Change Log:

Rev B (1/10/17) Changed written document to include clearer photos and clearer language.

Rev C (1/23/17) Added instructions and pictures for using the old spindle vs the new spindle. (page 3)

About:

This document was written to describe the calculation process for the distance between the table and center of rotation of the A axis. It is to be used in tandem with several other documents included with the zip containing this document. When complete, users should have an accurate number that can be used for setting tools and part orientations within CAM. Note that each machine shipped by Pocket NC has been through this process and unless otherwise instructed, this process should not be required by its operator.

Notes:

Please read through this entire document before beginning the Calibration process

This document is for reference only! Readers and operators take on all liability in the use of this document.

All measurements are in inches

This document assumes the user knows basic functions of the machine. These functions include setting up the Pocket NC vise, transferring files to and from the machine, loading /running programs, setting up tooling and measuring tool length offsets.

Tooling setup for this calculation do not require that they be set up in the tool offset table.

All files talked about in this document can be found within the zip folder containing this document.

The Calibration Calculations spreadsheet, included with this document, uses columns to represent each iteration of the offset calculation process. Using a new column for each iteration will help users with the process by showing a linear progression by the documentation of past numbers.

The CNC program included with this document, (Test Part Rev B.ngc) is to be used at the risk of the operator or machine owner. Pocket NC does not take responsibility for any damage or injury caused by the use of this or any other shared program.

If using the old spindle, an additional step is required to offset tooling. This step is described in the Procedure section on page 3.

Required Tools:

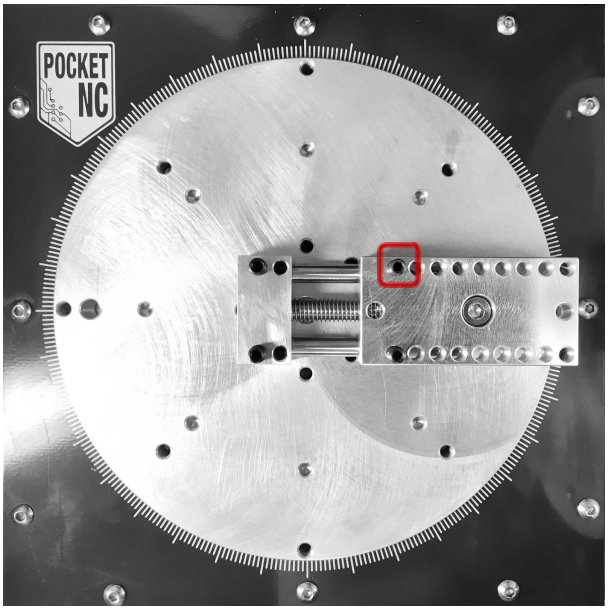
SAE or digital calipers

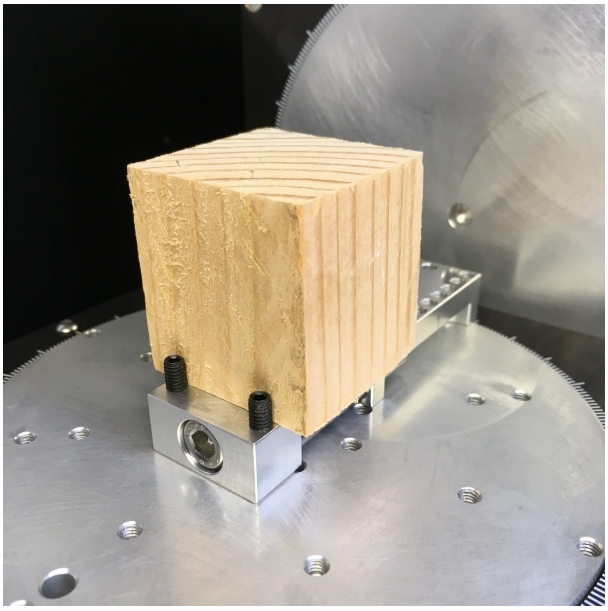
1.5” wood cube(s) Note that the wood material used in this tutorial is pine. Harder material may give poor results.

