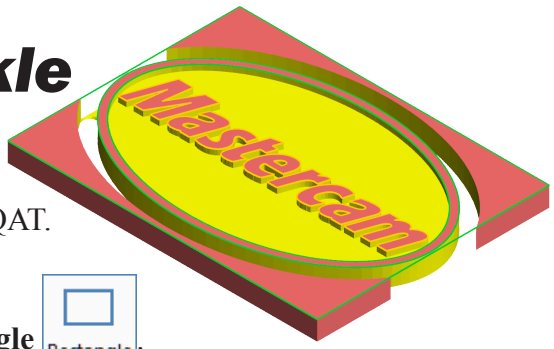
Belt Buckle



A. Create Rectangle.

Step 1. If necessary start a new Mastercam file, click **New** (**Ctrl-N**) on the Quick Access Toolbar QAT.

Step 2. On the Wireframe tab WIREFRAME click **Rectangle** Rectangle.

Step 3. In the Rectangle function panel:
under Dimensions, **Fig. 1**
Width 4
Height 3 and press ENTER

Press **spacebar** to activate Fast Point

Key-in **.5**, **0** .5,0 and press ENTER **twice**

Click OK .

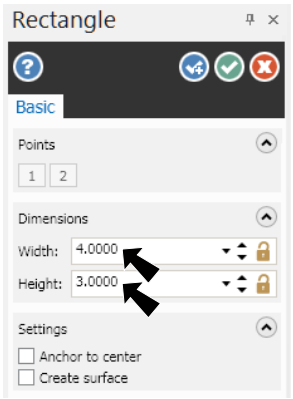


Fig. 1

Step 4. **Right click** the graphics window and click **Fit** (Alt-F1).

Step 5. Use **F9** to toggle Origin/Axis display on and off to confirm Origin, **Fig. 2**.

Fig. 2

B. Save As "BELT BUCKLE"

Step 1. Click **Save As** (**Ctrl-Shift-S**) on the Quick Access Toolbar QAT.

Step 2. Key-in **BELT BUCKLE** for the file-name and press ENTER.

C. Create Ellipse.

Step 1. On the Wireframe tab WIREFRAME click **Ellipse** Ellipse on **Rectangle** Rectangle drop down.

Step 2. In the Ellipse dialog box set:

Width **1.975** **Fig. 3**

Height **1.25** and press ENTER

Press **spacebar** to activate Fast Point

Key-in **2.5**, **1.5** 2.5,1.5 and press ENTER

Click OK.

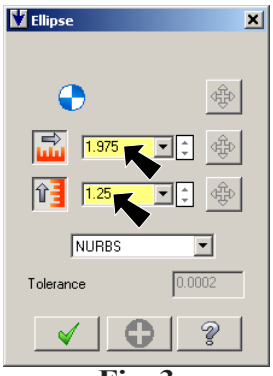


Fig. 3

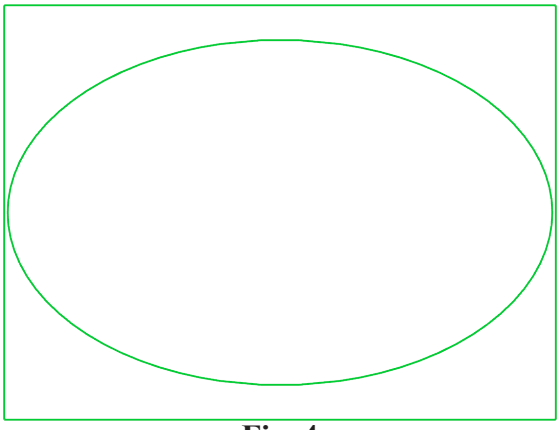


Fig. 4

D. Offset Ellipse.

Step 1. On the Wireframe tab WIREFRAME click **Offset** Offset.

Step 2. In Offset dialog box:

under Mode, **Fig. 5**

select **Copy**

Distance **.09**

Click **ellipse**, then **click inside**, **Fig. 6**

The purple offset should be inside of the red original.

If it is not, click Reverse button, **Fig. 5**.

Click OK.

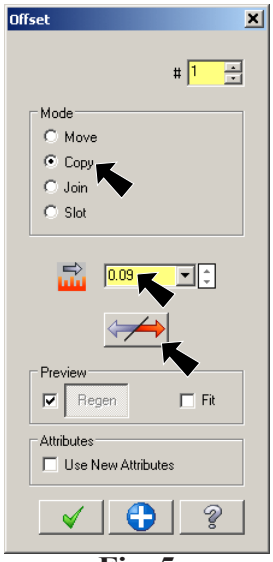


Fig. 5

Step 3. **Right click** the graphics window and click **Clear Colors**.

Step 4. Save (**Ctrl-S**).

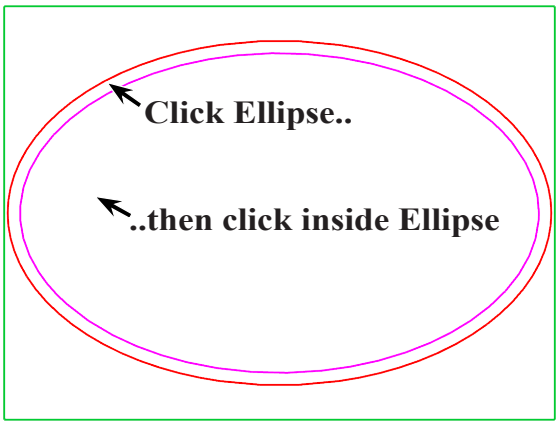
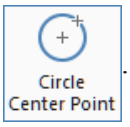


Fig. 6

E. Three Circles.

Step 1. On the Wireframe tab WIREFRAME click **Circle Center Point** 

.

Step 2. In the Circle Center Point function panel:
under Size, **Fig. 7**
Click **Locked**
Diameter .159 and press ENTER

Press **spacebar** to activate AutoCursor **Fast Point**

Key-in **1.2**, **1.5**, **-.25** 1.2,1.5,-.25 and press ENTER

Key-in **3.5**, **1.95**, **-.25** 3.5,1.95,-.25 and press ENTER

Key-in **3.5**, **1.05**, **-.25** 3.5,1.05,-.25 and press ENTER **twice**

Click OK .

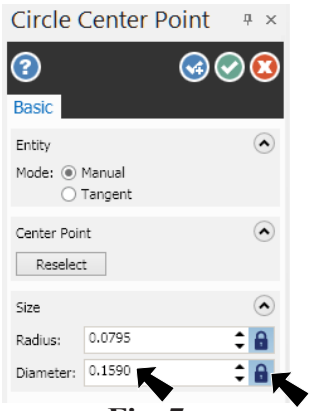


Fig. 7

F. Merge Mastercam Graphic File.

Step 1. Download **mastercam-graphic.dxf** from http://www.cudacountry.net/html/master-cam17_toc.html

Step 2. Back in Mastercam 2017, click File Menu > Merge.

Step 3. In the Open dialog box:
Set **Files of type** to **AutoCAD.DXF**, **Fig. 9**
Select the **mastercam-graphic.dxf** file and click Open.

Step 4. In the Merge Pattern function panel click OK .

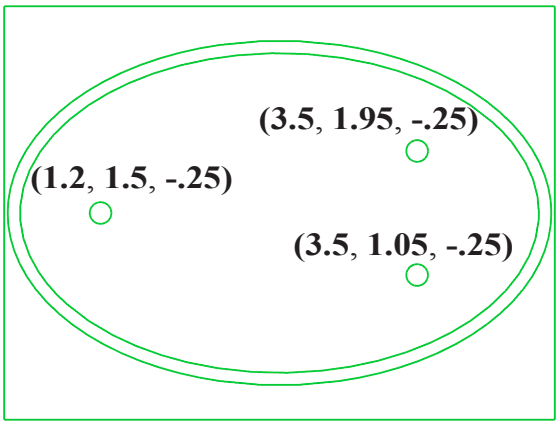


Fig. 8

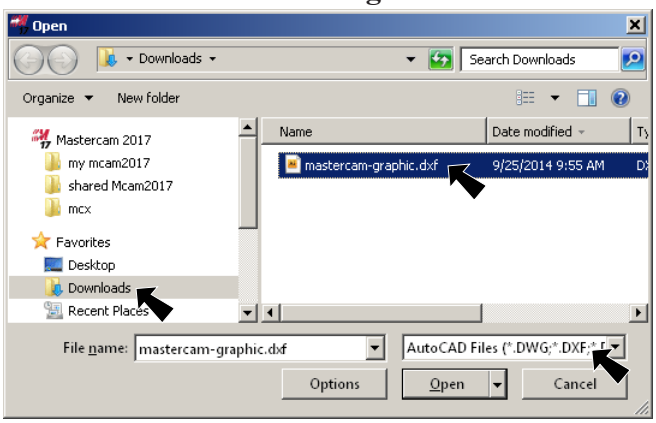


Fig. 9

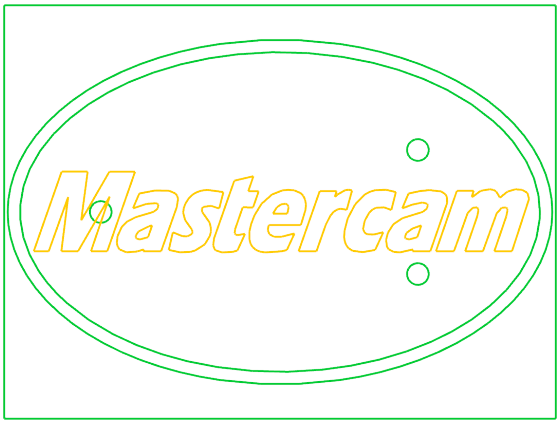


Fig. 11

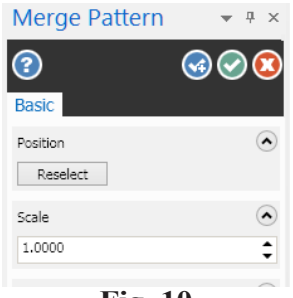


Fig. 10

G. Extrude Outside Ellipse Solid.

Step 1. Change to the Isometric View. **Right click** in the graphics window and click Isometric (WCS) (**Alt-7**).

Step 2. **Right click** in the graphics window and on the Mini Toolbar click **Solid Color** drop down arrow, then click **light cyan**, **Fig. 12**.

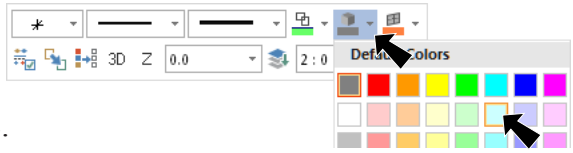


Fig. 12

Step 3. On the Solids tab SOLIDS click **Extrude** Extrude.

Step 4. Click Chain in Chaining dialog box, **Fig. 13**.

Step 5. Click **outside ellipse** to chain, **Fig. 14**.

Step 6. Click OK in Chaining dialog box.

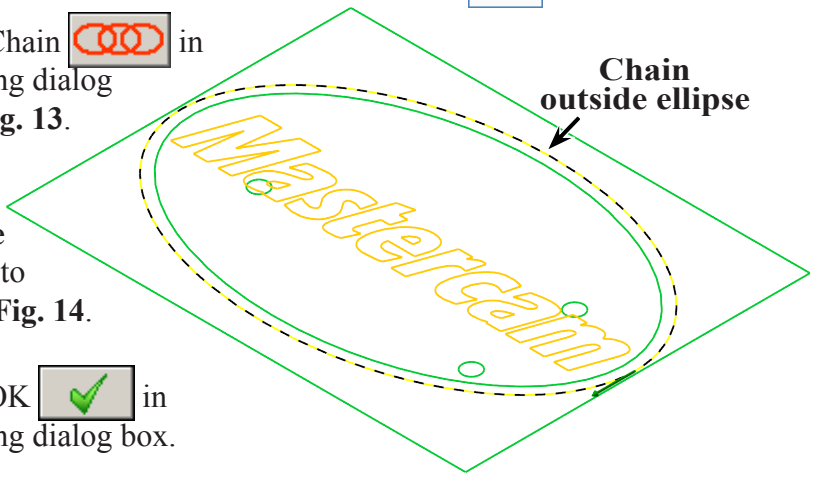


Fig. 14

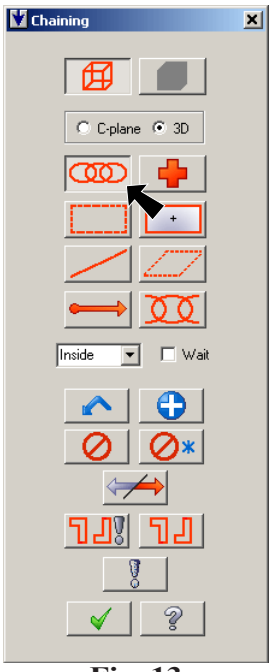


Fig. 13

Step 7. In the Solid Extrude function panel:
under Operation, **Fig. 15**
select **Create body**
under Distance
Distance .25 and press ENTER
The direction arrow should **point down**, **Fig. 16**. If arrow points in wrong direction, click Reverse All , **Fig. 15**.
Click **OK and Create New Operation** .

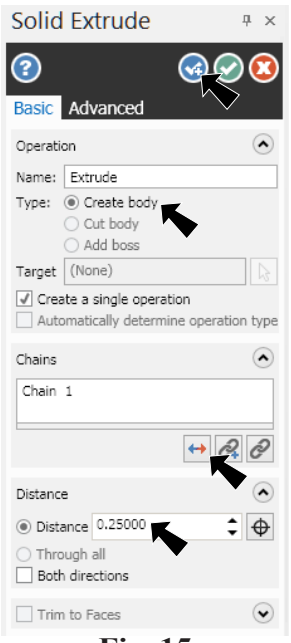


Fig. 15

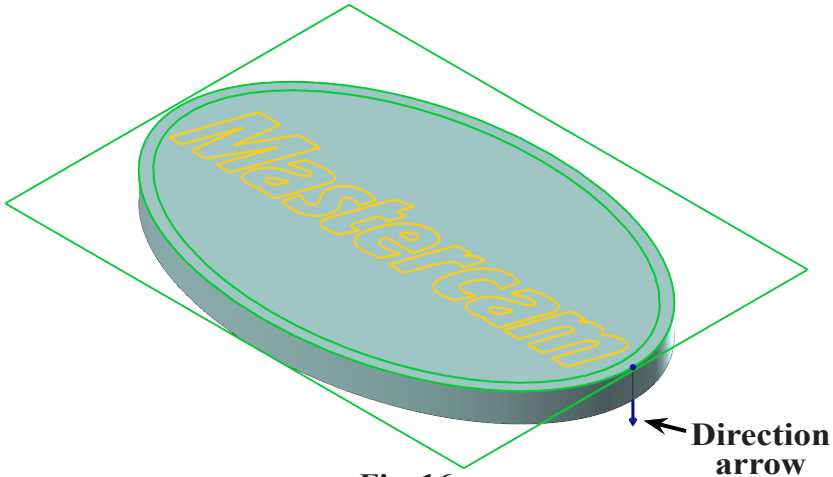


Fig. 16

H. Cut Inside Ellipse.

Step 1. Click Chain  in Chaining dialog box.

Step 2. Click **inside ellipse** to chain, **Fig. 17**.

Step 3. Click OK  in Chaining dialog box.

Step 4. In the Solid Extrude function panel:
under Operation, **Fig. 18**
select **Cut body**
under Distance
Distance .07 and press ENTER
The direction arrow should **point down**, **Fig. 19**. If arrow points in wrong direction, click Reverse All  , **Fig. 18**.
Click **OK and Create New Operation**  .

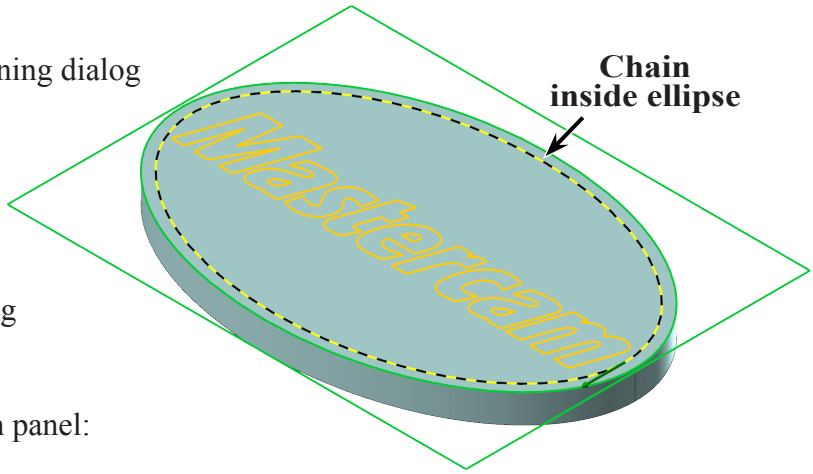


Fig. 17

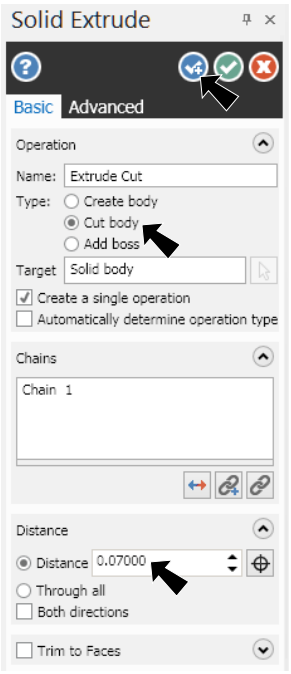


Fig. 18

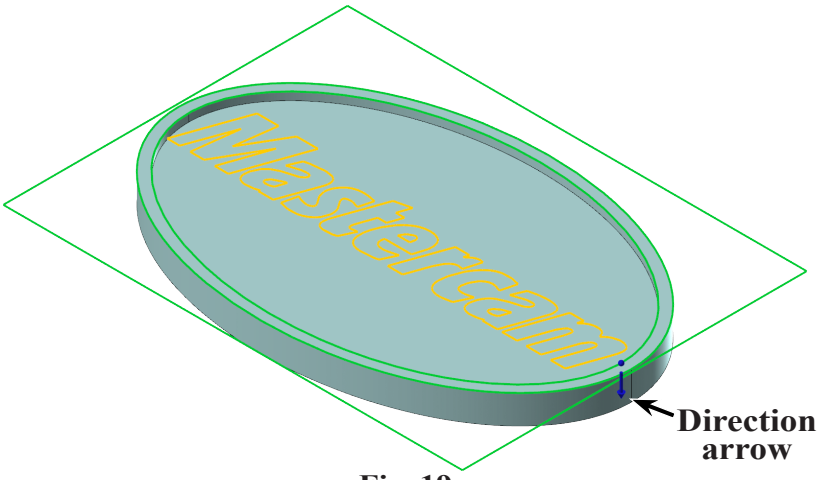


Fig. 19

I. Extrude Mastercam Solid.

Step 1. **Right click** in the graphics window and on the Mini Toolbar click **Solid Color** drop down arrow, then click **light red**, **Fig. 20**.

