3D ENGRAVING WITH CNC MILL (CYLINDRICAL)

- CNC mill will carve 3D shapes using STL files commonly used with 3D printers.

- You can use cylindrical pieces up to 4.72" in diameter and 10.7" long, though one end needs reduced to 2" or less to fit into vice.

- Note the exact diameter and length of your material (in inches, such as 3.31").

Insert your material

1. If flat, brown bed is currently installed in machine, replace with rotary axis unit as per separate instruction sheet.
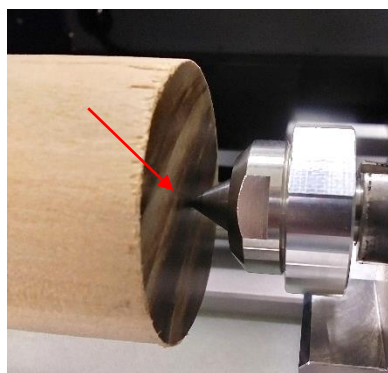
2. Loosen:
   a. Black tailstock knob on right side of rotary.
   b. Black tailstock lever.
   c. Silver vice knob on marked center on one edge of material.
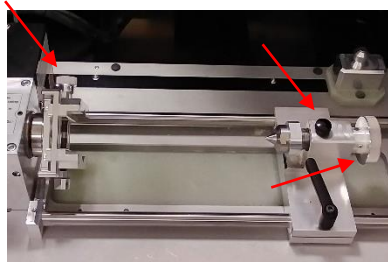
3. Insert material into vice (marked edge facing right), then lightly tighten silver vice knob to secure it.

4. Slide tailstock so that its point touches material. Nudge material until tailstock point touches your mark.

5. Tighten silver vice knob and black tailstock lever.

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6. Rotate silver tailstock wheel until its point *slightly* digs into material.

7. Tighten black tailstock knob.

Insert milling bit

1. Remove existing bit from toolhead with two black wrenches. Squeeze wrenches toward each other to loosen.
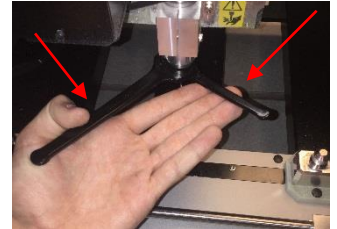
2. Find desired bit from "long reach" bag of bits.
   a. **It's best to start with 1/4" bit to quickly remove material, then switch to smaller bit later for fine carving.**

3. Insert bit into collet.
   a. Bit shaft faces threaded collet end.
   b. Bit shaft has a slight mark; insert into collet to this mark (about halfway).
   c. Screw collet-with-bit into machine's toolhead. Use two black wrenches to tighten it (do not over tighten). Push wrenches apart to tighten.

4. Close lid.

Turn on mill

1. Turn on machine via switch in back.

2. Hold down small, black & green power button on front of machine until Modeling and Scanning lights are lit.
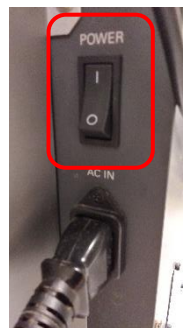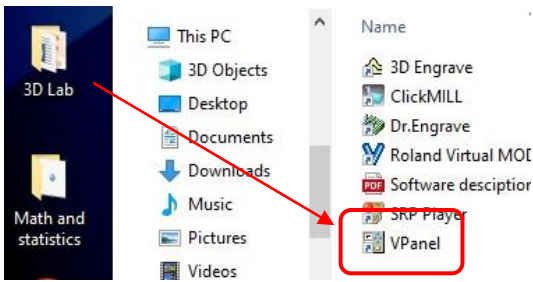
3. Press View button on front of mill. Rotary access unit will move toward you.

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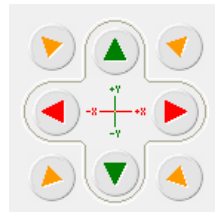4. On computer's desktop, open 3D Lab > Roland CNC machine > VPanel.

