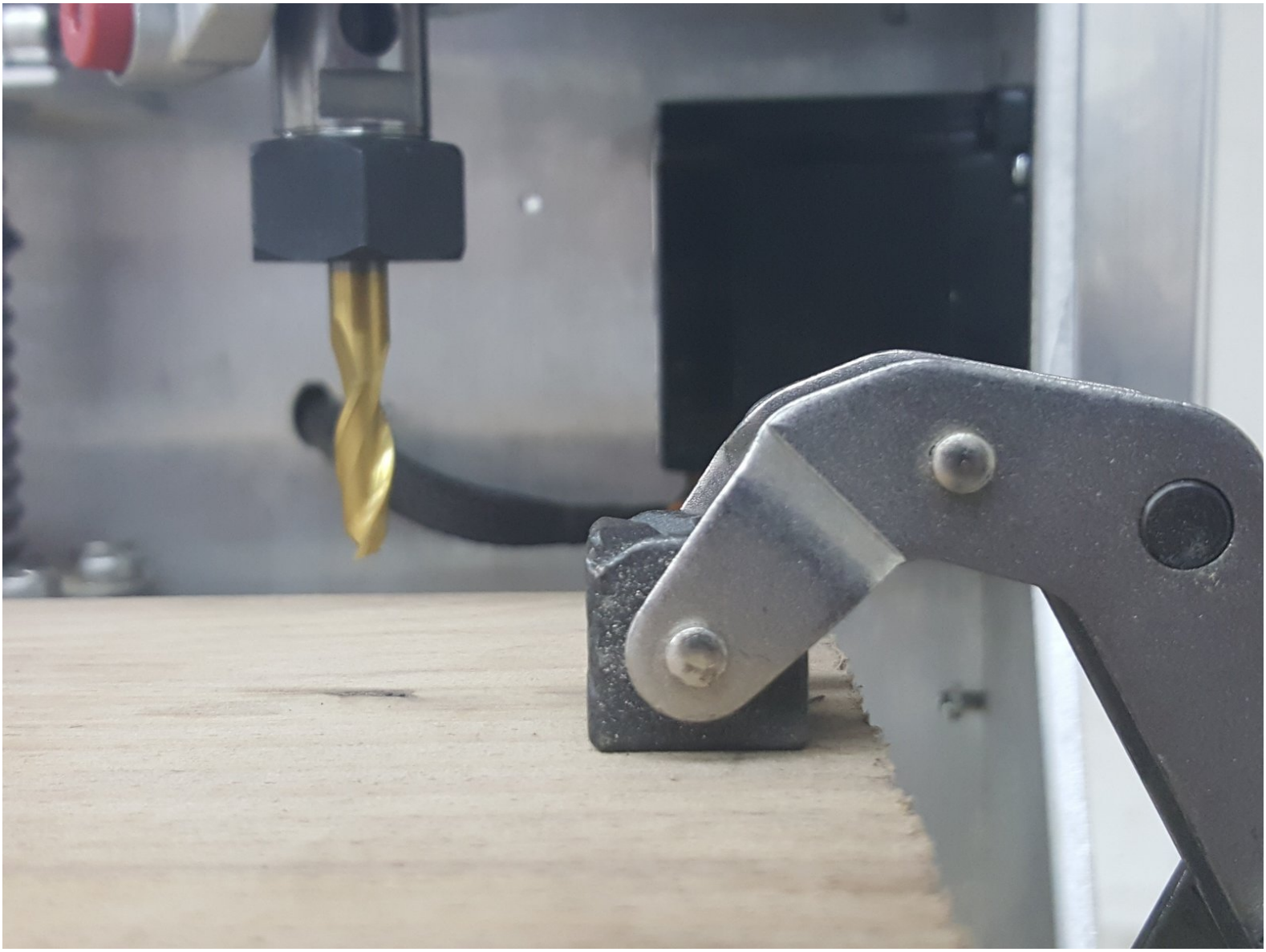
Mounting Material to Mill on BoXZY

This mini-manual explains how to securely mount materials into BoXZY for milling.

