

X-Carve Quick Start & Resource Guide



JCPL
JESSAMINE COUNTY
PUBLIC LIBRARY

X-Carve Manual and Guide

X-Carve FAQs:

https://inventables.desk.com/customer/en/portal/topics/820499-x-carve-faq/articles?b_id=9563

X-Carve Manual:

<http://x-carve-instructions.inventables.com/1000mm/>

X-Carve Basics and Community

Easel Live Classes:

<https://www.inventables.com/collections/29>

Inventables' Forum:

<https://discuss.inventables.com/>

CNC Subreddit:

<https://www.reddit.com/r/CNC/>

Software

Inkscape – Vector Graphics Software

<https://inkscape.org/en/>

Easel – Print Driver / Vector / CAM Software

<https://www.inventables.com/technologies/easel>

Materials

Laser Cutter Material Vendor:

<https://www.johnsonplastics.com>

<https://www.tapplastics.com>

<https://www.inventables.com/categories/materials/>

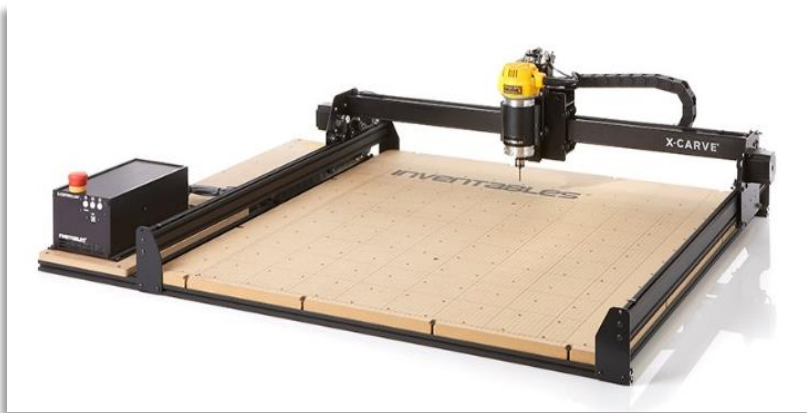
<https://www.interstateplastics.com>

- NO METAL, PVC, VINYL, OR STYROFOAM ALLOWED FOR USE WITH THE X-CARVE. -

X-Carve Quick Start Guide

Machine Basics

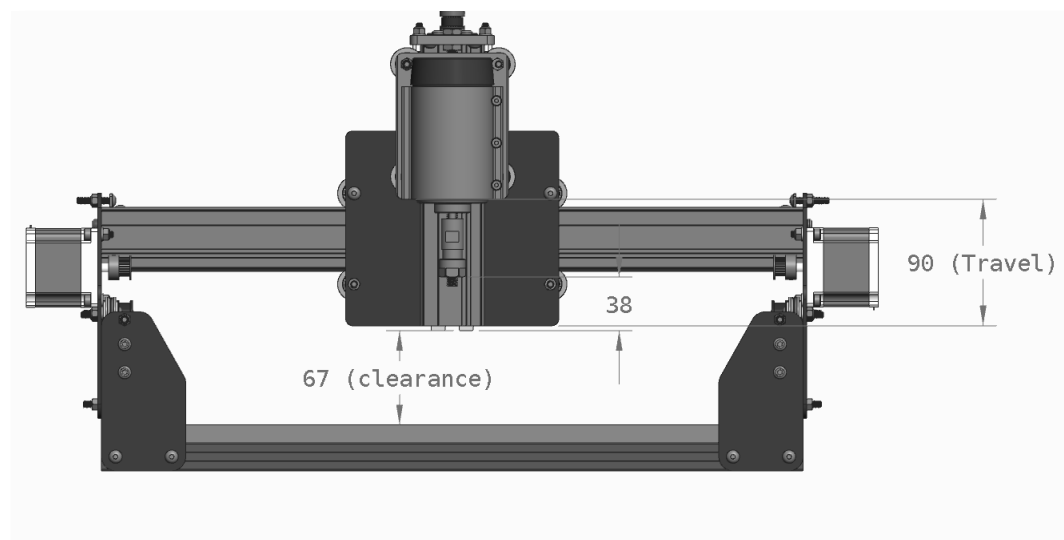
What is a CNC routing machine? “CNC” actually stands for Computer Numerical Control. This machine is a way to transform a stock piece of material such as a block of wood and arrive at a finished product. The most common cuts that can be made with this machine will be 2D cuts. It is possible to cut 3-Dimensional designs with a machine such as the X-Carve, but it requires specialized software. When you look at the X-Carve for the first time, you will notice several important features. The first is the Spindle, which houses the router. The second is the Waste Board, which protects the bed, electronics, and mechanics while carving, engraving, routing, or cutting.