Set Z axis

1. In "Set ___ origin at center of rotation" field, click down arrow to choose "Z Origin", then click Apply, then Continue.

2. When machine finishes setting Z axis, click OK.

3. The Current Jig area should show red arrow with red "YZ" above it. If not, you **must** follow "Calibrate tool sensor" and "Calibrate rotation origin" sections on rotary instruction sheet, then repeat all of these instructions.

Set X axis

1. Use red & green arrows to carefully move toolhead to right edge of material. **Do not let bit strike material!**

2. In "Set ___ Origin here" field, choose "X Origin", then click Apply.

3. To verify XY axis, choose "XY Origin" in "Move to ___" field, then click Move. The toolhead should move to right and center edge of material.
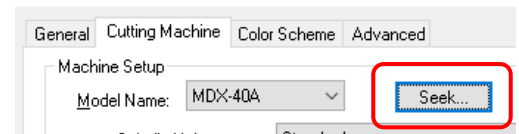
Load your design

1. On computer's desktop, open 3D Lab > Roland CNC machine > SRP Player.
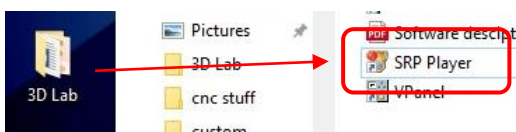
2. Click File > Preferences > Cutting Machine > Seek > Apply > OK to detect rotary axis unit.

3. Click File > Open, then chose "STL Files" in lower-right corner of the window (replacing "SRP Player Files").

4. Locate and choose STL file that you wish to use.

Choose milling settings

1. On right, set Y to less than diameter of material.

2. Click one radio button encircling green head to align STL along red dotted line (represents material length).

3. Click "2: Type of Milling" on bottom-right.
   a. Choose quality:
      i. If STL is curvy, "Model with many curved surfaces".
      ii. If STL is block-like, click "Model with many flat planes".
   b. Choose "Cylindrical workpiece"
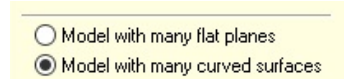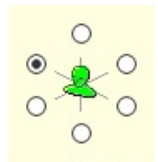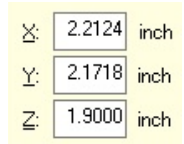
Choose tool path settings

1. Click "3: Create Tool Path".
   a. Choose material type in "Choose workpiece material"
   b. Enter material size in X (length) and D (diameter) fields
   c. If model is too big to fit D size
      i. Click Section 2: Type of Milling, then Section 1: Model Size.
      ii. Reduce model Y size.
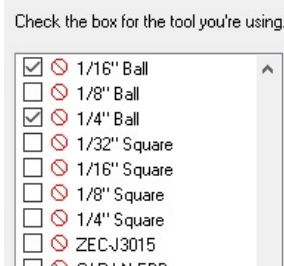   iii. Complete Sections 2 & 3 again.

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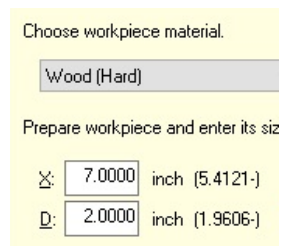
d. In preview, **red** area indicates total material size, **green** indicates material to be removed.
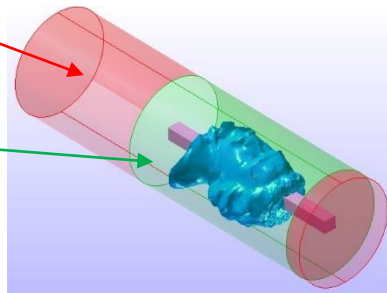
e. Click Options > My Tools menu.

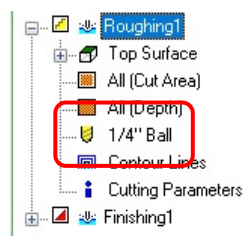f. In list of bits, click bit(s) you will use, then click OK.

   i. The bits' plastic cases indicate their size & type on a label

Check the box for the tool you're using.