Written By: BoXZY



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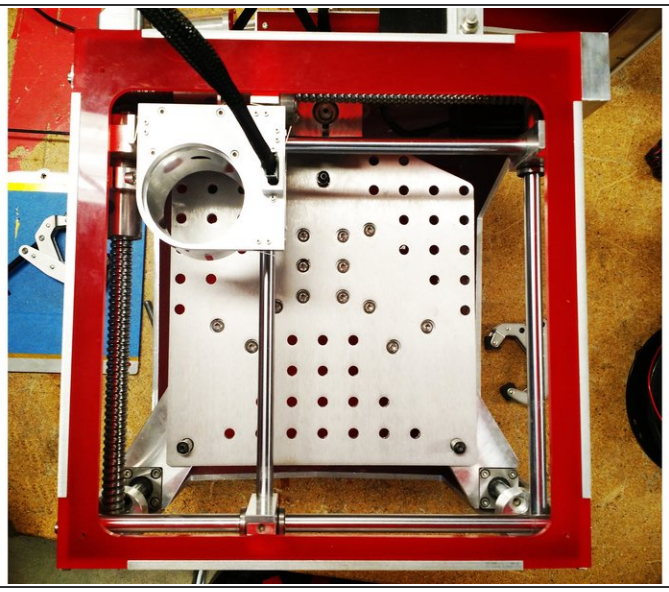
INTRODUCTION

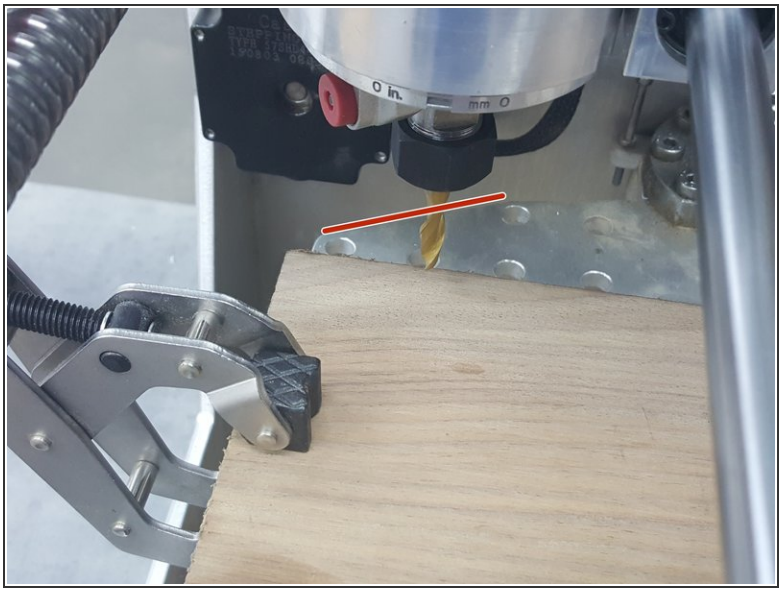
This is a mini-manual that expands on topics introduced in 2.3 CNC Milling with BoXZY.

By beginning this manual we assume you have read and understand the following manuals and wiki. If you have not read them, please review them now:

- 0.1 Preparing to Use BoXZY
- 1.0 BoXZY Safe Use
- 1.1 Un-Boxing Your BoXZY
- 1.2 Setting Up Your BoXZY
- 1.3 Using Your BoXZY