⅛” flat end mill .5” flute length or greater. **Set tool stick out ~0.75” from the extended tool holder.**

Procedure:

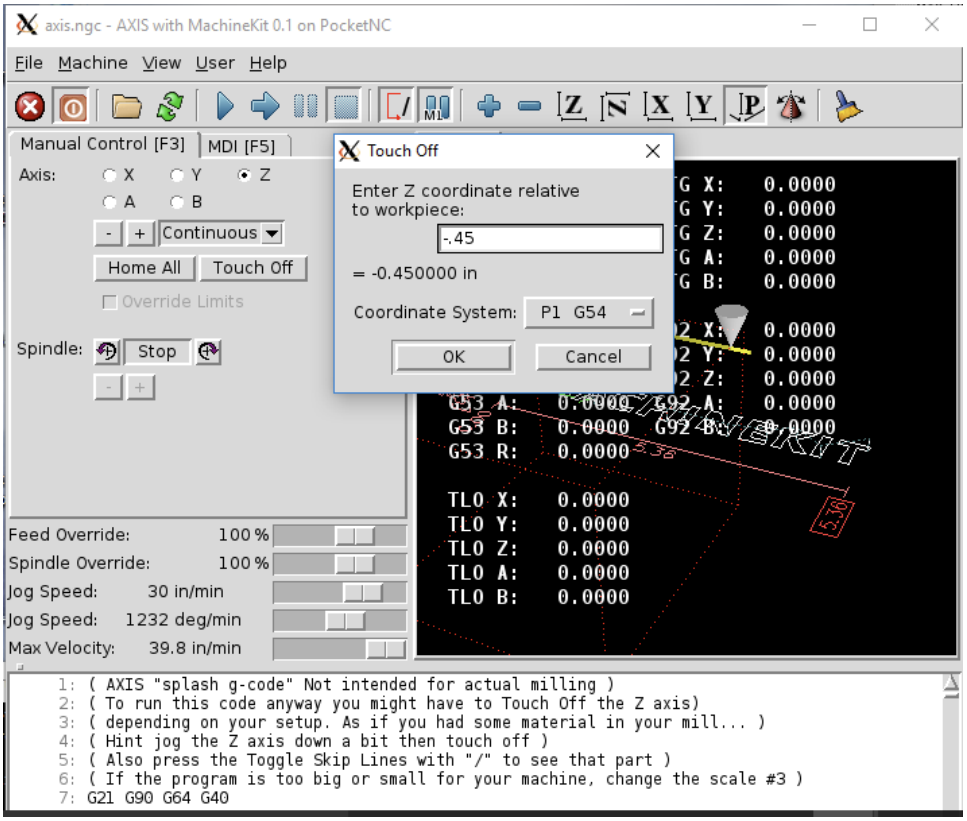
1. Power on Pocket NC Mill
2. Connect to the machine using computer or HDMI interface
3. Load the Machine Kit GUI and Home the machine
4. Install the ⅛” endmill into the spindle. Be sure tool stick out is ~.75”
5. Install a 1.5” wood cube into the Pocket NC vise using the setup in the following pictures.





6. Load the CNC program “Test Part Rev B.ngc” into the Pocket NC user interface.

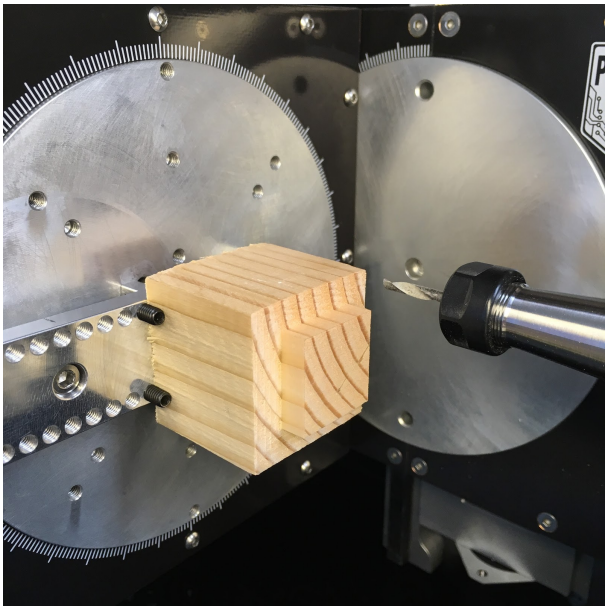
An additional step is required if using the old spindle to decrease tool cut depth. At this time, select the Z axis, then select “Touch Off” enter a value of “-.45”. Note that the output (tool length offset) within the spreadsheet will need to be reduced by .45 when using this method.

