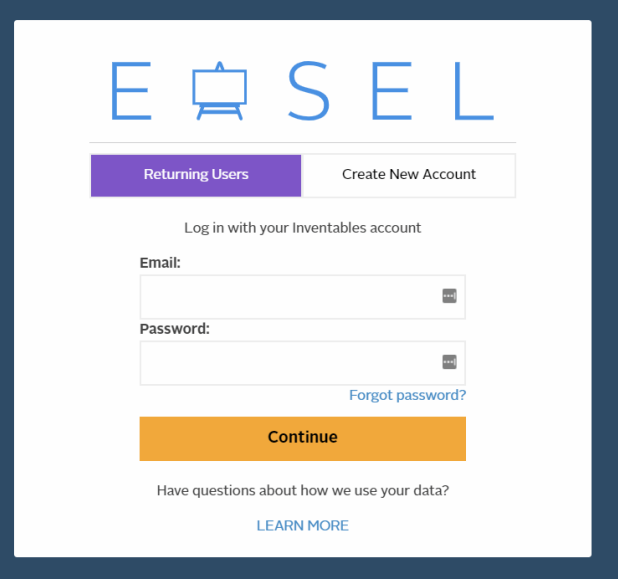


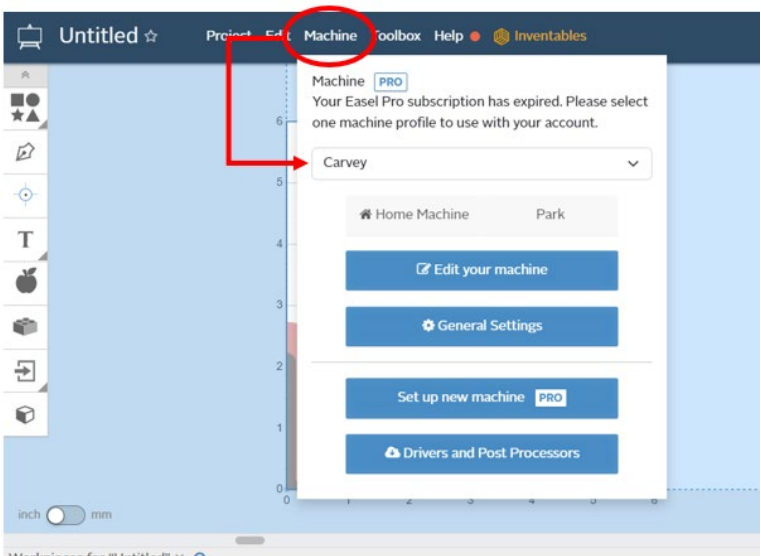
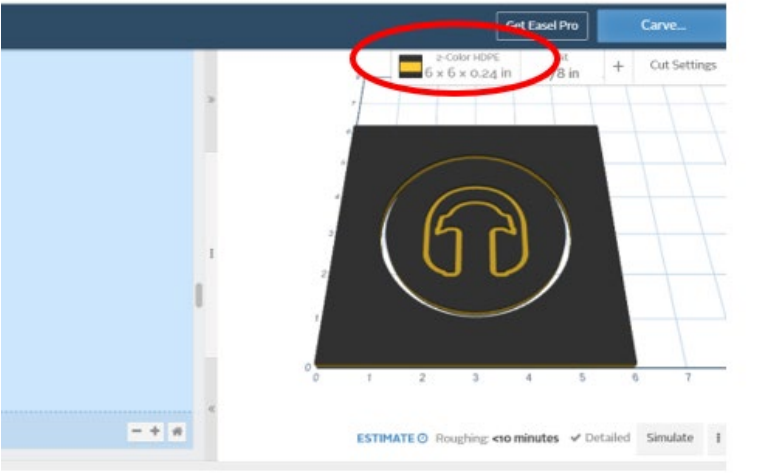


