hit the ENTER Key twice.

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For Lead In/Lead Out select the Straight Line Tangent Option.  
Use 0.55 for the distance.

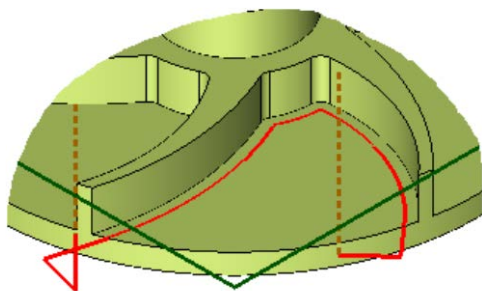
Then, click on the YES for Cutter Compensation and select the Output non-offset profile Option.

Click on the NEXT Button. The third sheet of the Profile Milling Dialog Box appears.

Place a check on Finish Passes and type 1 for the Number of Passes.

Click on the Cursor Select Button to the right of the Z-Surf Button. Then, using the EndEnt Option, click on the top end of one of the arms.

Next, click on the Cursor Select Button to the right of the Z-Floor Button. Then, using the EndEnt Option, click on the bottom end of one of the arms.



Click on the CREATE PATH Button.

A small Dialog Box appears.  
Type “ArmClean” for the tool path name and click on the CREATE Button.

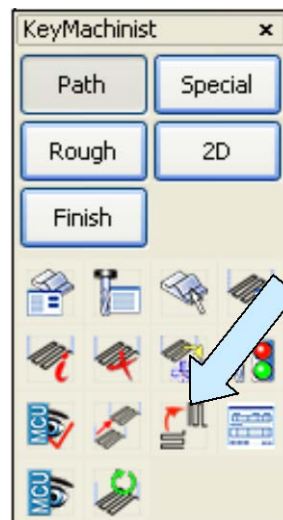
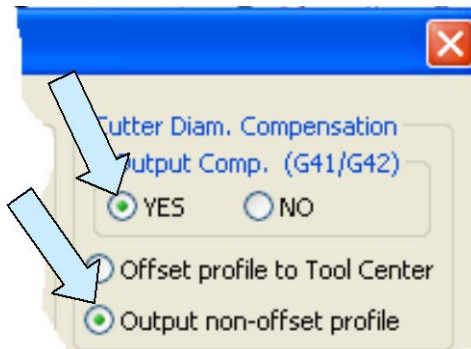
Your tool path should look like this:

Now, click on the ROTATE TOOL PATH Icon.

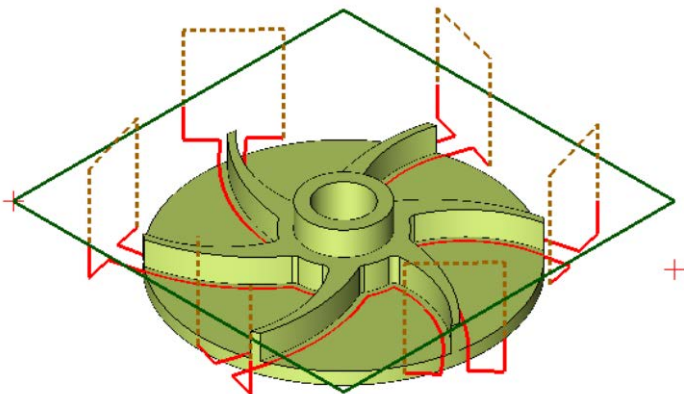
Select the tool path and hit the ENTER Key.  
Type 5 for the Number of Copies.

Type YES when asked if you want to join the tool paths.  
Type 60 for the Angle and hit the ENTER Key.

Using the CtrMid Option, click on the top circular edge of the part to indicate the center of rotation.



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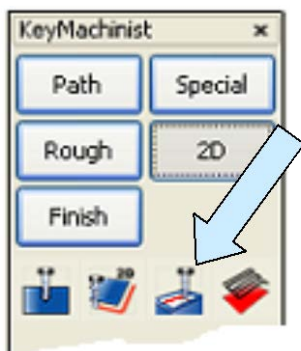
Your complex tool path should look like this:

Take a moment to move the ArmClean tool path to level 50, rename the level “Arm Clean TP” and remove level 50 from the display.



### Creating the Bore1 Tool Path

Our final tool path creates the rough bore in the center of the part.



Click on the 2D POCKET Icon.

The first sheet of the Pocketing Dialog Box appears. Click on the Select New Tool Button.

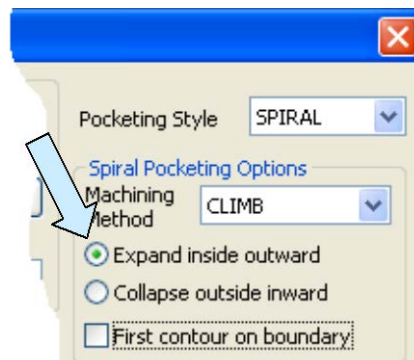
Click on the 0.750 Flat End Mill and click on the DONE Button. You are returned to the Pocketing Dialog Box. Click on the NEXT Button.