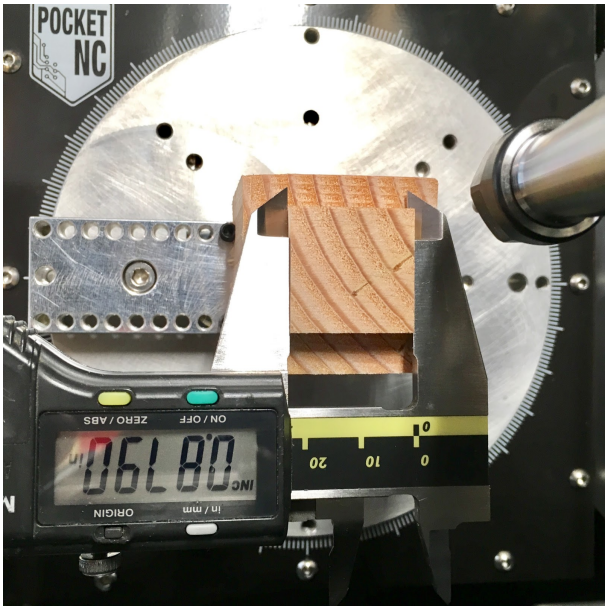


7. Run the program “Test Part Rev B.ngc”. **Note that tool should cut with a depth of .1” - .2”, if the cut should exceed .3”, stop the program and adjust the tool to have less stick out.**

Once completed, the program should leave an inset square similar to that of the following image. Be sure to clean all debris from the table and wooden block after every cut as even a single wooden shaving can offset measurements by more than .01”

8. Measure the internal square in the X dimension using calipers and record the information into cell B23 within the Calibration Calculations Spreadsheet.

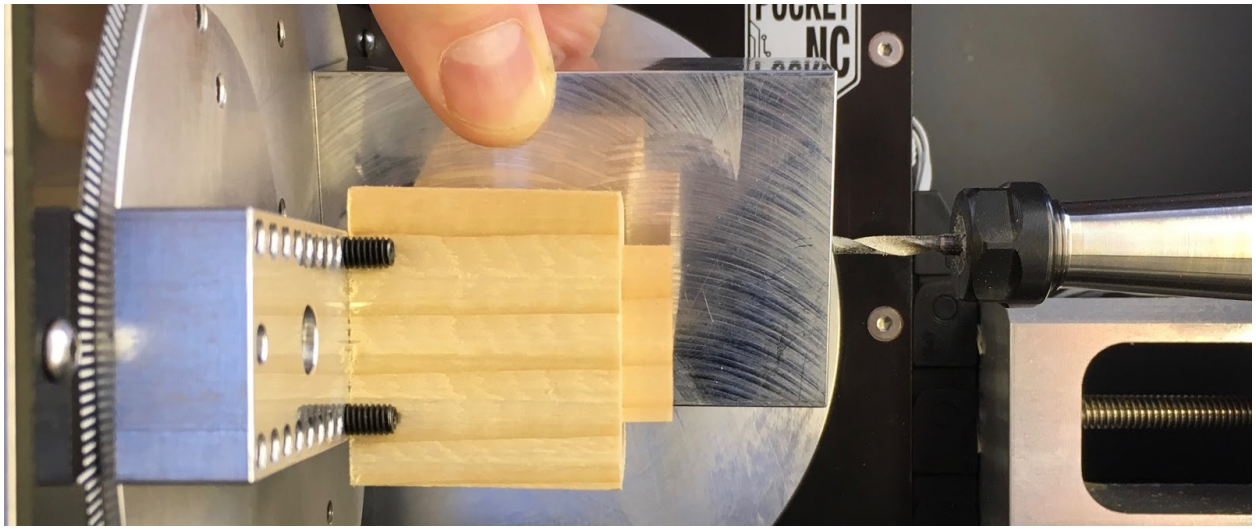




9. Measure the internal square in the Y dimension using calipers and record the information into cell B24 within the Calibration Calculations Spreadsheet.