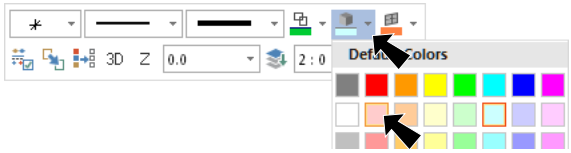


Fig. 20

Step 2. Click Chain in Chaining dialog box.

Step 3. Click **each letter** and **include inner geometry of a's and e** in chaining, **Fig. 21**.

Step 4. Click OK in Chaining dialog box.

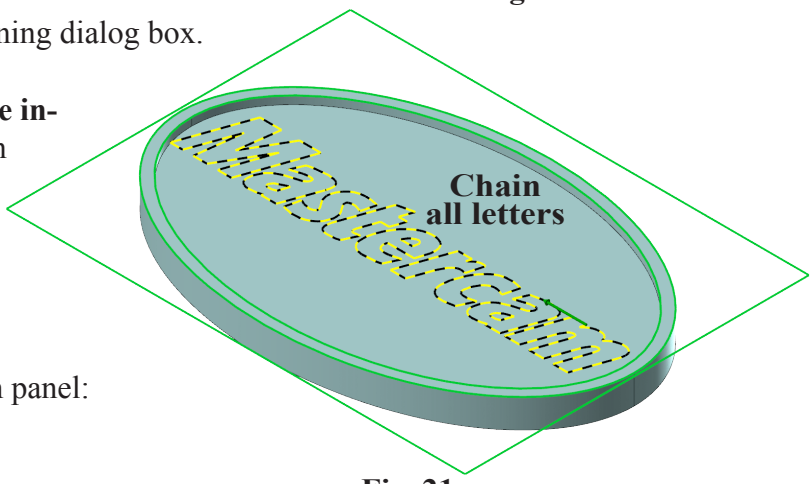


Fig. 21

Step 5. In the Solid Extrude function panel:
under Operation, **Fig. 22**
select **Create body**
under Distance
Distance .07 and press ENTER
The direction arrow should **point down**, **Fig. 23**. If arrow points in wrong direction, click Reverse All , **Fig. 22**.
Click **OK and Create New Operation** .

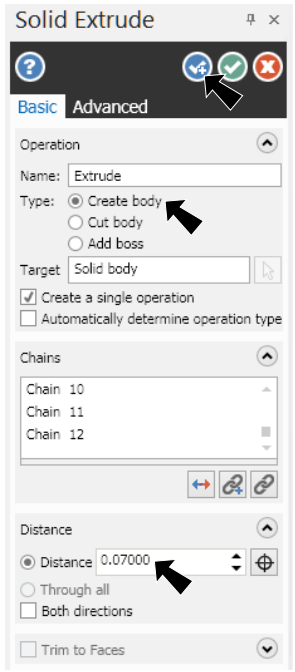


Fig. 22

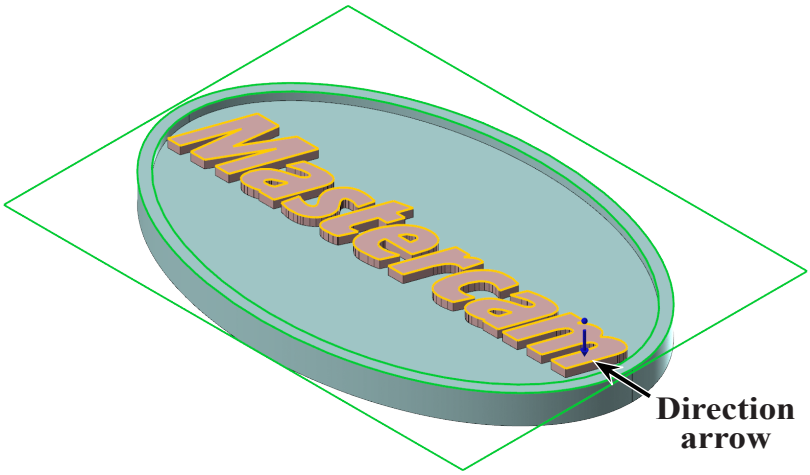


Fig. 23

J. Cut Holes.

Step 1. Use **Ctrl-T** to toggle **Translucency**.

Step 2. Click Chain  in Chaining dialog box.

Step 3. Click the **3 circles**, **Fig. 24**.

Step 4. Click OK  in Chaining dialog box.

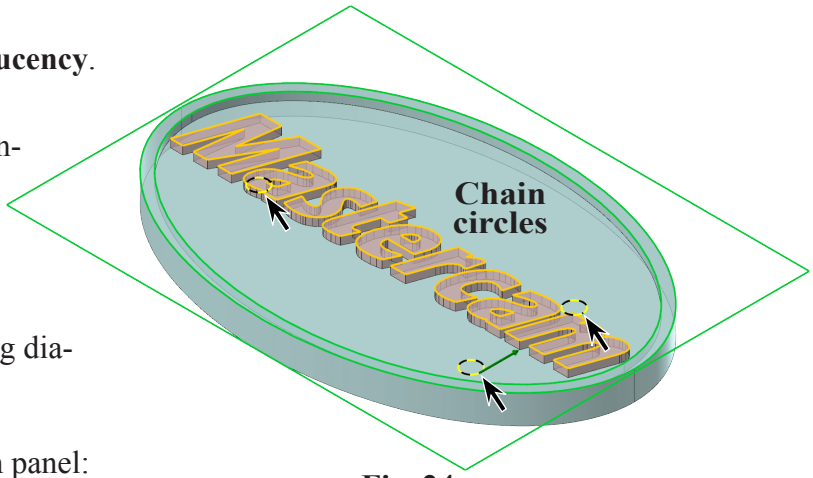


Fig. 24

Step 5. In the Solid Extrude function panel:
under Operation, **Fig. 25**
select **Cut body**
under Distance
Distance .15 and press ENTER
The direction arrow should **point up**, **Fig. 26**. If arrow points in wrong direction, click Reverse All  , **Fig. 25**.
Click OK  .

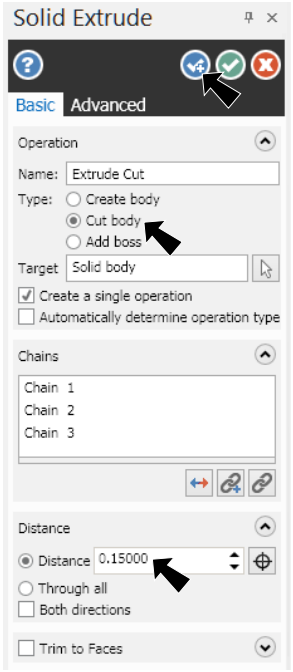


Fig. 25

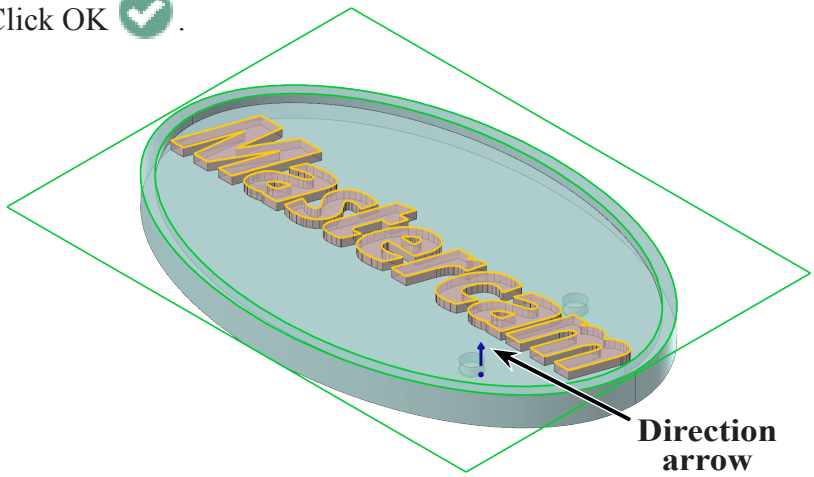


Fig. 26

Step 6. Turn **off** Shading (**Alt-S**).

Step 7. Use **Ctrl-T** to toggle **Translucency**.

Step 8. Save  (**Ctrl-S**).

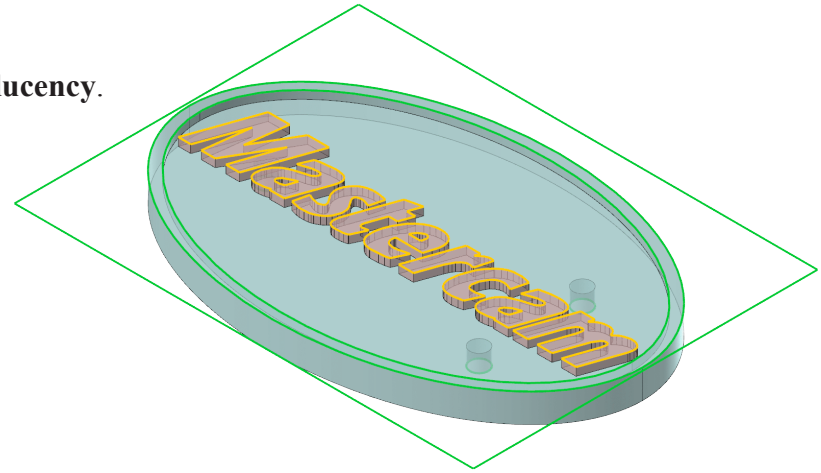


Fig. 27

K. Stock Setup.

Step 1. If necessary, display Toolpaths Manager. On the View tab VIEW click Toolpaths (**Alt-O**).

Step 2. If Machine Group is **not** displayed in the Toolpaths Manager, **Fig. 28** on the Machine tab MACHINE, click Machine Mill > Default from the menu.

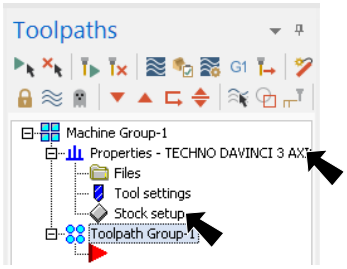


Fig. 28

Step 3. Expand **Properties (click +)** in Toolpaths Manager, **Fig. 28**.

Step 4. Click **Stock Setup** in Toolpaths Manager, **Fig. 29**.

Step 5. Click left front top corner of the stock to move the origin, **Fig. 29**. After you click corner the arrow will point to corner.

Step 6. Click **All Entities** in Stock Setup dialog box, **Fig. 29**.

Step 7. Confirm **Display** check box is checked, **Fig. 29**.

Step 8. Click OK in Machine Group Properties, **Fig. 30**.

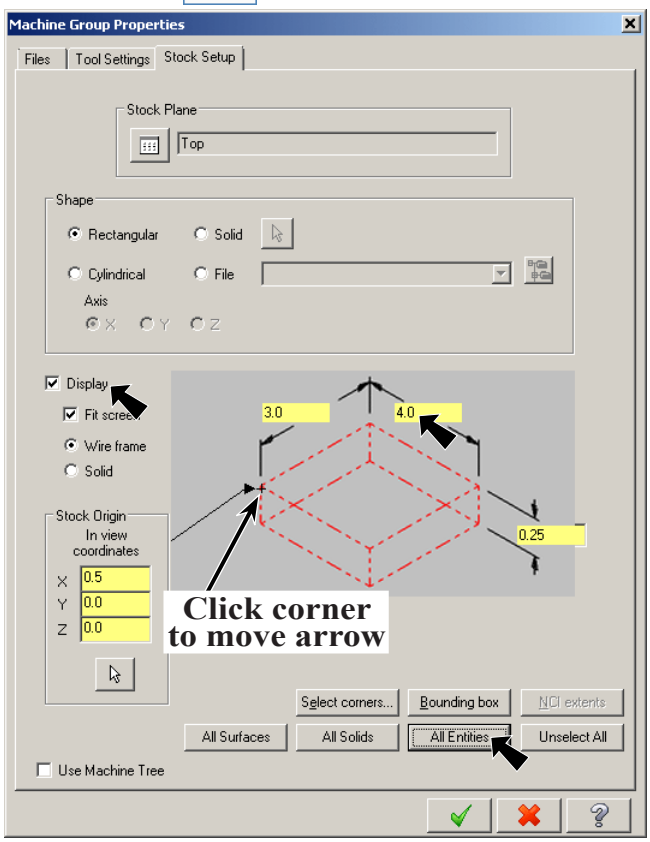


Fig. 29

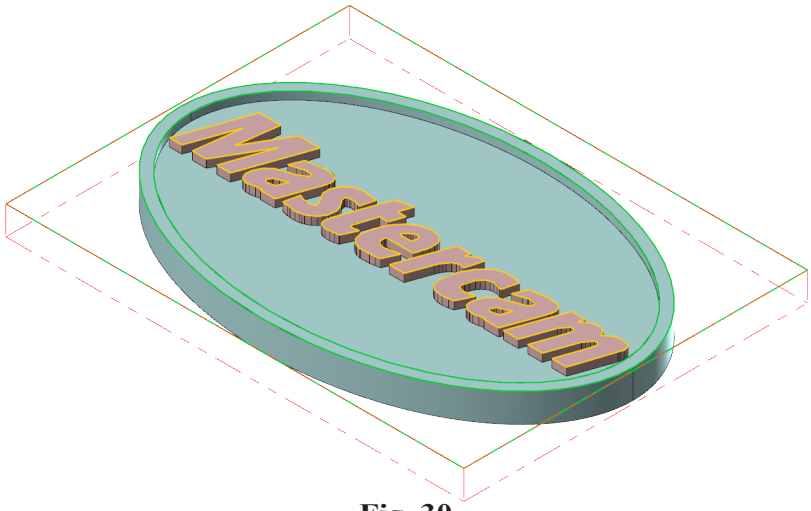


Fig. 30

L. 2D High Speed Dynamic Mill Toolpath.

Step 1. On the Toolpaths tab TOOLPATHS in the 2D group click **Dynamic Mill** Dynamic ... .

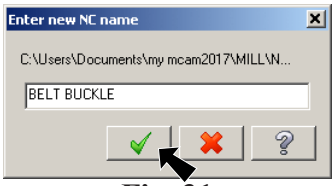


Fig. 31

Step 2. Click OK in NC name dialog, **Fig. 31**.

Step 3. Select **Machining regions** button in Chain Options dialog box, **Fig. 32**.

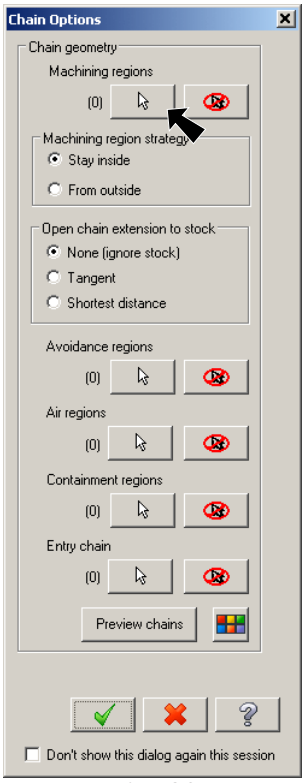


Fig. 32

Step 4. Select **Chain** in Chaining dialog box, **Fig. 33**.

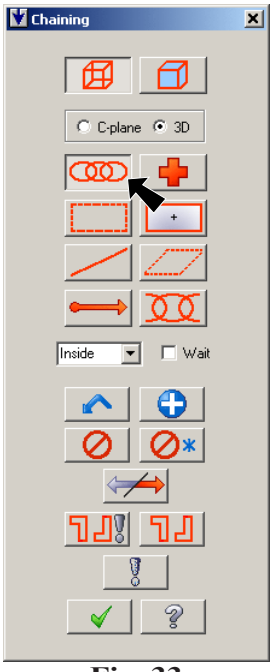


Fig. 33

Step 5. Click the **inside ellipse** to Chain the ellipse and click OK in Chain dialog box, **Fig 34**.

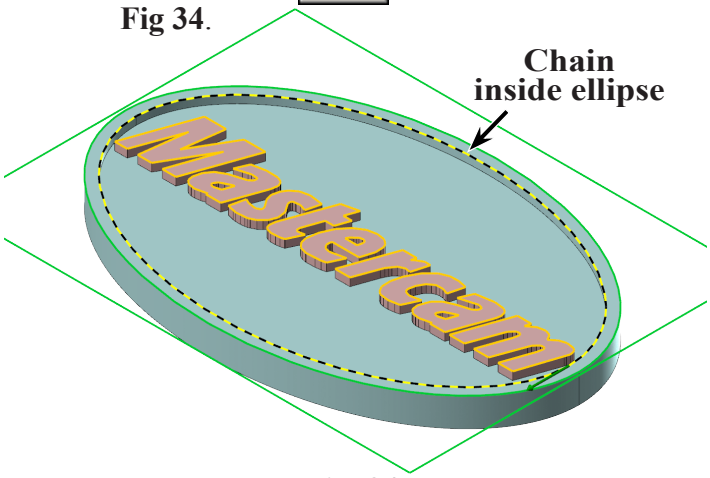


Fig. 34

Step 6. Select **Avoidance regions** button in Chain Options dialog box, **Fig. 35**.

Step 7. Click **each letters** to Chain letters (no inner space) and click OK in Chain dialog box, **Fig 36**.

Step 8. Click OK in Chain Options box, **Fig 35**.

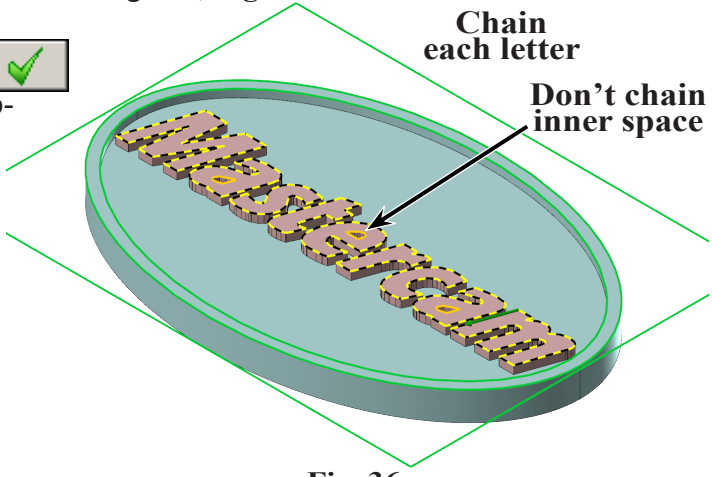


Fig. 36

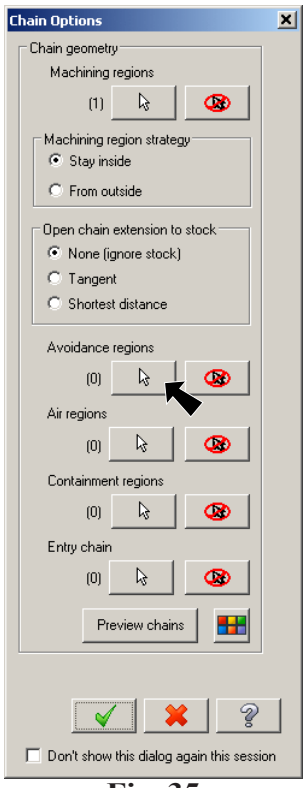


Fig. 35

Step 9. Select **Toolpath Type** from the tree control and confirm:

Dynamic Mill toolpath

Machining regions 1

Avoidance regions 9
Fig. 37.