If you look at the bottom left corner, you will find the X-Control system which houses the power supply and the attachments for each rail and the gantry. Without these components, the X-Carve would not be able to run. There is a separate probe not directly attached to the machine that is used in leveling and homing the machine.

Machine Specs

The X-Carve has a workspace of 39.37" x 39.37" or 1000mm². The Maximum size of material that can be cut is 800mm x 800mm x 65mm; however, our clamps will only allow material up to 2" thick. Most bits will not be able to reach the full 2", so keep that in mind when choosing material.



Pre-beginning Instruction

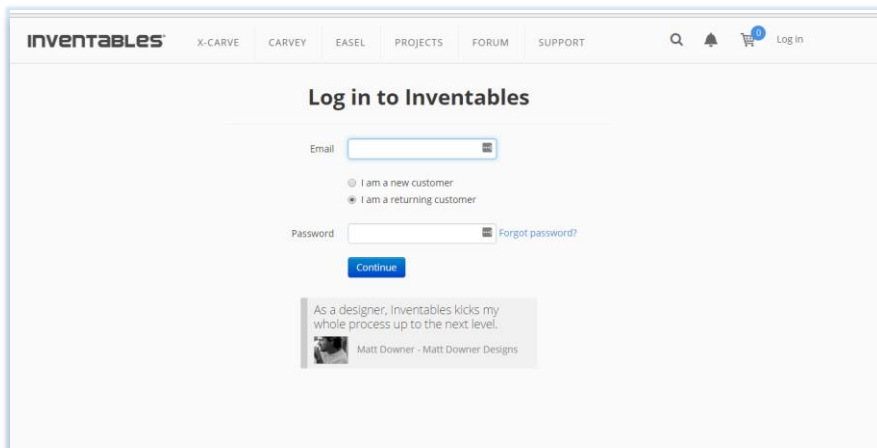
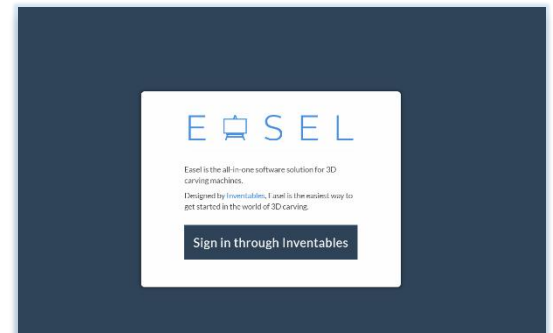
Turn on the X-Carve:

This sounds like a joke, but actually this is one of the more challenging parts about operating the machine. If you are looking at the machine from the front, you should be able to see the X-controller on the left hand side. On the back of the X-Controller you will see a variety of wires with green attachments, a small fan, and a black plug. The on and off switch is nestled right next to the black plug.

Working with Easel

1. Log onto the computer and go to <https://easel.inventables.com/>

Firstly, you will need to create an Inventables account, if you have already completed the sign up process, then proceed to login to your account.

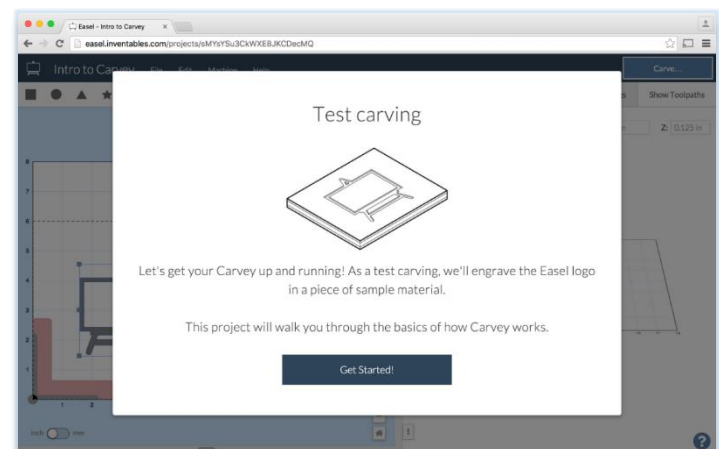


2. Login or Sign up With Inventables

Follow the on screen directions to create or login to your account. This account is separate from any JCPL account or service. JCPL does not store or have access to any credentials with third party services.

3. Using Easel

When you first login to Easel, you will be presented with a simple project. The first project is of the Inventables' Logo. This is done as both a test carve for the X-Carve, and as a way of showing you around Easel.

