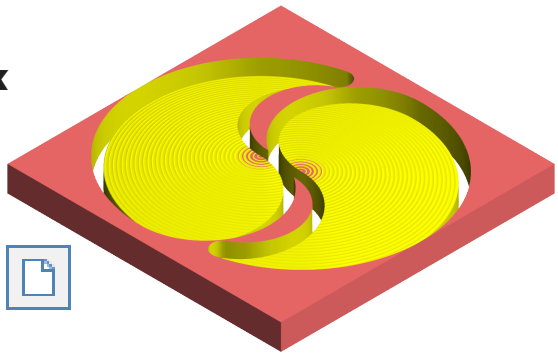
Jewelry Box
Lid



A. Sketch Lid Circle.

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 **Circle Center Point** Circle Center Point.

Step 3. In the Circle Center Point function panel:
under Size, **Fig. 1**
Diameter 6.5 and press ENTER
Press **O key** on keyboard to select AutoCursor **Origin** override, **Fig 2**.
Click OK.

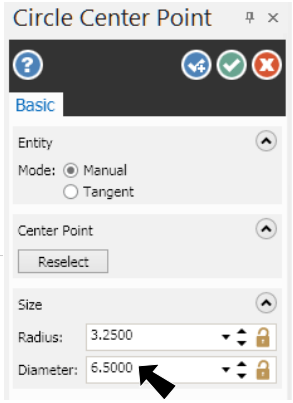


Fig. 1

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**.

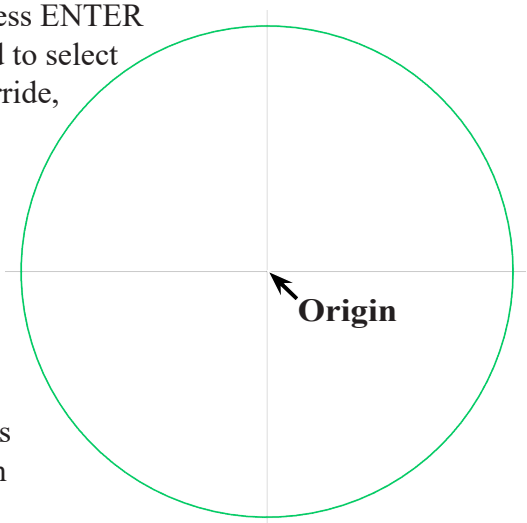


Fig. 2

B. Twin Edge Point Circles.

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

Step 2. Use the **upper quadrant and Origin** for the two points to sketch circle, **Fig. 3**.

Step 3. Repeat, and sketch second circle using **lower quadrant and Origin**, **Fig. 4**.

Step 3. Click OK in the Circle Edge Point function panel.

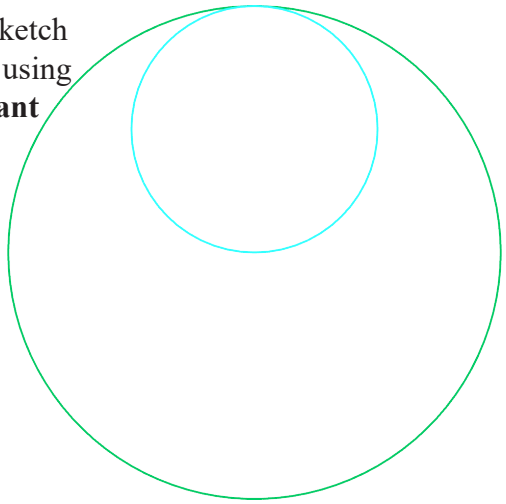


Fig. 3

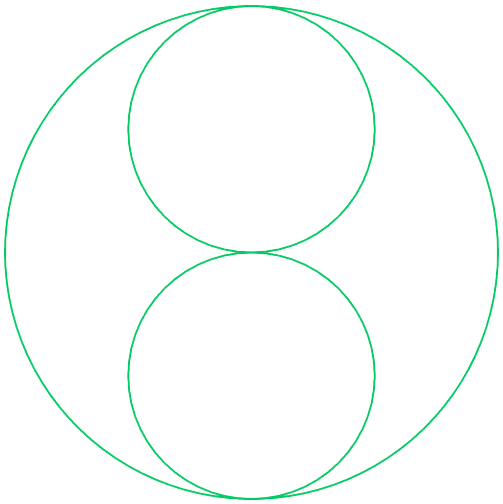


Fig. 4

C. Save As "LID"

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

Step 2. Key-in **LID** for the filename and press ENTER.

D. Trim Divide.

Step 1. On the Wireframe tab WIREFRAME click **Trim Break Extend**

Trim Break Extend

Step 2. In the Trim Break Extend function panel:
under Type, **Fig. 5**
select **Divide/delete**
Trim arcs, **Fig. 6-9**.
Click OK when done.

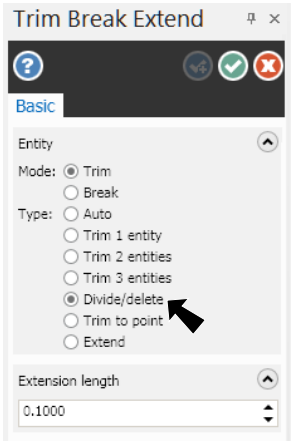


Fig. 5

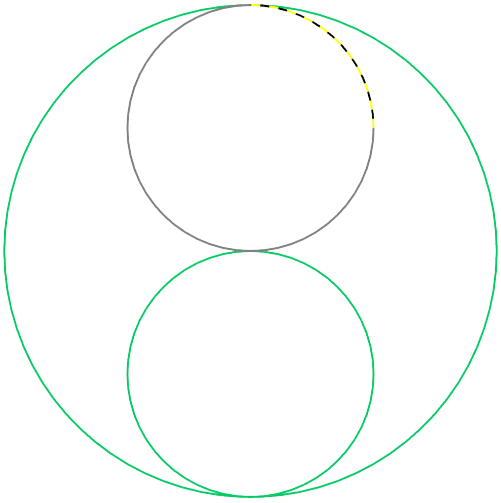


Fig. 6

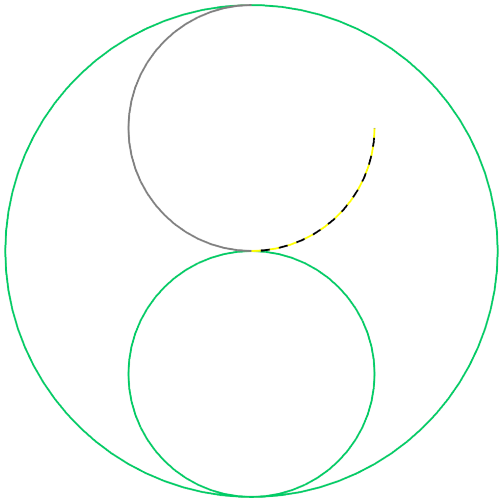


Fig. 7

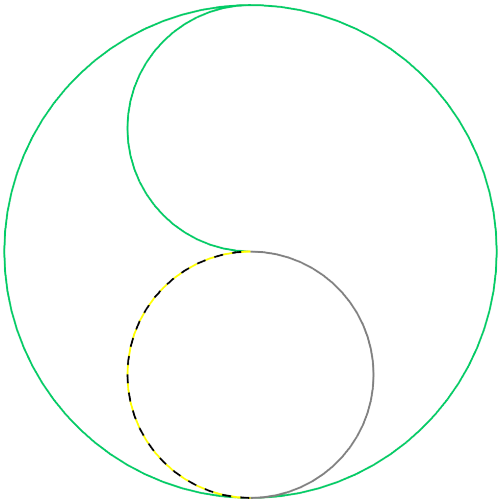


Fig. 8

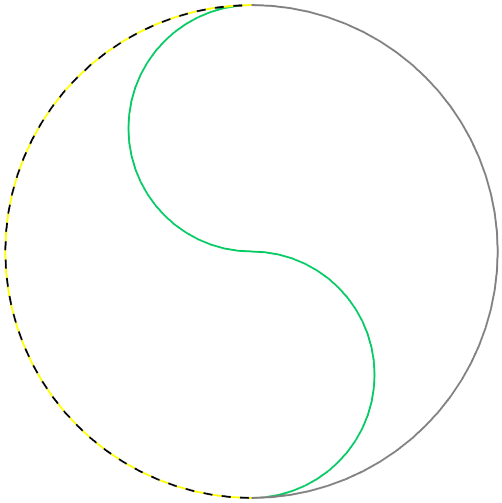


Fig. 9

E. Fillet.

Step 1. On the Wireframe tab WIREFRAME click **Fillet Entities** 

.

Step 2. In the Fillet Entities function panel:
under Radius, **Fig. 10**
Radius .05
Click **both arcs at tip**, **Fig. 11**.
Click OK .

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

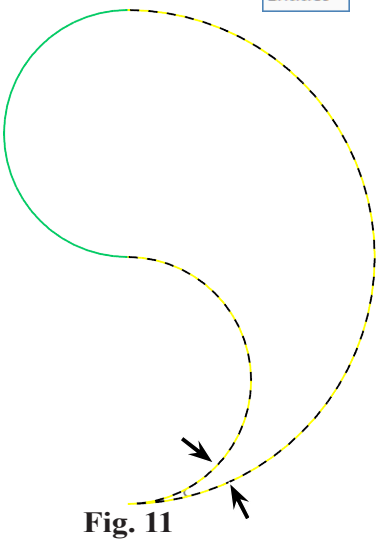


Fig. 11

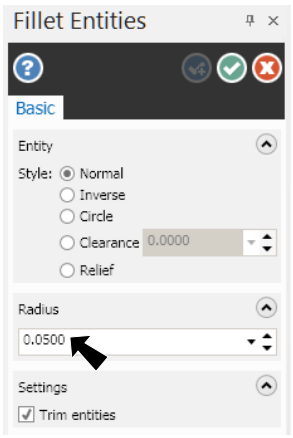
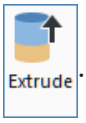


Fig. 10

F. Extrude Solid.

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

Step 2. On the Solids tab SOLIDS click **Extrude** 

.

Step 3. Click Chain in Chaining dialog box.

Step 4. Click **any geometry**, **Fig. 12**.

Step 5. Click OK in Chaining dialog box.

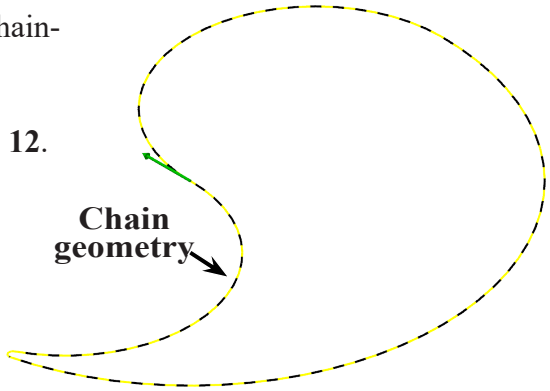


Fig. 12

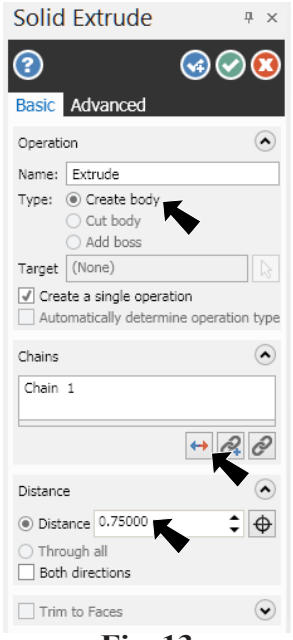


Fig. 13

Step 6. In the Solid Extrude function panel:
under Operation, **Fig. 13**
select **Create body**
under Distance
Distance .75 and press ENTER
The direction arrow should **point down**, **Fig. 14**.
If arrow points in wrong direction, click Reverse All , **Fig. 13**.
Click OK .

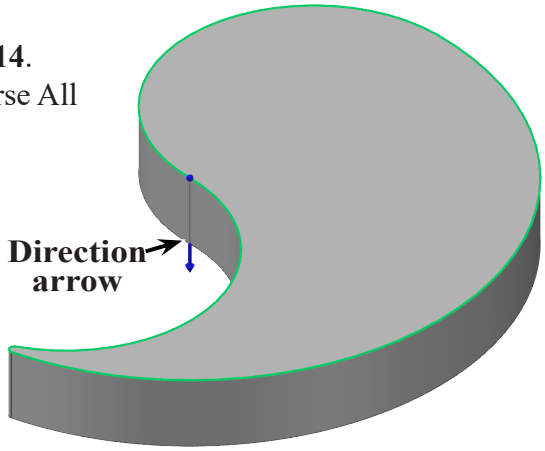


Fig. 14

G. Create Vertical Line Down from Origin.

Step 1. Change to Front View. **Right click** in the graphics window and click Front (**Alt-2**).

Step 2. **Right click** the graphics window and click **Fit** (**Alt-F1**).

Step 3. Use **F9** to toggle Origin/Axis display on.

Step 4. On the Wireframe tab WIREFRAME click **Line Endpoints** Line Endpoints.

Step 5. Sketch a vertical line down from the Origin, **Fig. 15**.

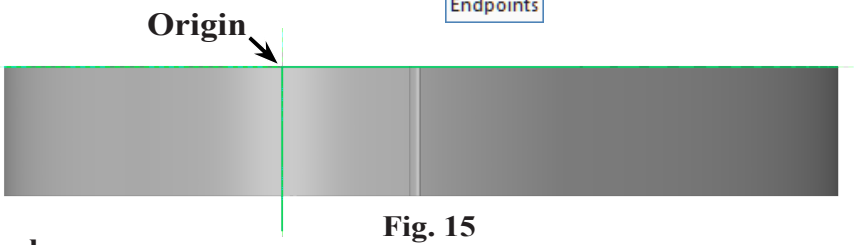


Fig. 15

H. Polar Arc.

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

Step 2. On the Wireframe tab WIREFRAME click **Arc Polar** Arc Polar on **Circle Edge Point** Circle Edge Point drop down.

Step 3. In the Arc Polar function panel:

under Size, **Fig. 16**

Radius 19

under Angle

Start angle 90

End angle 80 and press ENTER

Press **spacebar** to activate Fast Point

Key-in **0, -19** 0,-19 and press ENTER **twice**

Click OK.

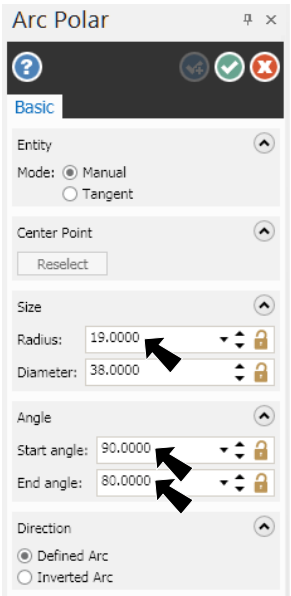


Fig. 16

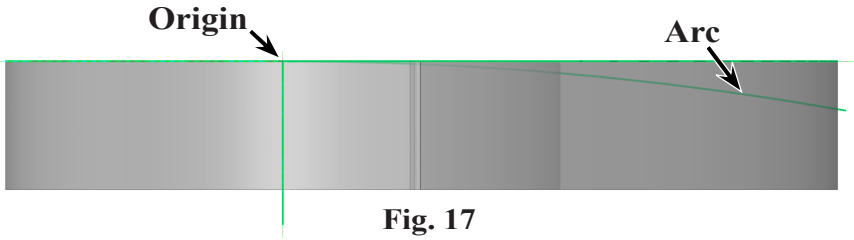


Fig. 17

I. Revolved Surface.

Step 1. On the Surfaces tab SURFACES click **Revolve** Revolve.

Step 2. Click Chain in Chaining dialog box.

Step 3. Click **arc** for profile curve, **Fig. 18**.

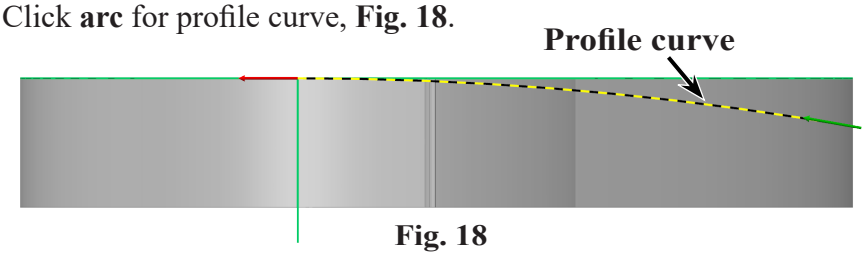


Fig. 18

Step 4. Click OK in Chaining dialog box.

Step 5. Click **vertical line** for axis of rotation, **Fig. 19**.

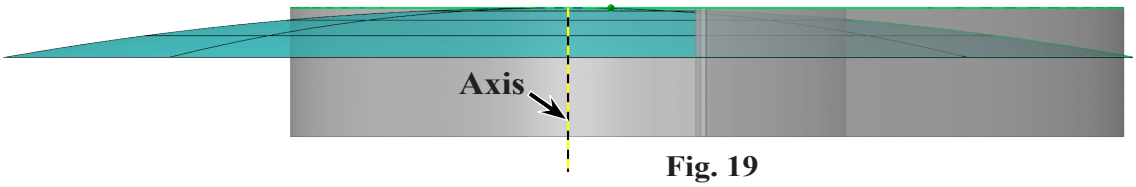


Fig. 19

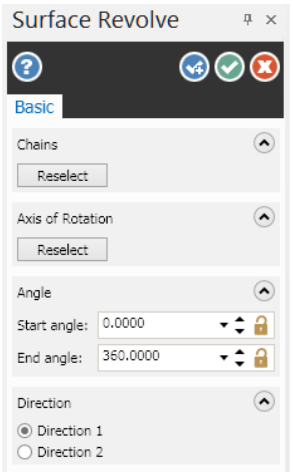


Fig. 20

Step 6. Click OK in the Surface Revolve function panel, **Fig. 20**.