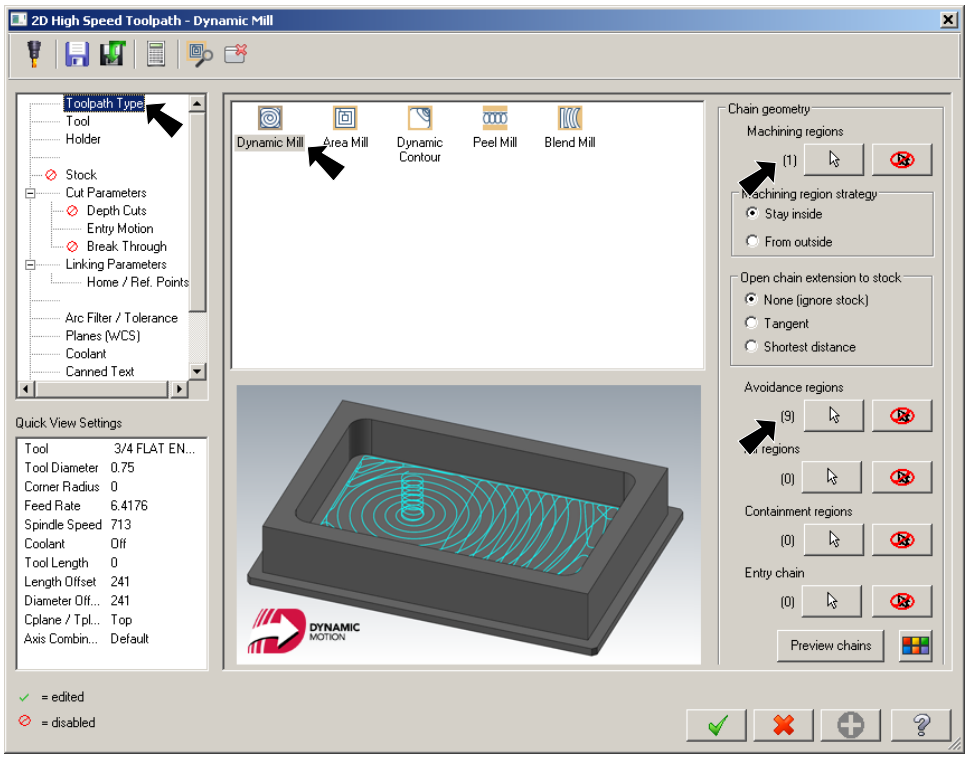


Fig. 37

Step 10. Select **Tool** from tree control and: click **Select library tool** **Fig. 38**.

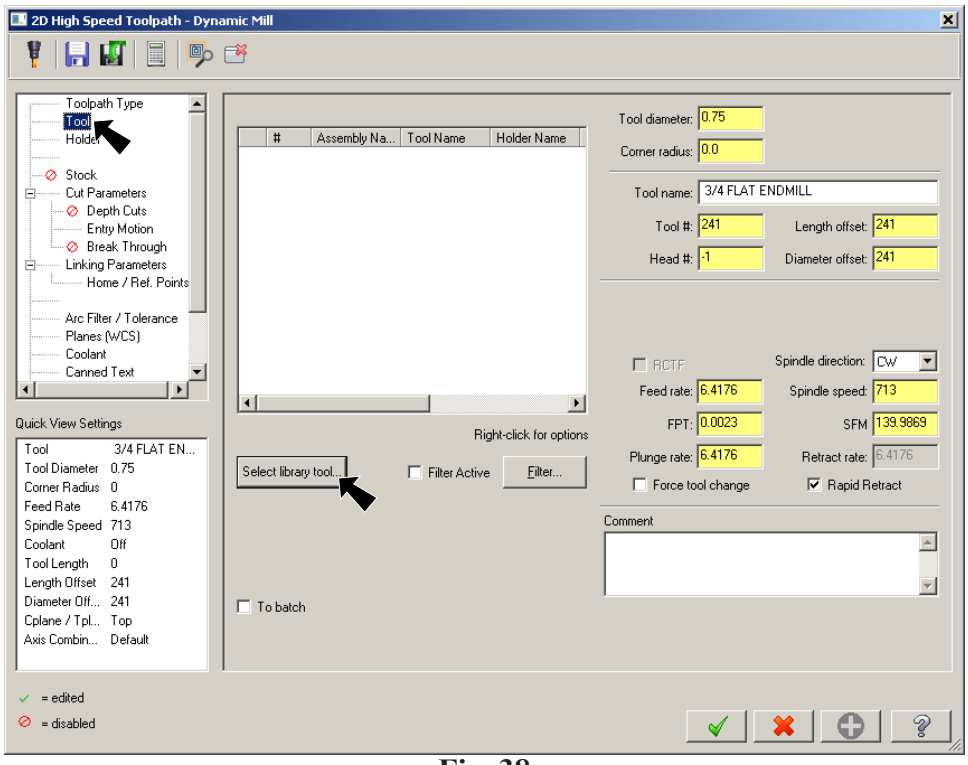


Fig. 38

Step 11. Click **Filter** in Tool Selection dialog box, **Fig. 39**.

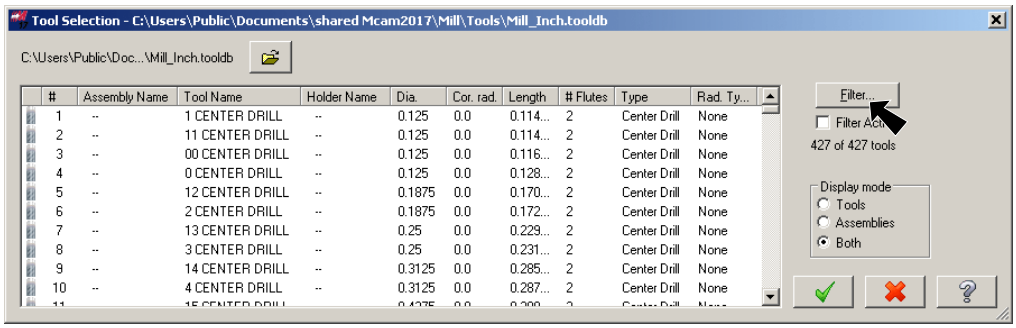


Fig. 39

Step 12. Click **None under Tool Types Fig. 40**.

Step 13. Click **Endmill1 Flat** button (first button top row) and click OK **Fig. 40**.

Step 14. Click **284 3/16 FLAT ENDMILL** and click OK **Fig. 41**.

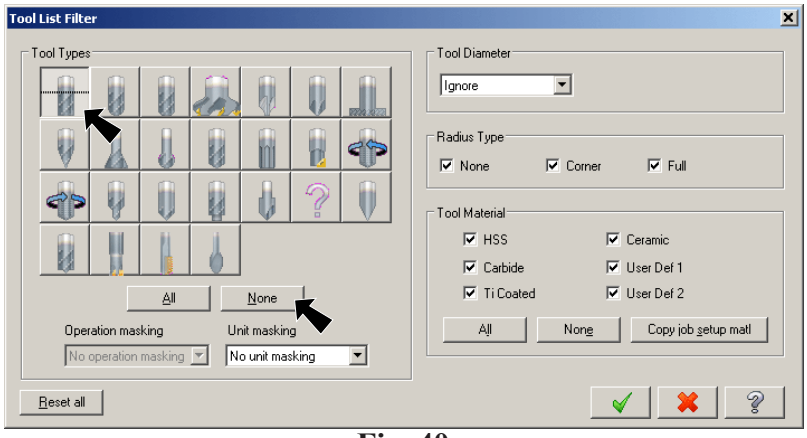


Fig. 40

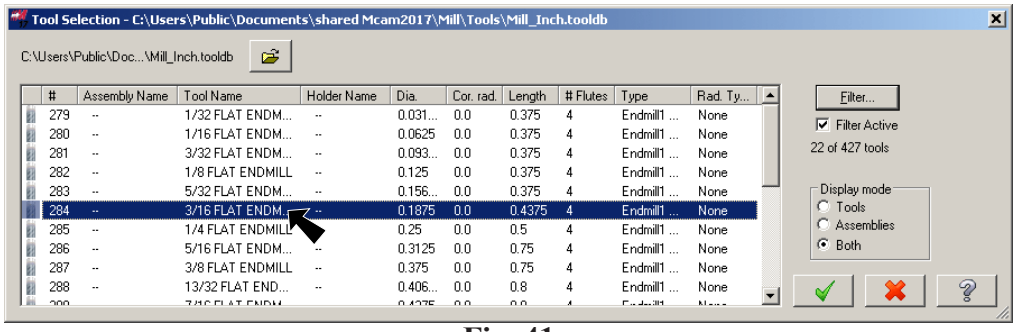


Fig. 41

Step 15. Back in **Tool** page set:

Tool # 1
Feed rate 200

Plunge rate 100
Fig. 42.

Step 16. Select **Cut Parameters** from tree control and set:

Cutting method Climb

Stock to leave on walls and floors 0
Fig. 43.

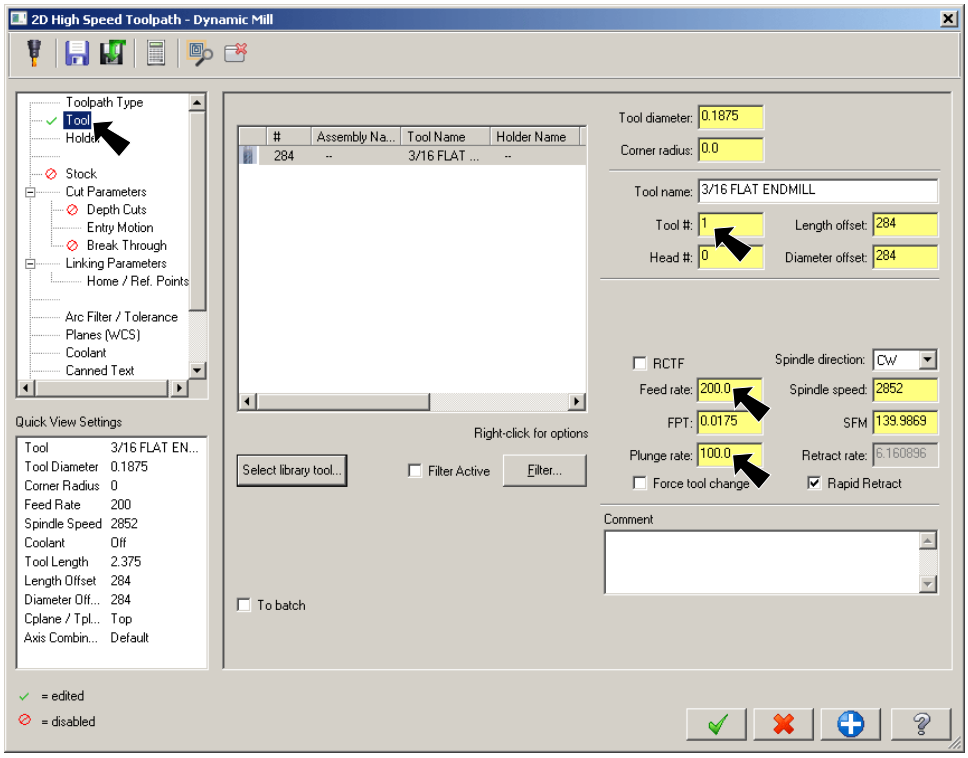


Fig. 42

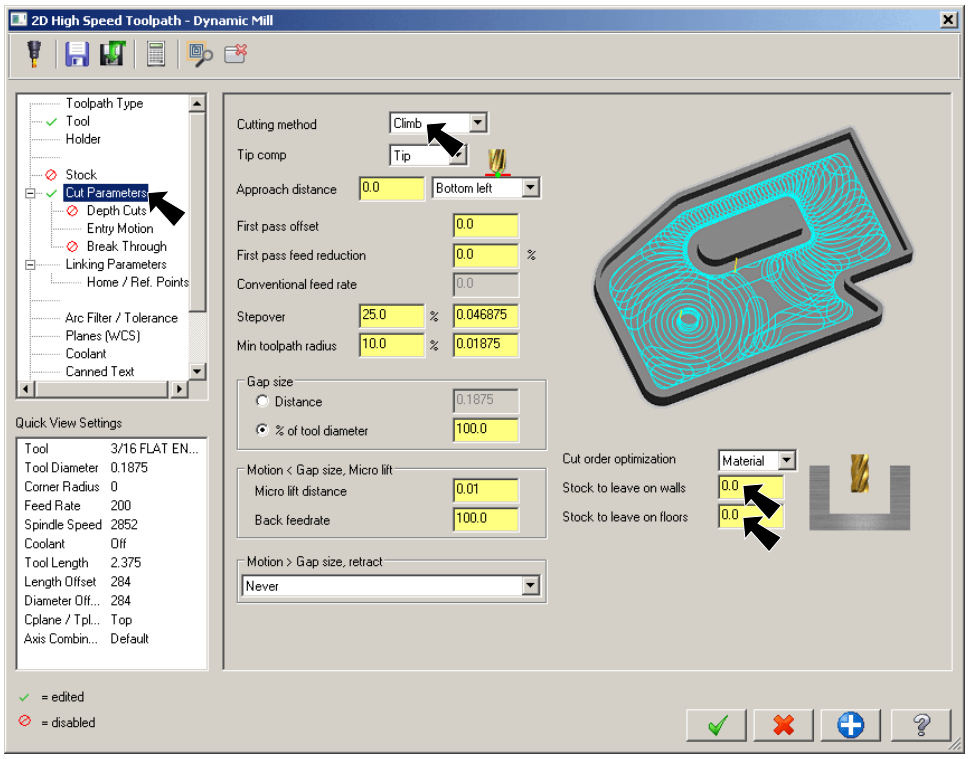


Fig. 43

Step 17. Select **Depth Cuts** from tree control and set:

Check **Depth cuts**

Max rough step .02
Fig. 44.

Step 18. Select **Entry Motion** from tree control and set:

Z clearance .02
Fig. 45.

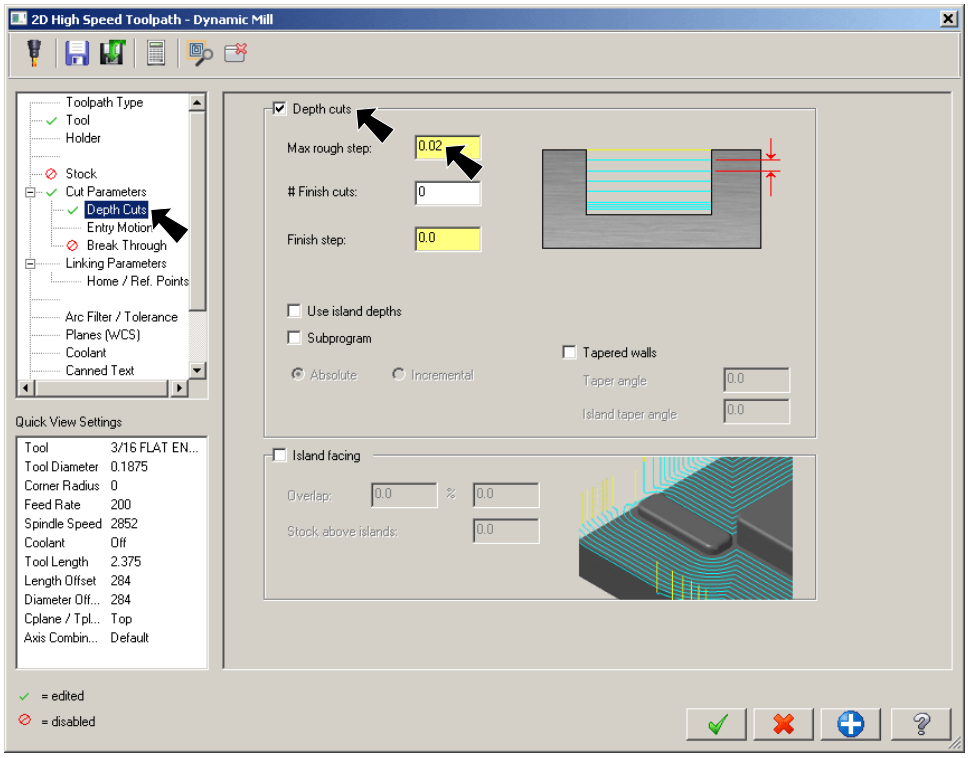


Fig. 44

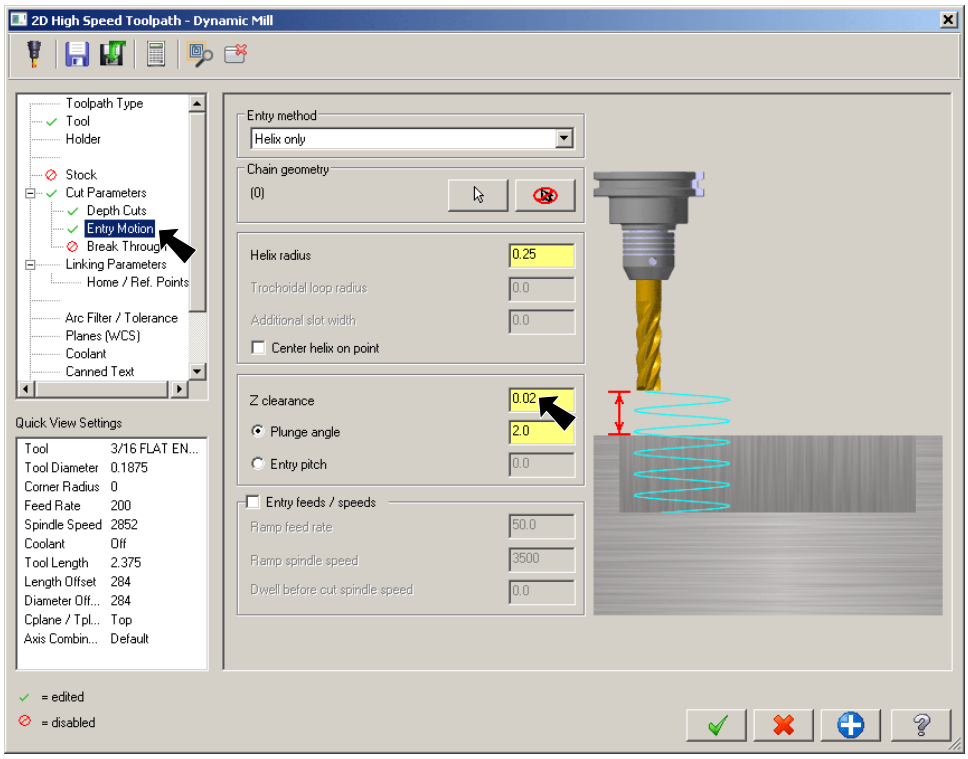


Fig. 45

Step 19. Select **Linking Parameters** from tree control and set:

Depth -.07
Fig. 46.

