

## Information:

Forum thread, login info, etc.

## Safety at a Glance

CNC machines don't care what they're cutting, whether it is steel, or human flesh.

### Required:

- Safety Glasses
- Secure method of affixing material to cutting bed (if not machining through, fixing directly to the bed is okay, otherwise attach to a well-anchored sacrificial piece)
- an experienced machine operator (if this is not you, you must get someone to help you!)
- long hair must be tied back

### Optional (but recommended):

- Face Shield

### Not recommended (must have a reason why):

- Hearing Protection (The CNC machine isn't very loud, and you will be able to determine how well a particular job is running based on how the machine sounds)

### Prohibited:

- Gloves, loose clothing (NEVER near rotating machinery!)
- Unclamped Material (can be thrown off the machine!)

## Startup

1. With the power switched off at the wall (both plugs), clear all non essential material from the CNC working area.
2. Turn on both switches at the wall
3. Turn on computer
4. Log in with your LDAP account (please create one if you haven't got one)
5. Open LinuxCNC from the Programs menu
6. Click the red 'X' button to toggle the software emergency stop.

## Mounting Stock

1. The CNC machine will accept stock up to a thickness of 40mm for guaranteed clearance of the X-axis rail (left to right).
2. The best way to mount stock to the machine is to drill holes in the corners of your stock and screw your material directly to the spoil board (base).
  - a. This method requires that your stock has sufficient margins outside the dimensions of your cutting pattern so the mill does not run into the mounting screws.
  - b. If you are cutting through the entire thickness of your stock material, you need a piece of sacrificial material underneath your stock so that you don't damage the base when the cutter has cut all the way through.

## Inserting The Bit

1. Click the **orange** button at the top of the program window to activate machine control.
2. Move the Z axis up using the UP direction key until the cutter is above the top of the stock.
3. Unscrew the collar that holds in the tool collet in place:
  - a. Use a **spanner** of the appropriate size to hold the spindle still, there is a flat section on either side for this purpose. **DO NOT USE A WRENCH.**
  - b. While holding top still, unscrew the bottom half and take out the collet.
4. Find the appropriate size collet for your bit and insert it into the spindle.  
\*The current spindle can accommodate a tool up to ½ inch in diameter.
5. Reattach the collar and tighten it until the bit cannot rotate.

## Zeroing The Stock

1. For Z, put a piece of paper between the endmill and stock.
  - a. Move the bit downward using the DOWN key.
  - b. When the bit gets very near to the paper, set the control in the program from 'Continuous' to 0.1000 so that you are now lowering the Z-axis in steps.
  - c. When the paper can't be moved without ripping, consider that zero. Save this in the program by making sure Axis: Z is selected then click 'Home Axis'.
  - d. Set the mode to 'Continuous' again.
2. For X & Y, there are two methods, a) or b) below.
  - a. If you are using the entire stock (designed to fit between the mounting screws):
    - i. Turn on the spindle by pressing the green button on the controller around the back of the machine. Then press the upwards arrow button to increase the speed to about 8000.

- ii. Lower the Z to below the level of the top of the stock, AWAY from the stock.
- iii. Slowly drive into the stock from horizontally above the stock for Y and from the left of the stock for X. As soon as you hear the bit engage the material, consider that zero. Assign these by making sure Axis: X or Axis: X are selected then click 'Home Axis' for each.
- iv. For each axis, you must then click 'Touch Off' to offset the tool diameter.
  - 1. On the X-axis, you must input a minus sign '-' then a value equal to HALF the width of your cutting bit.
  - 2. On the Y-axis, you then do the same thing but without the minus sign.
- b. If you are NOT using the entire stock:
  - i. Raise the Z to above the level of the top of the stock, AWAY from the stock.
  - ii. Move the X and Y position until the mill is over where you want to start machining from (your 'Origin'). Assign these by making sure Axis: X or Axis: X are selected then click 'Home Axis' for each

## Dust Extraction

1. Once the axis have all been homed, raise the Z axis near the top of the axis.
2. Attach the foam vacuum collar to the black metal body of the spindle motor, around the spindle.
3. Attach the vacuum hose to the smaller hole in the collar.
4. Before starting the cutting program, make sure the vacuum is running.

## Running The Program

1. Check your **.ngc** file does not have any commands for tool-changes, which are usually something like '**G8**' followed by an '**H8**' command further down (actual numbers will vary). These commands will throw up errors when you try to run your program.
2. Load your program into the software with 'File ->Open...'
3. The key commands for running the program are as follows:
  - a. Begin program: **R**
  - b. Pause: **P**, Resume: **S**
  - c. Stop program: **ESC** (this will RESET the progress in software, regardless of how much the physical machine has actually cut)
  - d. Emergency Stop: **F1**
4. If you think the machine is struggling to cut at the current speed, you can reduce the movement speed using the '**Feed Override**' slider and moving it to the left.

# Shut down

1. Remove your tool(s) from the chuck.
2. Clean up the cutting leftovers. The next user thanks you!
3. Exit LinuxCNC & shut down the PC
4. Turn off both plugs at the wall