J. Trim Solid.

Step 1. On the Solids tab SOLIDS click **Trim to Surface/Sheet** Trim to Surface/Sheet on **Trim by Plane** Trim by Plane drop down.

Step 2. Click **solid body below the surface** as body **to trim**, **Fig. 21**.

Step 3. Click **surface** as surface or sheet **trim to**, **Fig. 21**.

Step 4. Click OK in Trim to Surface/Sheet function panel, **Fig. 22**.

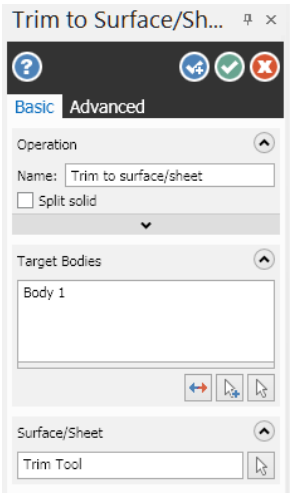


Fig. 22

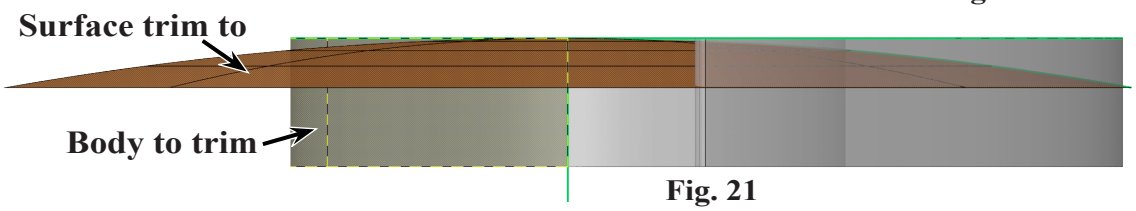


Fig. 21

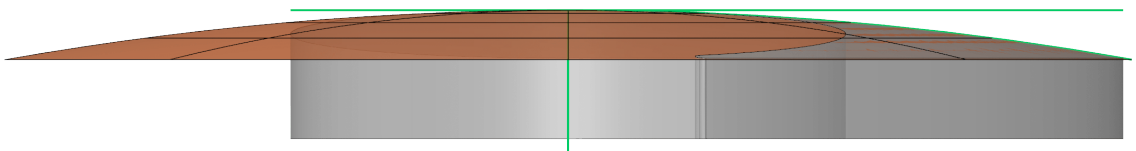


Fig. 23

K. Move Geometry to New Level.

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

Step 2. Use **Ctrl-A** to select all.

Step 3. Click the **solid** to **unselect**, **Fig. 24**.

Step 4. **Right click** in the graphics window and on the Mini Toolbar click **Change level**, **Fig. 25**.

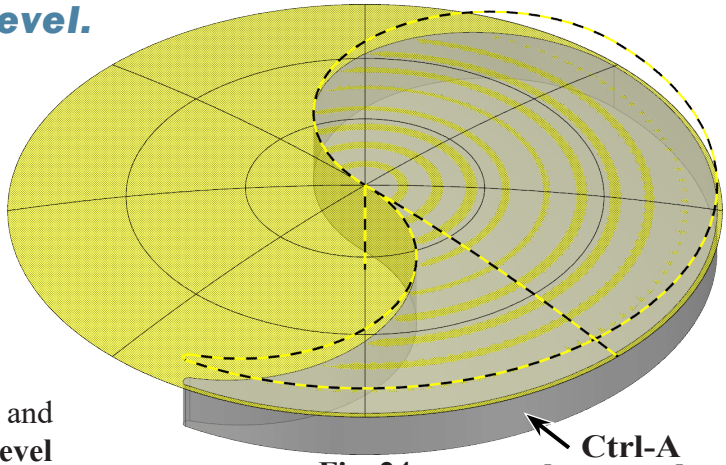


Fig. 24

Fig. 25

Step 5. In the Change Levels dialog box:
under Operation, **Fig. 26**
select **Move**
under Level Number
Uncheck **Use Main Level**
Key-in **2** for Level Number
Click OK.

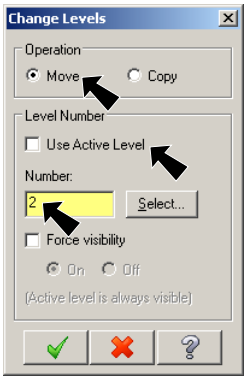


Fig. 26

Step 6. In the Levels Manager (**Alt-Z**), **Fig. 27**
Key-in **GEOMETRY** in Level 2 Name
Click 1 in Number column to make Level active
Click to remove X in Visible column of **GEOMETRY** level to hide level.

Step 7. Save (**Ctrl-S**).

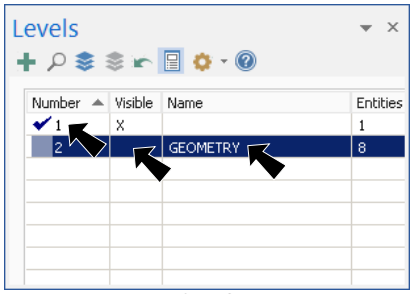


Fig. 27

L. Create BOTTOM CUT WCS.

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

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

Step 3. In the Planes Manger:

Click **Create a new plane** drop down and select **Relative to WCS > Bottom**, **Fig. 28**.

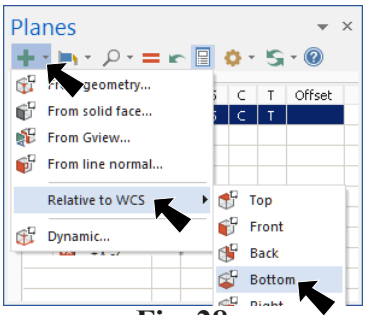


Fig. 28

Step 4. In the New Plane dialog box:

Key-in **BOTTOM CUT** for name, **Fig. 29**
Origin X 0
Origin Y 0
Origin Z .75
Click OK .

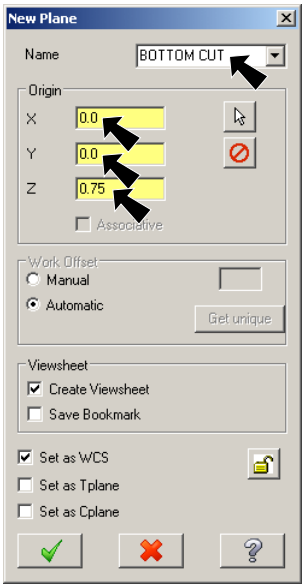


Fig. 29

Step 5. Change to the Isometric View. **Right click** in the graphics window and click Isometric (WCS) (**Alt-7**).

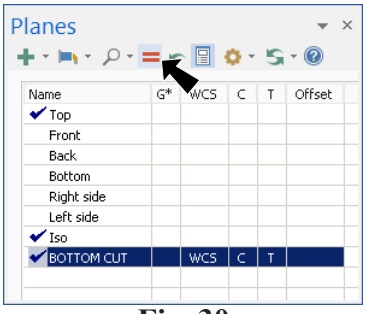


Fig. 30

Step 6. Back in the Planes Manager:

Click **Set All** , **Fig. 30**.

Step 7. Save (**Ctrl-S**).

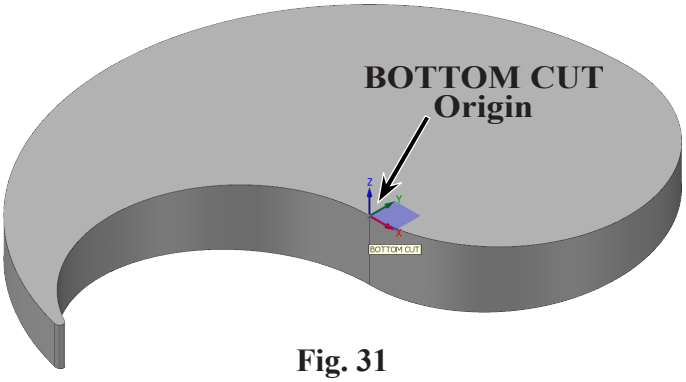


Fig. 31

M. Pin Hole Circle.

Step 1. **Right click** in the graphics window and on the Mini Toolbar click **Wireframe Color** drop down arrow and select **magenta**, **Fig. 32**.

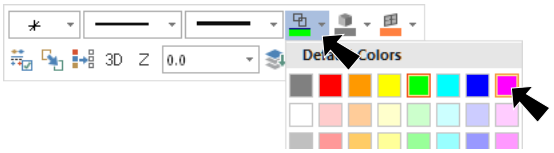


Fig. 32

Step 2. On the Wireframe tab WIREFRAME click **Circle Center Point** Circle Center Point.

Step 3. In the Circle Center Point function panel:
under Size, **Fig. 33**
Diameter .125 and press ENTER
Key-in **0, 3.035** 0,3.035 in AutoCursor **Fast Point** and press ENTER **twice**.
Click OK.

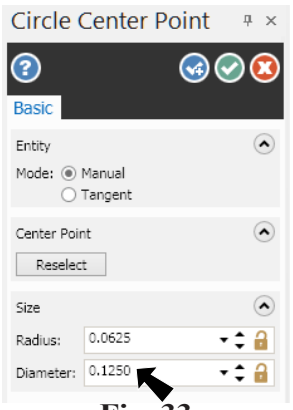


Fig. 33

N. Cut Hole.

Step 1. On the Solids tab SOLIDS click **Extrude** Extrude.

Step 2. Click Chain in Chaining dialog box.

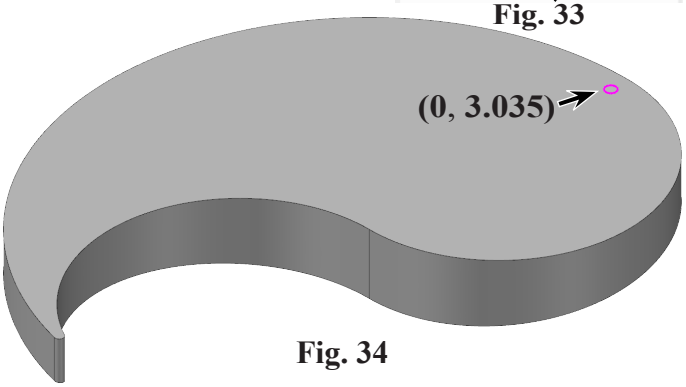


Fig. 34

Step 3. Chain **circle**, **Fig. 35**.

Step 4. Click OK in Chaining dialog box.

Step 5. In Extrude function panel, **Fig. 36**
Select **Cut Body**
Select **Distance**
Set **Distance .35**

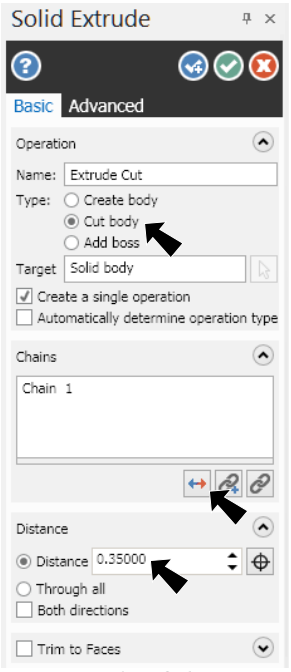


Fig. 36

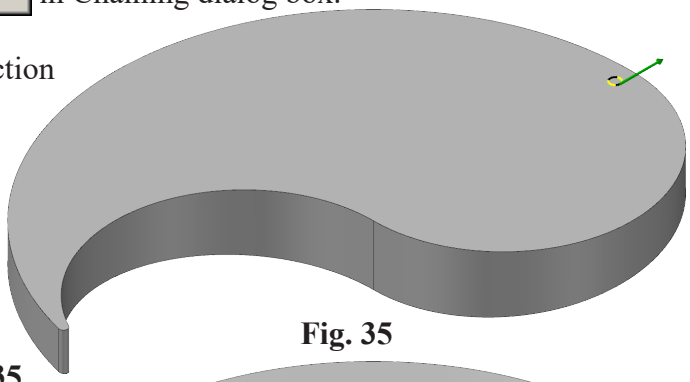


Fig. 35

The direction arrow should **point down**.
Click OK.

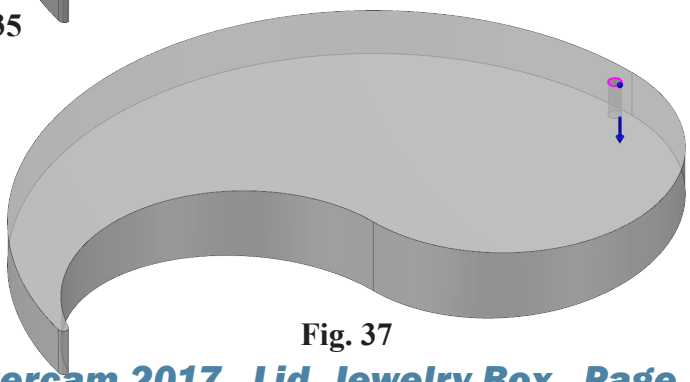


Fig. 37

O. Switch to TOP WCS.

Step 1. In the Planes Manger (**Alt-L**):
under Name, **Fig. 38**
Click **Top**
Click **Set All** .

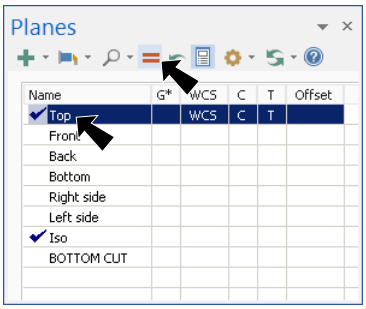


Fig. 38

Step 2. Change to Top View. **Right click** in the graphics window and click Top (WCS) (**Alt-1**).

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

P. Translate Solid.

Step 1. Use **F9** to toggle Origin/Axis display on.

Step 2. On the Transform tab TRANSFORM click **Translate** Translate.

Step 3. Click the **solid body** to select it and click **End Selection** End Selection (**ENTER**), **Fig. 39**.

Step 4. In Translate dialog box set:
Select **Move** **Fig. 40**
ΔX **.5**
ΔY **.1**
Click OK .

Step 5. Click Yes to move defining wireframe entities, **Fig. 42**.

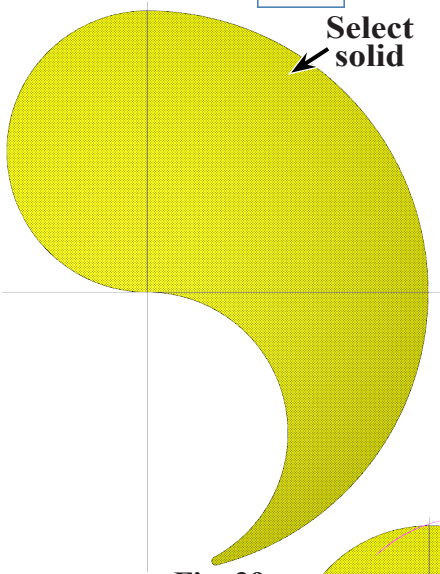


Fig. 39

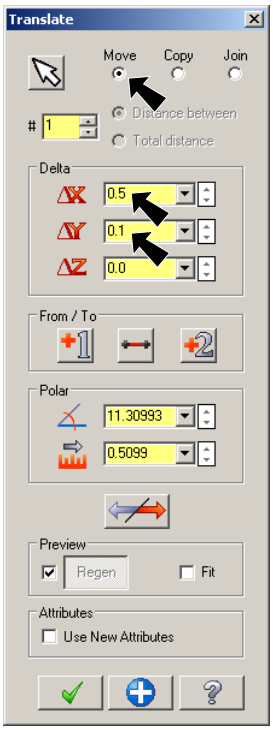


Fig. 40

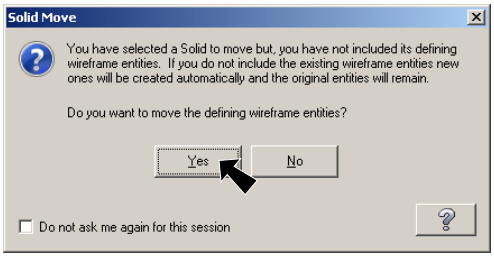


Fig. 42

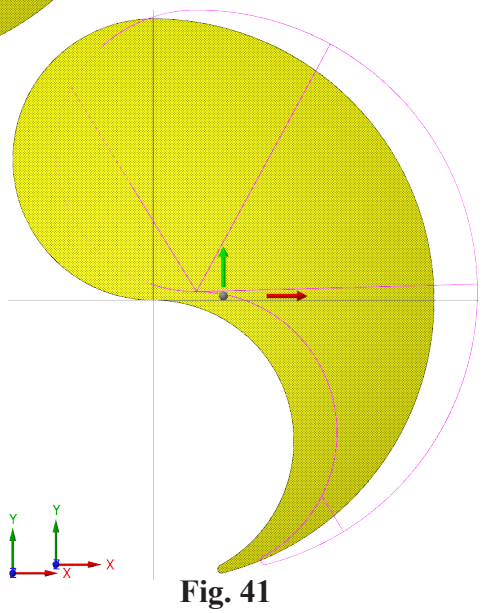


Fig. 41

Q. Rotate Solid.

Step 1. On the Transform tab TRANSFORM click **Rotate** Rotate.

Step 2. Click the **solid body** to select it and click **End Selection** End Selection **(ENTER)**, **Fig. 43**.