STEP BY STEP:
DESIGN IN EASEL AND OPERATE THE CARVEY CNC MILL

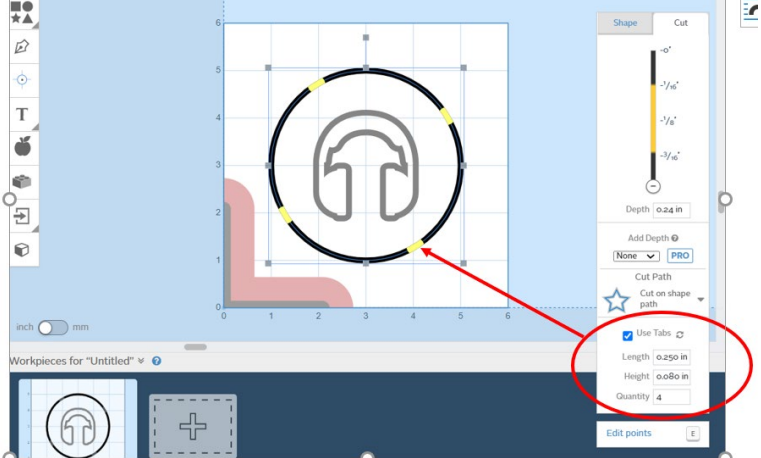
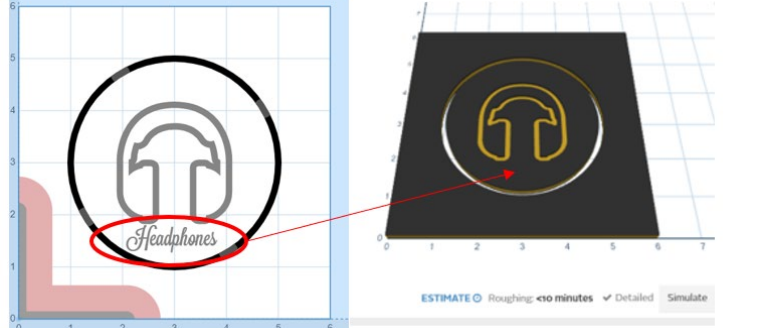
CNC Mill – Carvey

1/09/2023


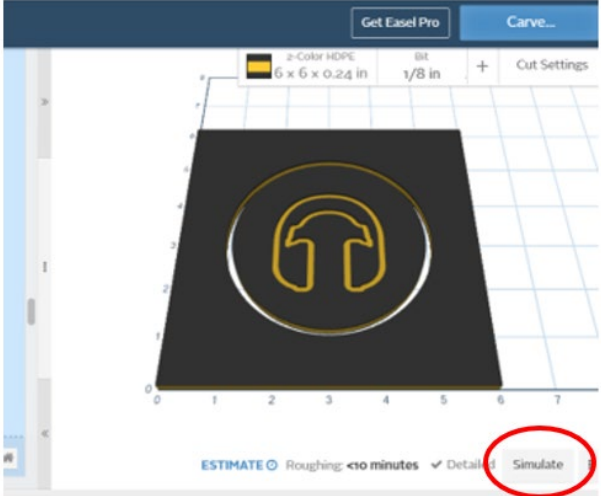
| # | Steps | Key Points | Why | Pictures |
|---|---|---|--|--|
| 1 | Log into your Easel account: easel.inventables.com/users/sign_in | Log into your account. Navigate to your design in Easel. | In order to use Carvey, you will need to sign up for a free account at Inventables.com and create a design. Use the Easel software to create your design and send it to the Carvey machine. |  A screenshot of the Easel login page. At the top, the word 'EASEL' is displayed in blue, with a stylized machine icon for the letter 'A'. Below the logo are two buttons: 'Returning Users' (purple) and 'Create New Account' (white). Underneath, it says 'Log in with your Inventables account'. There are two input fields: 'Email:' and 'Password:', each with a small eye icon to toggle visibility. A blue link 'Forgot password?' is positioned below the password field. A large orange 'Continue' button is centered below the fields. At the bottom, it asks 'Have questions about how we use your data?' with a blue 'LEARN MORE' link. |