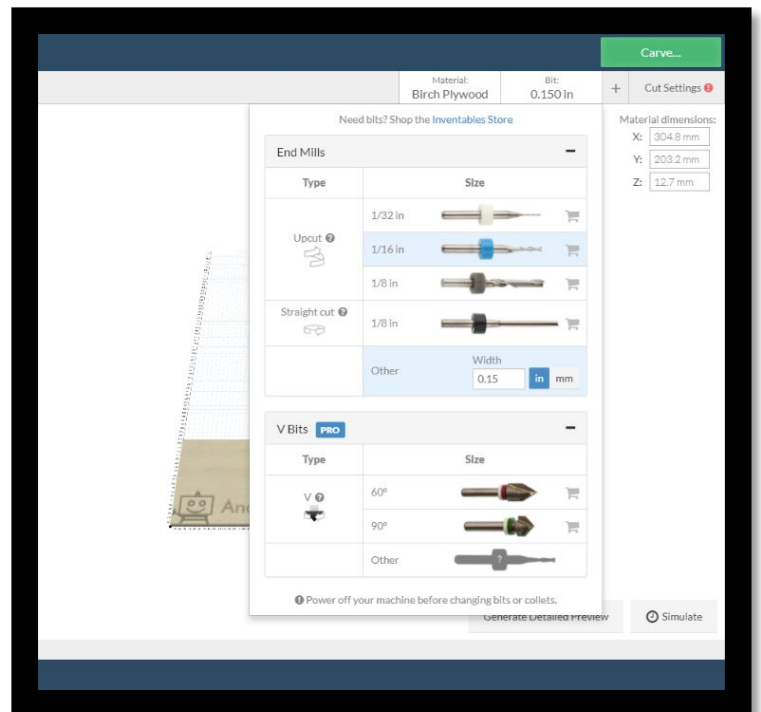
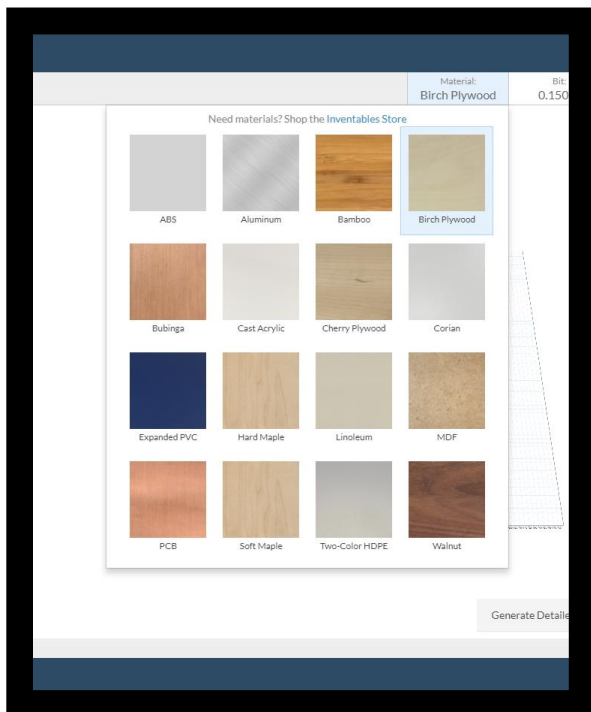


4. Design your project

Before you start designing, it would be helpful to input your material size in the top right hand corner of the screen. Easel needs the X, Y, and Z dimensions so that it knows what dimensions your design will be cut. Easel has a fairly simple and intuitive interface. There are selections of rectangles, circles, stars, a pen tool, text, and icons from which you can choose. You can also import photos via the import button. If you want to learn how to design projects in Easel, you can go to <https://www.inventables.com/collections/29>. This website has classes that will teach you different aspects of the design process. At the end of the designing process, make sure your design is set to the appropriate cut depth.

5. Select your material type and routing bit size

Choosing a material type will select specific settings for the router to carve through the material. The more dense the material, typically the longer it will take. If you were to choose the wrong settings for the material, there is a strong chance the bit may break or the machine may fail. Similarly, the bit size will change the step over for a project and will ensure that not too little, or too much material is cut out and that the machine is working efficiently.



***Tips and Tricks:** thinner materials (1/8") tend to be pulled upward because of the cutting force of the X-Carve. Think about using a downcut endmill, using a sacrifice board to protect the wasteboard, and ask if you would be able to tape the material down. The Creative Space Support Associate or the Computer Desk Staff should tell you whether that would be appropriate for your material.