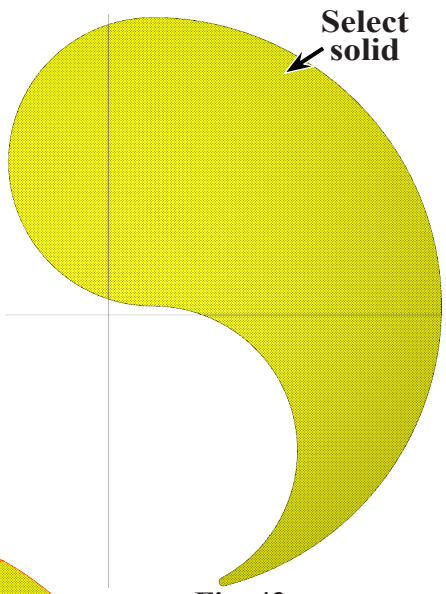


Fig. 43

Step 3. In Rotate dialog box set:

Copy **Fig. 44**

Number of Steps # **1**

Rotation Angle **180**

Click OK.

Step 4. **Right click** the graphics window and click **Clear Colors**.

Step 5. Save (**Ctrl-S**).

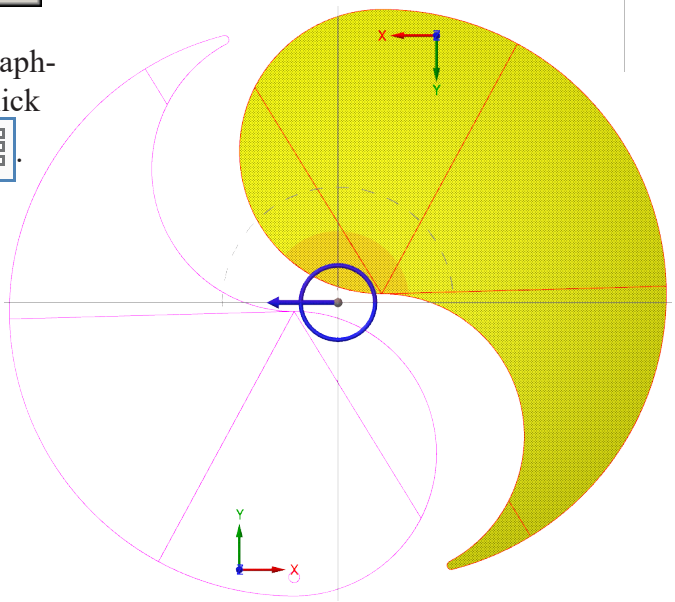


Fig. 45

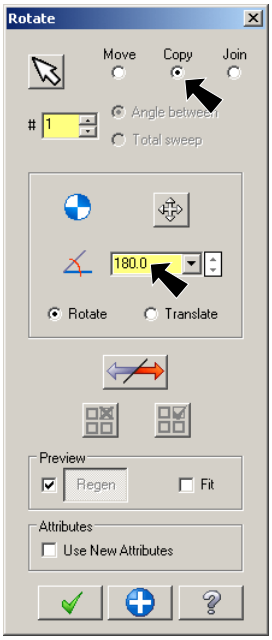


Fig. 44

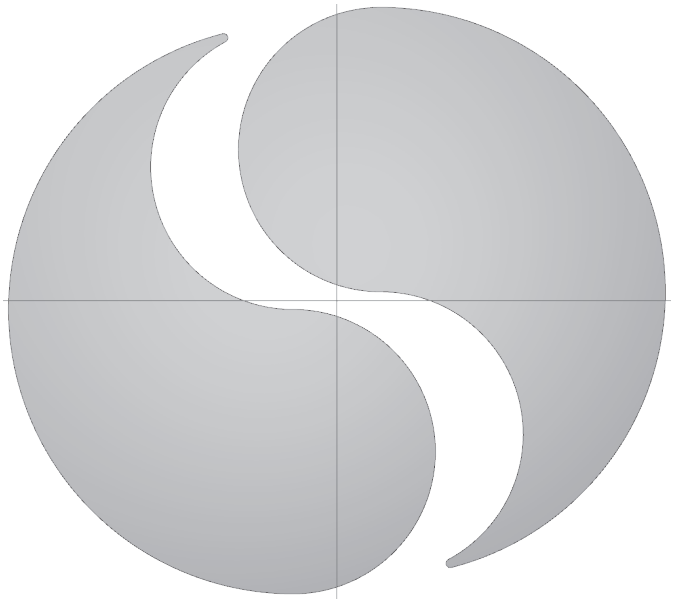


Fig. 46

R. Machine Type and Stock Setup.

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

Step 2. If necessary, display Toolpaths Manager. On the View tab VIEW click Toolpaths (**Alt-O**).

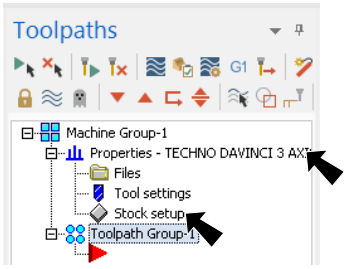


Fig. 47

Step 3. If Machine Group is **not** displayed in the Toolpaths Manager, **Fig. 47** on the Machine tab MACHINE, click Machine Mill > Default from the menu.

Step 4. Expand **Properties** in the Toolpaths Manager and click **Stock Setup**, **Fig. 47**.

Step 5. Confirm Stock Plane is **Top**, **Fig. 48**.

Step 6. Confirm **Display** is checked.

Step 7. Key-in for X, Y and Z stock dimensions:

X 8
Y 8
Z .75

Step 8. Confirm Stock Origin coordinates:

X 0
Y 0
Z 0

Step 9. Click OK in the Machine Group Properties.

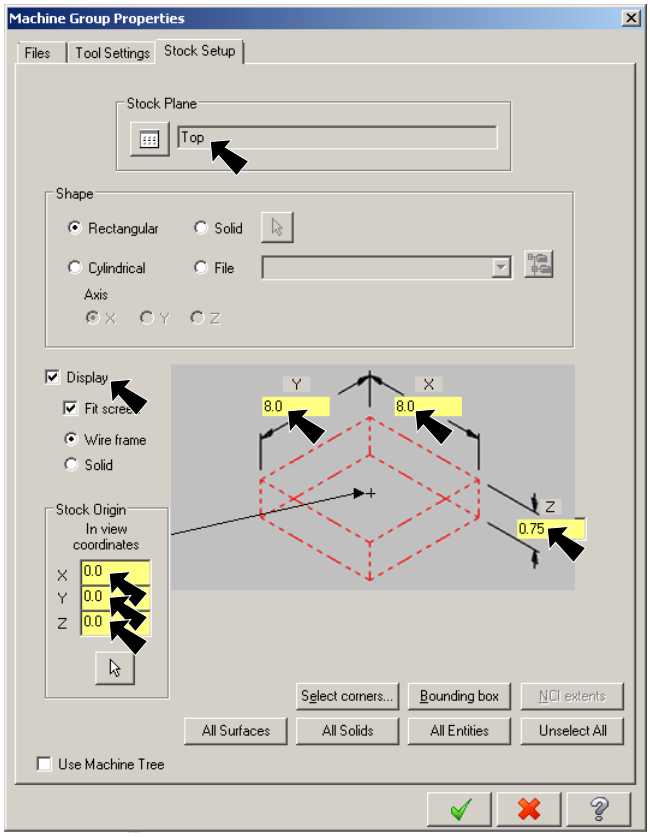


Fig. 48

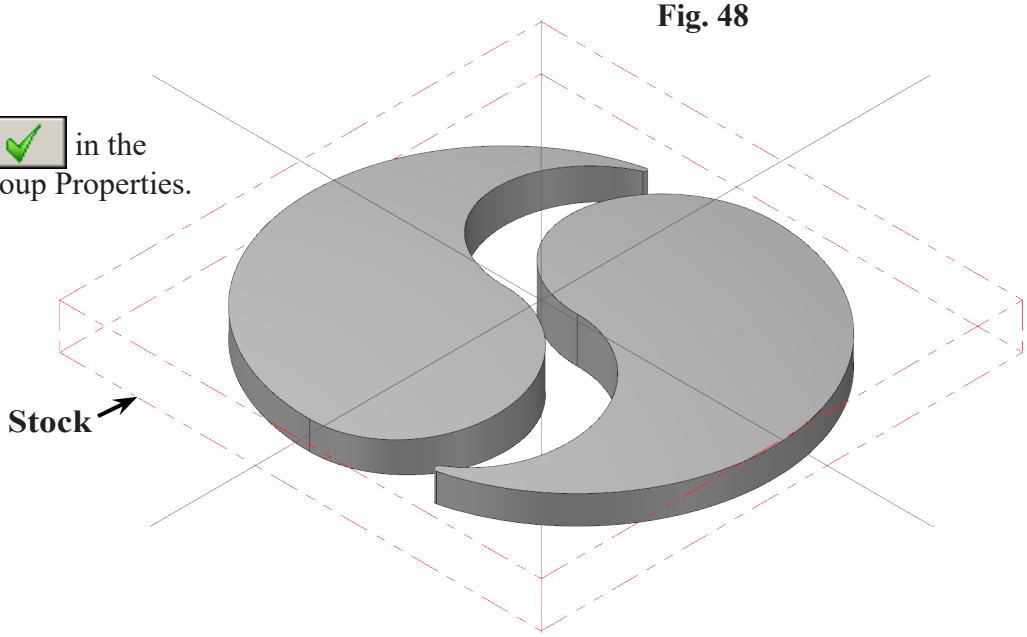


Fig. 49

S. Spiral Toolpath.

Step 1. On the Toolpaths tab TOOLPATHS in the 3D group click **expand gallery** button and click **Spiral** Spiral, **Fig. 50**.

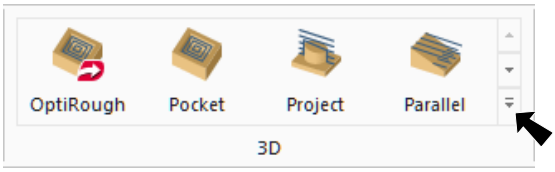


Fig. 50

Step 2. Click OK in the NC name dialog, **Fig. 51**.

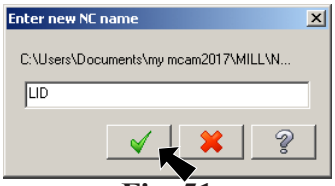


Fig. 51

Step 3. Click the **right solid body** to select as Drive Surfaces, **Fig. 52**. The solid will highlight when selected.

Step 4. Click **End Selection** End Selection **(ENTER)**.

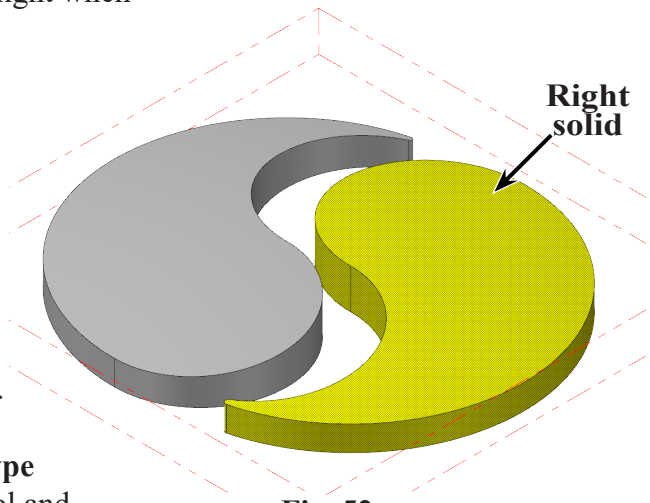


Fig. 52

Step 5. Click OK in the Toolpath/surface selection dialog box, **Fig. 53**.

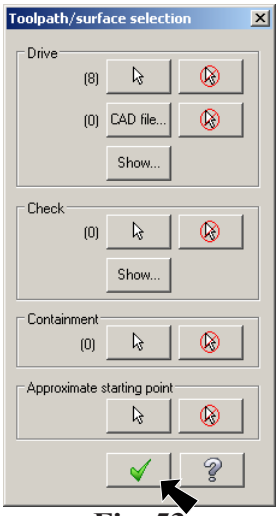


Fig. 53

Step 6. Select **Toolpath Type** from the tree control and confirm:
Spiral toolpath
Drive surfaces
Fig. 54.

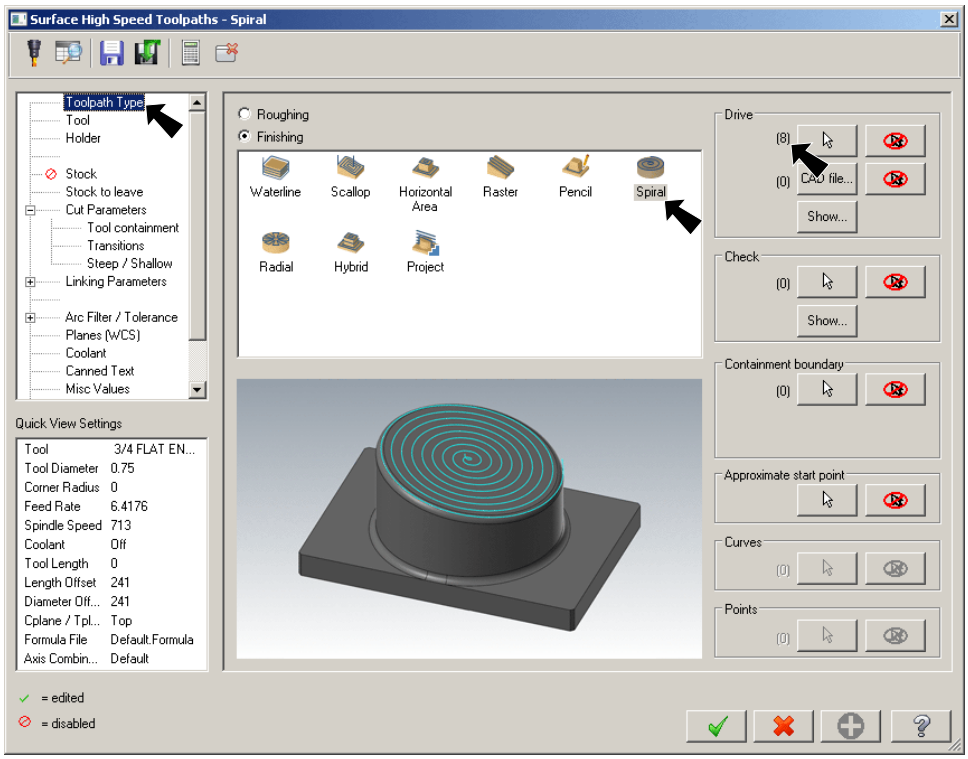


Fig. 54

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

Click **Select library tool** button **Fig. 55**.

Step 8. Click **Filter** button **Fig. 56**.

Step 9. Click **None** button under **Tool Types** **Fig. 56**.

Step 10. Click **End-mill2 Sphere** button (second button top row) and click OK, **Fig. 57**.

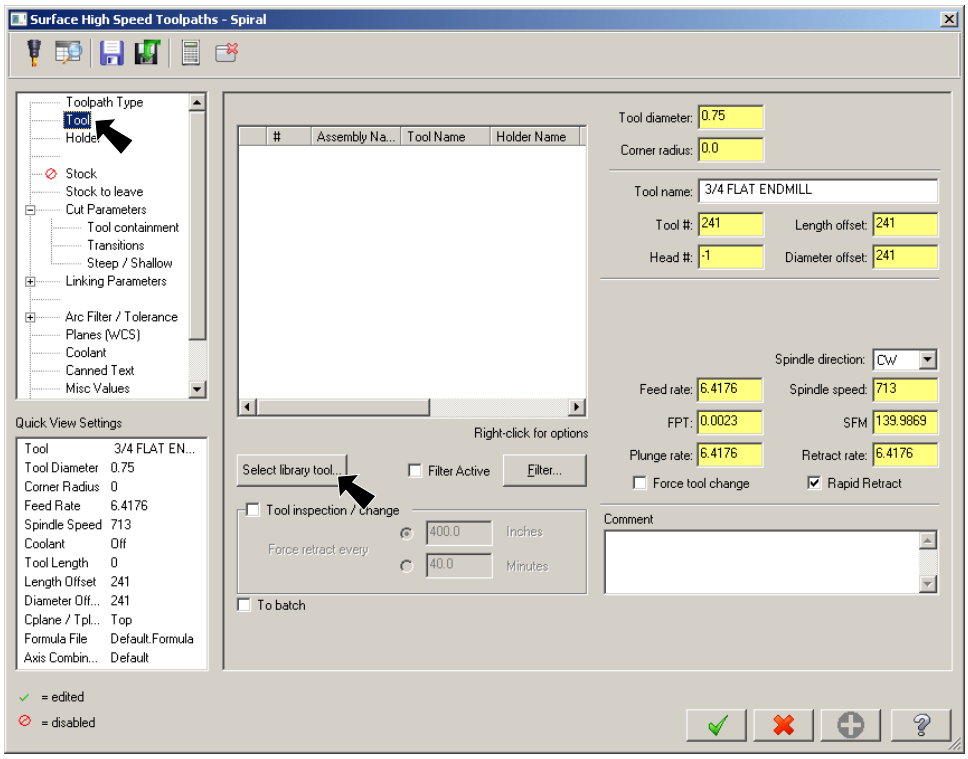


Fig. 55

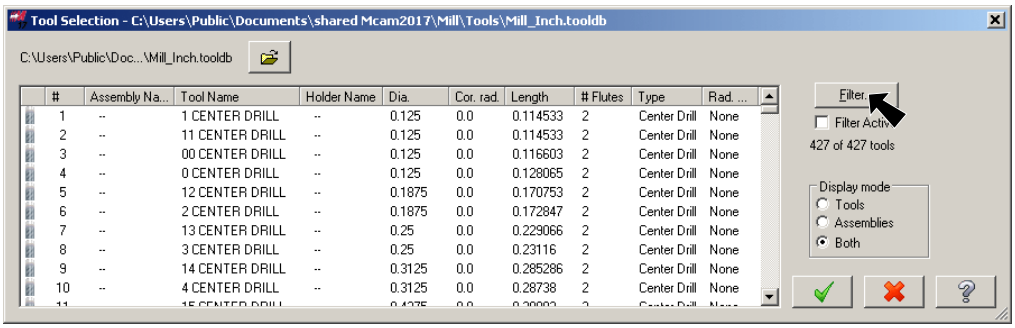


Fig. 56

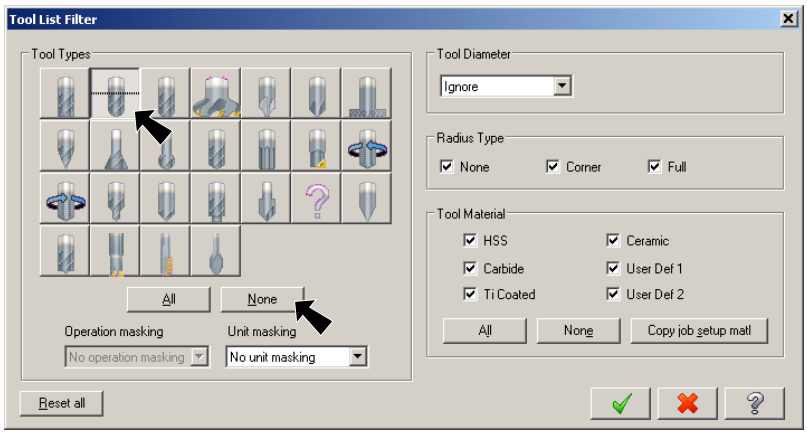


Fig. 57

Step 11. Click **307 1/4 BALL ENDMILL** and click OK **Fig. 58**.