Step 1 — Just a Reminder





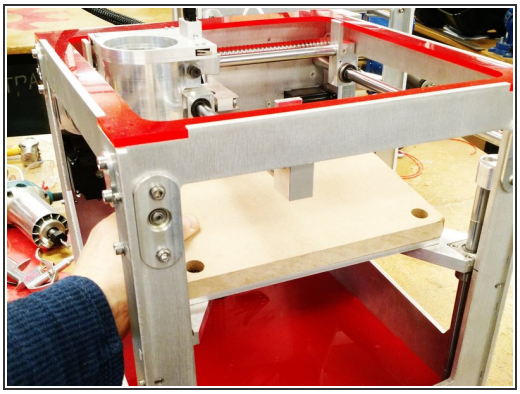
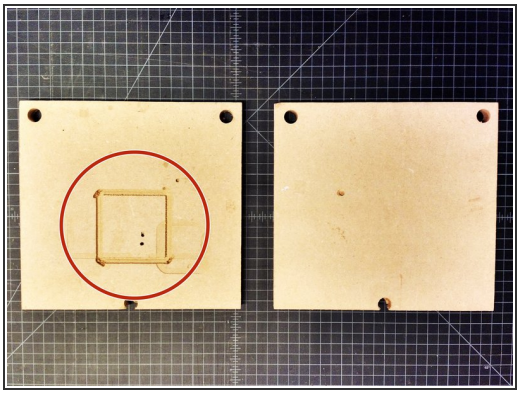
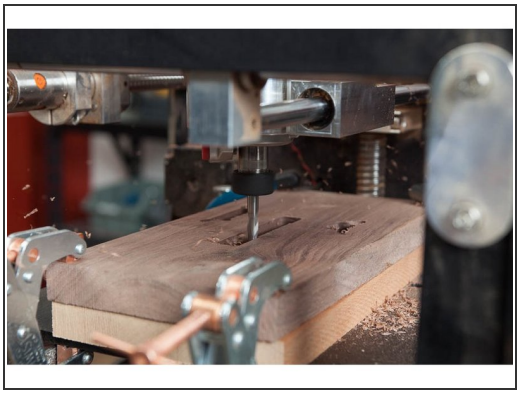
You want to send your machine to Machine Home using the interface home buttons when you first connect BoXZY to the computer and power it on. **Do not repeat this step or use a G28 command during any part of the milling setup process.**

You can use G1 commands to move your axes back to 0 during milling setup and operation.

You will have to lower your platform, by moving the Z in a positive direction, to create the clearance you need to mount your material.

Do not mount any material over the edge of the Milling Platform where it begins to taper towards the back of BoXZY, as seen in the **second image shown with a red line**. This would prevent the platform from moving up past that point.

Step 2 — The Sacrificial Board

When cutting **entirely through** a material, you need to secure a sacrificial board to the Milling Platform **under** your work material. This allows you to cut entirely through the milling material without cutting into the metal Milling Platform. We've provided you with one, as shown in the first image.

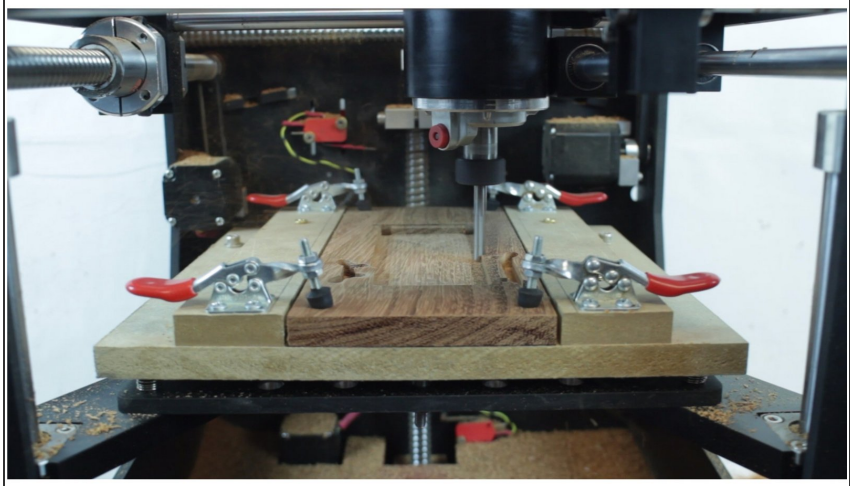
If you are engraving material or not cutting all the way through, you won't need a sacrificial board.

- The red circle in the second image shows where the user milled clear through the primary material into the sacrificial board. This is how you are able to cut all the way through your primary working material without damaging your platform.