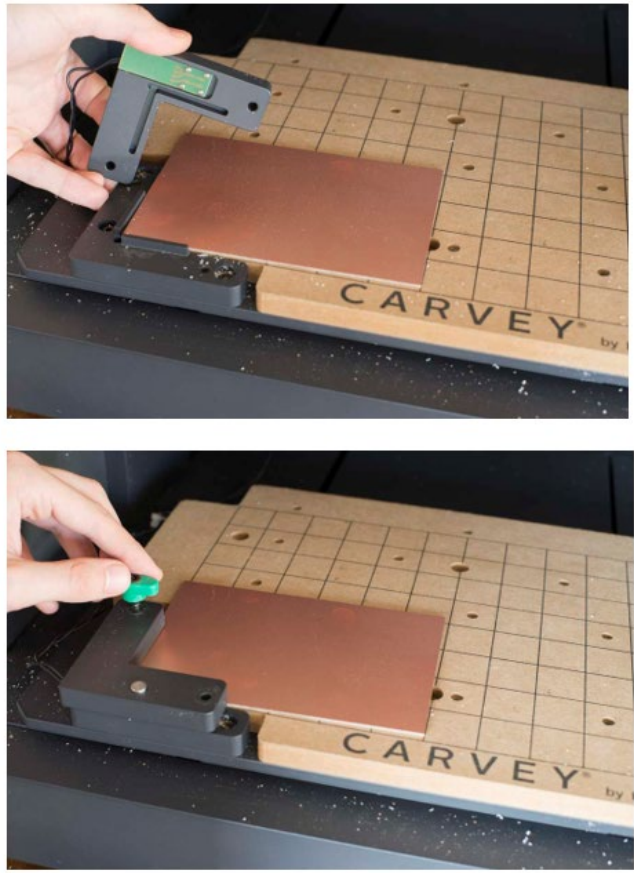
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| <p>2</p> | <p>Check Machine Selection: Carvey</p> | <p>Click the Machine menu. Select Carvey in dropdown</p> | <p>In order to send instructions to the CNC Mill you will need to have the correct machine selected.</p> |  |
| <p>3</p> | <p>Check Material Dimensions</p> | <p>Click on the dimensions and double check using:</p> <ul style="list-style-type: none"> • Measuring tape • Calipers | <p>In order for the results to match the design, the correct and exact dimensions for the material must be entered.</p> |  |

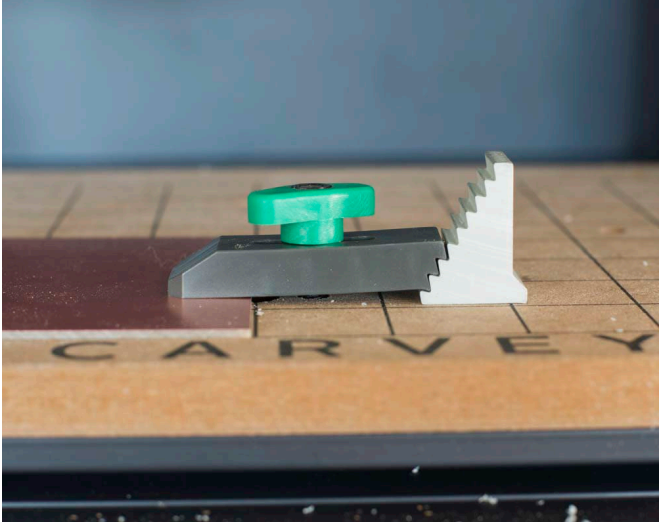
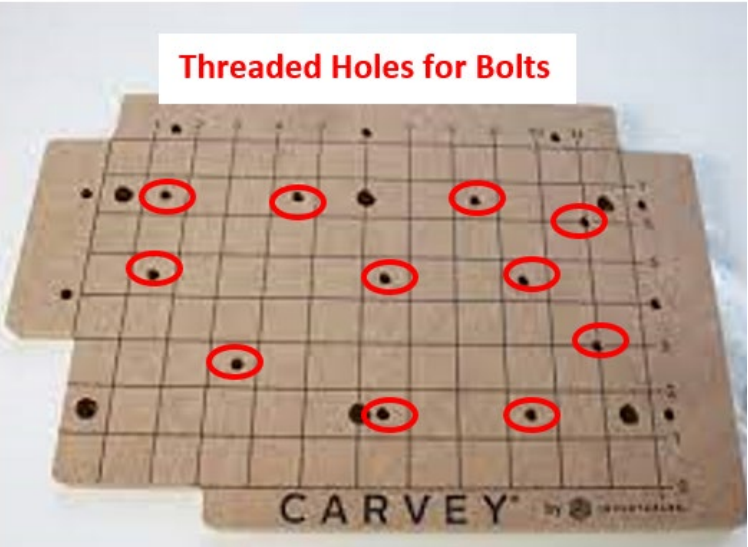
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| <p>4</p> | <p>Check Material Type</p> | <p>Click on dimensions and select closest material type.</p> | <p>Material type will adjust the speed the spindle will spin and move through material.</p> <p>Choosing a soft material when using a hard material will result in the machine being unable to execute the design.</p> <p>Possible to damage milling bits and machine mechanisms.</p> | |
| <p>5</p> | <p>Check Cut Depths</p> | <p>Click on a line in design pane.</p> <p>Select Cut Tab in pop up.</p> <p>Repeat for each design element.</p> | <p>Double checking the depth of cut before beginning a job will save having to repeat a job because the depth of the cut was not what was desired.</p> | |