- ☑ ⊘ 1/16" Ball
- ☐ ⊘ 1/8" Ball
- ☑ ⊘ 1/4" Ball
- ☐ ⊘ 1/32" Square
- ☐ ⊘ 1/16" Square
- ☐ ⊘ 1/8" Square
- ☐ ⊘ 1/4" Square
- ☐ ⊘ ZEC-J3015

g. Click Edit on right.

h. Open Roughing1 section, replace "ZCB-150" bit with bit installed in machine, then click Apply.

   i. Ignore "The tool has been changed…" message.

- Roughing1
  - Top Surface
  - All (Cut Area)
  - All (Depth)
  - 1/4" Ball
  - Contour Lines
  - Cutting Parameters
- Finishing1

i. Open Finishing1 section, replace "ZCB-150" bit with bit you will use later for detailing, then click Apply, then Close.
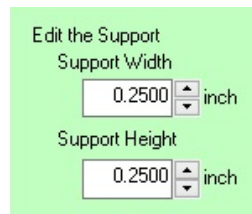
j. Go back to Section 2, click "Add support to model," then Edit.

☑ Add support to model   Edit...
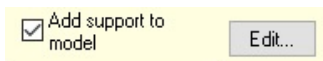
   i. Optionally, move and resize purple supports with mouse.
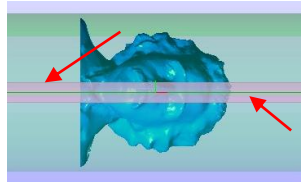
   ii. Optionally, enter "0.25" for width and height.

Edit the Support
Support Width
0.2500 ⇕ inch
Support Height
0.2500 ⇕ inch

   iii. Click Apply and Close.

k. Go back to Section 3.

l. Click Create Tool Path. Wait while toolpath is generated.

Create tool path.
Tool path generation may take a few minutes.
Create Tool Path   Edit...

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The University of Akron
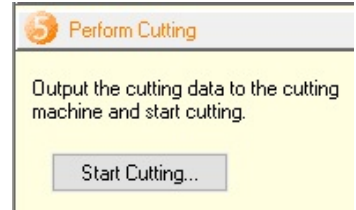**Wayne College 3D Lab**
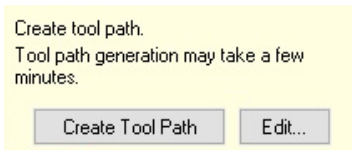
Preview results

1. Click "4: Preview Results".

   a. Note estimated cutting time.

   b. Click Preview Cutting button.

   c. If preview looks what you expect, continue to next step.

④ Preview Results
After generating tool paths, you can preview cutting before operating milling machine.
☐ Display only the shape within the modeling form
Preview Cutting
Estimated cutting time   1.9 h
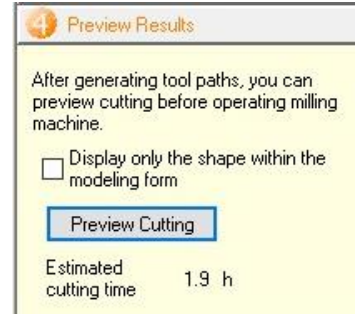
Begin cutting

1. Click "5: Perform Cutting".

   a. Click Start Cutting to begin milling.

⑤ Perform Cutting
Output the cutting data to the cutting machine and start cutting.
Start Cutting...

   b. If mill is malfunctioning, immediately press red STOP button on top right of machine!

   c. If you chose different bits for roughing and finishing, the program will prompt you to change bits when needed.

When milling has finished

1. After toolhead stops moving and rotating, press View button on front of mill.

2. When bed slides forward and stops, open lid.

3. Loosen black knob and black lever on right side of tailstock.

4. Loosen silver knob on left side of vice.

5. Carefully remove material from rotary axis unit.

6. Remove collet & bit from tool head, store each in respective bags.

7. **Please cleanup debris inside the machine with the Shop Vac under the table.**