6. Carving Your Project

After pressing the carve button, a display window will pop up detailing the steps necessary to take before you're able to cut. This step is an overview, each part will be covered in more detail in later steps.

Before getting to this step, you need to verify your design is set to the correct cutting depth. The cut depth should not exceed the thickness of the material unless you have a sacrifice board* secured below your project piece. Selected "Generate Detailed Preview" to get a brief overview of your project as it will be cut. If the design is free of errors, click on the large **Carve** button on the top right of the screen. It will now connect to the X-Carve and begin uploading the design to the X-Carve.

Machine controls

Y
X
Z

Step Interval
0.1 in
0.001 0.01 0.1 1
in mm
?

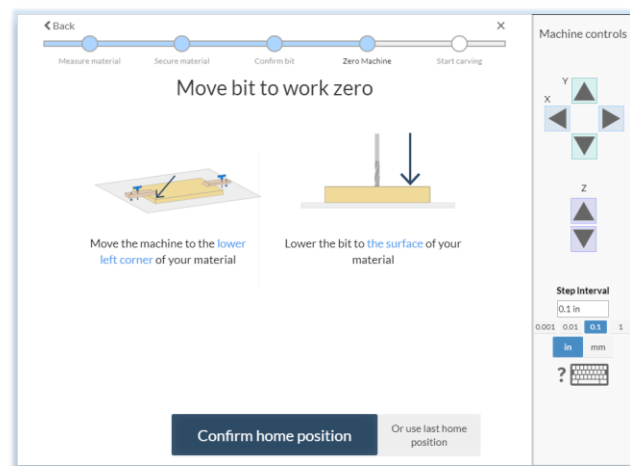
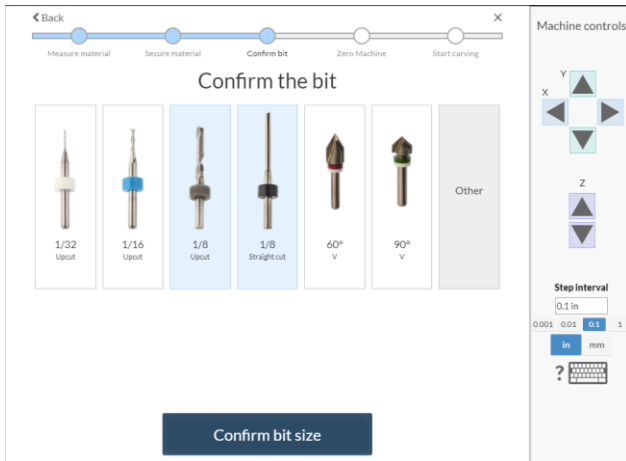
Machine controls

Y
X
Z

Step Interval
0.1 in
0.001 0.01 0.1 1
in mm
?

There are five steps to start your project. The first three steps just confirm that your material is of the right dimensions, your material is firmly fixed in position and that you have the appropriate bit size. Failure to verify any of these steps can lead to a depth error, ruined material, and gaps in your design.

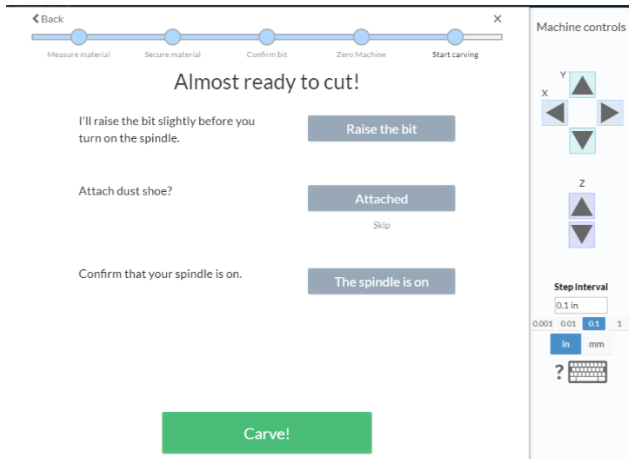
Take a few minutes now to go over your material and make sure that they correspond with the machine setup.



This step will only appear if you selected that you did not have a Z probe. If you elected to use the Z probe, you zero the machine by lowering the bit to touch the probe as it sits above the material.

To home without the Z probe, you have to jog the machine to the bottom lefthand corner of your material. Make sure the bit is touching the material as close to both edges as possible without going off.

Once you have found that corner, confirm your home position.



The last step will raise the bit so that it's not against the material. You should then confirm if you are going to use the dust shoe as the machine runs, and then turn on the spindle by hitting the power button on the side of the DeWalt 611.