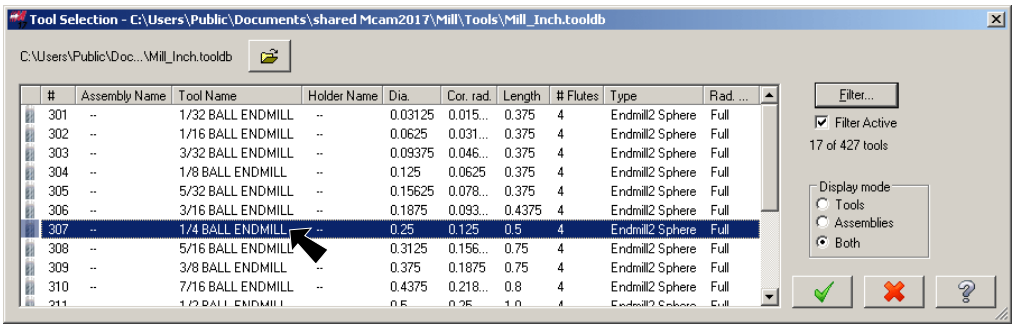


Fig. 58

Step 12. Back in **Tool** page set:
Feed rate 40

Plunge rate 20
Fig. 59.

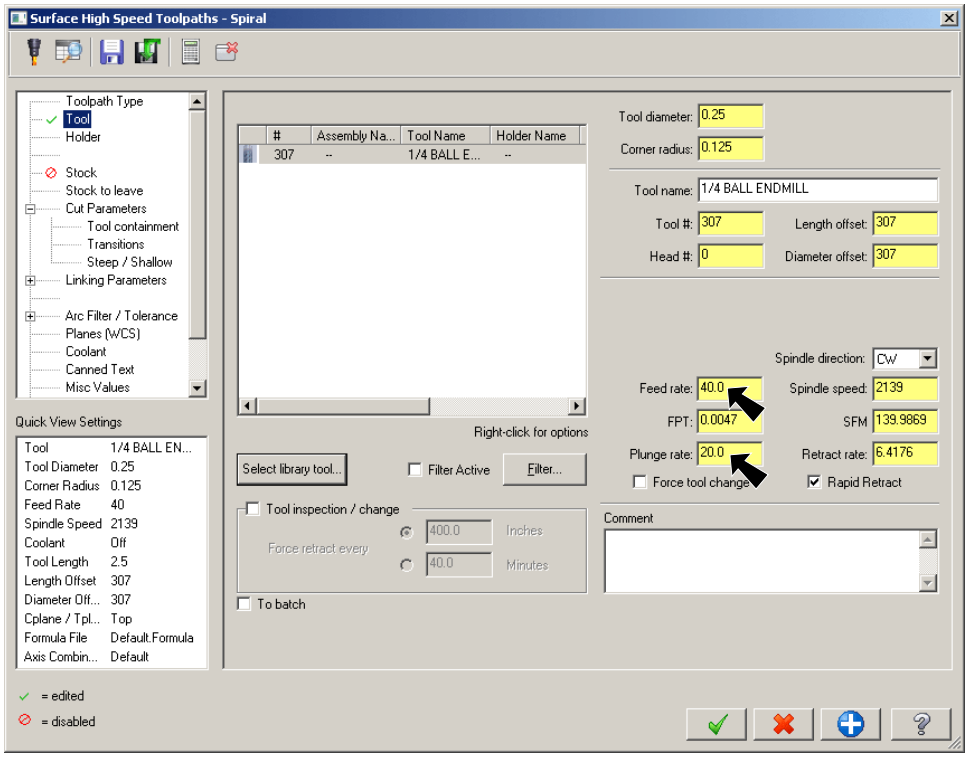


Fig. 59

Step 13. Select **Stock to leave** from tree control and set:

Stock to leave on Walls and Floors 0
Fig. 60.

Step 14. Select **Cut Parameters** from tree control and set:

Cut method One Way

Stepover .09

Click **Define Center Point** Button  **Fig. 61**.

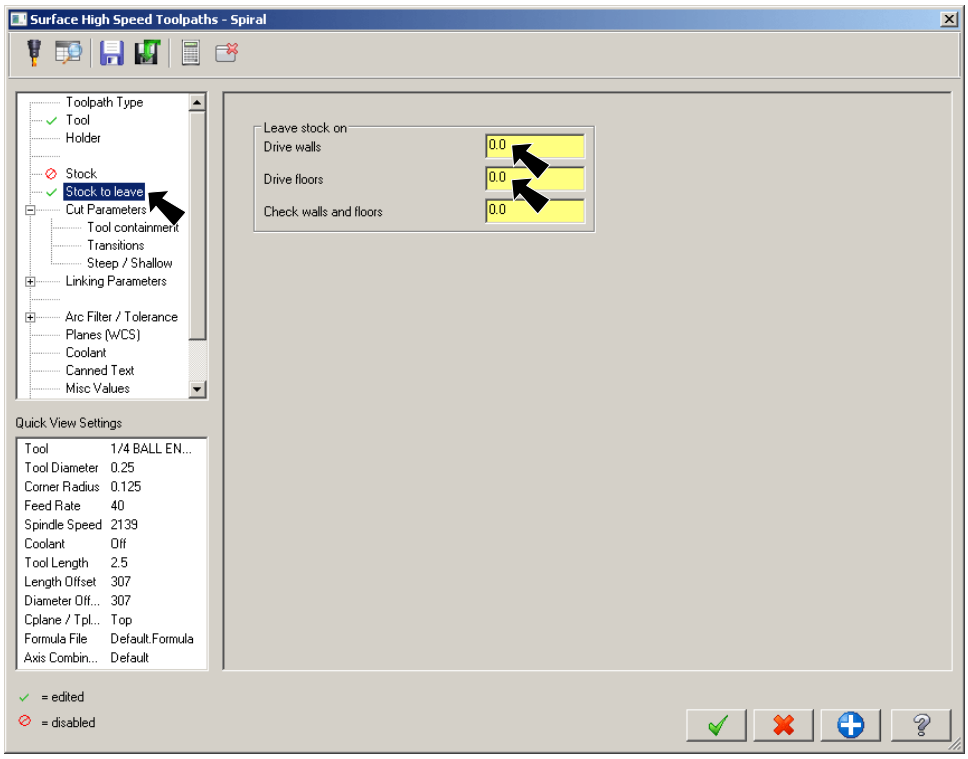


Fig. 60

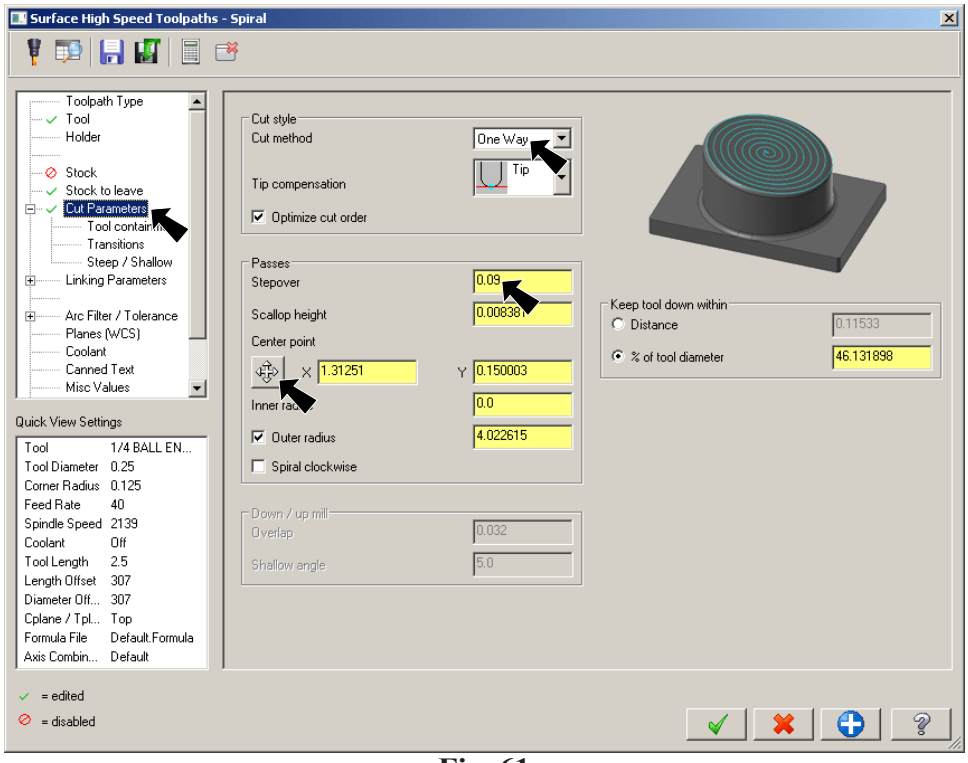


Fig. 61

Step 15. Click **geometry original Origin (intersection of the two circles) in right Lid, Fig. 62**.

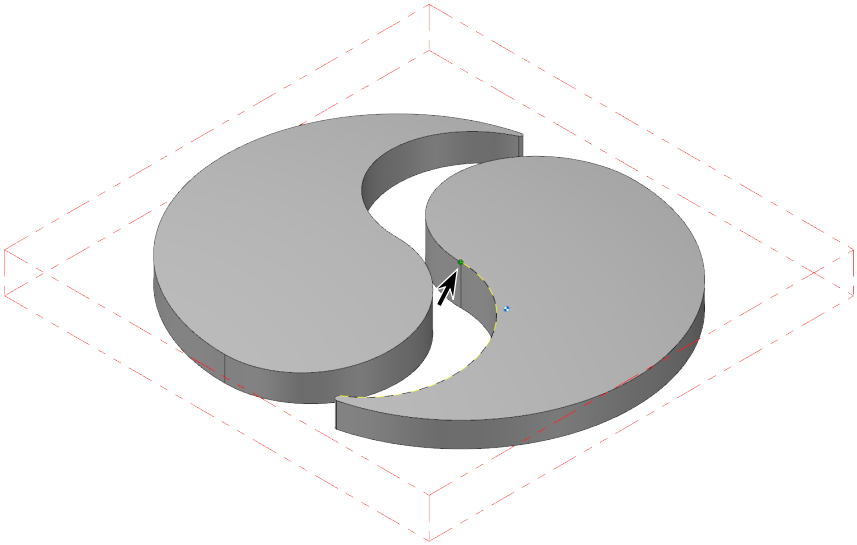


Fig. 62

Step 16. Back in **Cut Parameters** set:

Confirm **X .5 Y .1**

Outer radius 4.6

Keep tool down within 80%
Fig. 63.

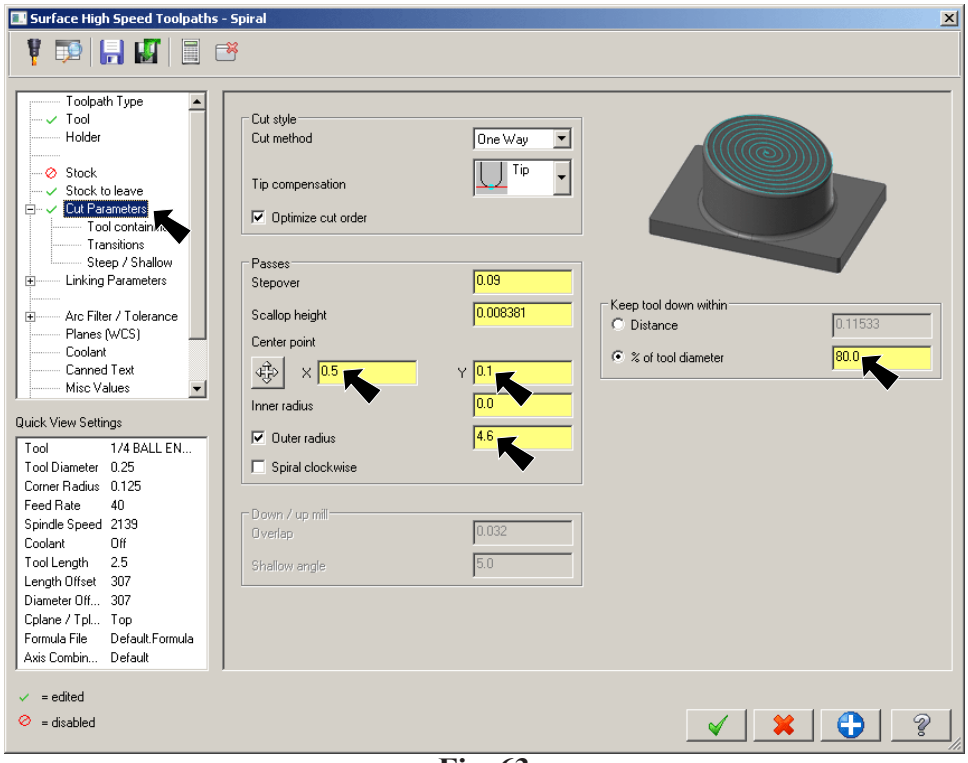


Fig. 63

Step 17. Select **Steep/ Shallow** from tree control and set:

Check **Use Z depths**
Minimum 0
Maximum -.3

Click **Apply**  **Fig. 64**.

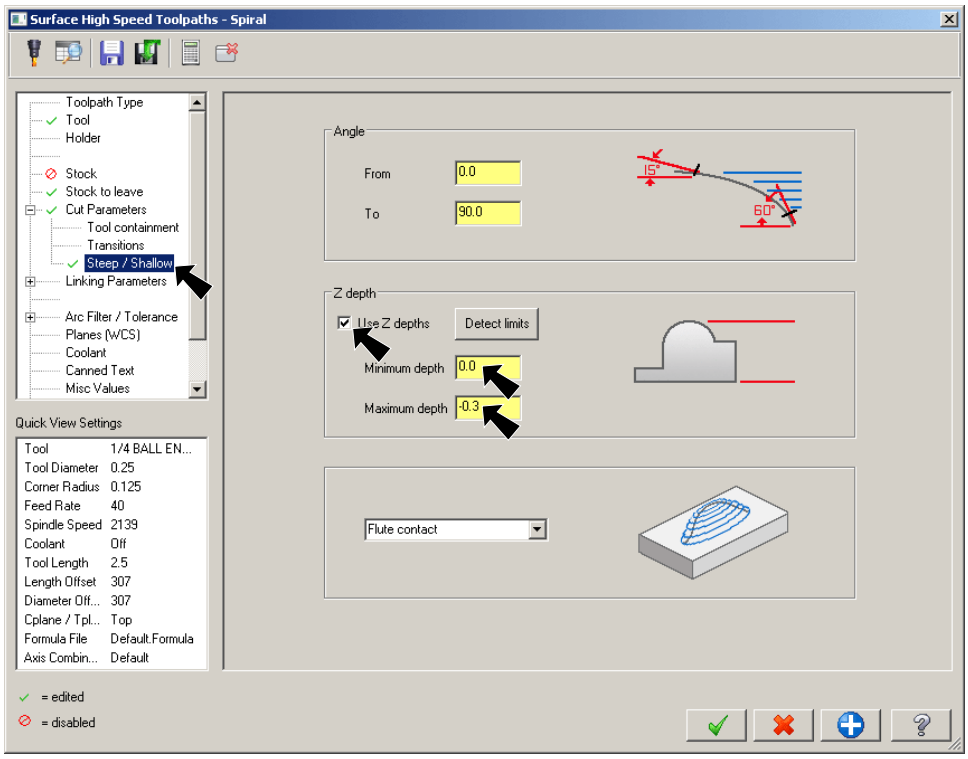


Fig. 64

Step 18. Select **Linking Parameters** from tree control and set:

Clearance plane .5

All Leads 0
Fig. 65.