You can mill a flat, recessed pocket into your sacrificial board to create a perfectly flat and level mounting surface for very high accuracy operations. Use this technique for milling and drilling PCBs, very thin material, or highly detailed engravings.

The sacrificial board can be any material that is easier to cut than the primary material you're cutting through. HDPE plastic and various soft woods are commonly used materials.

Step 3 — Workholding: Introduction



The process of holding down material for milling is called **workholding** or **fixturing**.

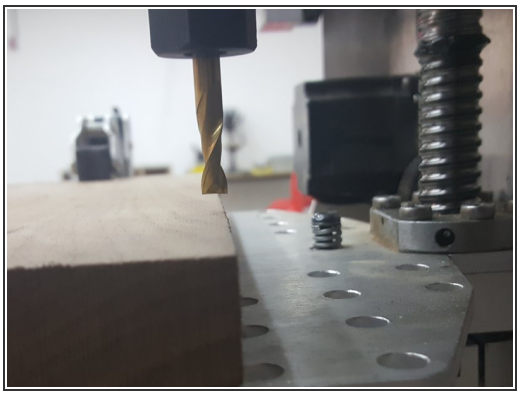
Many workholding methods use vises, clamps, or jigs. A **jig** is any prefabricated (made by you) holding mechanism that allows components to be repeatably milled from an identically sized piece of material.

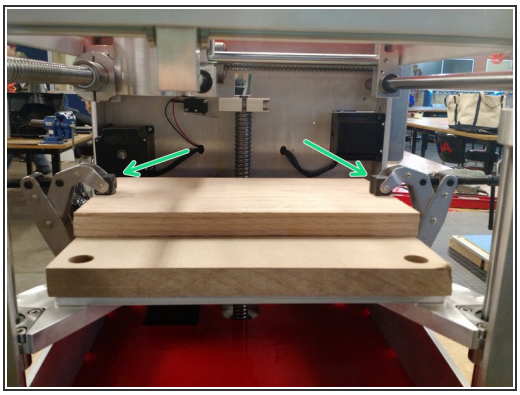
Leveling so the surface of your material is perfectly parallel with the X and Y movement may be necessary for precise parts. The fixture shown has been shimmed. Some common methods are:

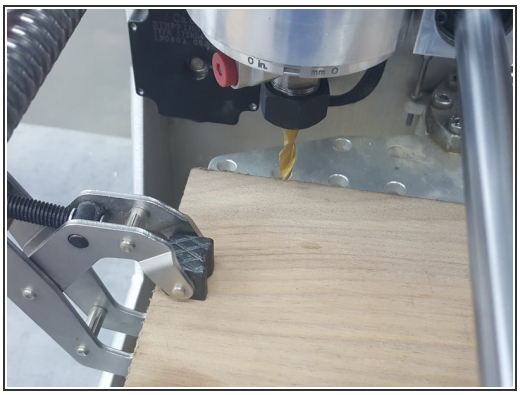
- Mill a pocket.
- Surface the entire X Y plane of the sacrificial board by using the mill
- Shim your material or sacrificial board, moving the mill and bit around to reference from.

In the following steps, we'll go over two simple methods of securely mounting material to mill on BoXZY. These mounting methods apply when using a sacrificial board or material by itself.