Step 20. Click OK  in Dynamic Mill dialog box.

Step 21. Allow Mastercam to calculate the toolpath.

Step 22. Save  (**Ctrl-S**).

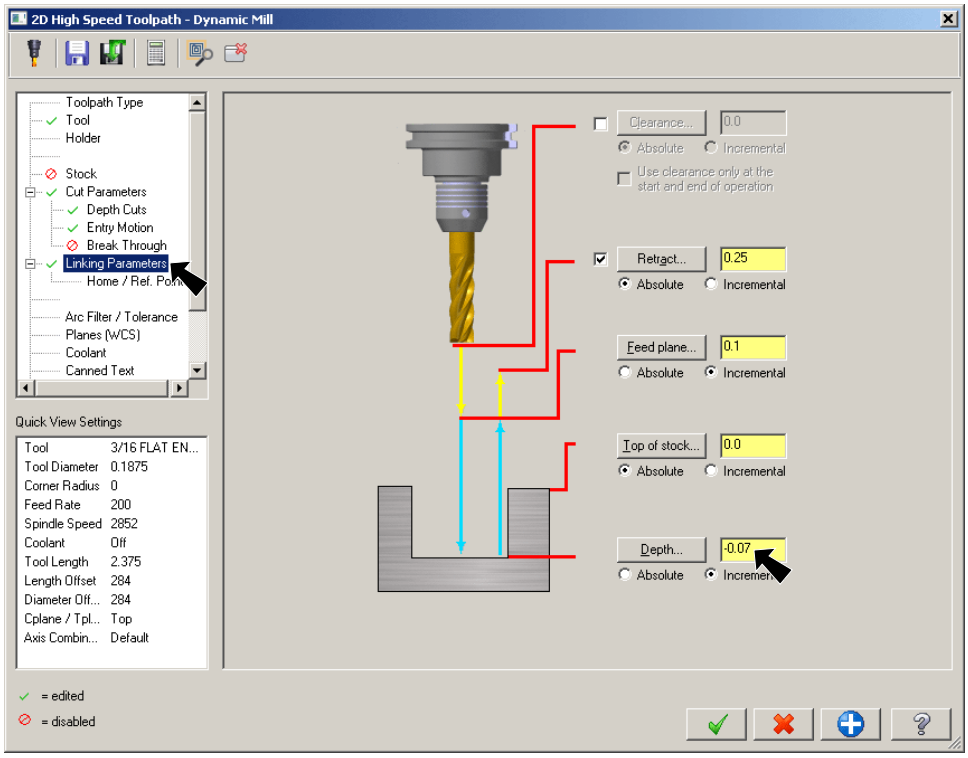


Fig. 46

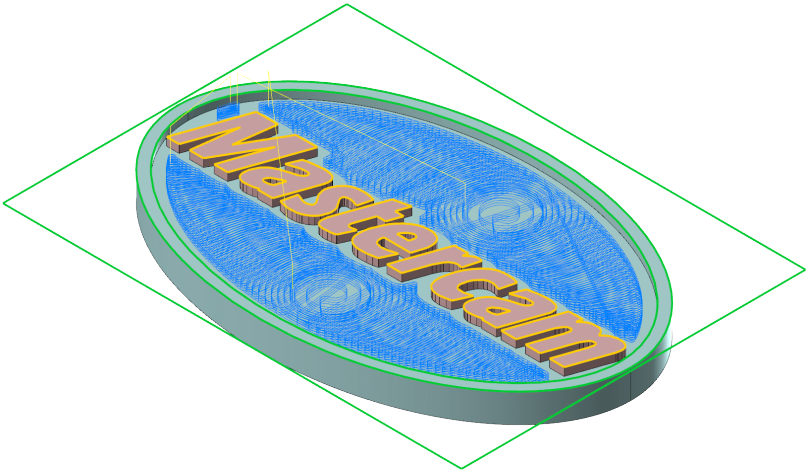


Fig. 47

M. 2D High Speed Area Mill Toolpath.

Step 1. Use **Alt-T** to turn off toolpath display.

Step 2. Copy and Paste **Dynamic Mill** toolpath in the Toolpaths Manager. To copy, click to select toolpath, **Fig. 48**. Then, use **Ctrl-C** and **Ctrl-V**, **Fig. 49**.

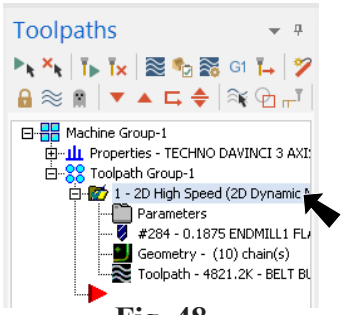


Fig. 48

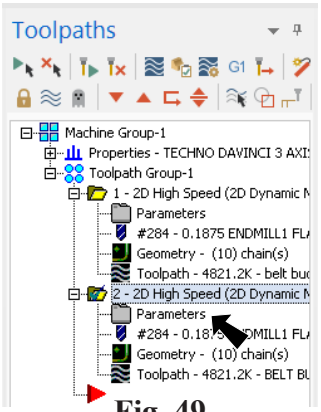


Fig. 49

Step 3. Expand copied toolpath and click **Parameters**, **Fig. 49**.

Step 4. Select **Toolpath Type** from the tree control and select:

Area Mill
Fig. 50.

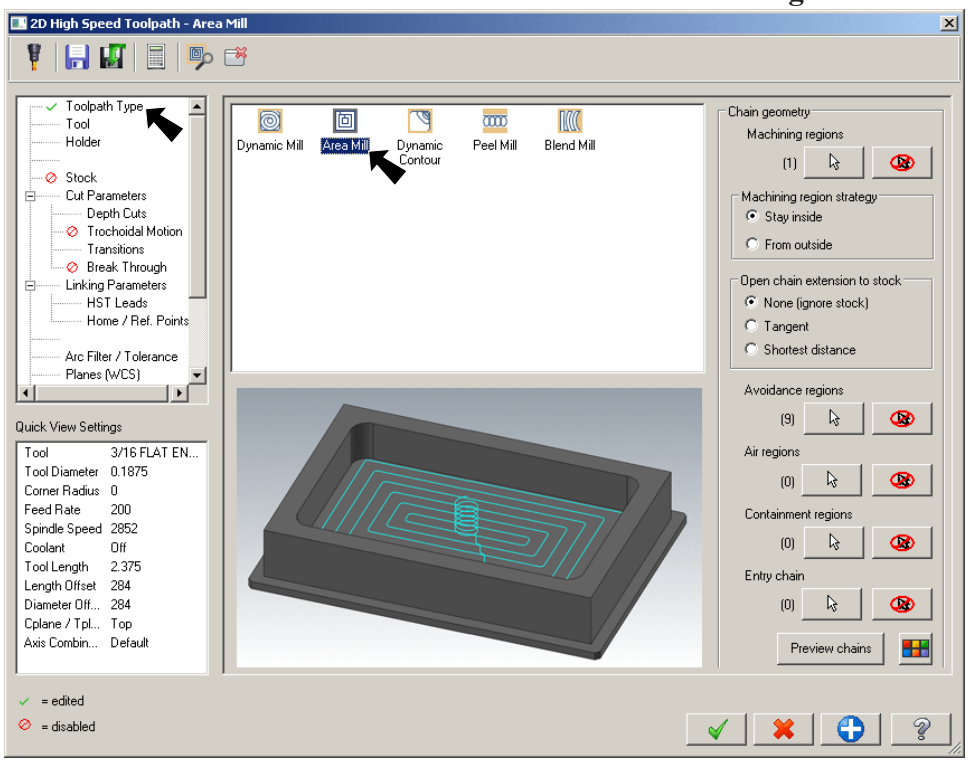


Fig. 50

Step 5. Select **Tool** from tree control and click **Select library tool**
Fig. 51.

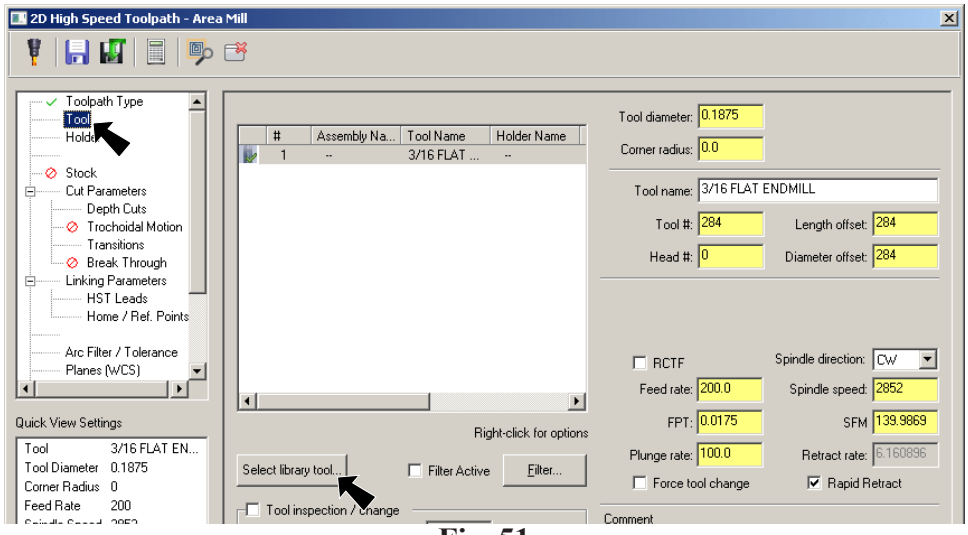


Fig. 51

Step 6. Click **279 1/32 FLAT END-MILL** and click OK **Fig. 52**.

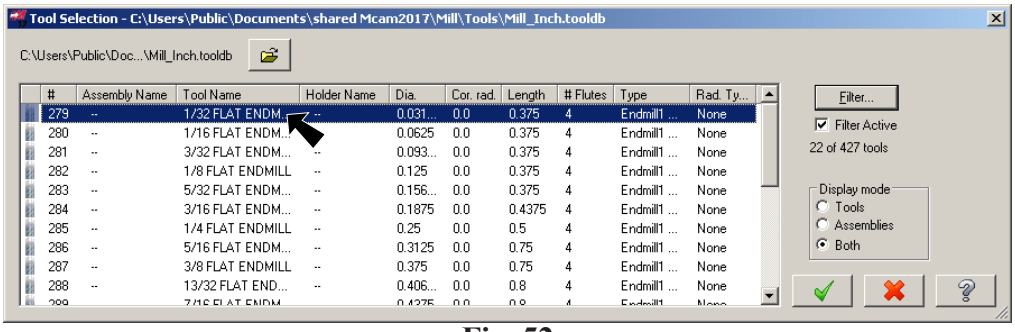


Fig. 52

Step 7. Back in **Tool** page set:

Tool # 2

Feed rate 2

Plunge rate 1
Fig. 53.

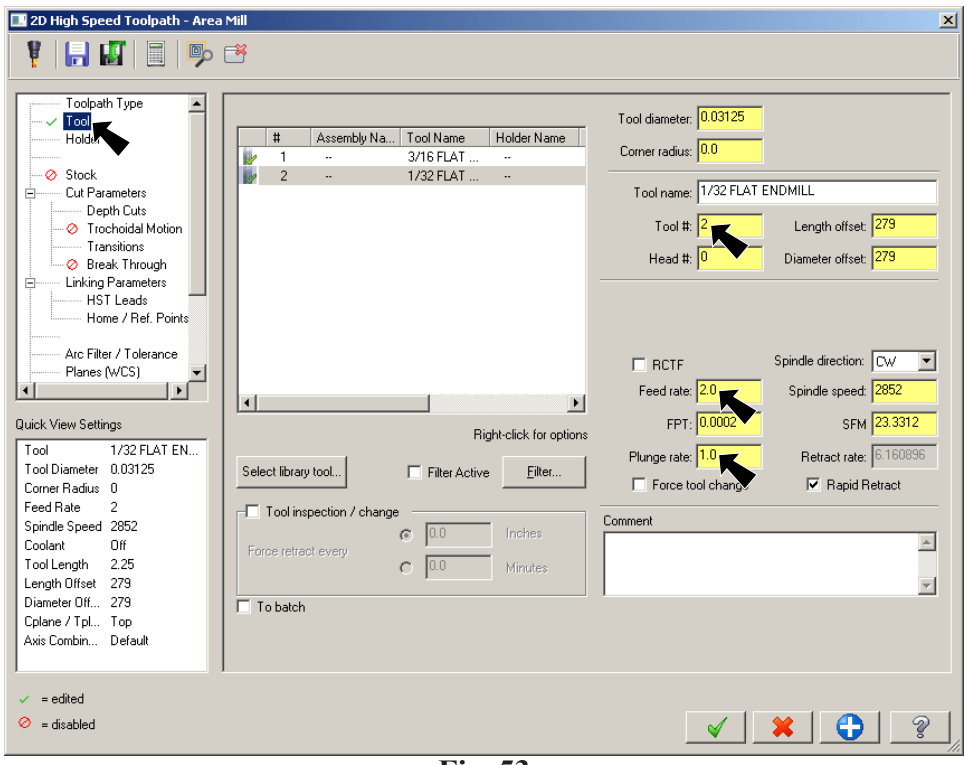


Fig. 53

Step 8. Select **Cut Parameters** from tree control and set:

XY stepover
% of dia
45
Fig. 54.

Step 9. Select **Transitions** from tree control and set:

Z clearance
.02
Fig. 55.

Step 10. Click OK  in Area Mill dialog box.

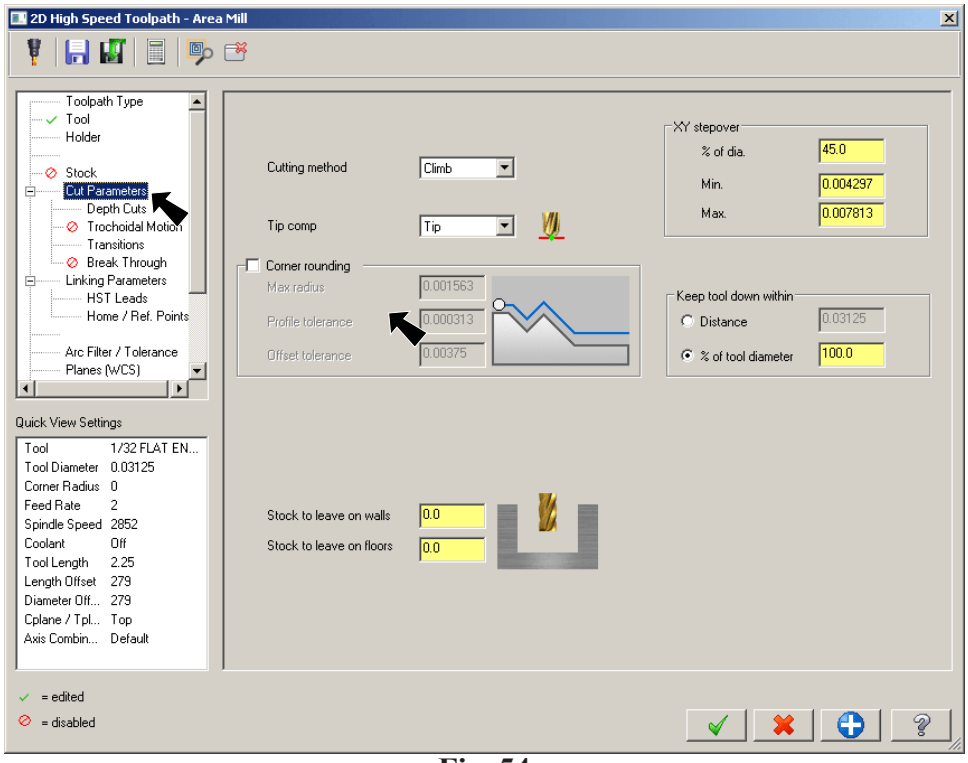


Fig. 54

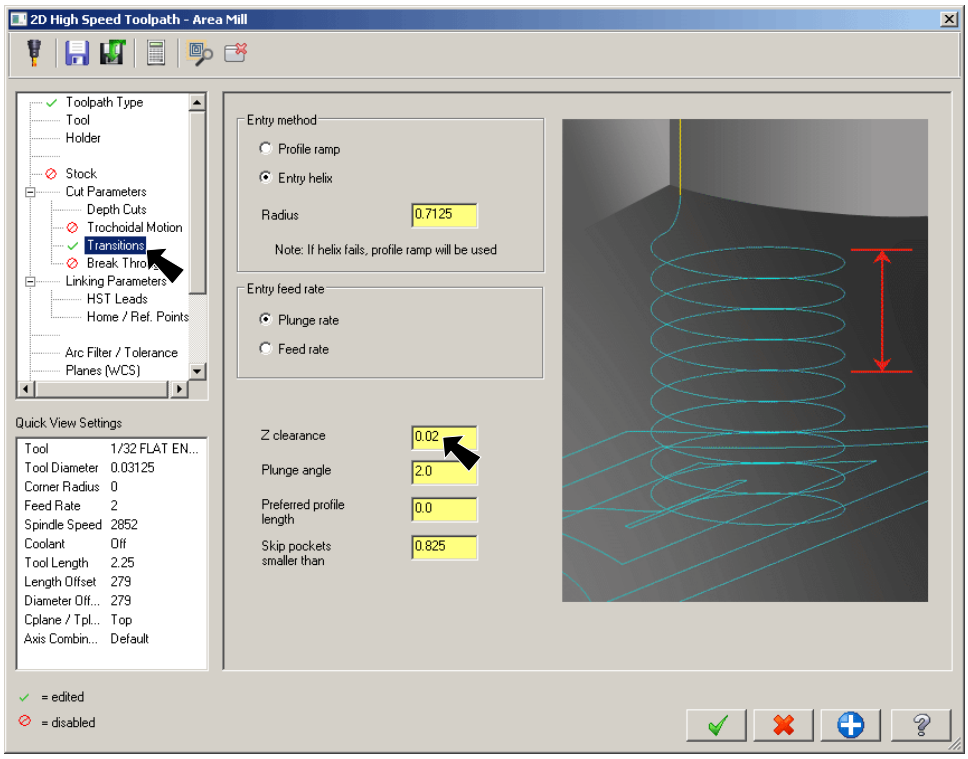


Fig. 55

N. Verify Two Toolpaths.

Step 1. In the Toolpaths Manager, click **Regenerate all selected operations**  , **Fig. 56**.