Before you hit carve, you need to turn on the vacuum cleaner- this acts as our ventilation system for the X-Carve. The vacuum is located in the back left side of the cabinet the X-Carve sits on. After that, you're free to start carving!

*** a sacrifice board is any piece of material that should be relatively close to the same size as the material you would like to cut through. Ideal sacrifice boards will be the exact same size as your material and are willing to be cut on.**

IF the Carve button is blue instead of green, you need to follow these steps:
If not, skip to number 7.

Setting up the machine

Before starting a job, it is necessary to check the machine type and entering in the machine details. From this screen, the **X and Y** work area axis should be set to 1000 mm or 39.37 in.

Entering machine details

The details that need to be input for our machine should be:

Machine type- X-Carve

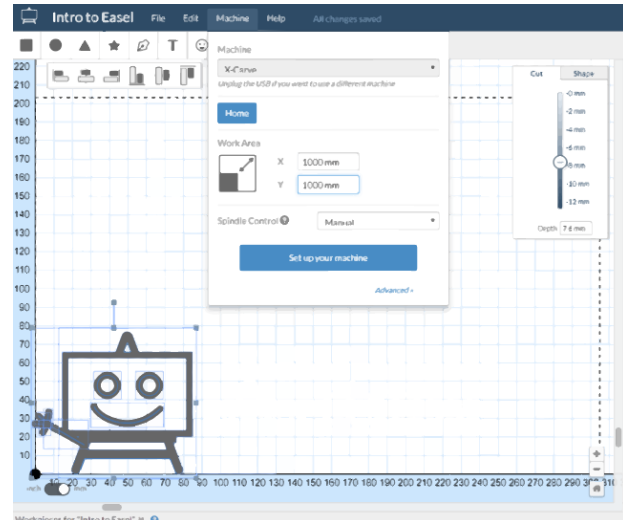
Motion Controller- X-Controller

Rail size- 1000mm x 1000mm

Lead Screw- ACME threaded rod

Spindle- DeWalt 611

Dust shoe- checked box.



Enter your machine details

Select the settings that match your machine.

Machine type	X-Carve
Motion Controller	X-Controller
Rail size	1000mm x 1000mm
Lead screw	ACME threaded rod
Spindle	DeWalt 611
Dust shoe	<input checked="" type="checkbox"/>

You must use the correct settings for your machine to run correctly.

Confirm settings

(You can always change them later.)

Jogging the machine

In order to ensure your project will turn out the way you want it to, it is necessary to check and make sure the X-Carve is still wired with the correct orientations. Once the arrows for each corresponding axis are pushed, the machine will move along the axis as you have directed it. Once all three axes are tested and the boxes are checked you may move on to the next screen.

Test your wiring

Now we'll test that your motors are wired correctly. Test each axis using the controls and confirm that each axis moves correctly. We'll troubleshoot any axes that aren't working in the next step.

If you have homing switches, be careful jogging your machine. The switches are currently disabled and can easily be crushed.

Working correctly?

X	◀▶	Yes	No
Y	▲▼	Yes	No
Z	▲▼	Yes	No

Continue

Spindle setting and Z Probe

The spindle setting is set to manual and then confirm that you have a Z probe. Insert the Z probe into the carriage.

You can also forgo this process if you plan on homing the machine manually. If this is the case, press no. Homing manually is a much easier process.

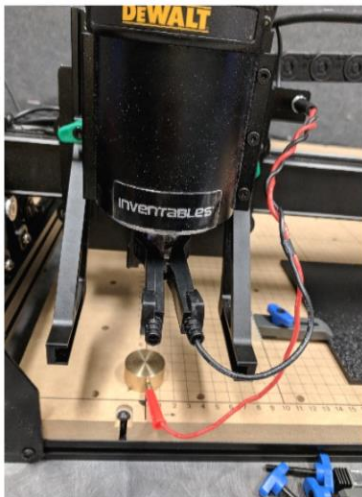
Do you have a Z-Probe?



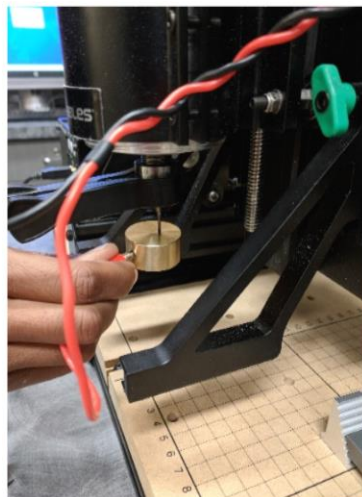
Setting up the Z probe

After attaching the Z probe to the carriage, you will attach the clip to the collet and touch the precision touch disc to the endmill.