Step 19. Click OK  in Surface High Speed Toolpaths - Spiral dialog box.

Step 20. Allow Mastercam to calculate toolpath.

Step 21. Save  (**Ctrl-S**).

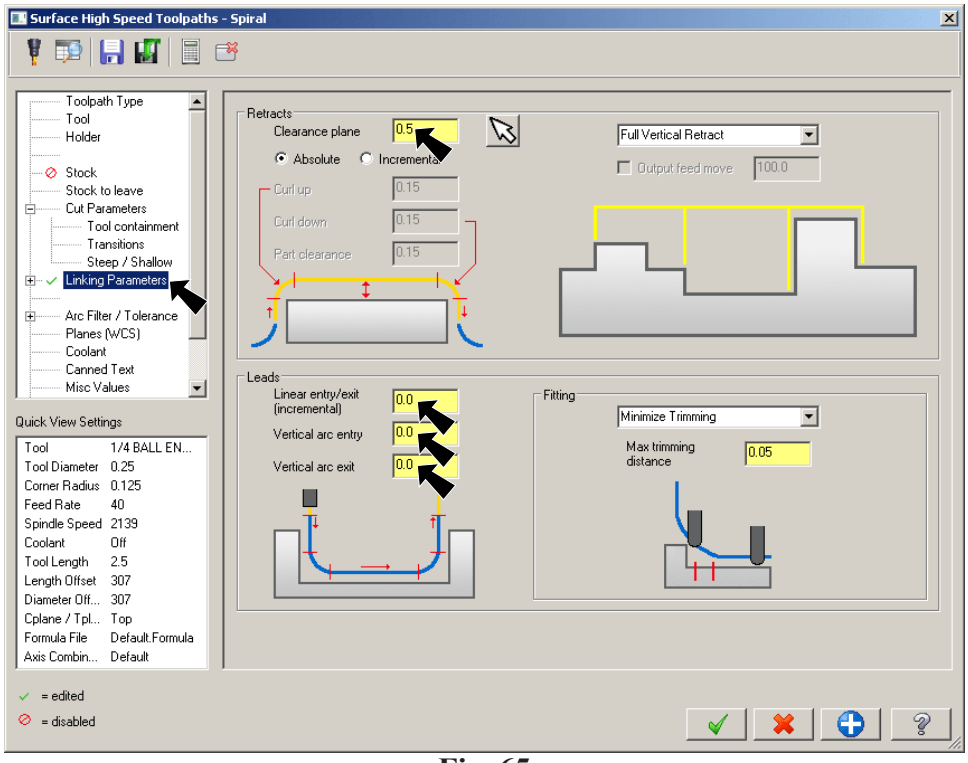


Fig. 65

T. Verify Toolpath.

Step 1. Click **Verify** in the Toolpaths Manager, **Fig. 67**.

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

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

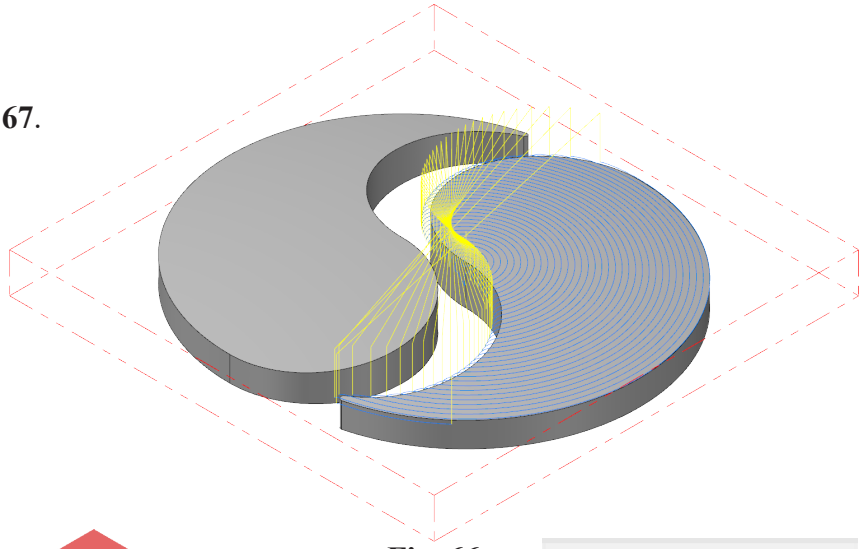


Fig. 66

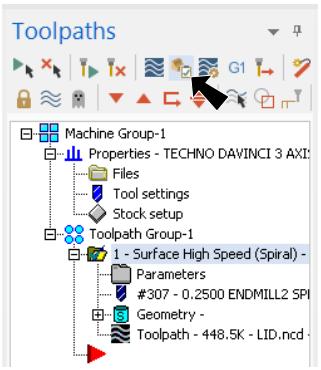


Fig. 67

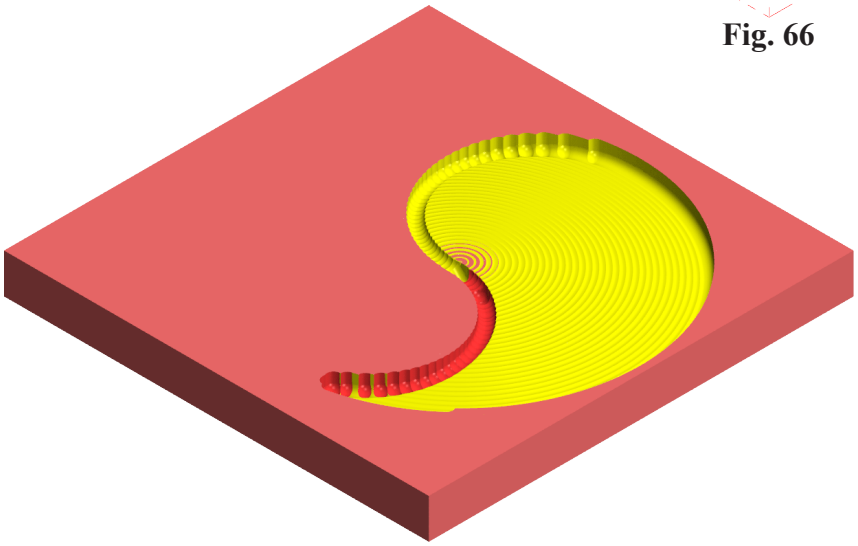


Fig. 68

U. Copy Spiral Toolpath.

Step 1. Copy Spiral toolpath in the Toolpaths Manager. To copy, click to select toolpath, **Fig. 69**.
Then, use **Ctrl-C** and **Ctrl-V**, **Fig. 70**.

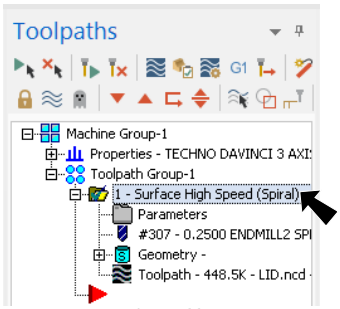


Fig. 69

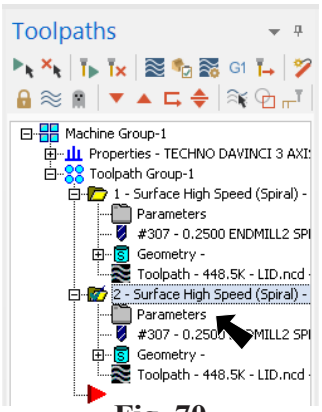


Fig. 70

Step 2. Expand copied Surface High Speed Spiral toolpath and click **Parameters**, **Fig. 70**.

Step 3. Select **Toolpath type** from the tree control and:

Click **Remove selected drive surfaces**

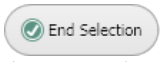
Fig. 71.

Click **Drive Surfaces**

Fig. 71.

Click the **left Lid**, **Fig. 72**.

Click **End Selection**



(**ENTER**) to accept solid as drive surfaces.

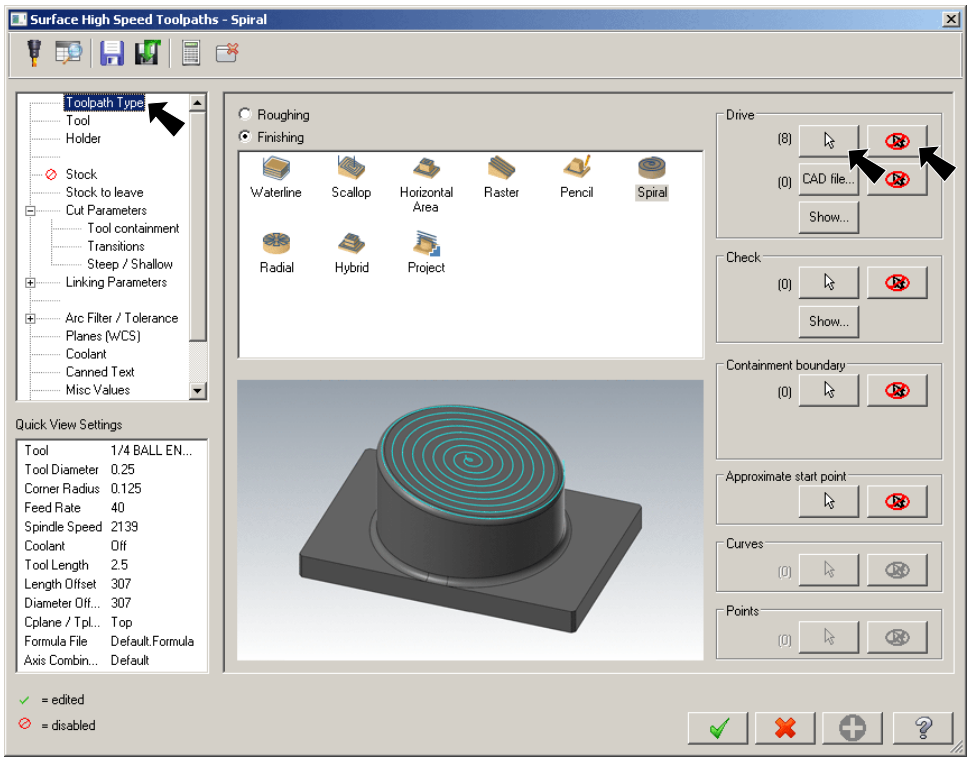


Fig. 71

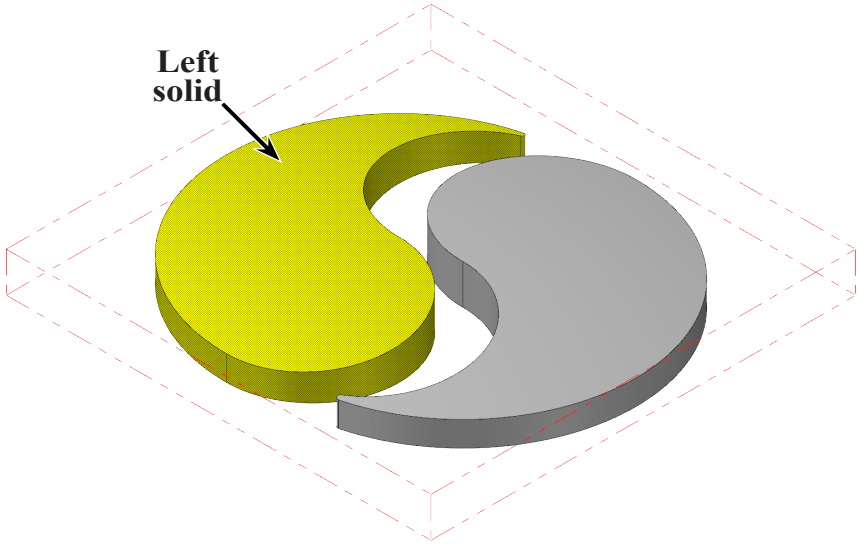


Fig. 72

Step 4. Select **Cut Parameters** from tree control and set:

Click **Define Center Point** Button  **Fig. 73**.

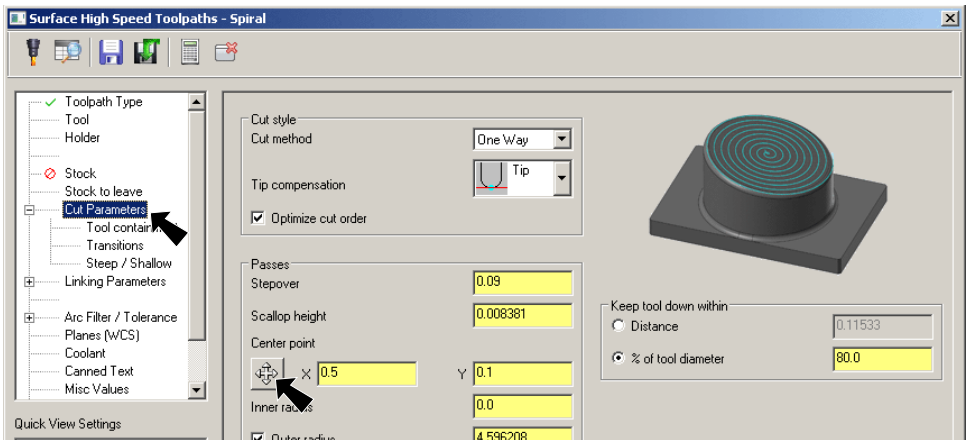


Fig. 73

Click **geometry Origin (intersection of the two circles) in left Lid Fig. 74**.

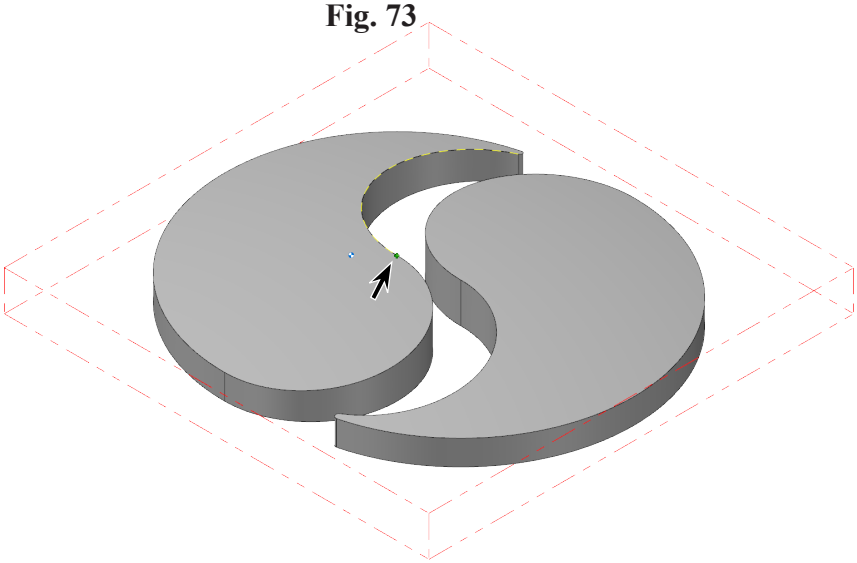


Fig. 74

Confirm **X -.5 Y -.1 Fig. 75**.

Step 5. Click OK  in Surface High Speed Toolpaths - Spiral dialog box.

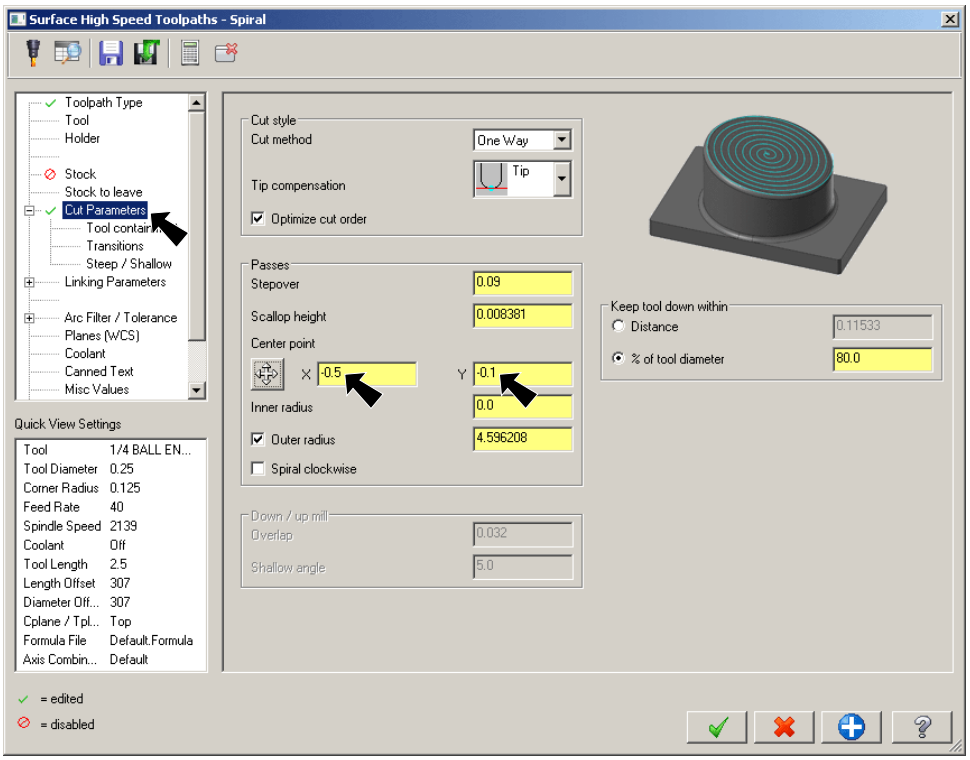


Fig. 75

Step 6. In the Toolpaths Manager, click **Regenerate all selected operations**  , **Fig. 76**.