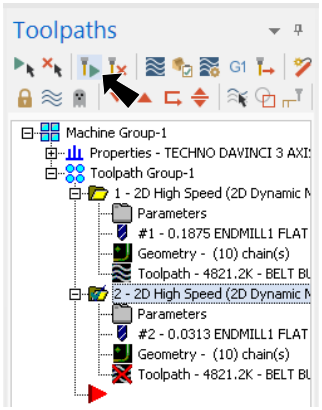


Fig. 56

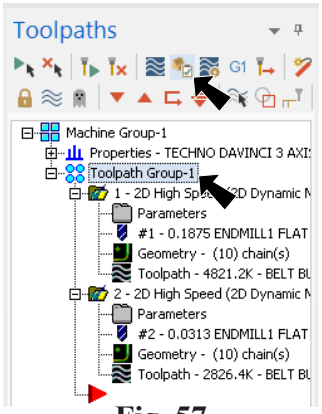


Fig. 57

Step 2. Save  (**Ctrl-S**).

Step 3. Click **Toolpath Group-1** in the Toolpaths Manager to select **both** toolpaths, **Fig. 57**.

Step 4. Click **Verify**  in the Toolpaths Manager, **Fig. 57**.

Fig. 58

Step 5. Click **Play**  (**R**) in VCR bar along bottom of the window, **Fig. 58**.

Step 6. Note **Total Time** to run program under Toolpath Info in the Move List panel (**roughly 4 hours**), **Fig. 59**.

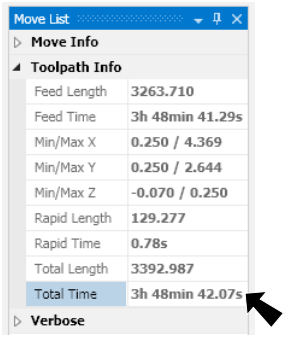


Fig. 59

Step 7. Switch back to Mastercam (**Alt-Tab**).

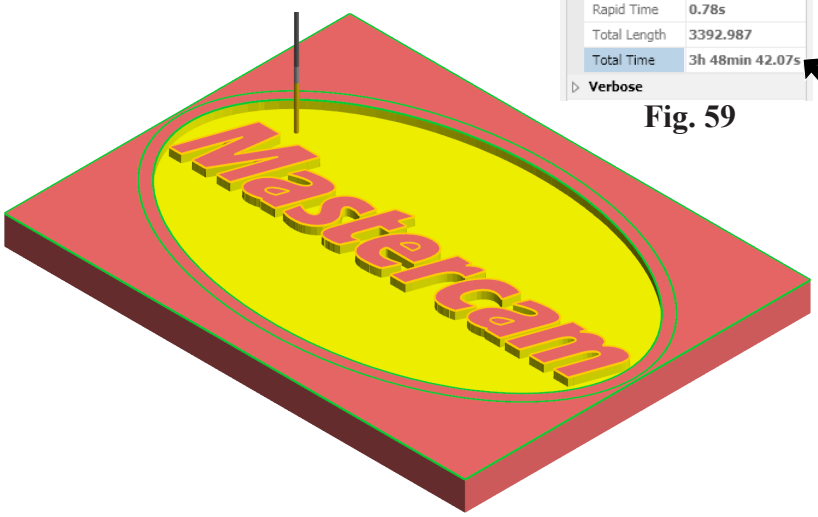


Fig. 60

O. 2D High Speed Dynamic Mill Toolpath.

Step 1. Use **Alt-T** to turn off toolpath display.

Step 2. Copy and Paste **Dynamic Mill** toolpath in the Toolpaths Manager. To copy, click to select toolpath, **Fig. 61**. Then, use **Ctrl-C** and **Ctrl-V**, **Fig. 62**.

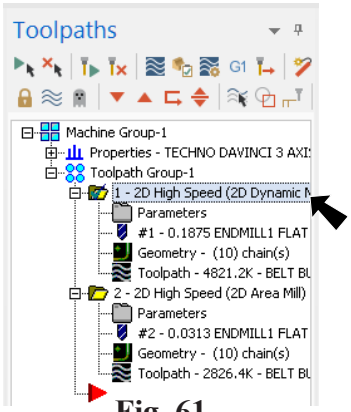


Fig. 61

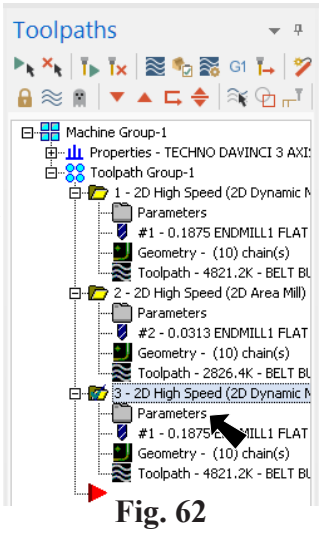


Fig. 62

Step 3. Expand copied toolpath and click **Parameters**, **Fig. 62**.

Step 4. Select **Toolpath Type** from the tree control and:

Click both **Remove selected machining chains** 

and **Remove selected Avoidance chains** 
Fig. 63.

Step 5. Under **Machining regions**

Click **Select machining chains** 
Fig. 64.

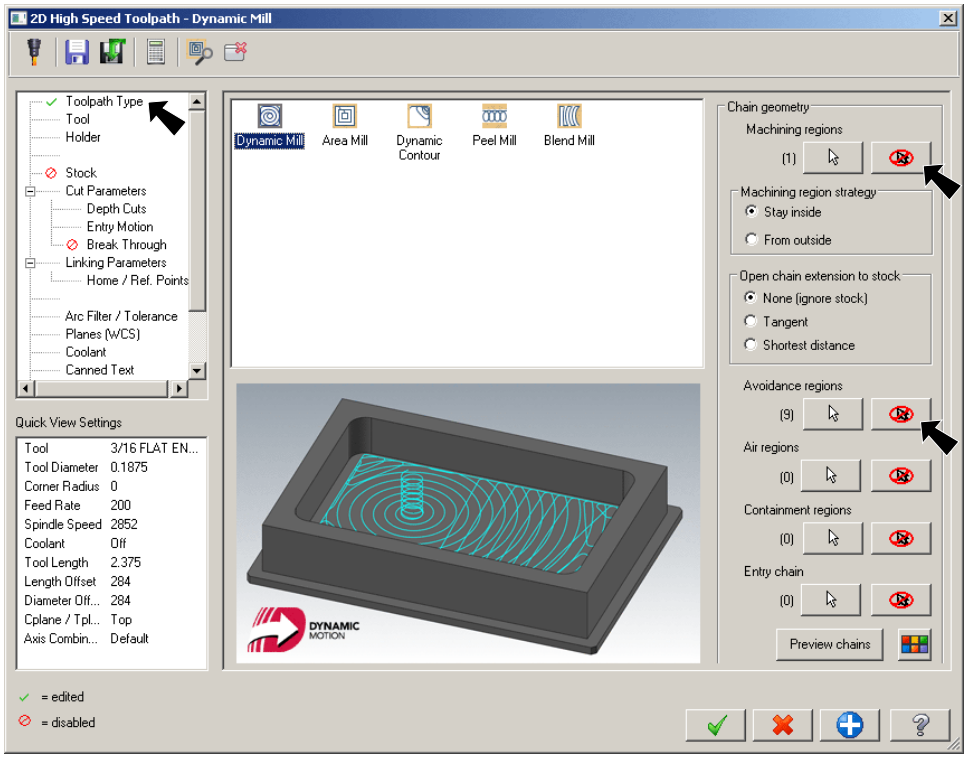


Fig. 63

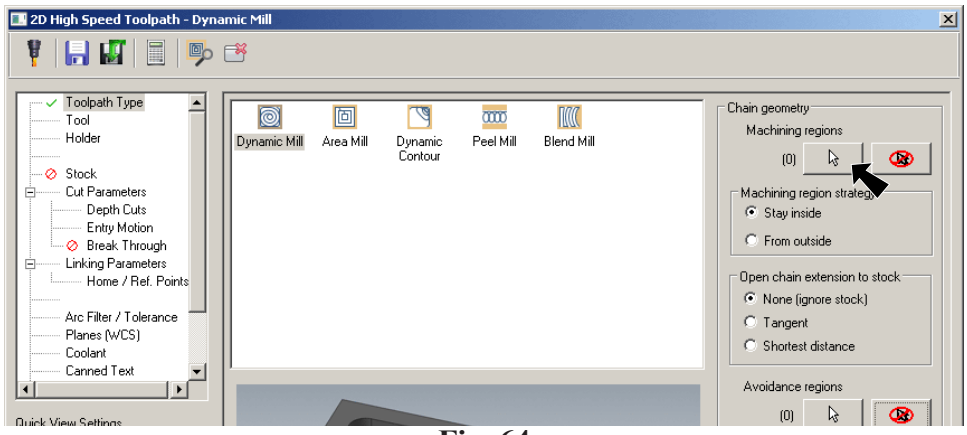
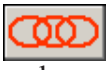


Fig. 64

Step 6. Select **Chain**  in Chaining dialog box

Step 7. Click to chain **inner geometry of both a's and e letters**, **Fig. 65**.

Step 8. Click OK  in Chaining dialog box.

Step 9. Back in the Dynamic Mill dialog box, confirm **3** Machining regions chained, **Fig. 66**.

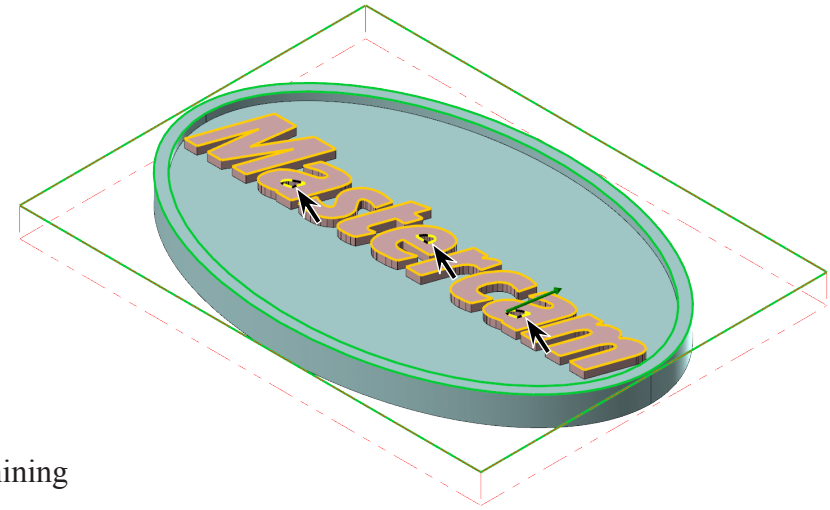


Fig. 65

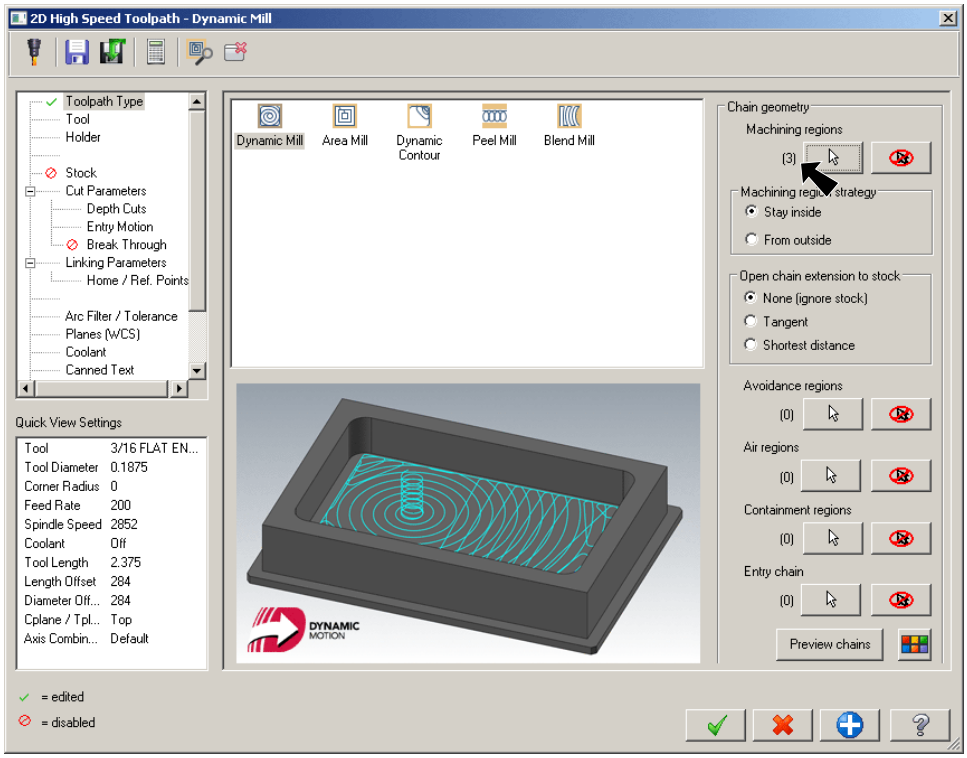


Fig. 66

Step 10. Select **Tool** from tree control and set:

Select **1/32 FLAT END-MILL** in the Tool display window

Feed rate 2

Plunge rate 1
Fig. 67.

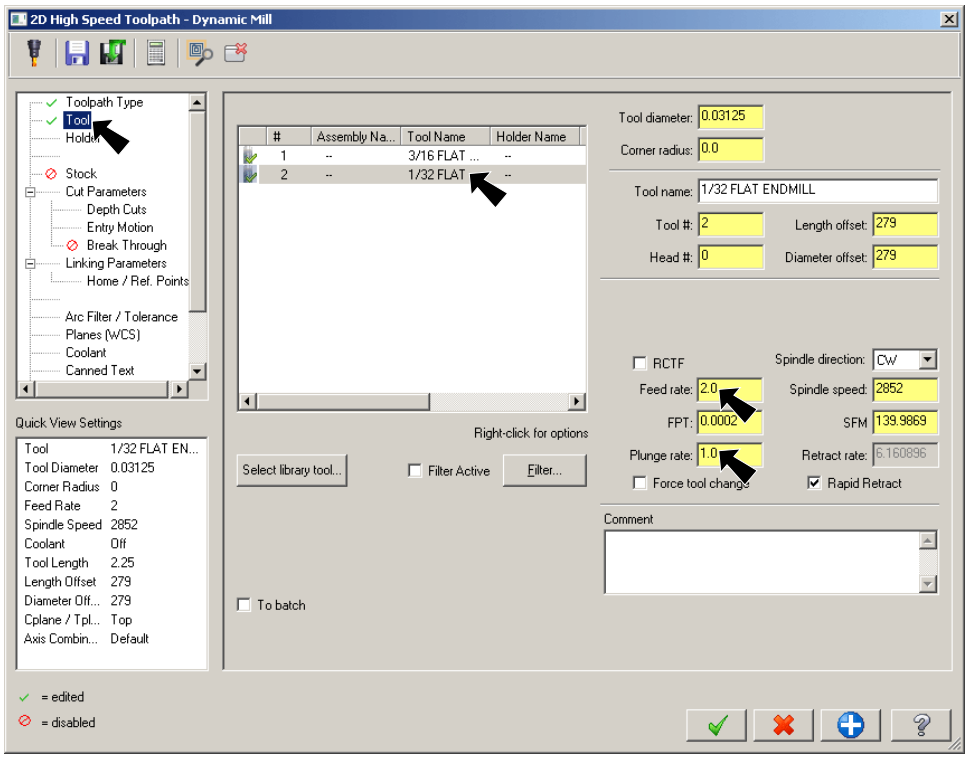


Fig. 67

Step 11. Select **Entry Motion** from tree control and set:

Z clearance .02
Fig. 68.

Step 12. Click OK  in Dynamic Mill dialog box.

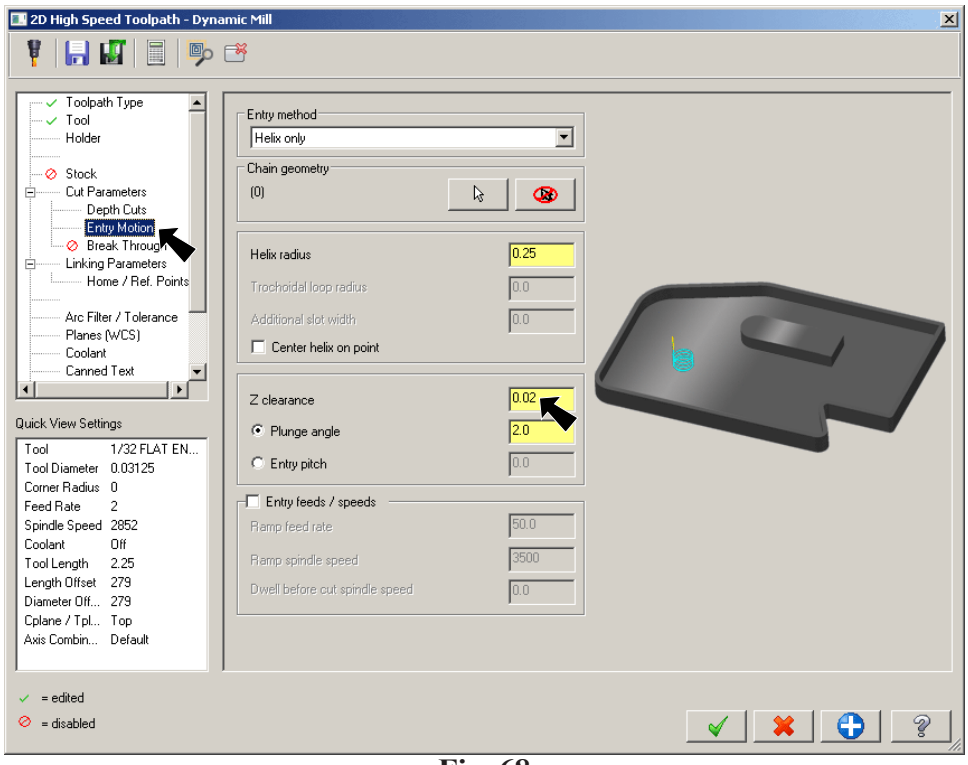


Fig. 68

P. Verify 3 Toolpaths.

Step 1. In the Toolpaths Manager, click **Regenerate all selected operations**  , **Fig. 69**.

Step 2. Save  (**Ctrl-S**).

Step 3. Click **Toolpath Group-1** in the Toolpaths Manager to select **all 3** toolpaths, **Fig. 70**.

Step 4. Click **Verify**  in the Toolpaths Manager, **Fig. 70**.