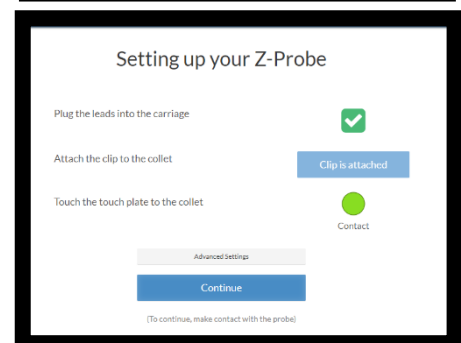
Z probe fully attached with clip on the collet



Precision touch plate contacting the collet via the endmill

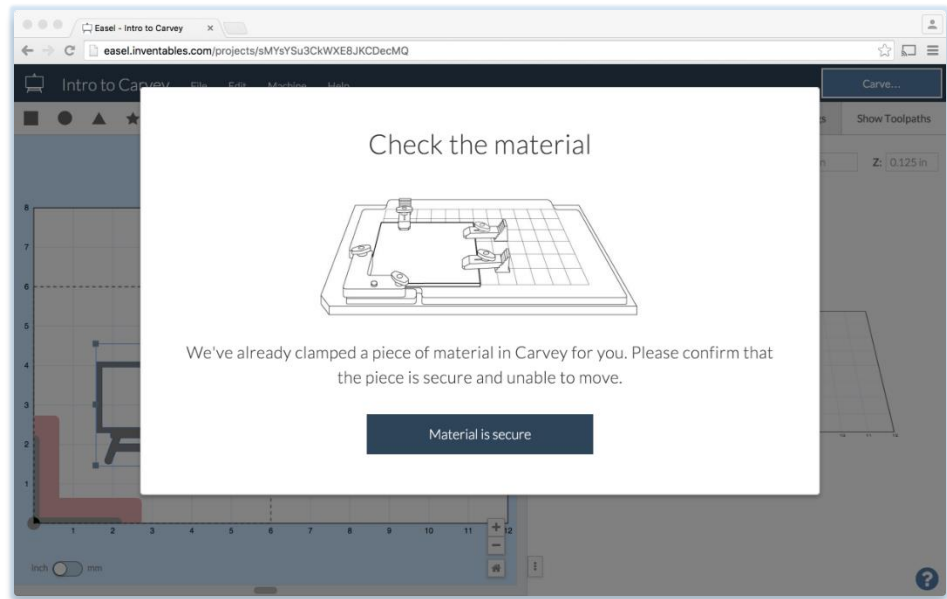


Z probe set up complete screen

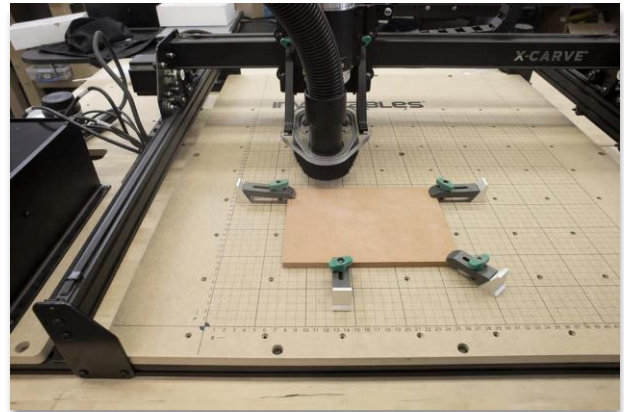


7. Securing the Material

Following the on screen prompt will show us the steps in settings up our carving project. We need to secure the material to the bed using clamps, bolts, and step blocks. If you are missing any of these, please let staff know immediately and we will do our best to resolve the issues. The picture to the right is showing the start up for the Carvey, but the screen will look the same with the X-Carve.



In the image to the right, you can see how these various pieces are used to secure your material to the Waste Board. You will line up the clamps on top of the step blocks and finally, using a bolt you will secure them to the bed of the X-Carve. If you plan to manually input a non-zero axis, then you need to be sure that the bottom left hand corner of your material is not obstructed by a clamp.



Be aware that clamps can interfere with certain designs. When designing or importing work into Easel, **be sure to account for the clamps**. We have measuring tape to help you accurately gauge the distances and areas that it is safe to cut.

