

# Finding Your Way *Home* Manually, Version 1.1

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## Conclusion

When running Computer Numerical Control, loss of power can cause a loss of known position. The standard solution is to have Home switches that work with the software to move the cutter back to a unique location called *Home*. The workpiece's origin is defined relative to Home.

Without Home switches, it is still possible to perform this procedure if you plan ahead. Although not as fast as just pushing the Home button, this procedure only takes a minute or two. Unlike having a single Home location, this procedure lets you define any position as Home. Rather than call this location Home, I will call it the part's origin.

## The Full Story



It happens to everyone. You are running your g-code and the cutting is going well. Then the phone rings and the next thing you know you must be out the door in the next 5 minutes. Not much you can do but hit the Stop switch, shut down power, and degrease your hands.

The challenge comes later when you must power up and reestablish your reference position. If you have Home switches, it is easy. But I have not yet added that feature to my RF-30 mill/drill. Fortunately, I did plan ahead so it was just a few minutes before I had my end mill back to the part's origin.

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<sup>1</sup> You are free to distribute this article but not to change it.

## Defining The Part's Origin

The key is to plan ahead. After setting up the fixture and mounting my stock for the first time, I moved my end mill to  $X = 0$ ,  $Y = 0$ ,  $Z = 1.250$ . Then I took a few measurements. I needed to have a  $Z$  of 1.250 inches so the cutter would clear the part.



At the left end of my table, I measured the distance in to the apron. It was 4.1165 inches.

Note that you are limited by the range of the caliper.

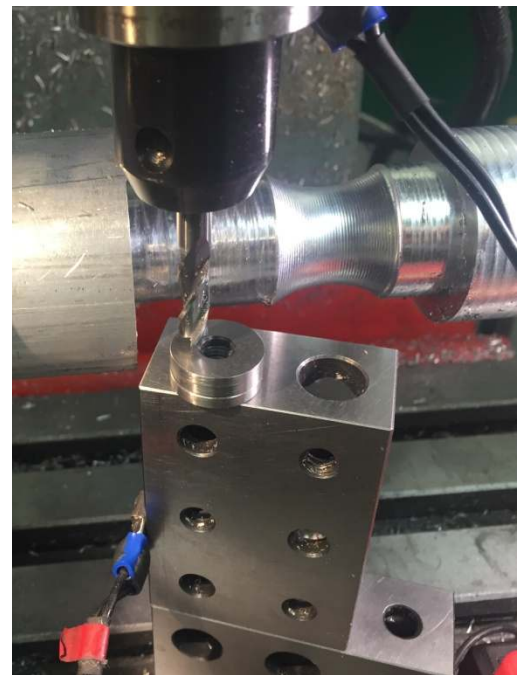


Did the same thing between the front of the base casting and the apron along the  $Y$  axis. It measured 2.5940 inches.

I knew from making the  $A$  axis tailstock that the center of rotation was 5.135 inches above the table. That is also my  $Z = 0$ . After moving away from the part, I lowered the cutter. After touching down the cutter on my

1-2-3 blocks and spacers, I just needed to zero my  $Z$  axis.

These three numbers represent the origin for this part and were saved in my shop notebook.



## Going To the Part's Origin

This procedure assumes that a positive movement of the cutter with respect to the table causes the table to move to the left along the X axis and towards the front along the Y axis. Raising the cutter is positive movement along the Z axis.

When there is a disruption that causes a loss of location, it is time to pull out the location of origin for this part (4.1165, 2.5940, 5.135).

There are a few ways to use these numbers. The most obvious method is to jog an axis until it reads the previously measured number. But hey, this is CNC! Why not let the computer help us get Home.

1. Raise the cutter so it can't hit anything.
2. Move the table so the we are near the X value of home.
3. Measure the distance with the caliper.
4. Subtract the Home number from the measured value. Call it  $vvv$
5. Zero the X DRO and then use  $G0 Xvvv$  to move the table to Home.
6. Zero the X DRO again.
7. Using the caliper, verify that the measured distance is equal to the Home value.

Repeat this procedure for the Y axis.

For the Z axis, I repeated touchdown on the stack of 1-2-3 blocks and spacer.

Example:

1. I verified the cutter is high enough not to hit anything.
2. Then I moved the table so the left end is close to Home for this part.
3. Using the caliper, I measured 2.9245.
4. Measured - home =  $2.9245 - 4.1165 = -1.1920$
5. Zeroed the X DRO and then moved to -1.1920
6. Zeroed the X DRO again.
7. And finally, I measured the distance and read 4.1160. That is within the repeatability of the caliper.

Note that by using the same caliper to both measure the part's origin and to find origin, we are relying only on the repeatability of the instrument. This is more accurate than looking for an absolute number.

After version 1.0 of this article was published, I received an email from Richard of the Yahoo Mill\_Drill group:

"Just a small extension to your method. Given that you have no Home switches, one additional option is to ALWAYS manually drive your table to the center of travel in both X and Y. This will be your virtual but permanent Home.

A couple of sharpie marks will roughly locate it. Then use your caliper to determine your standard offsets to get you Home. Drive to achieve the standard offsets as you discussed. Then set X and Y to zero. You are now Home.

Within your CNC software set your maximum travel limits to be + and - half of your X and Y travel. When generating your g-code with your preferred software, move the designed object so it is centered around X0 Y0. Then generate your g-code. As long as the item is smaller than the operating limits of your machine you will now never hit limit.

Of course another very basic option is to manually CNC drive to the sharpie marks then drive to 0.0 on the graduated dials then set CNC zero off these. Provisos - Always drive to 0.0 in the same direction, Never move the graduated dials! You now have home to within a thou! No need for calipers!"

### **Acknowledgments**

Thanks to Corey Renner for helping me understand the value of Home switches. One of these days I will certainly add them. Thanks to Richard for his insights on where to set Home.

I welcome your comments and questions.

If you wish to be contacted each time I publish an article, email me with just "Article Alias" in the subject line.

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