10. Using a 1-2-3 block, measure the distance between the B Axis table and tool tip. See following image. Record the information into cell B25.

11. Input the number shown for Z axis position into cell B26

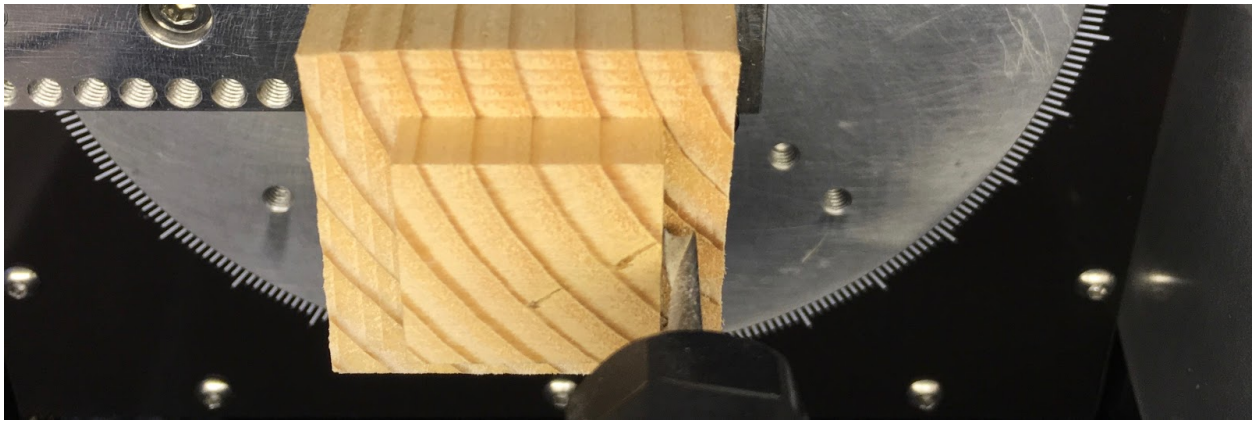


The next set of steps will be measuring the sides of the cut block using the side of the tool, while the tool is rotating. These measurement require listening for tool engagement

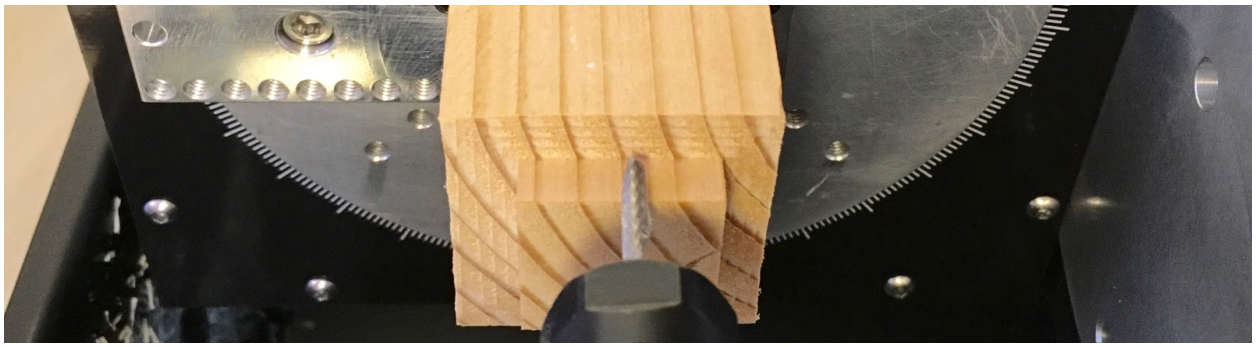
and should be performed in a relatively quiet environment. For the measurement to be accurate, the step increments should decrease in distance as the tool approaches the cut surface of the block. Ideally, the last step traveled as the tool engages the block, will be .001” or less. Use the Jog Increment drop down box located under the Manual Control tab to select travel distances other than continuous. A finer increment than .0005” is not necessary.

12. Turn the spindle on with a clockwise rotation using Gcode “M3 S5000”. This code can be entered manually using the MDI tab.

13. Using the strategy described between steps 11 and 12, touch the X+ edge of the cut block with the side of the endmill. See following image. Note that the endmill should engage the block side as little as possible. Should the tool engage the block with a step increment larger than .001”, a new spot along the X+ edge should be used to measure the engagement location. Input the number shown for X axis position into cell B27.