8. Choosing an Endmill (Routing Bit)

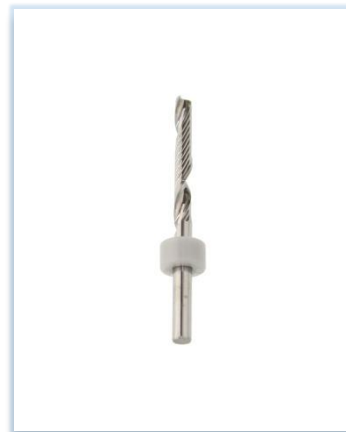
After securing our material to the Waste Board, we need to insert a routing bit (endmill). Provided by JCPL are 1/8" bits. We have Upcut routing bits in One Flute Spiral Upcut, Two Flute Straight bits, Two Flute Spiral Upcut bits and a compression bit. Every material cuts a bit differently and will require a different feed rate and depth per pass. Easel has some presets for commonly used materials that are an excellent place to start. Note that these presets are primarily designed for 1/8" and 1/16" bits. If you are using larger or smaller bits, you may need to adjust feed rates a bit to ensure proper carving performance

Upcut Bits

The **spiral upcut** bits pull chips from the cutting surface upwards, leaving a flat bottomed pocket. This provides accurate cuts without chatter in the plastic because the chips are being evacuated away from the cutting edges. This bit is not recommended for wood because it pulls the wood fibers causing tear out.

1/8" Single Flute Up cut

- Cutting Diameter: .125"
- Cutting Length: .87"
- Shank Diameter: .125"



1/8" 2 Flute Straight End Mill

- Cutting Diameter: .125"
- Cutting Length: .7"
- Shank Diameter: .125"



This end mill has a 2 straight flutes. It works well for materials where the lifting effect of a spiral flute might cause unwanted results, like wood or things with thin laminates or veneers.

1/8" Upcut Fishtail Spiral

- Cutting Diameter: .125"
- Cutting Length: .394"
- Shank Diameter: .125"

fishtail bits are great for fine detail and inlays. The upcut tip design creates a cleaner edge on the backside of the sheet when cutting through materials. The flute design works well with high speed spindles and high feedrates.

Upcut bits work especially well on materials that can melt when heated, like plastics.

Please note that these bits are solid carbide but are super sharp and brittle – they may break more easily than most end mills while milling, or if dropped.



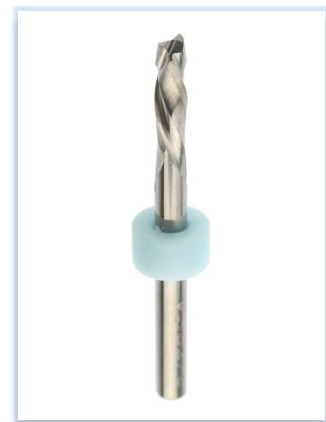
Compression Bits

Compression bits are great because they leave a nice finish on both the top and bottom side of your material. This is because they create both upward and downward force while cutting.

Upcut bits pull up on your material while cutting to help clear chips, but can create some chipping or a rougher finish on the topside of your material. **Downcut** bits push down on your material while cutting to create a nice top finish, but that can lead to some chipping or a rougher finish on the bottom side of your material. Choose a style of bit to match the type of cut and finish you'd like to achieve.

1/8" Compression Bit

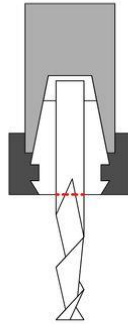
- Cutting Diameter: .125"
- Cutting Length: .25"
- Shank Diameter: .125"



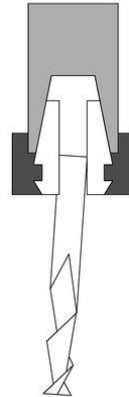
9. The Spindle

One of the most important aspects of inserting an end mill is making sure that the endmill is not too far inside the collet or too far down. The job will also mess up if the endmill is not securely fastened in the collet. If the endmill is not securely fastened, it may fall farther down in the collet and carve deeper into your material than is desired.