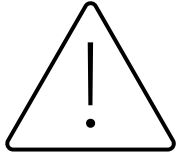
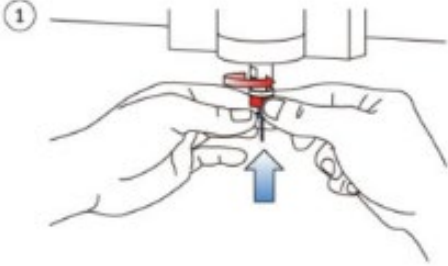
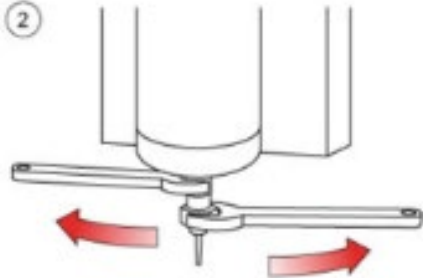
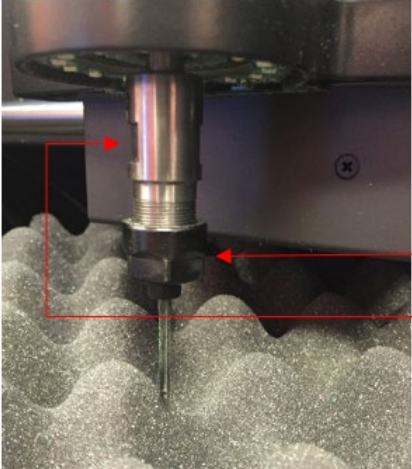
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| <p>6</p> | <p>Check Tabs</p> <p>Lines that cut through the material need tabs.</p> | <p>Focus on lines of design that are intended to cut through material.</p> <p>Click on a line in design pane.</p> <p>Select Cut tab in pop up.</p> <p>Yellow highlights show number and position of tabs.</p> <p>Adjust number and position of tabs as needed.</p> | <p>When cutting through the material, a small amount of material is left to keep it in place while the rest of the design is milled.</p> <p>Without any tabs, the material would become loose and move out of position resulting in the design not being completed correctly and damage to machine.</p> |  |
| <p>7</p> | <p>Check Preview</p> | <p>Check design preview for any missing or incomplete elements.</p> <p>Incomplete or missing elements may be due to the size of the bit being too wide to execute the line.</p> | <p>Possible solutions:</p> <ul style="list-style-type: none"> -eliminate design element -redesign to use wider lines -select different milling bit -use Workpieces for multiple bits (see next step) |  |