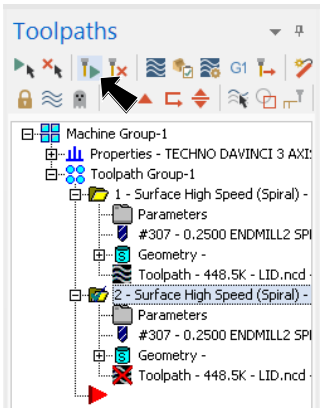


Fig. 76

Step 7. Save  **(Ctrl-S)**.

V. Contour Toolpath.

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

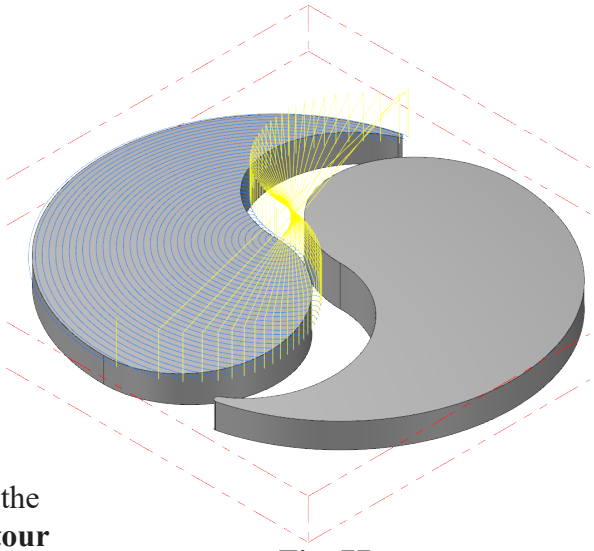
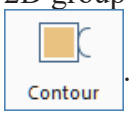


Fig. 77

Step 2. On the Toolpaths tab 

in the 2D group click **Contour** 

.

Step 3. Click **Solids**  in Chaining dialog box and select **Loop**  , **Fig. 78**.

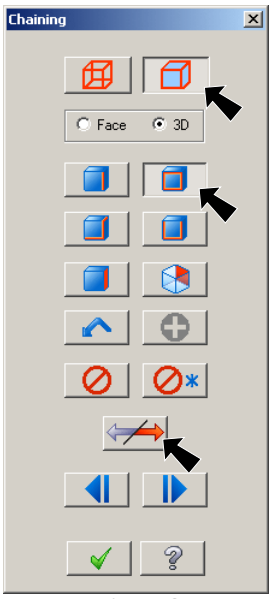


Fig. 78

Step 4. Click **bottom edge of right Lid solid**, **Fig. 79**. If the wrong edge is selected, click **Other face** in Pick Reference Face dialog box, **Fig. 80**. Click OK  in Pick Reference Face dialog box.

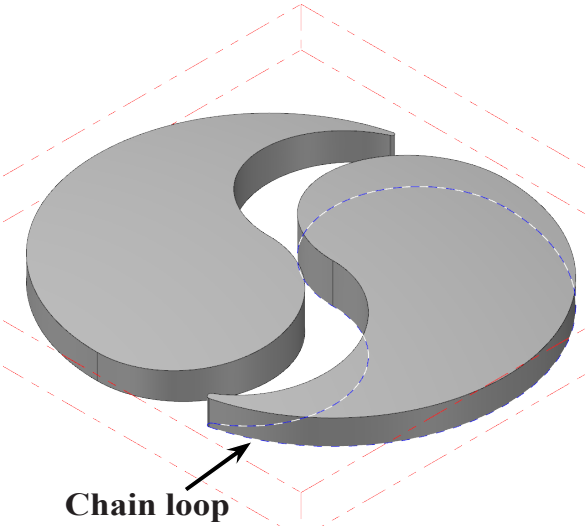


Fig. 79

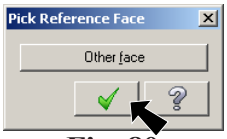
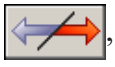


Fig. 80

Step 5. The chain arrow should point **clockwise** around the chain, **Fig. 81**. If chaining directions arrow is pointing in the opposite direction - click Reverse  , **Fig. 78**.

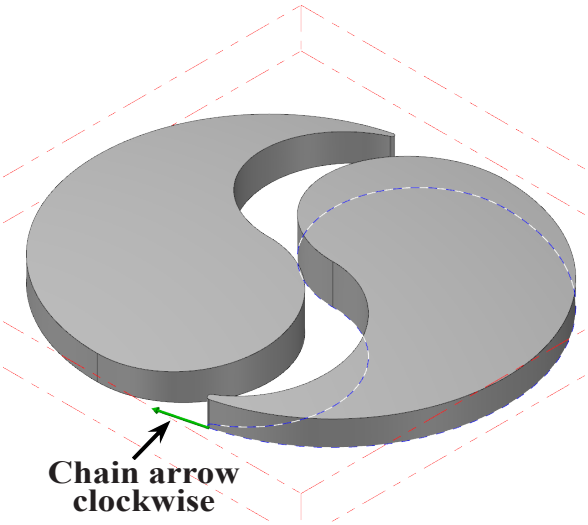


Fig. 81

Step 6. Click **bottom edge of left Lid solid**, **Fig. 82**. If the wrong edge is selected, click **Other face** in Pick Reference Face dialog box, **Fig. 83**. Click OK in Pick Reference Face dialog box.

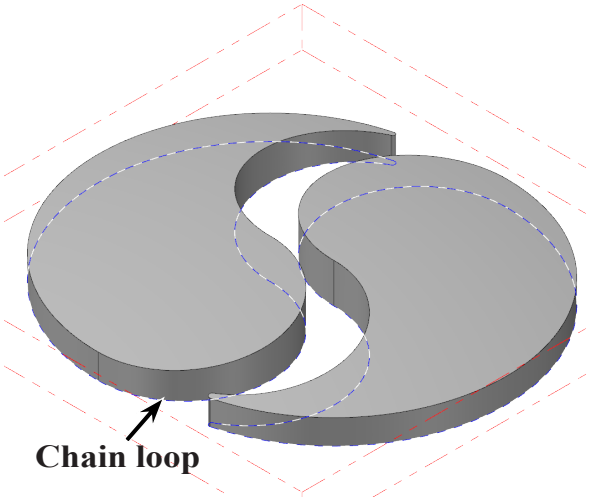


Fig. 82

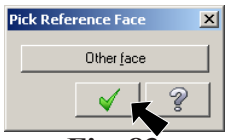


Fig. 83

Step 7. The chain arrow should point **clockwise** around the chain, **Fig. 84**. If chaining directions arrow is pointing in the opposite direction - click Reverse , **Fig. 85**.

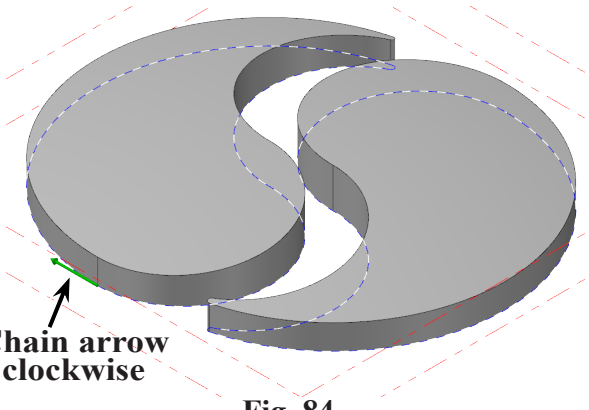


Fig. 84

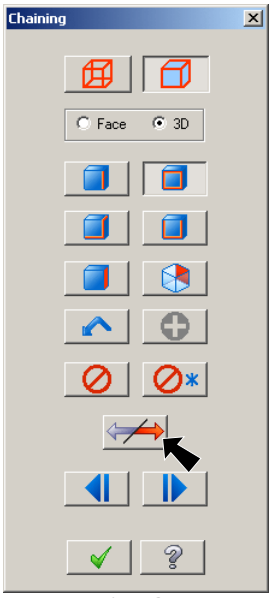


Fig. 85

Step 8. Click OK in Chaining dialog box, **Fig. 85**.

Step 9. In the 2D Toolpaths Contour dialog box confirm **2 Chains** are selected, **Fig. 86**.

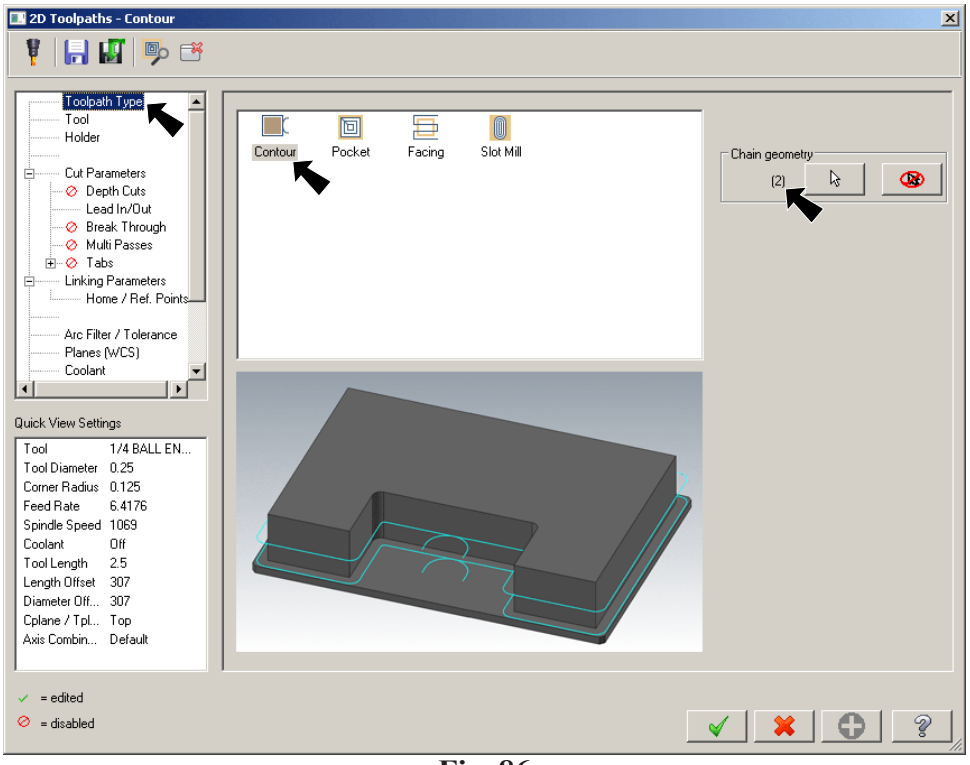


Fig. 86

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

Click **Select library tool** button **Fig. 87**.

Step 11. Use the Filter button to filter EndMill Flat and select **285 1/4 FLAT ENDMILL** and click OK, **Fig. 88**.

Step 12. Select **Tool** from the tree control and set:
Feed rate 40

Plunge rate 20
Fig. 89.

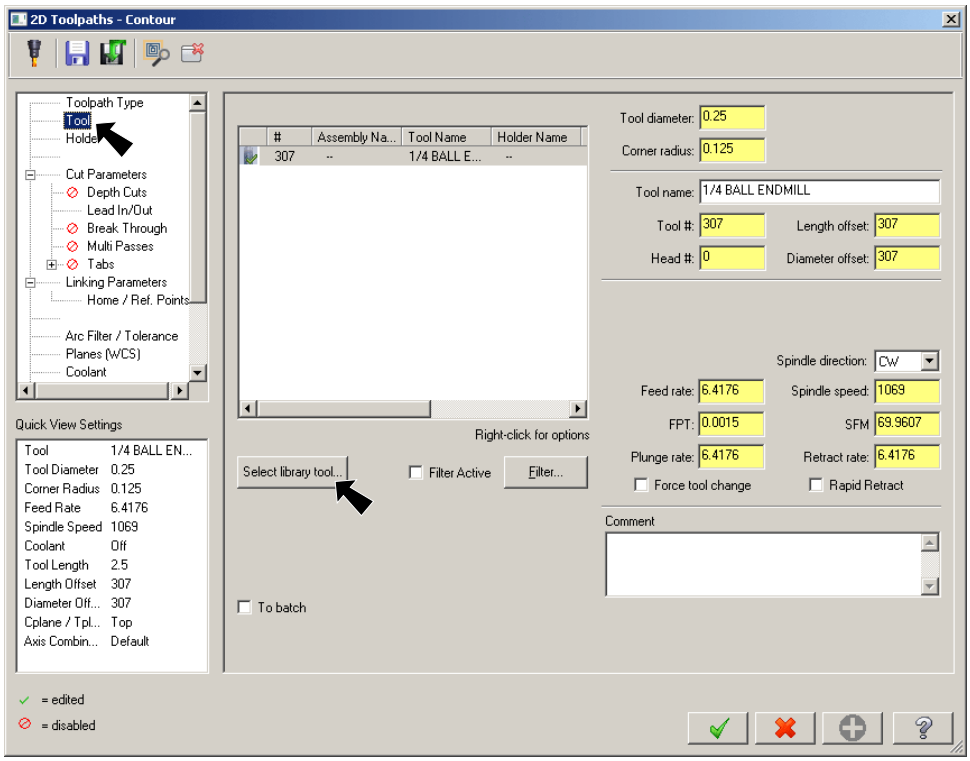


Fig. 87

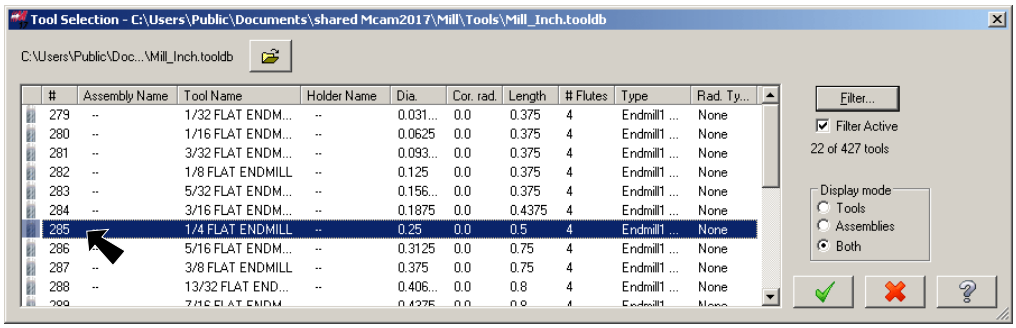


Fig. 88

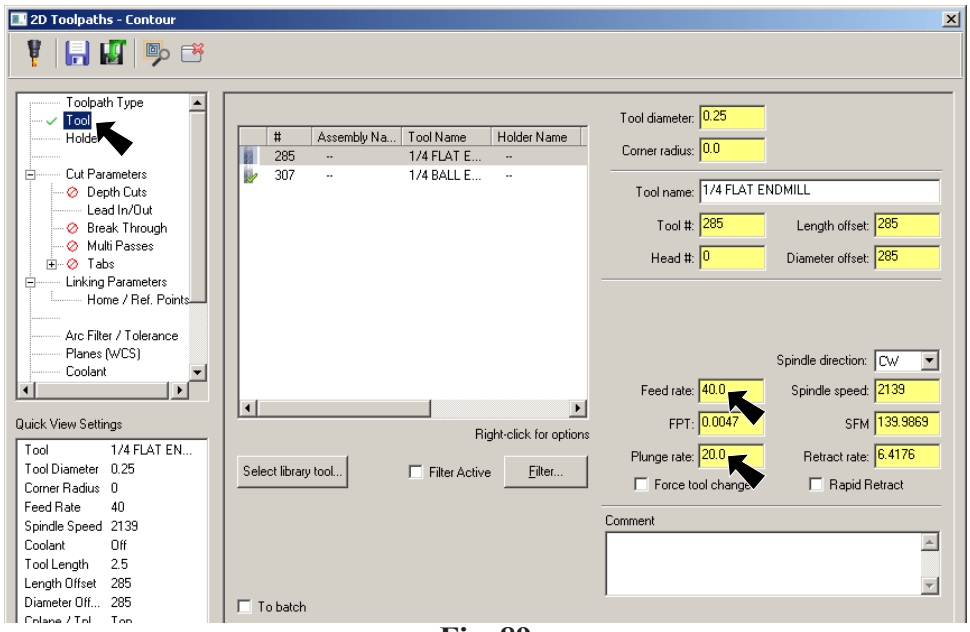


Fig. 89

Step 13. 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. 90.