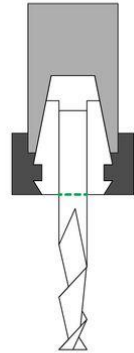
FLUTES INSIDE COLLET-
CHIPS MAY CLOG



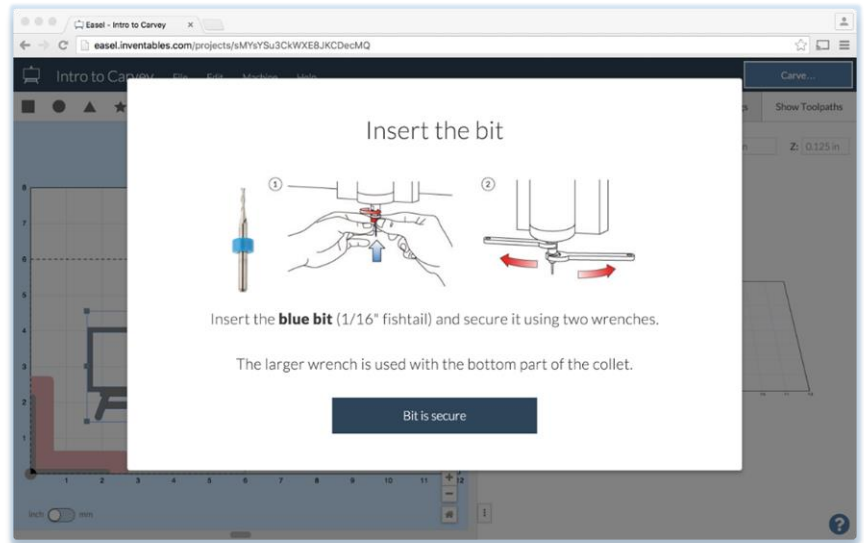
NOT ENOUGH PURCHASE-
END MILL MAY DISLODGE



FLUTES CLEAR OF COLLET /
ENOUGH PURCHASE FOR
SECURE END MILL



After choosing an endmill for your project, you will need to insert it into the Spindle. This requires removing the collet from the spindle, inserting the bit, and finally, tightening the collet back to the spindle.



STEP 1:



SUPPRESS
YELLOW
BUTTON ON
DRILL

STEP 2:



UNSCREW
COLLET FROM
SPINDLE

STEP 3:



INSERT THE
MILLING BIT
INSIDE THE
COLLET

STEP 4:



TIGHTEN
THE COLLET TO
THE SPINDLE
WITH WRENCHES

10. Last things before carving

At this point you should be ready to carve. Refer back to step number 6 to make sure that you have set up your project the way it should be set up. Make sure the ventilation system is turned on, and the dust shields are placed in the front of the machine. Then, if your material set up matches the display settings, then you're ready to carve. Turn the router on (on/off switch is on the left hand side of the router) and then click "carve now."

11. Cleaning Up

After carving, you will see a fair amount of dust and debris. Please use the ShopVac located in the creative space cabinet below the Carvey to clean up the work area.



Your project may need some finishing touches, such as sanding, routing, cutting, or millwork. Projects can be carved more than once, so don't be afraid to layer your design. When you are finished carving on your material, remove the bolts, clamps, step blocks, and Smart Clamp to release your project. Please remember place everything back in its container, including the endmill and vacuum up the mess made by the X-Carve.

15. CorelDRAW / CAM Software to Easel

- To import from CorelDRAW, save or export your design as an SVG file.
- Then after logging in to Inventables, close the "Get Started" popup box.
- Proceed to the Import Menu and select SVG. This will launch File Explorer and you can select your SVG file.
- Alternatively, if you have a traditional raster graphic (png, bmp, gif, or jpg file) you can use the Image Trace feature found in the Import Menu. This again, will launch File Explorer and allow you to select your file.
- Finally, if importing from CAD / CAM software, such as artCAM, Fusion360, V Carve, Aspire, Rhino, or MeshCAM, you will need to export or save your project as a g-code file. You can then import it into Easel by going to the File Menu and selecting Import g-code.

JCPL Approved Material

Material Dimensions

Materials officially approved for use in X-Carve should not exceed dimensions of Width (X-axis): 39.25 inches (100 cm), Depth (Y-axis): 39.25 inches (100 cm), Height (Z-axis): .75 inches (3.81 cm) –the clamps aren't very useful beyond this height- and are as follows:

JCPL Approved Materials for use with the X-Carve:

- ABS (Acrylonitrile Butadiene Styrene)
- Cast Acrylic / Plexiglas / Lucite / Perspex (Polymethyl methacrylate)
- HDPE (high-density polyethylene)
- Soft-Medium Natural Woods (Alder, Pine, Basswood, Bubinga, etc.)
- MDF
- Corian (Dupont Counter Top Surface)
- Birch Plywood (most plywoods but hardwood plywoods will be fine)

JCPL Banned Materials for use with the X-Carve

Banned Materials:

- PVC (including vinyl)
- Metal (including Aluminum and Circuit Boards)
- Styrofoam / Hobby Foam
- Treated or Glued Wood
- Ceramics

ABSOLUTELY NO PVC (INCLUDING VINYL), METAL, FOAM, TREATED WOOD, CERAMICS, OR PCB / CIRCUIT BOARDS ARE TO BE USED IN THE X-CARVE.