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| <p>8</p> | <p>Bit Selection</p> | <p>Double check milling bit selection.</p> <p>See Milling Bit Guide booklet for properties of each milling bit.</p> <p>Available Milling Bits:</p> <ul style="list-style-type: none"> • 1/16" Fish Tail • 1/16" Fish Tail Downcut • 1/8" Upcut • 1/8" Straight • 1/8" Fish Tail • Engraving Bit <p>(bit availability may change)</p> | <p>Milling bits are used to cut out the desired design.</p> <p>TIP: Easel Workpieces</p> <p>See tutorials on how to use more than one bit to complete a project by using the Easel Workpieces in the design pane.</p> <p>Click the question mark on the Workpieces pane to view video tutorial.</p> | <p>The screenshot shows the Easel software interface. At the top, there are buttons for 'Get Easel Pro' and 'Carve...'. Below these, a material selection dropdown shows '2-Color HDPE' and '6 x 6 x 0.24'. A red circle highlights the 'BIT' dropdown menu, which is currently set to '1/8 in'. The main workspace shows a black square workpiece with a yellow circular design of headphones. At the bottom, there is a 'Workpieces for "Untitled"' section with a red circle around a question mark icon and a red arrow pointing to it from the text 'Workpieces Video Tutorial'. Below this are two icons: one showing the headphone design and another showing a plus sign in a dashed box.</p> |
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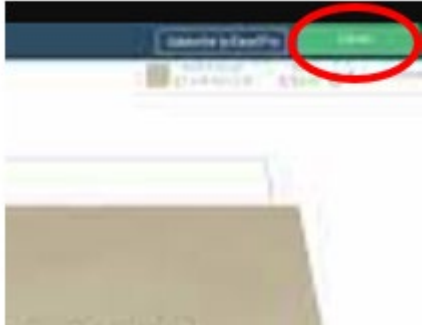
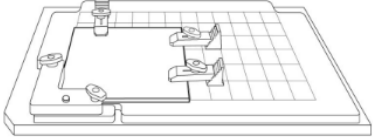
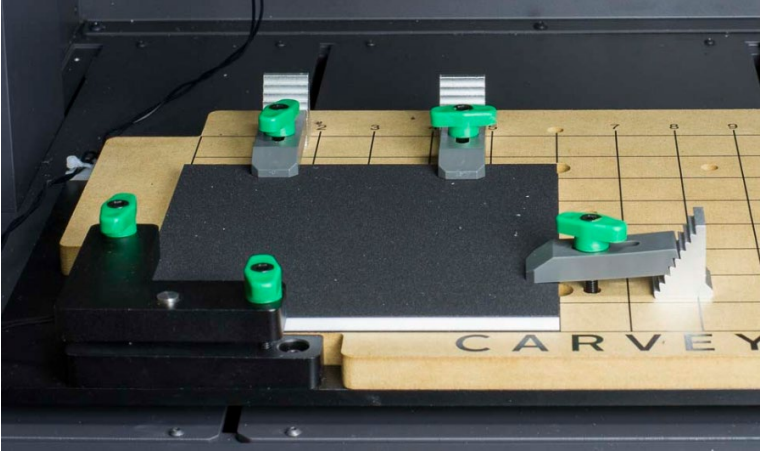
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| 9 | Time Check | <p>Click Simulate button.</p> <p>This will give you an estimate of the time needed to complete the design.</p> <p>Do you have enough time before the end of your reservation?</p> <p>Include at least 30 minutes to clean up and put away tools.</p> | <p>It is important to NOT run over your reservation time.</p>  |  |
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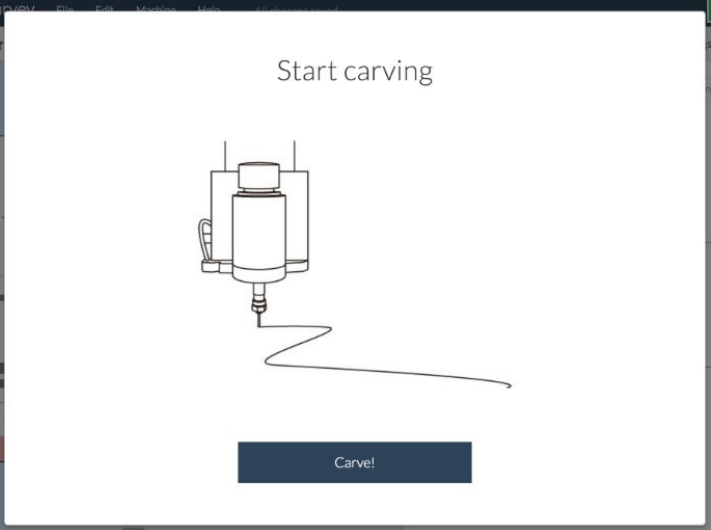
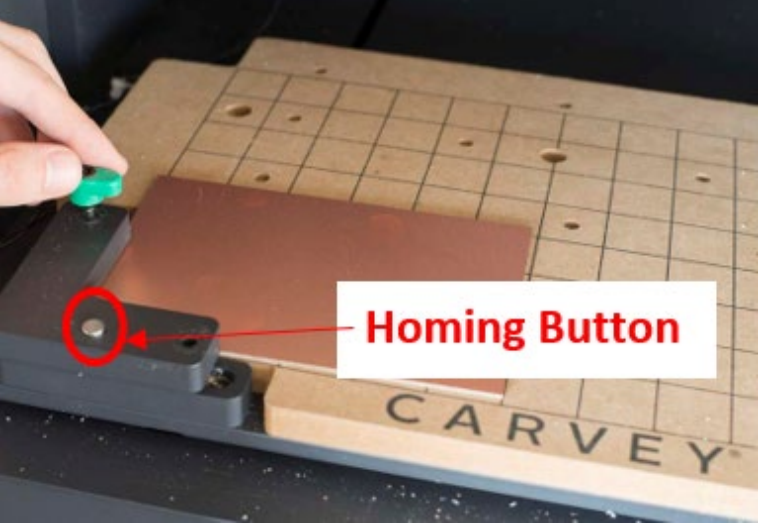
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| <p>10</p> | <p>Load the material into CNC Mill</p> | <p>Position the material on the Waste Board (print bed).</p> <p>Lift the smart Clamp and flush the material against the L-shaped bracket.</p> <p>Screw down the Smart Clamp.</p> | |  |