The next sheet of the Pocketing Dialog Box appears.

Click on the RESET Button to the right of the Select Outer Body Button. A small Dialog Box appears. Select the Single/Multiple Cavities Having Same Depth Option and hit the ENTER Key.

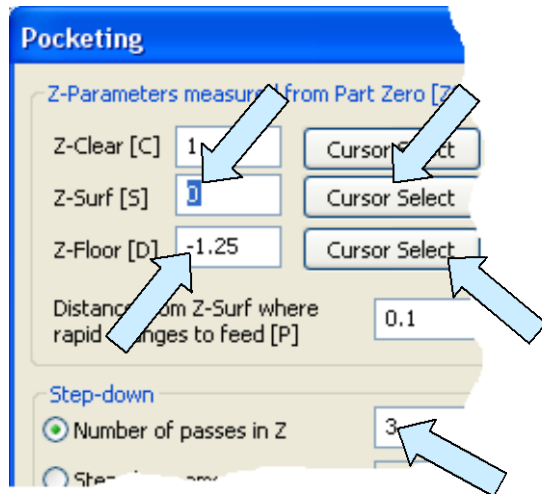
Then, using the Single Option, click on the circle at the top of the center bore on the hub. Hit the ENTER Key twice.

Select the Expand Inside Outward Option. You do NOT want the First Contour on Boundary checked. Click on the NEXT Button.





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The next sheet of the Pocketing Dialog Box appears.

Click on the Cursor Select button to the right of the Z-Surf Field. Using the CtrMid Option, click on the topmost circular edge on the part.

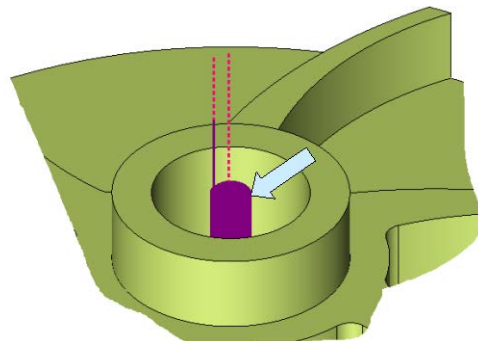
Next, click on the Cursor Select Button to the right of the Z-Floor Field. Using the EndEnt Option, click on the bottommost circular edge of the part.

Click on Number of Passes in Z and type 3.

Now, click on the CREATE PATH Button.

Type “Bore1” for the path name and click on the CREATE Button.

Your final tool path should look like this:



Take a moment to move the Bore1 tool path to level 60, rename the level “Bore1 TP” and remove level 60 from the display.

Your level list should look like this:

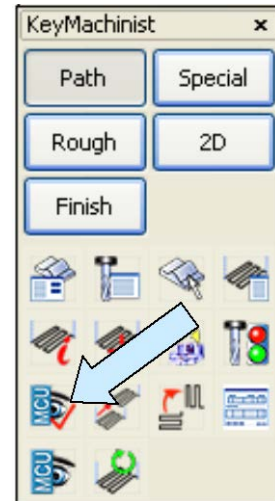
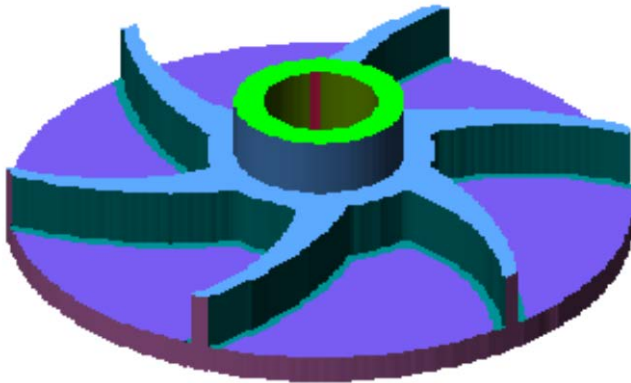
Level Name	LN...	A	D...	Co...
Model Mode Levels				
PartSolid	1			1
Construction	2			6
Rough1 TP	10			1
Rough2 TP	20			1
Rough3 TP	30			1
DiameerCleanTP	40			1
ArmClean TP	50			2
Bore1 TP	60			1

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## Verifying the Tool Paths

Our last task is to verify the tool paths. Click on the VERIFY TOOL PATH Icon. Select the six tool paths in the order that you created them and hit the ENTER Key.

Then, click on the Corners Option on the Conversation Bar. Using the Point Option, click on the point at the top, left of the part and then on the point at the bottom right of the part.



Click on the SKIP Button and the Meta Cut utilities screen appears. Because there are a lot of operations, move the slider at least three quarters of the way to the right before hitting the play button. You will get simulated cut part that ends up like this:

Take a moment to save your part. Call it "KC8217."