Step 5. Click **Play**  (**R**) in VCR bar along bottom of the window.

Step 6. Switch back to Mastercam (**Alt-Tab**).

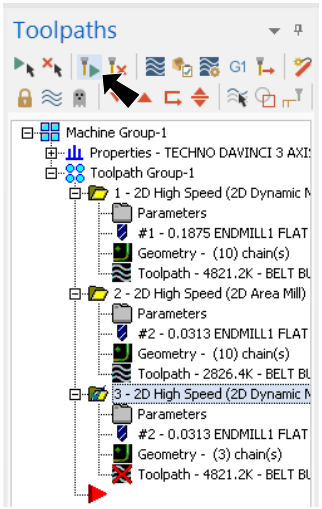


Fig. 69

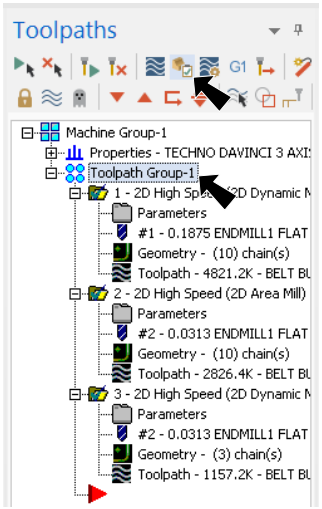


Fig. 70

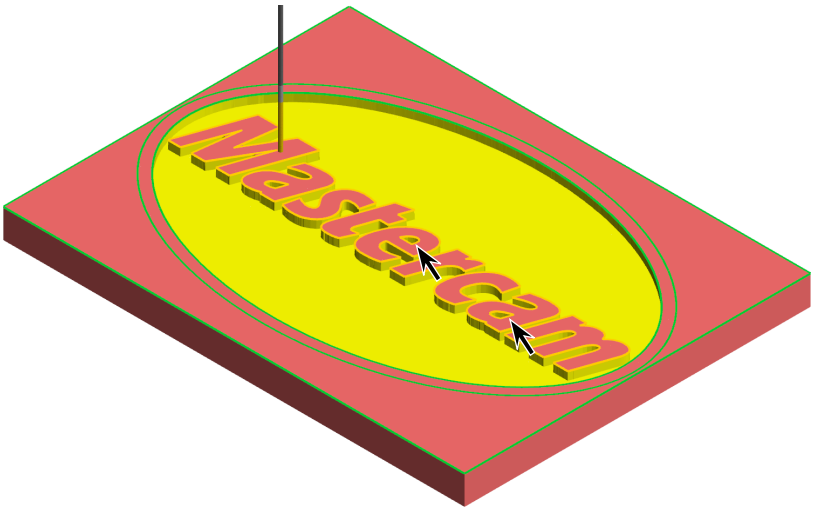


Fig. 71

Q. Contour Toolpath with Tab.

Step 1. Use **Alt-T** to turn off toolpath display.

Step 2. On the Toolpaths tab TOOLPATHS in the 2D group click **Contour** Contour.

Step 3. Click **Chain** (**C**) in Chaining dialog box, **Fig. 72**.

Step 4. Click **outside ellipse** to Chain, **Fig. 73**. The chain arrow should point **clockwise** around the chain. If chaining directions arrow is pointing in the opposite direction - click Reverse, **Fig. 72**.

Step 5. Click OK in Chaining dialog box.

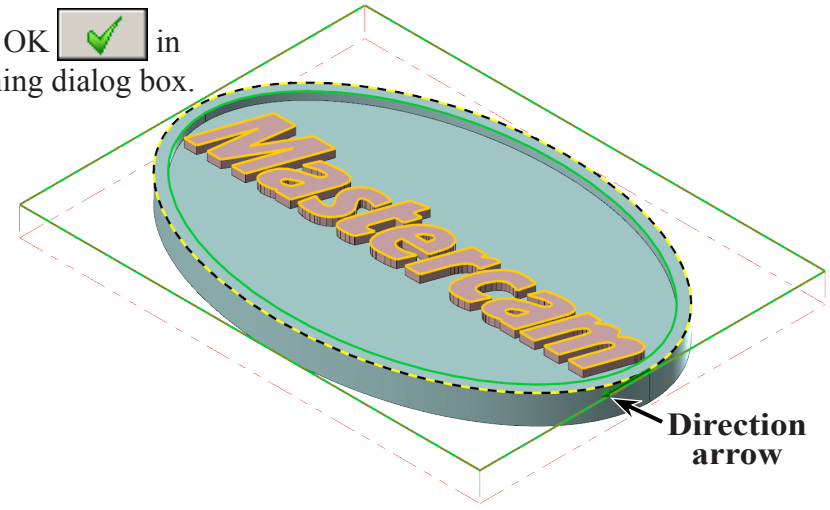


Fig. 73

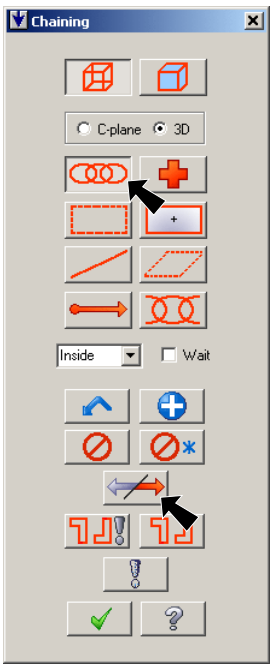


Fig. 72

Step 6. In the 2D Toolpaths Contour dialog box confirm **1 Chain** is selected, **Fig. 74**.

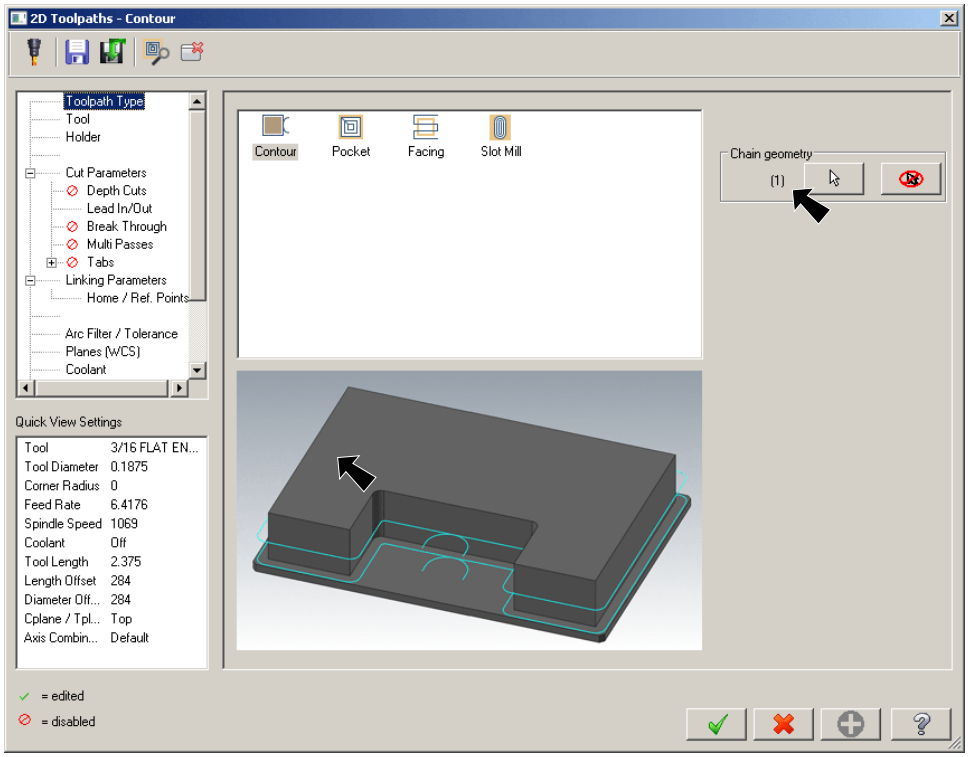


Fig. 74

Step 7. Select **Tool** from tree control and set:

Select **3/16 FLAT END-MILL** in the Tool display window

Feed rate 200

Plunge rate 100
Fig. 75.

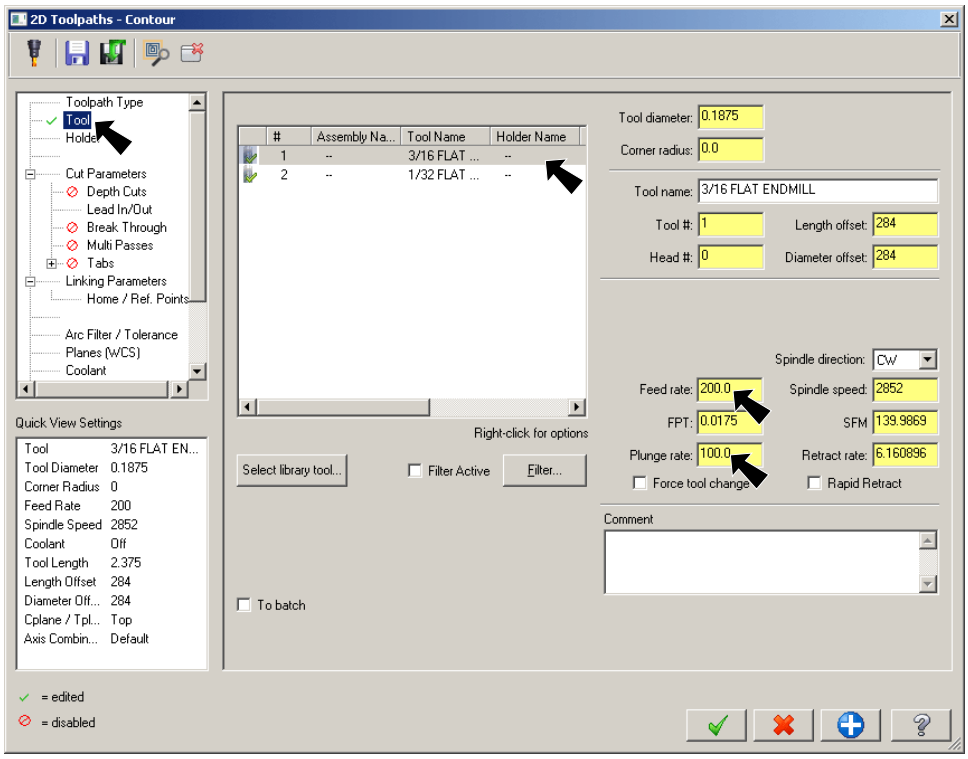


Fig. 75

Step 8. Select **Cut Parameters** from tree control and set:

Compensation type Wear

Compensation direction Left

Tip comp: Tip

Stock to leave on walls and floors 0
Fig. 76.

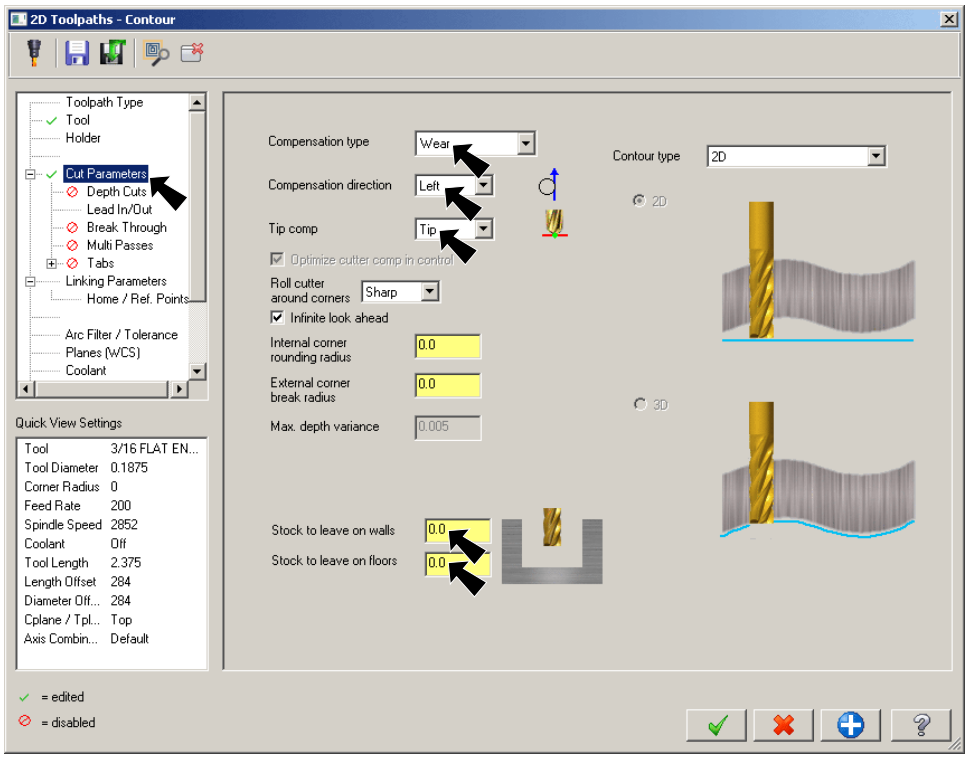


Fig. 76

Step 9. Select **Depth Cuts** from tree control and set:

Check **Depth cuts**

Max rough step: **.02**

Finish step 0
Fig. 77.

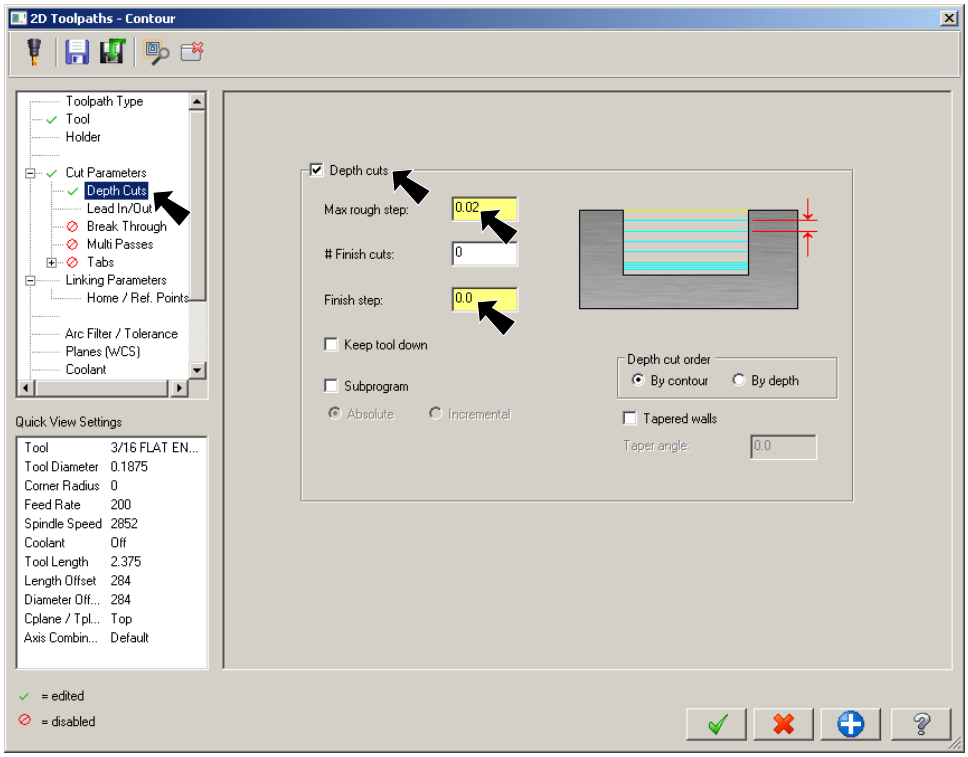


Fig. 77

Step 10. Select **Lead In/Out** from tree control and set:

Uncheck **Lead In/Out**
Fig. 78.

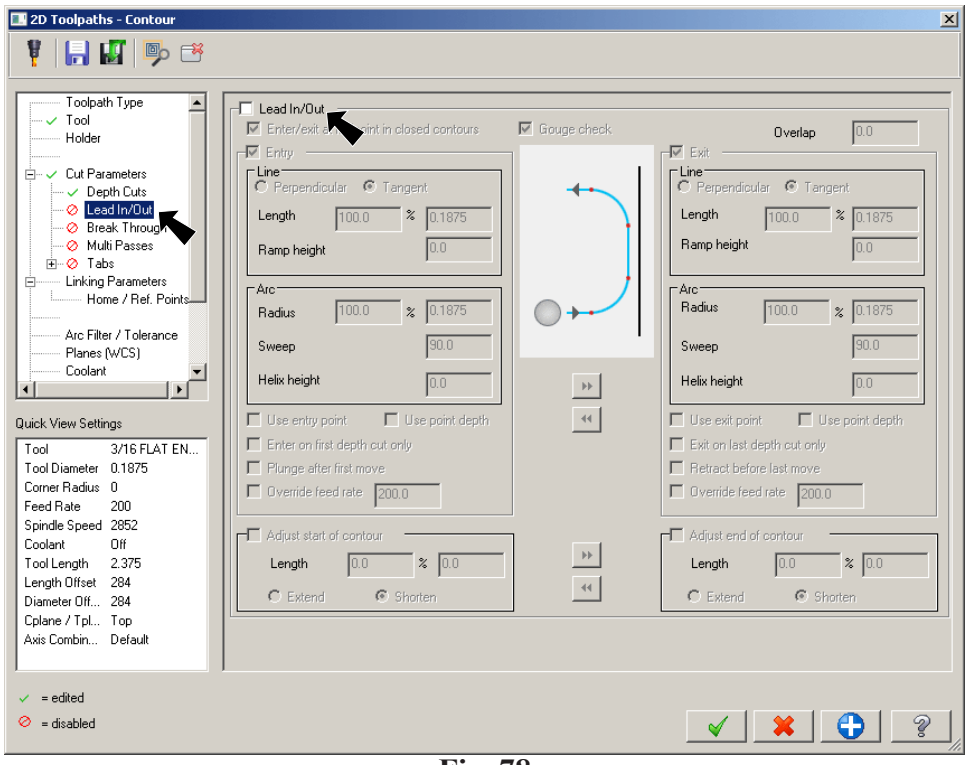


Fig. 78

Step 11. Select **Tabs** from tree control and set:

Check **Tabs**
Select **Automatic**
Fig. 79.

Step 12. Select **Linking Parameters** from tree control and set:

Depth -.25
Fig. 80.

Step 13. Click OK  .

Step 14. Save  (**Ctrl-S**).