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| <p>11</p> | <p>Clamp material</p> | <p>Check design pane to select locations that DO NOT have any design elements and plenty of space to accommodate a clamp.</p> <p>From toolbox use:</p> <ul style="list-style-type: none"> • Metal step block • Gray plastic arm • Bolt <p>Threaded bolt holes are in waste board for bolts to hold clamps.</p> | <p>Clamping material will prevent any shifting as CNC mill applies pressure to carve design.</p> <p>Clamping also keeps material flat and level against waste board.</p> |   |
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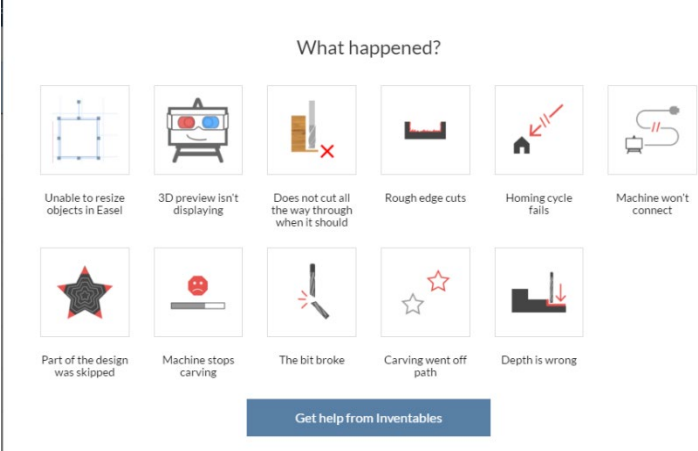
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| <p>12</p> | <p>Install Bit</p> | <p>Begin by making sure that the Carvey machine is turned off.</p> <ul style="list-style-type: none"> Place the foam in and unscrew the collet form the spindle. Insert the milling bit into the collet. <p>You may need to unscrew (turn to left) the collet to open it wide enough to insert milling bit.</p> <ul style="list-style-type: none"> Tighten the collet to the milling bit with wrenches | <p>Secure the milling bit in the spindle so that it does not come out.</p>  <p>Machine should be off when installing bit to <u>avoid injury</u> and damage to machine.</p> <p>Do not overtighten.</p> |  <p>①</p>  <p>②</p>  <p>Wrench on collet</p> <p>Wrench on flat of neck</p> |
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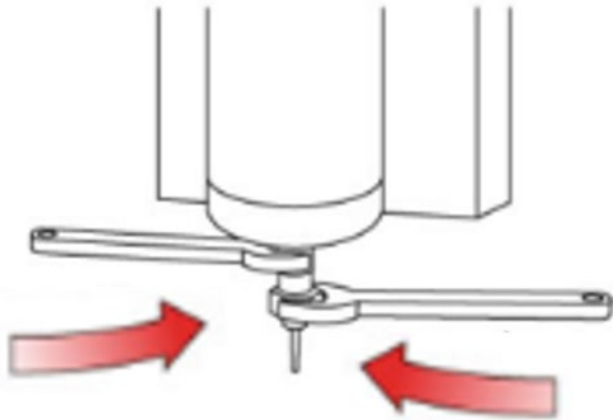
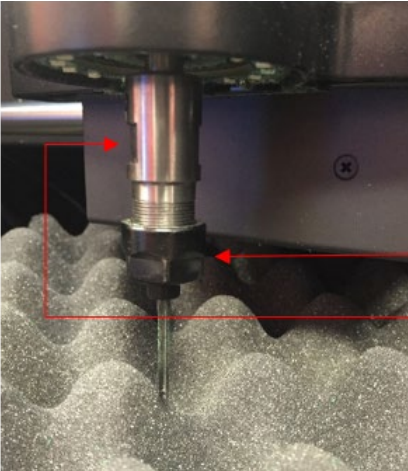
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| <p>13</p> | <p>Turn on CNC Mill</p> | <p>Make sure the CNC Mill (Carvey) is powered on.</p> <p>Front emergency stop button should light up.</p> <p>Carve button on computer screen should turn green.</p> | <p>When button lights up green on the screen, the computer is able to send the design and cut instructions to the Carvey CNC Mill.</p> <p>Carve button on the computer screen is not turning green?</p> <ul style="list-style-type: none"> • Make sure key is inserted and turned to allow power to machine. • Double check Machine selected is Carvey (see step 2). • Double check CNC Mill is turned on. Power switch is located on back of machine next to power cord. • Double check USB cable is connected to the computer. |   |
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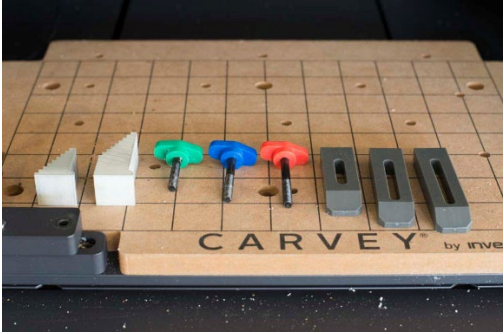