Step 4 — Workholding: Option 1



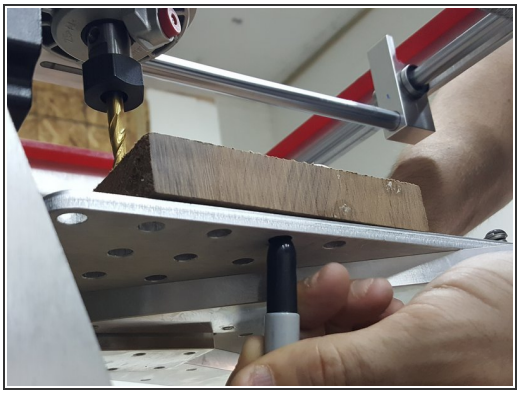


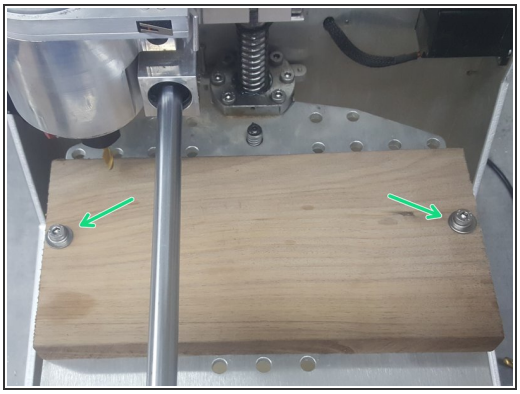


The first method is clamping the material directly to the Milling Platform.

- You will often want your material to be square or parallel with one or more axes.
  - You can align your material by temporarily inserting the Milling Head and moving one axis at a time, aligning the edges of the material to the bit at each end of the movement, as shown in the first image.
- Clamp both edges of your material to the Milling Platform once aligned.
  - Move each axis through its full range of movement to verify the clamps are not in the travel path.
    - If you are using cantilever clamps, like the ones that are provided with BoXZY Loaded, make sure the clamp is oriented so that the knob is on the top surface, as shown by green arrows in the second image. This will maintain a lower profile so that the clamps will not impact your machine when the Z is plunging.
      - One of the purposes of an **air pass** is to visually evaluate if your mounting method will allow contact during your milling operation.
- Tighten your clamps well. If your material moves while it is being cut you will not get good results and may damage your part and/or your bit.

Step 5 — Workholding: Option 2





- The second method is to drill through your material (and the sacrificial plate if it's needed), then bolt it to the Milling Platform using 2 or more of the holes drilled into it. You'll need to grab a marker or pen that can mark your chosen material.

  The best location to do this is at the very edges of BoXZY's platform, where the milling bit will not be able to reach. You won't always be able to avoid clamping within BoXZY's range of travel. We'll talk about how to account for this in the next step.

- You will often want your material to be square or parallel with one or more axes.

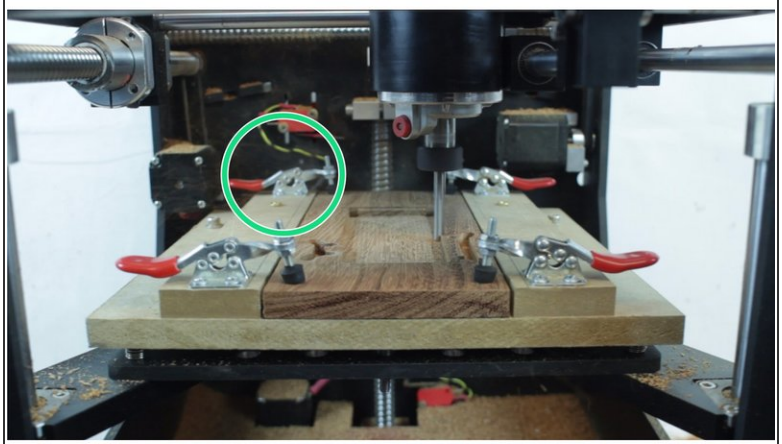
  You can align your material by temporarily inserting the Milling Head and moving one axis at a time, aligning the edges of the material to the bit at each end of the movement.