14. Using the strategy described between steps 11 and 12, touch the Y- edge of the cut block with the side of the endmill. See following image. Note that the endmill should engage the block side as little as possible. Should the tool engage the block with a step increment larger than .001”, a new spot along the Y+ edge should be used to measure the engagement location. Input the number shown for Y axis position into cell B28.

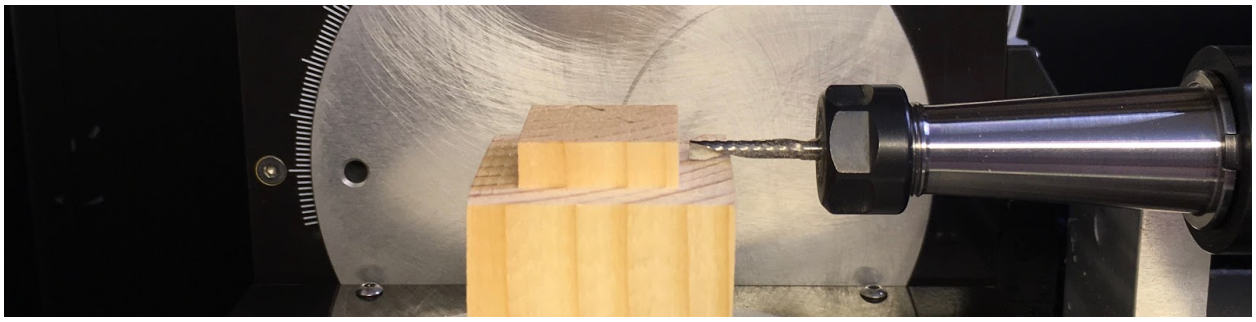


The next set of steps will measure the cut in Z and Y using the tool side and tip. For this, the A axis must be rotated -90 degrees to the A0.0 position. Before the table can be rotated, the tool must be in a location where it will not collide with the workpiece.

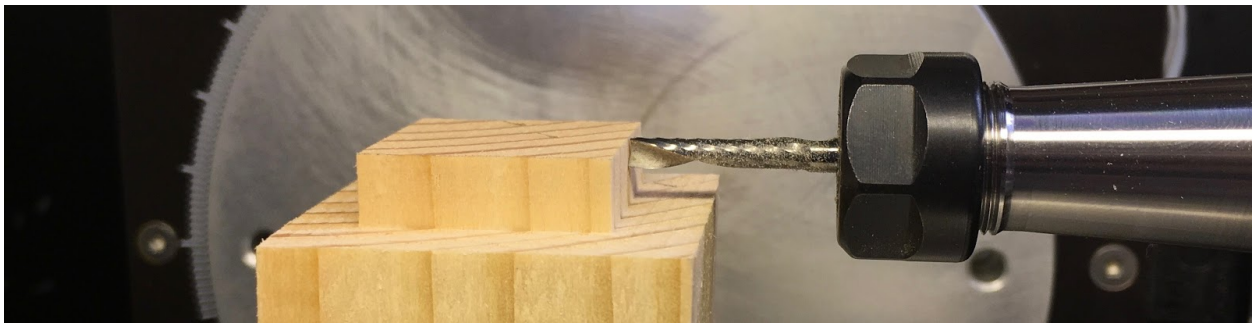
15. Jog the spindle to the Z+ position until fully retracted.

16. Rotate the A axis to A0.0 using the following Gcode “g90 g0 a0.”

17. Make the next measurement in Y using the same strategy as before. Input the number shown for Y axis position into cell B29. See following photo.



18. Make the next measurement in Z using the same strategy. Input the number shown for Z axis position into cell B30. See following photo.



This concludes the measurements required to calculate the rotational distance of the A axis to the B axis table. Repeating this process 3 - 4 times can increase the accuracy of the the process by finding the average of several measurements. When repeating the process, use cells C23 - C30 and so on. This will help users find the average of more than one measurement. Rotational numbers should be close to .87”, a number varying by more than .01” from this should be rechecked.

Calculated values can be found in cells B33 -B36. Record these values in a place where they can be easily accessed as they are specific to a machine and are used for setting tools and setting up parts within CAM.