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| <p>14</p> | <p>Press Carve in the upper right-hand corner and follow the prompts</p> | <p>Measure the material and enter the dimensions (size and thickness) and the type of material.</p> <p>Click on Confirm Material Thickness.</p> | <p>This step confirms that the material dimensions entered are correct. As part of the carving prompts, Easel will tell you which size screws to use based on the thickness of your material.</p> |  |
| <p>15</p> | <p>Check material loaded correctly.</p> | <p>Take note of the color of bolts recommended in image on the computer screen.</p> <p>Make sure you have selected the correct color bolts.</p> | <p>This step ensures that material is firmly fixed in position.</p> | <p>Check the material</p>  <p>We've already clamped a piece of material in Carvey for you. Please confirm that the piece is secure and unable to move.</p> |
| <p>16</p> | <p>Check material is clamped.</p> | <p>Clear any debris and position the clamps over the corner of the material away from any design elements and use the bolts to tighten clamps down if needed.</p> <p>Use the colored screw as prompted on the screen.</p> <p>Click Next</p> | <p>Reposition so the design does not overlap with any clamps. Remember, the machine can't detect the clamps and will run right into them!</p> |  |

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| <p>17</p> | <p>Start Carving</p> | <p>Double check again the size of your bit and the position of your clamps to avoid collisions.</p> <p>If the design is free of errors:</p> <ul style="list-style-type: none"> • lower the hood • click on the large Carve button on the computer screen. | |  |
| <p>18</p> | <p>Observe homing sequence</p> | <p>The machine will position milling bit over homing button.</p> <p>The milling bit will lower slowly and LIGHTLY touch the homing button.</p> | <p>If the machine <u>does not immediately respond</u> to a light touch of the homing button:</p> <ul style="list-style-type: none"> • Press Stop • Seek Staff <p>Anything more than a light touch indicates the machine requires maintenance.</p> <p>Continuing to run a job can result in damage to machine and the design will not execute correctly.</p> |  |