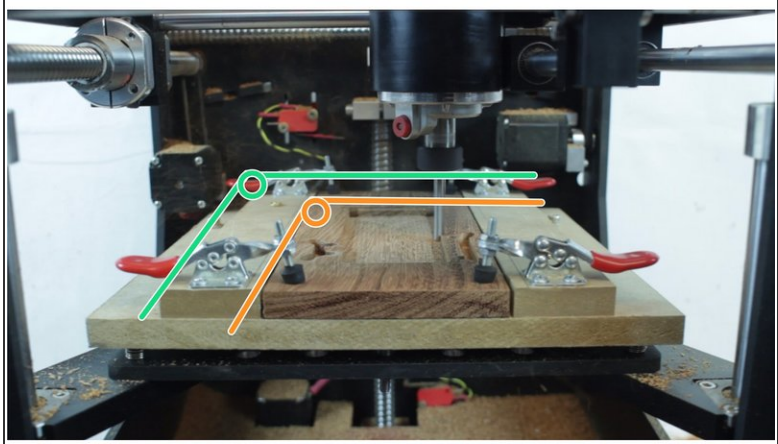
- Once the material is aligned, mark it through the Milling Platform from underneath, as shown in the first image.

- Take your material off of the Milling Platform and drill holes through it where you made your marks, as seen in the second image.

- Place your material back onto the Milling Platform and line up the holes you drilled to the holes on the platform. Using a bolt, washers, and a nut, bolt the material down through your holes, as shown by the green arrows in the third image.

Step 6 — Clamps Within the Travel Path





Sometimes you may be limited in your mounting options based on the process or material shape you're using. This may require clamps or hardware to be placed within the X and Y travel at Z0.

- An example can be seen in the first image of a fixture that has a clamp obstructing the **Machine Home** position, circled in green. "Homing" the X or Y axis at Z0 would lead to a crash.

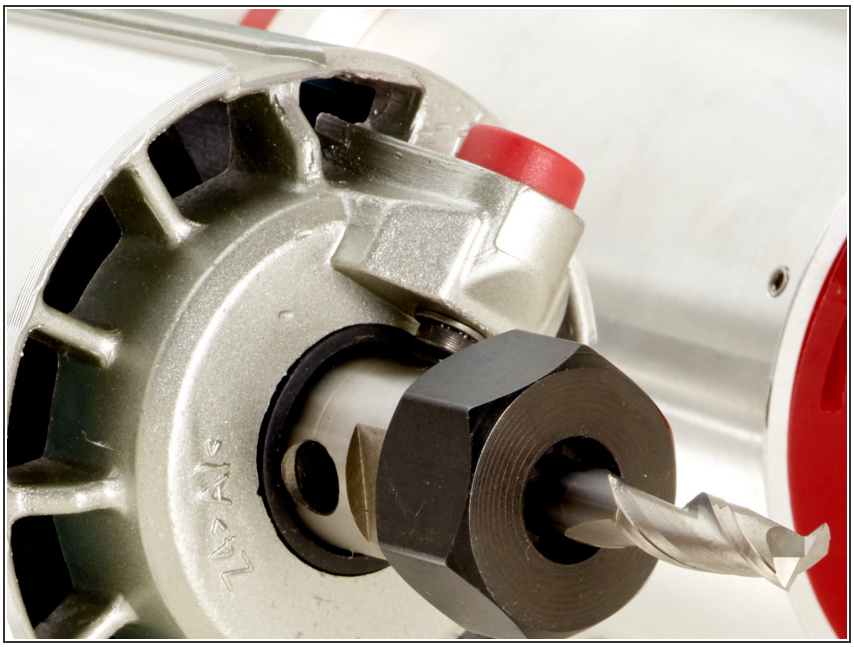
In a situation like this, you will need to establish an **"Offset"** for the X0 and Y0, creating a new starting point further inside BoXZY's platform, out of the way of the X and Y travel. We call this establishing a **User Home**.

- The second image shows the original X0 and Y0, or **Machine Home**, in green. We can set a **User Home** at X25 Y25, shown in orange. This way we create a home position *after* the clamp, so the machine can start from, and return to 0, 0 without crashing. Most importantly the Z can be set properly off the surface of the mounted material.

We discuss how to create an offset by setting a User Home in THIS manual.

This is also useful if you just want to mill on a **different** portion of the material blank without going back into your CAM program or re-mounting the material. Offset gives you control of what area the gcode script will execute over, *assuming the job is small enough to be moved around*

Step 7 — Return to the Milling Manual



- Return to 2.3 CNC Milling with BoXZY.