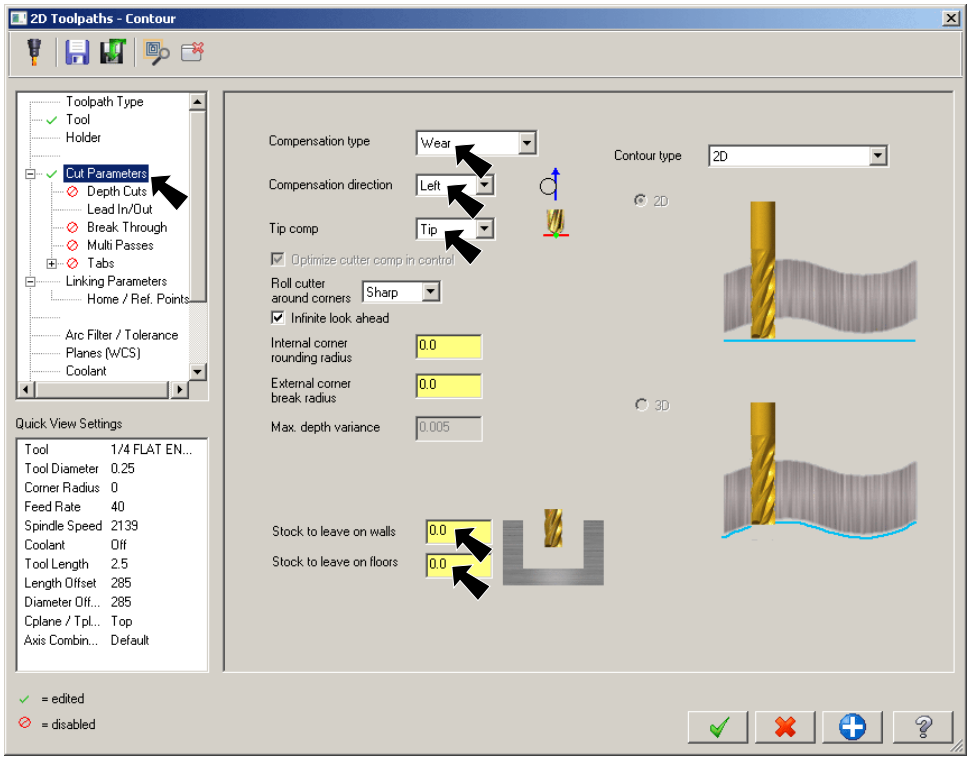


Fig. 90

Step 14. Select **Depth Cuts** from tree control and set:

Check **Depth cuts**

Max rough step .2

Check **Keep tool down Fig. 91.**

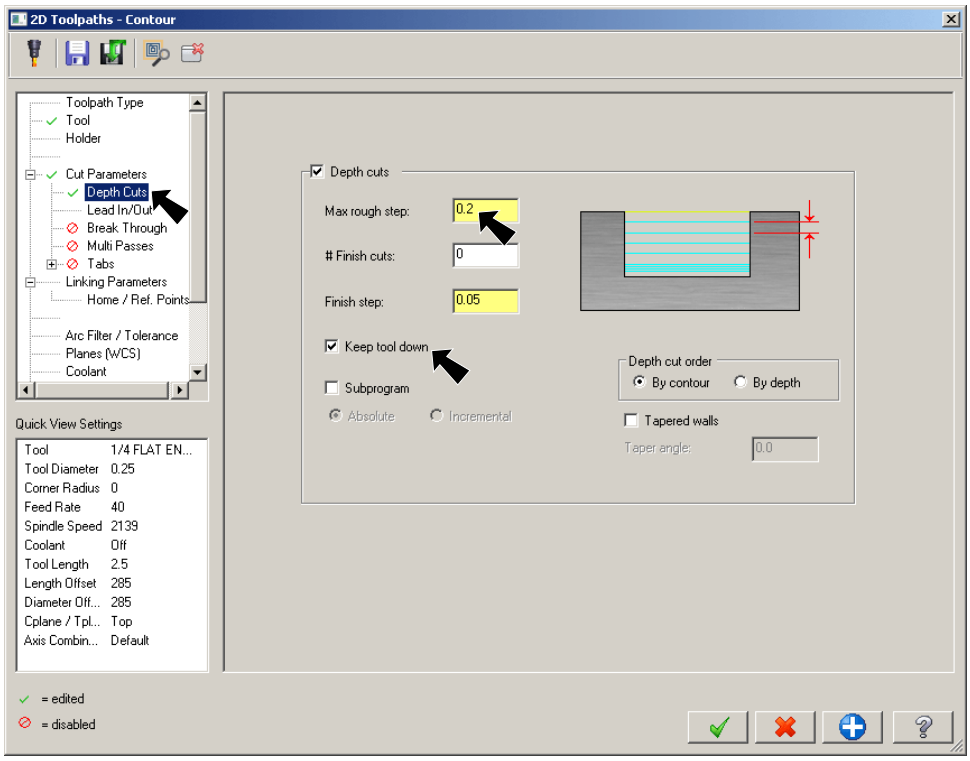


Fig. 91

Step 15. Select **Lead In/Out** from tree control and set:

Uncheck **Lead In/Out**
Fig. 92.

Step 16. Select **Break Through** from tree control and set:

Check **Break through**

Break through amount .01
Fig. 93.

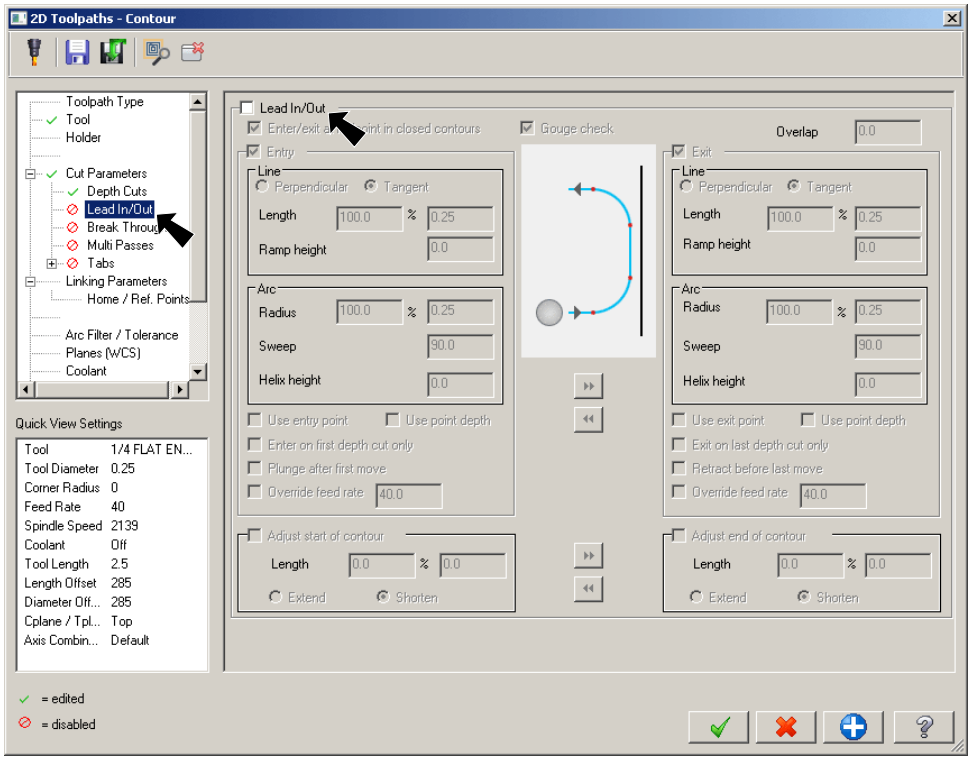


Fig. 92

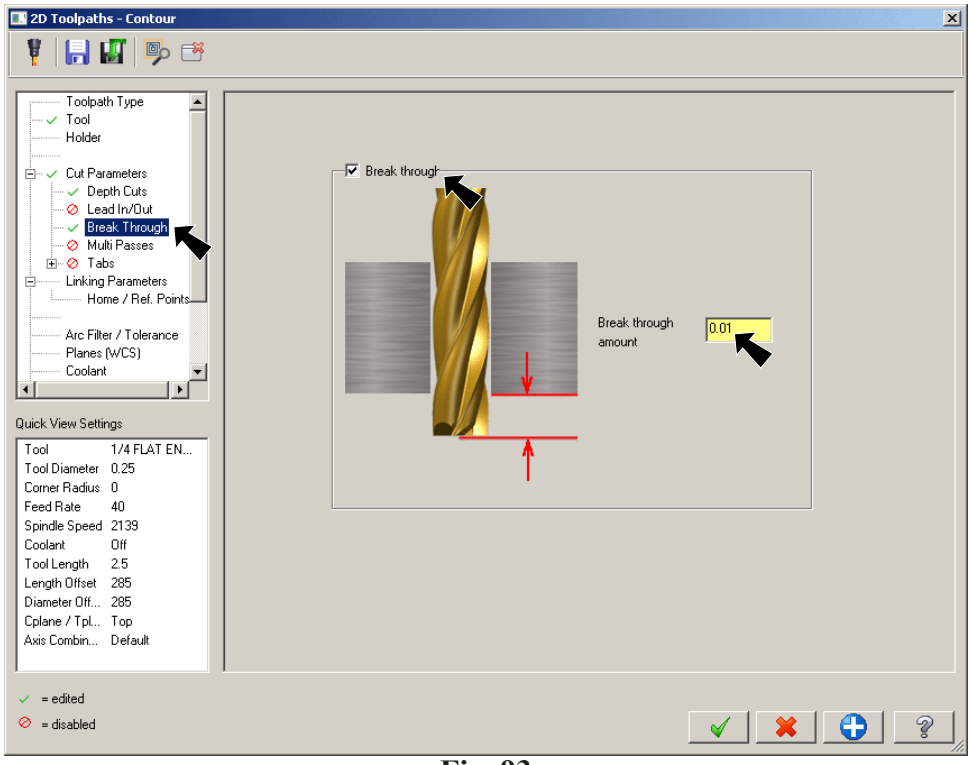


Fig. 93

Step 17. Select **Linking Parameters** from tree control and set:

Depth 0
Fig. 94.

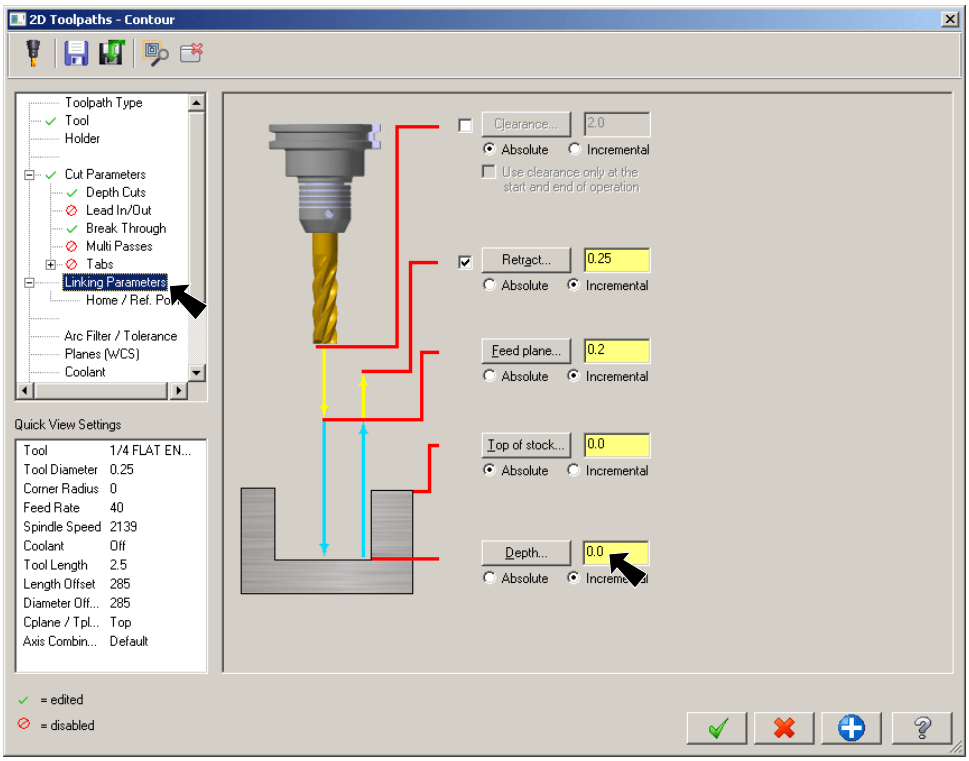


Fig. 94

Step 18. Click OK .

Step 19. Save (**Ctrl-S**).

W. Verify Toolpaths.

Step 1. Click **Toolpath Group-1** in the Toolpaths Manager to select **all three toolpaths**, **Fig. 95**.

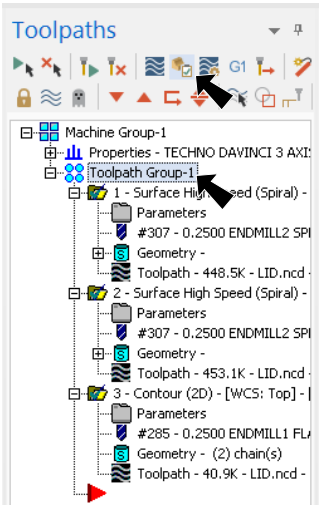


Fig. 95

Step 2. Click **Verify** in the Toolpaths Manager, **Fig. 95**.

Step 3. Click **Play** (**R**) in VCR bar along bottom of the window.

Step 4. Note **Total Time** to run program under Toolpath Info in the Move List panel (**roughly 14.5 minutes**), **Fig. 96**.

Step 5. Switch back to Mastercam (**Alt-Tab**).

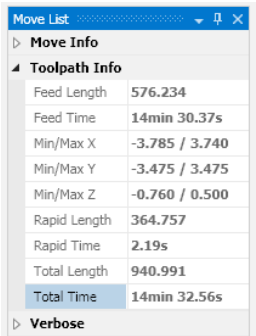


Fig. 96

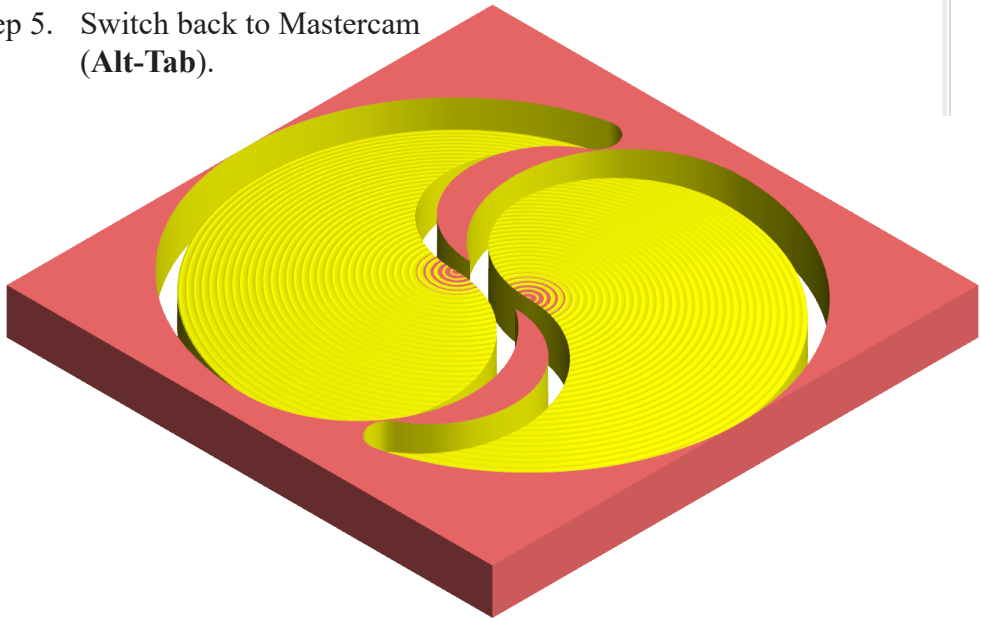


Fig. 97

X. Switch to BOTTOM CUT WCS.

Step 1. If necessary, use **Alt-T** to turn off toolpath display.

Step 2. In the Planes Manger (**Alt-L**) set:
under Name, **Fig. 98**
Click **BOTTOM CUT**
Click **Set All** .

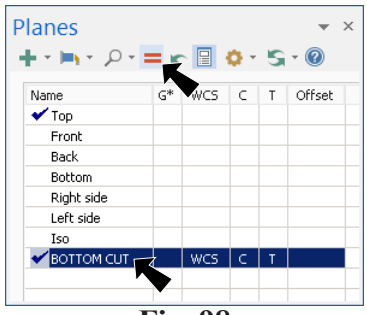


Fig. 98

Step 3. Change to the Isometric View. **Right click** in the graphics window and click Isometric (WCS) (**Alt-7**).

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

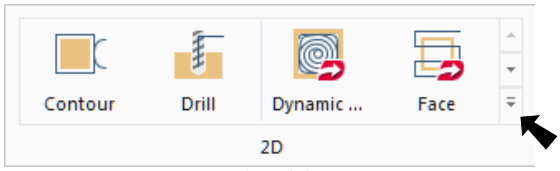


Fig. 99

Y. FBM Drill Toolpath Right Lid.

Step 1. On the Toolpaths tab TOOLPATHS in the 2D group click **Expand gallery** button and click **FBM Drill** , **Fig. 99**.

Step 2. Click the **right Lid solid**, **Fig. 100**.

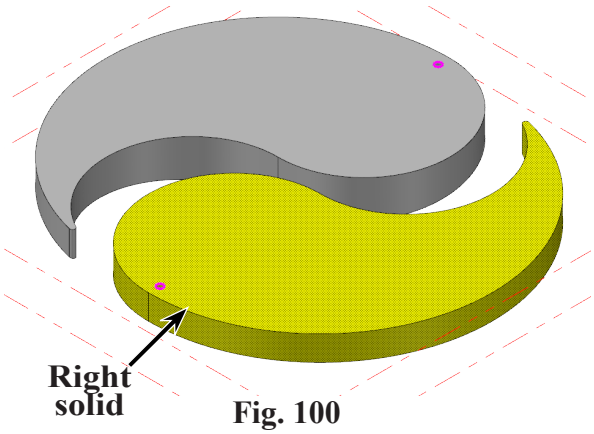


Fig. 100

Step 3. Select **Hole Detection** from the tree control and set:

Uncheck **Limit search to plane**
Fig. 101.