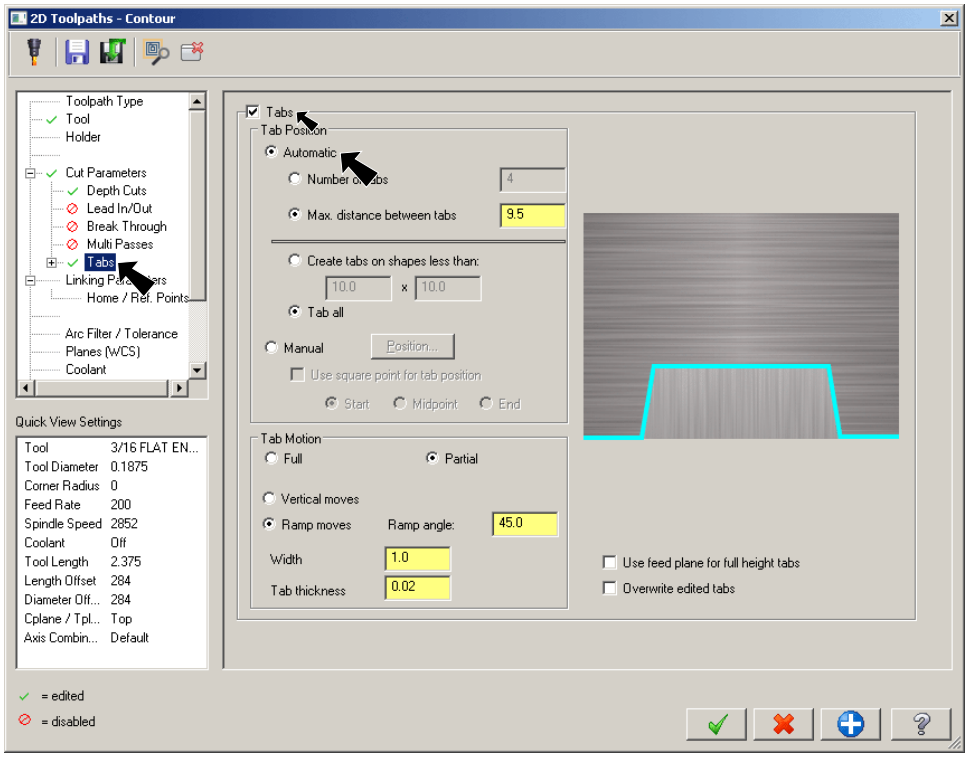


Fig. 79

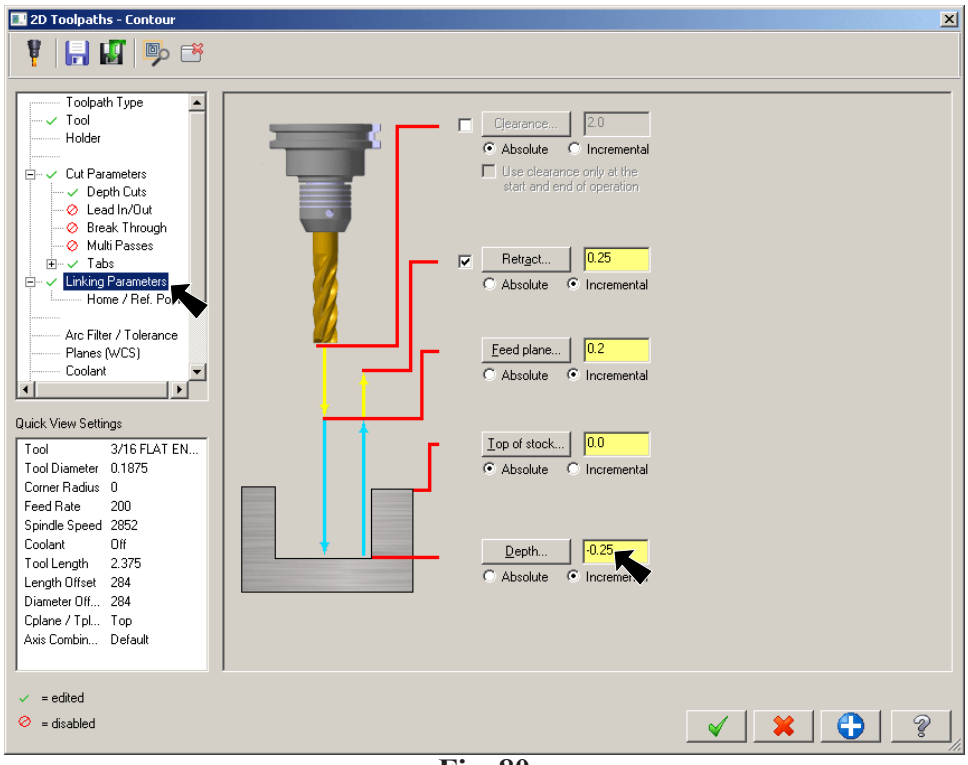


Fig. 80

R. Verify Contour with Tab.

Step 1. Click **Toolpath Group-1** in the Toolpaths Manager to select **all 4** toolpaths, **Fig. 81**.

Step 2. Click **Verify**  in the Toolpaths Manager, **Fig. 81**.

Step 3. Click **Play**  **(R)** in VCR bar.

Step 4. Switch back to Mastercam (**Alt-Tab**).

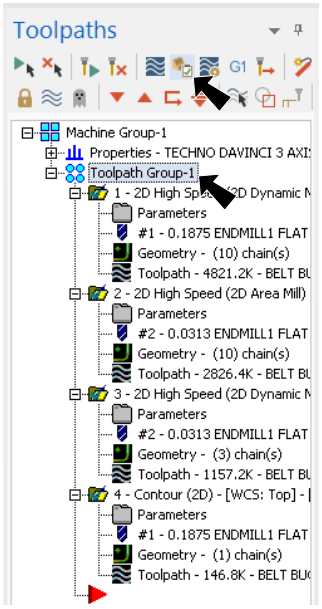


Fig. 81

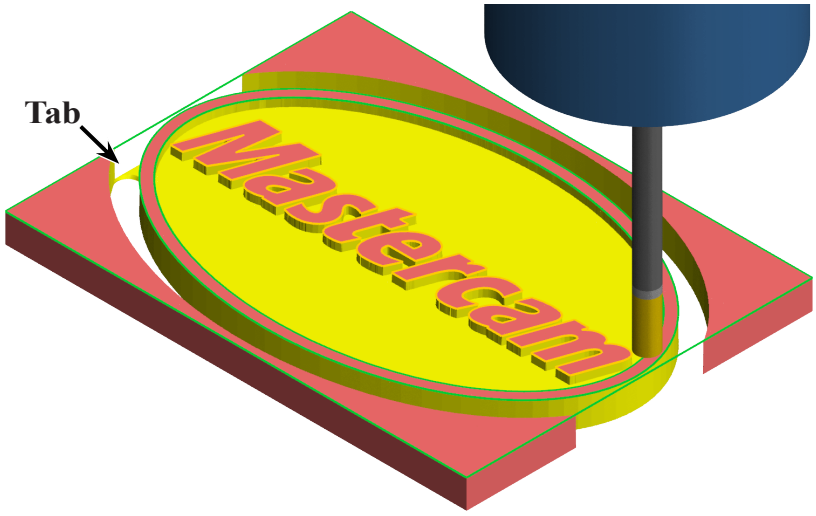


Fig. 82

S. Create WCS BOTTOM CUT.

Step 1. Rotate view to view **bottom of solid with single hole on left side**, hold down middle mouse button (wheel) and drag to rotate view, **Fig. 83**.

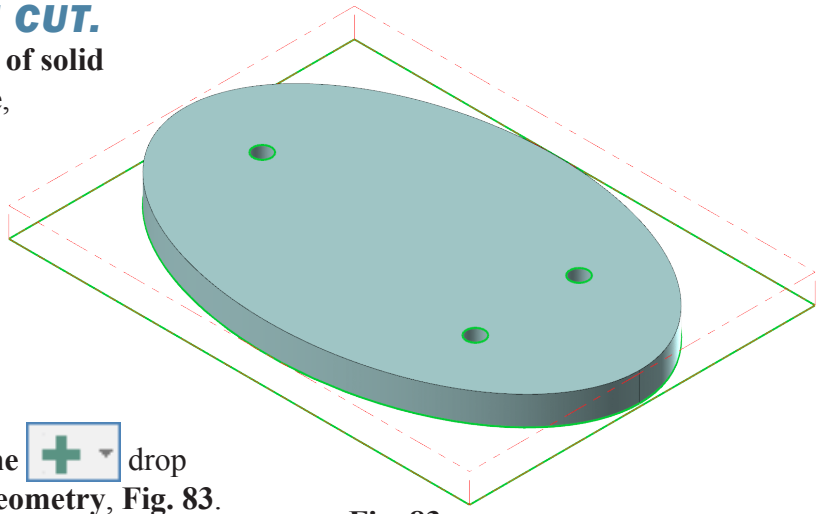


Fig. 83

Step 2. Display the **Planes Manger** (**Alt-L**).

Step 3. In the Planes Manger:

Click **Create a new plane** drop down and select **From geometry**, **Fig. 83**.

Step 4. Click the **2 lines** in left corner to define construction plane, **Fig. 85**.

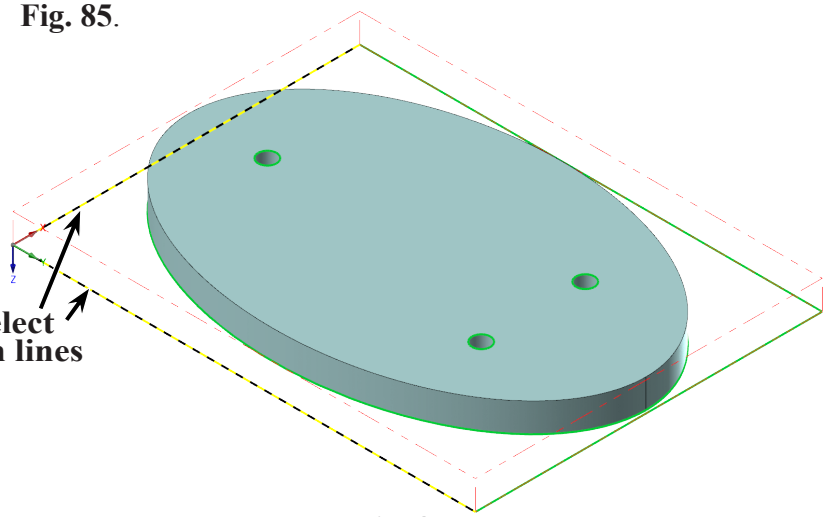


Fig. 85

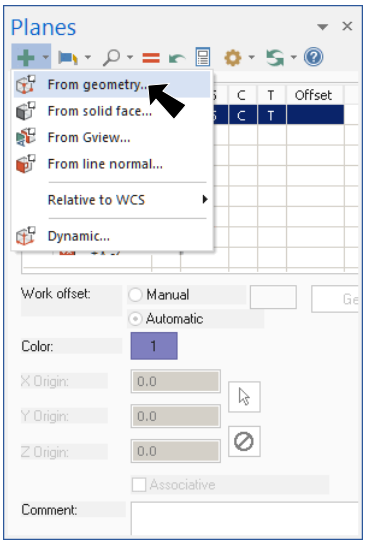


Fig. 84

Step 5. Rotate axes by clicking the arrow in the Select plane dialog box, **Fig. 86** until **X axes points to right, Y axes to rear and Z up**, **Fig. 87**. This should be **Plane 6**, **Fig. 86**.

Click OK  in the Select plane dialog box.

Fig. 86

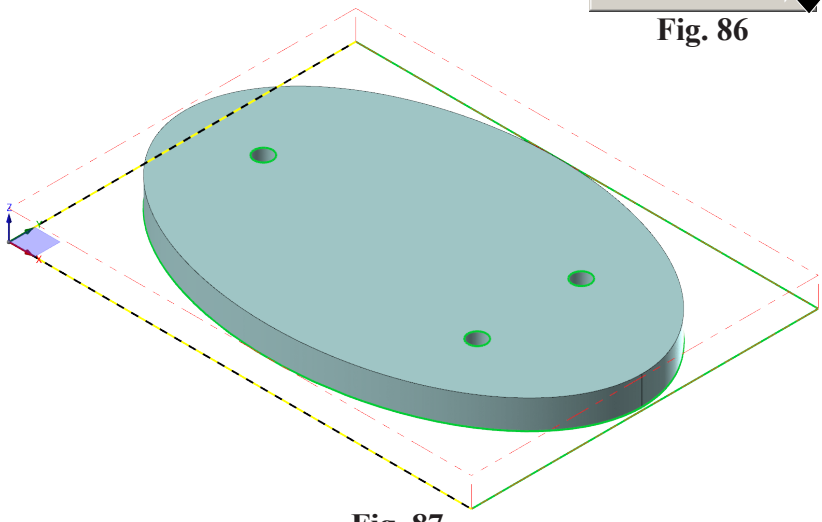


Fig. 87

Step 6. In the New Plane dialog box:
Key-in **BOTTOM CUT** for name, **Fig. 88**
Origin X 0
Origin Y -3
Origin Z .25
Click OK  .

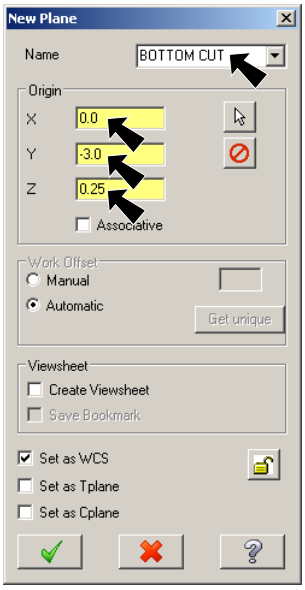


Fig. 88

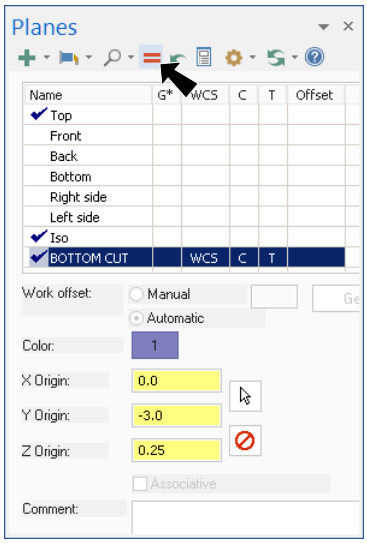
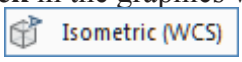


Fig. 89

Step 7. Back in the Planes Manager:
Click **Set All**  , **Fig. 89**.

Step 8. Change to the Isometric View.
Right click in the graphics window and click 

(**Alt-7**).

Step 9. Save 
(**Ctrl-S**).

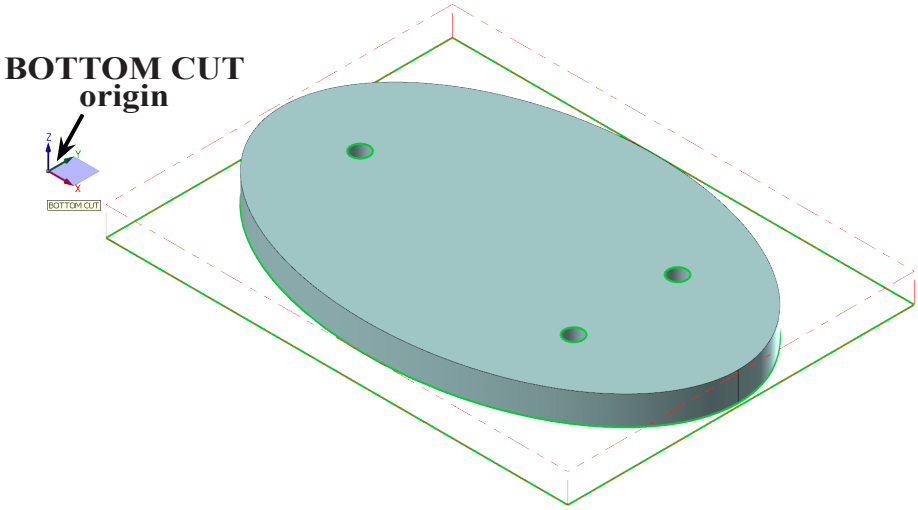


Fig. 90

T. Circle Mill Toolpath.

Step 1. Confirm origin. Use **F9** to toggle axes, **Fig. 91**.

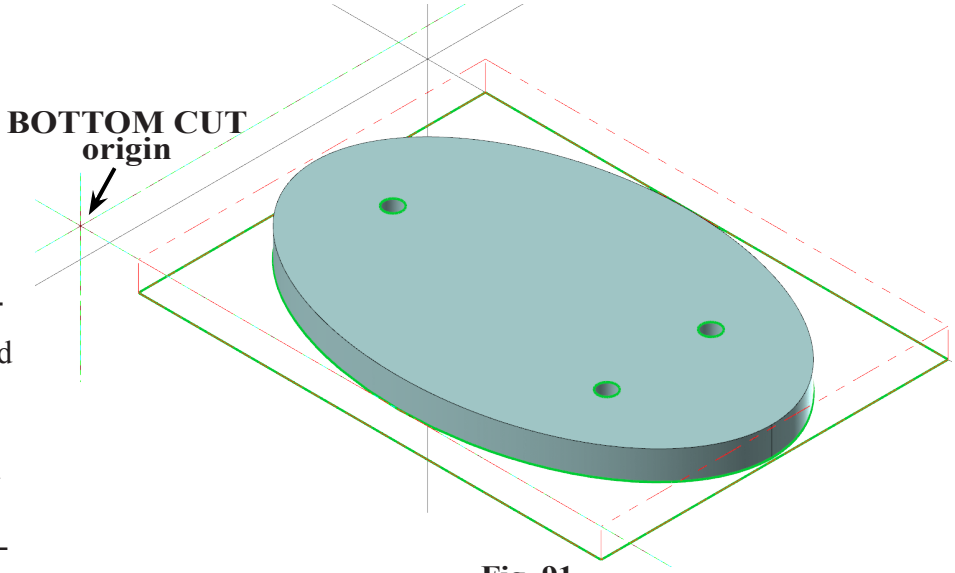
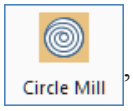


Fig. 91

Step 2. On the Toolpaths tab TOOLPATHS in the 2D group click **Expand gallery** button and click **Circle Mill** 

, **Fig. 92**.

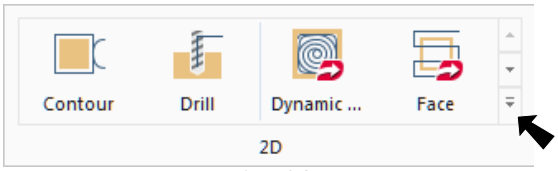
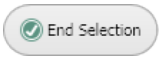


Fig. 92

Step 3. Click **Entities** button in Drill Point Selection dialog box, **Fig. 93**.

Step 4. Click the **3 circles** and click **End Selection** 

(**ENTER**), **Fig. 94**.

Step 5. Click OK  in the Drill Point Selection dialog box.