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| <p>19</p> | <p>Observe Milling Process</p> | <p>Actively monitor for:</p> <ul style="list-style-type: none"> • Loose debris • Milling bit coming loose • Milling bit warble while spinning • Cutting deeply into waste board | <p>Safety first when using any equipment in the makerspace.</p> <p>Press the emergency stop at any sign of trouble.</p> <p>Do not open hood when machine is operating.</p> |  |
| <p>20</p> | <p>Inspect Completed Job</p> | <p>When milling process is complete and machine has come to a rest:</p> <p>Open hood.</p> <p>Inspect results for issues.</p> |  <p>Do not open hood until machine has stopped moving and spindle has come to a rest.</p> |  |

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| <p>21</p> | <p>Troubleshoot Results</p> | <p>Software on the computer will prompt you with a question if everything looks okay.</p> <p>If there was a problem, answering this question will launch an automated troubleshooting menu and connect you with a human expert online to help you resolve the problem.</p> | <p>Using the built-in software troubleshooting will connect you to an expert at Inventables (machine manufacturer).</p> <p>These online experts can assist in making needed adjustments, calibrating machine remotely, and suggestions on how to achieve your desired results.</p> <p>The online experts will communicate directly with you via email. They will use the email associated with your Easel account.</p> <p>Be prepared for an initial email that ask for additional details such as material dimensions, images of results, images of machine.</p> <p>Frisco Public Library staff are unable to perform these functions.</p> |  |
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| <p>22</p> | <p>Remove Bit</p> <p>Milling bits are sharp and should be removed first.</p> | <p>Turn off machine using power key.</p> <p>Place foam under milling bit.</p> <p>Use wrenches to remove bit.</p> <p>Bit will fall onto foam when collet is loosened enough.</p> <p>Return bit to holder and toolbox.</p> | <p>Turn machine off to avoid injury.</p>  <p>Bits are fragile and can shattered when dropped.</p> <p>Placing foam under bit will protect the bit when it falls.</p> <p>Removing the sharp milling bits first will prevent accidental scrapes and scratches to you when removing the material.</p> |   <p>Wrench on collet</p> <p>Wrench on flat of neck</p> |
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| 23 | Remove Material | <p>Remove clamps.</p> <p>Return clamps and bolts to the toolbox.</p> <p>Remove your material.</p> | |  |
| 24 | Clean Up | <p>Return all tools and parts to the toolbox.</p> <p>Vacuum debris and dust inside machine.</p> <p>Vacuum debris and dust outside machine.</p> | |  |
| 25 | Call for staff | <p>Staff will confirm tools and parts are all present and stored properly.</p> <p>Staff will inspect cleanup.</p> <p>Staff will collect keys.</p> | <p>Access keys are checked out to your account. Not returning keys can result in additional fees.</p> |  |
| 26 | Post Processing | <p>Most projects require additional post processing steps such as:</p> <ul style="list-style-type: none"> • Removing tabs • Sanding | |  |

TOOL INVENTORY

Drawer 1 – 2 items



- Material Sample on Ring
- Instructions

Drawer 2 - 32 items



- Red clamp bolts (5)
- Blue clamp bolts (5)
- Green clamp bolts (5)
- Wrenches (2)
- Plastic clamp arms (9)
- Metal clamp steps (6)

Drawer 3 – 2 items



- Clear organizer of milling bits
- Milling bit guide

Drawer 4 – 0 items

This tool space is empty.