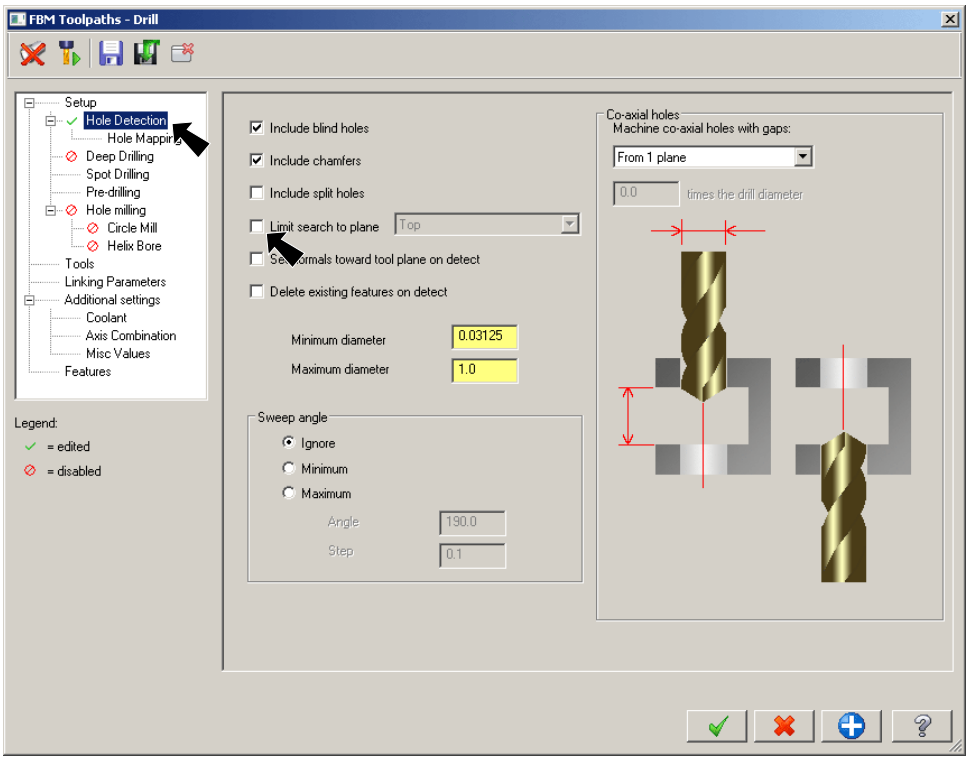


Fig. 101

Step 4. Select **Spot Drilling** from the tree control and uncheck **Spot Drilling** check box, **Fig. 102**.

Step 5. Select **Pre-drilling** from the tree control and uncheck **Pre-drilling** check box, **Fig. 103**.

Step 6. Click **Detect** button  at the top of the dialog box to find the holes, **Fig. 103**.

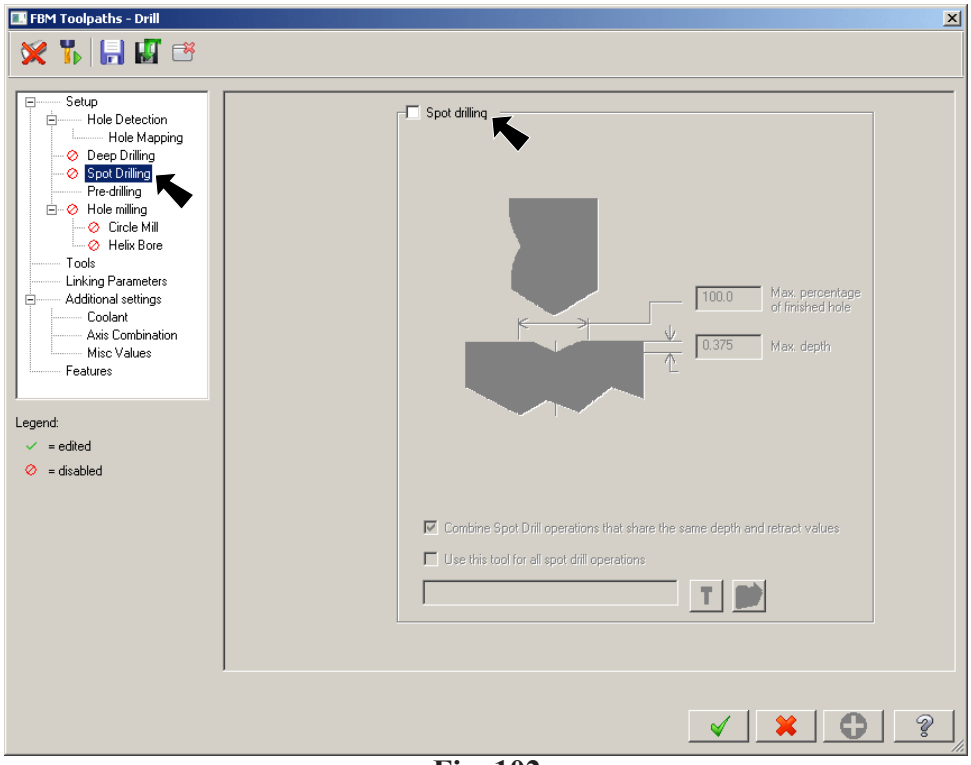


Fig. 102

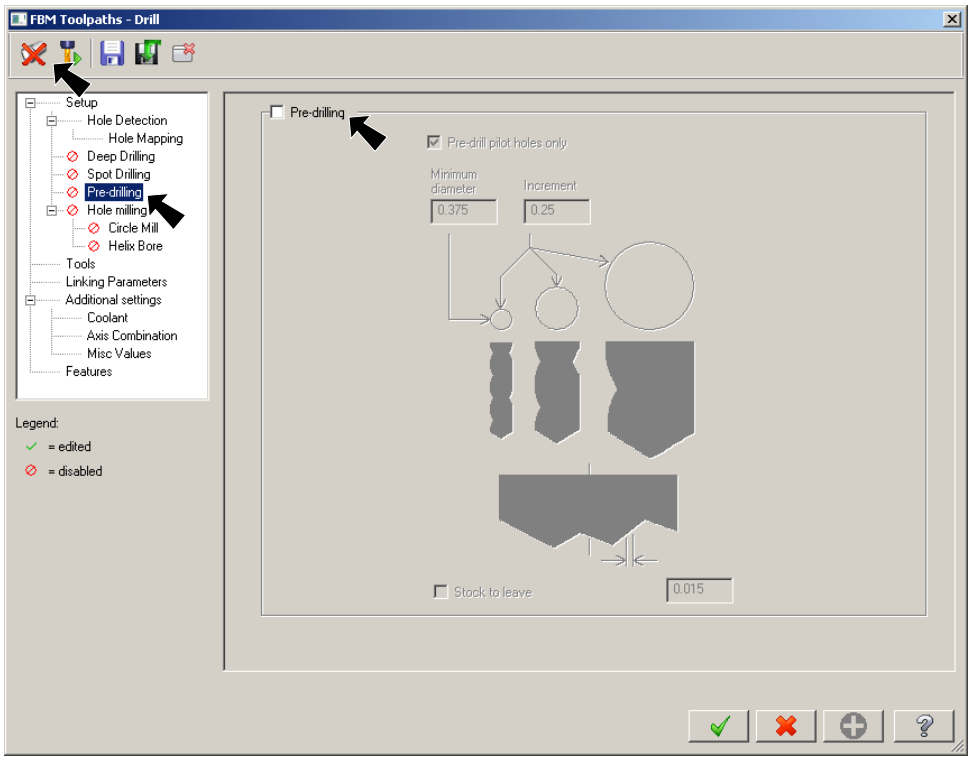


Fig. 103

Step 7. Confirm **1** hole with **depth of .35** is listed and click OK  , **Fig. 104**.

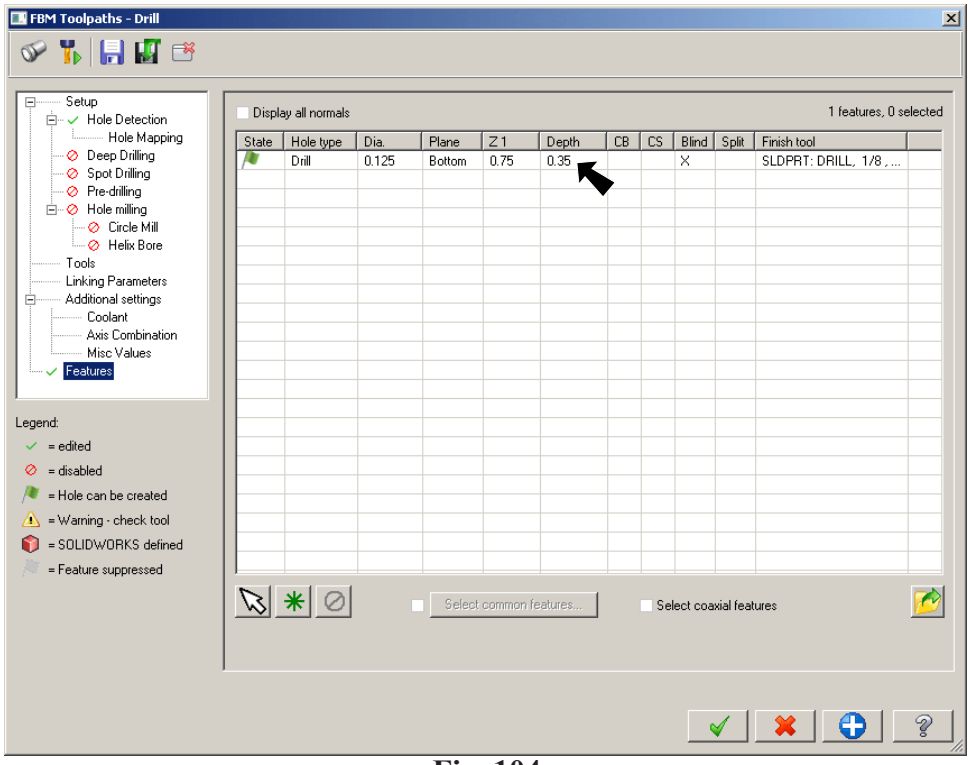


Fig. 104

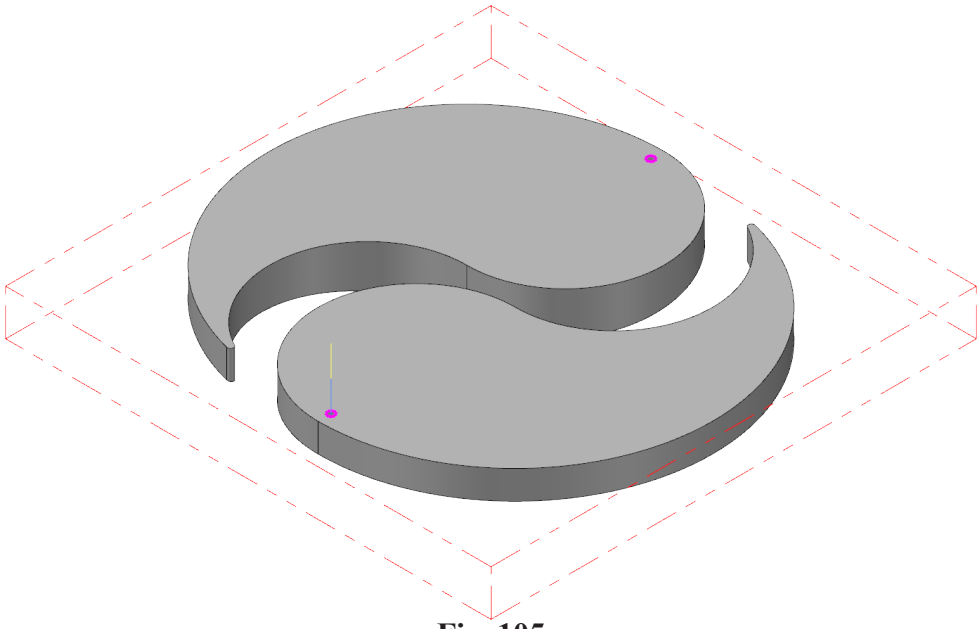


Fig. 105

Z. FBM Drill Toolpath Left Lid.

Step 1. On the Toolpaths tab TOOLPATHS in the 2D group click **FBM Drill** 

.

Step 2. Click the **left Lid solid** and params are all set so just click **Detect** button  , **Fig. 106**.

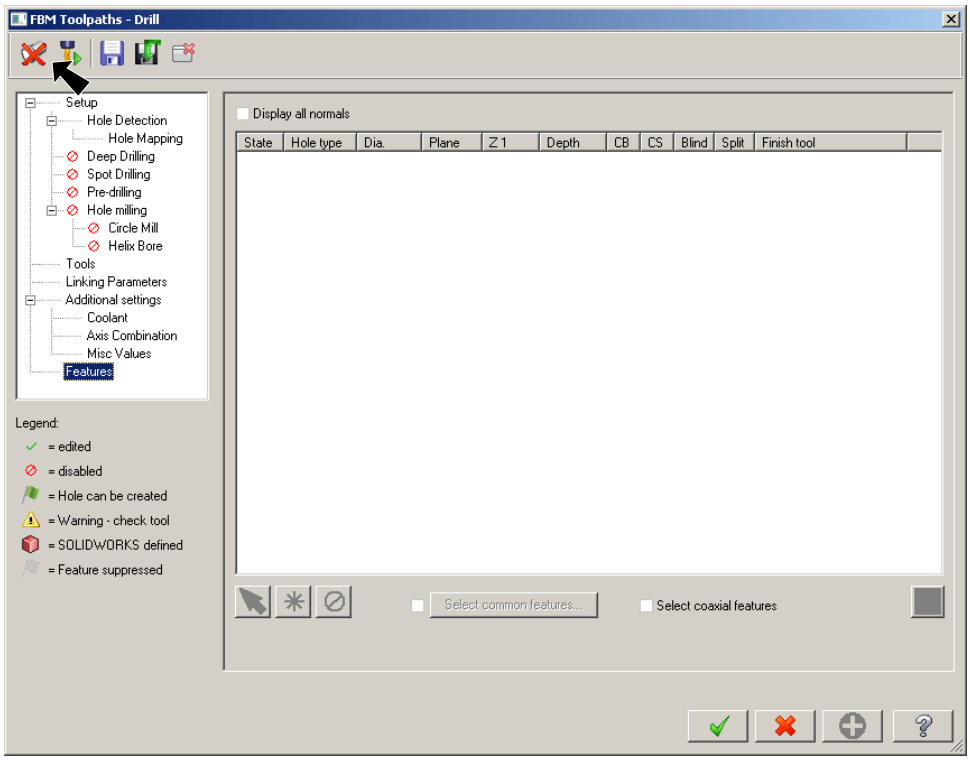


Fig. 106

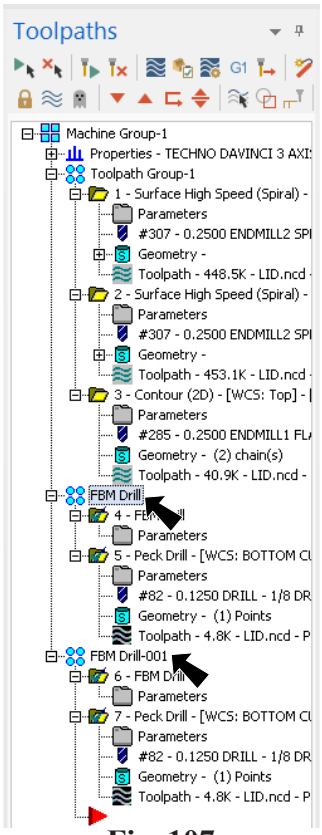


Fig. 107

Step 3. In the Toolpaths Manager **Ctrl click both FBM Drill Toolpath Groups** to select both Toolpath groups, **Fig. 107**.

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

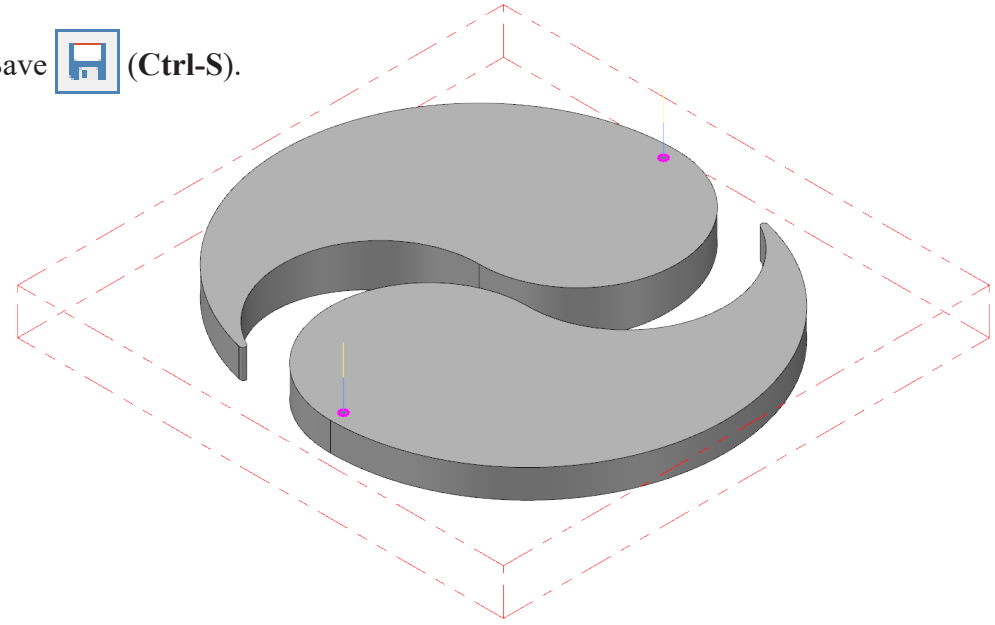


Fig. 108