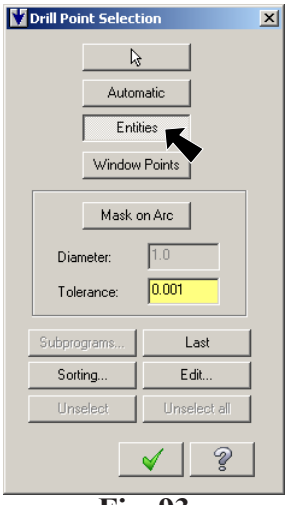


Fig. 93

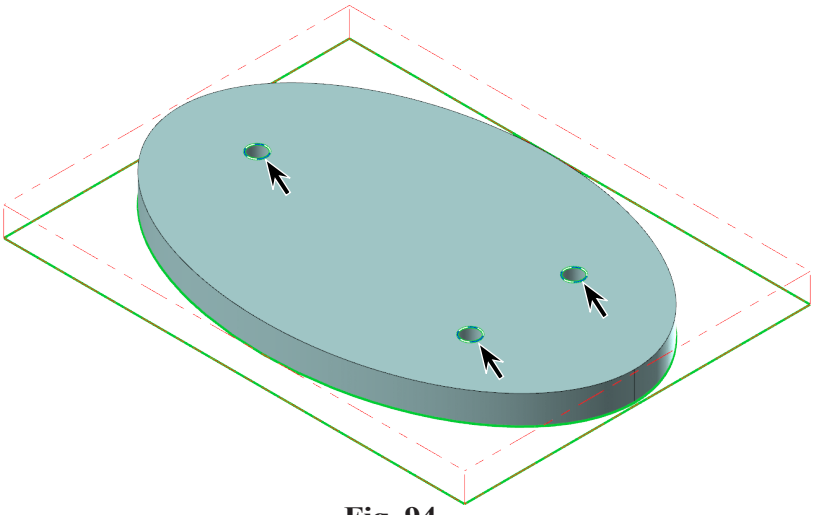


Fig. 94

Step 6. Select **Tool** from tree control and click **Select library tool** **Fig. 95**.

Step 7. Select **282 1/8 FLAT END-MILL** and click OK **Fig. 96**.

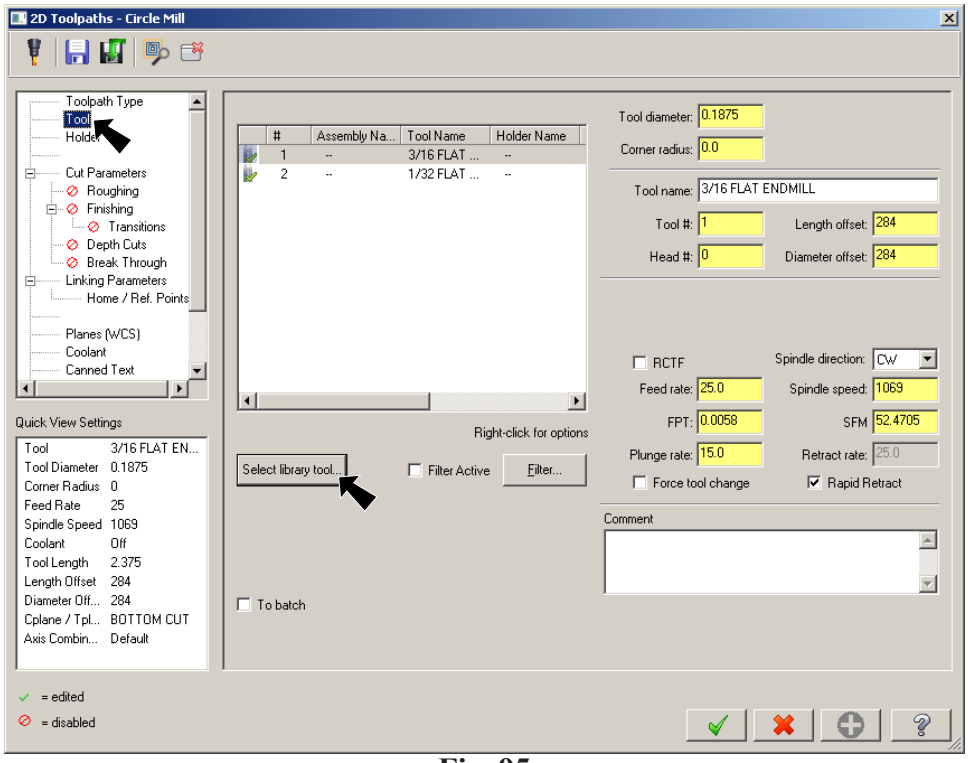


Fig. 95

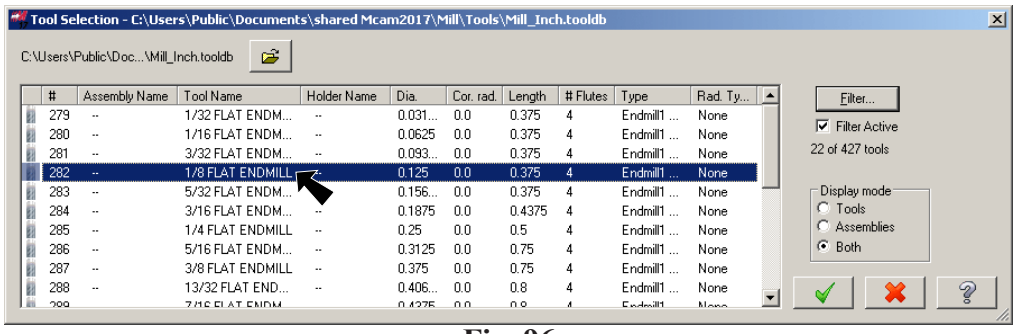


Fig. 96

Step 8. Back in **Tool** page set:

Tool # 3

Feed rate 2

Plunge rate 1
Fig. 97.

Step 9. Select **Cut Parameters** from the tree control and set:

Compensation type Computer

Compensation direction Left

Tip comp: Tip

Stock to leave on walls and floors 0
Fig. 98.

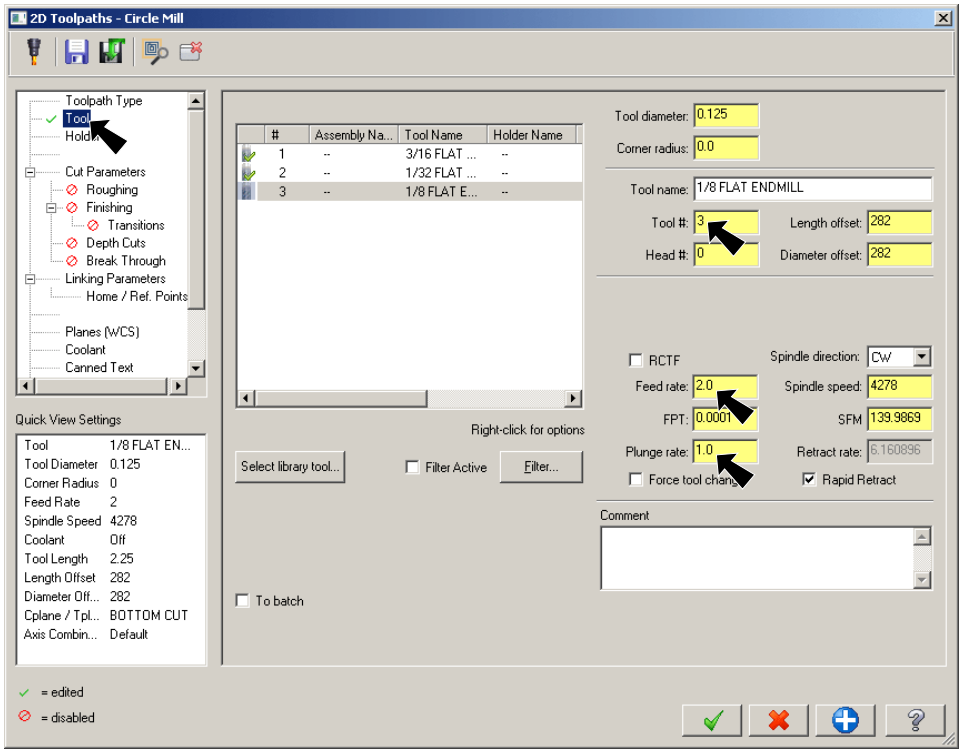


Fig. 97

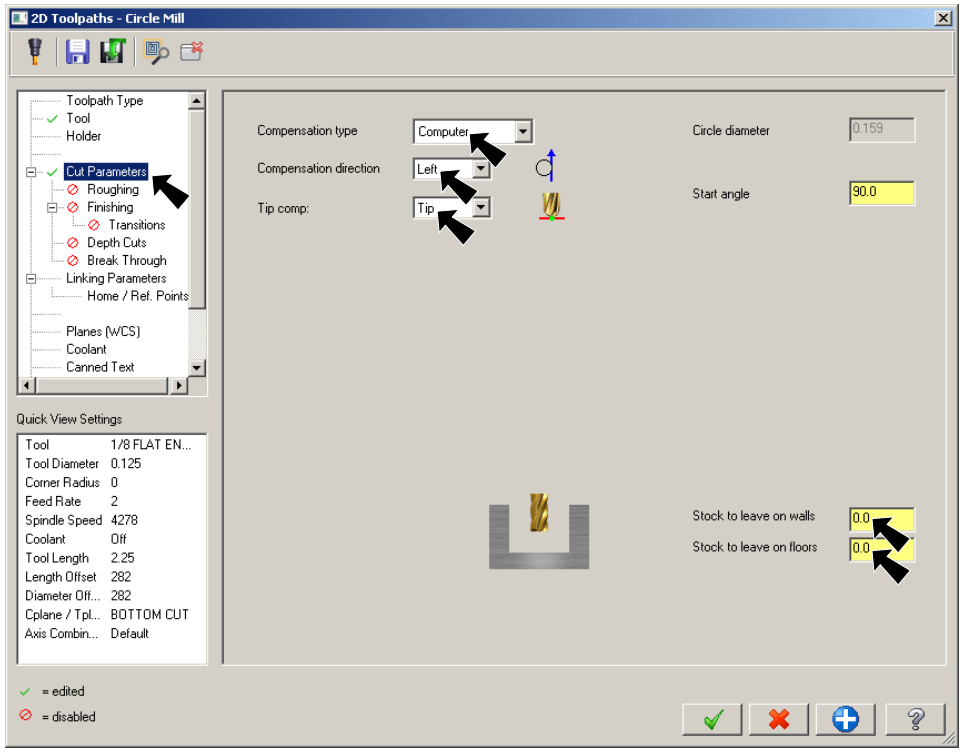


Fig. 98

Step 10. Select **Depth Cuts** from the tree control and set:

Check **Depth cuts**

Max rough step: **.02**
Fig. 99.

Step 11. Select **Linking Parameters** from the tree control and set:

Depth -.15
Fig. 100.

Step 12. Click OK  .

Step 13. Save  (**Ctrl-S**).

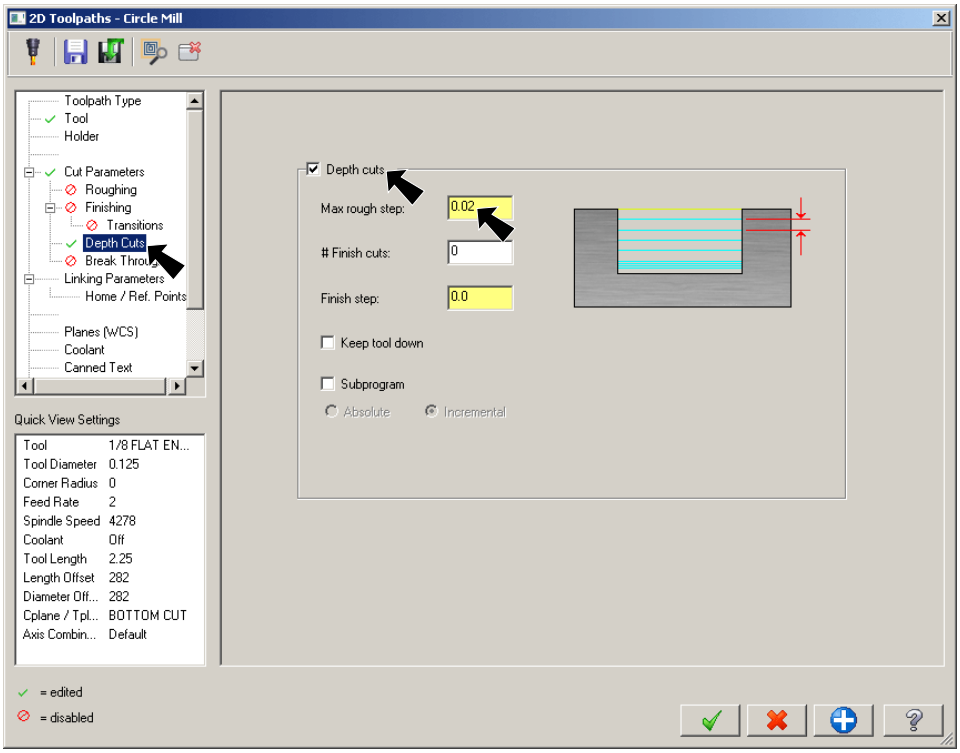


Fig. 99

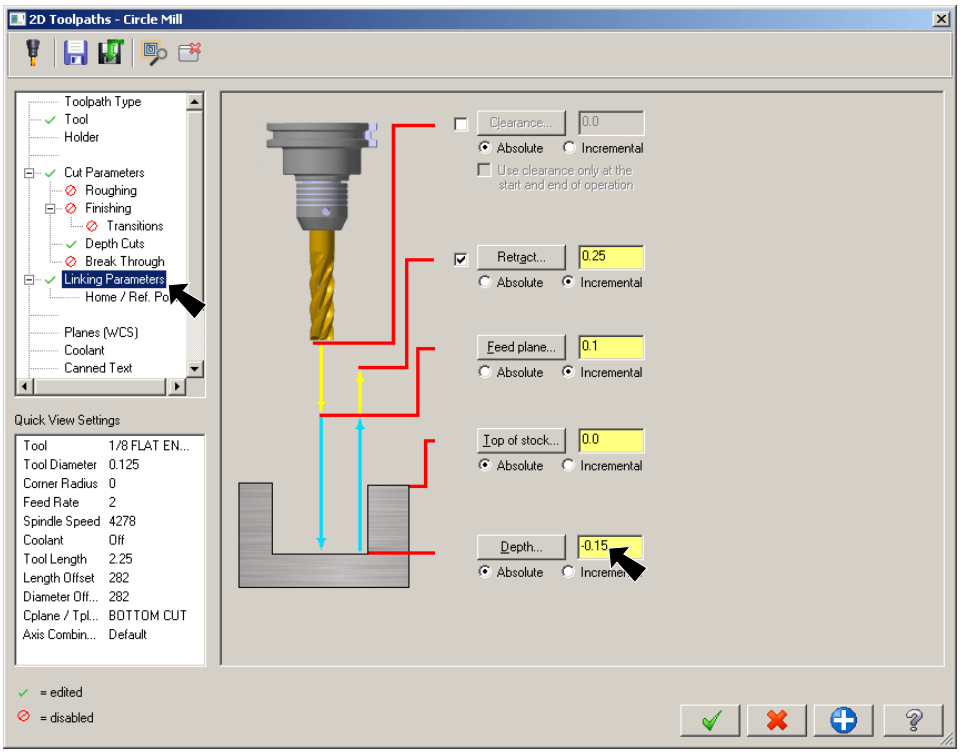


Fig. 100

U. Verify Circle Mill.

Step 1. Click **Verify** in the Toolpaths Manager, **Fig. 101**.

Step 2. Click **Play** (**R**) in VCR bar.

Step 3. Switch back to Mastercam (**Alt-Tab**).

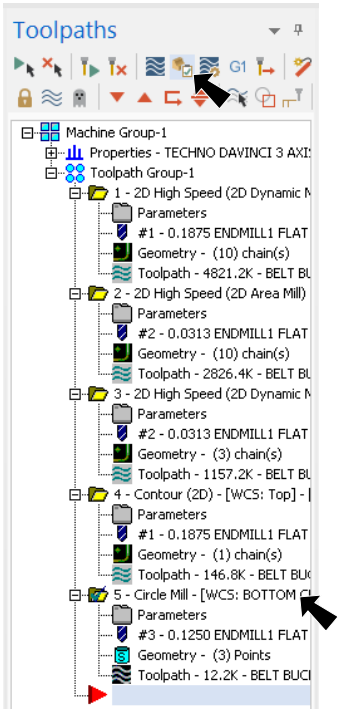


Fig. 101

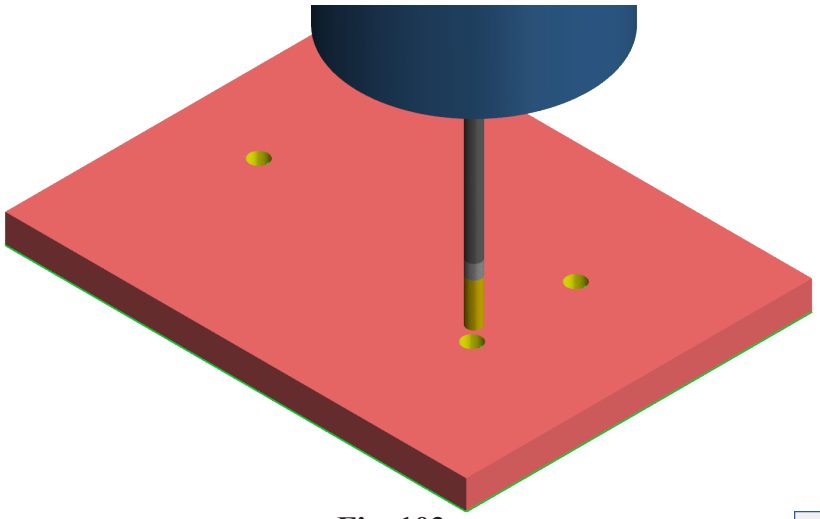


Fig. 102

V. Change Back to Top WCS.

Step 1. In the Planes Manger (**Alt-L**) set:
under Name, **Fig. 103**
Click **Top**
Click **Set All** .

Step 2. Change to the Isometric View. **Right click** in the graphics window and click Isometric (WCS) (**Alt-7**).

Step 3. Save (**Ctrl-S**).

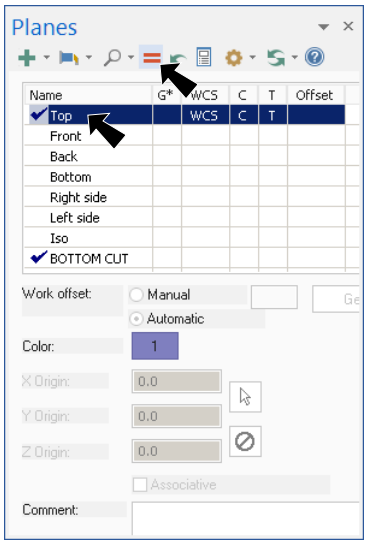


Fig. 103