intelitek

CNC Milling

ACTIVITY 5 HARDWARE TASKS

Name	Class/Period	Date

1. Overview

In this hardware task you will home your milling machine and define the workpiece origin.

2. Performance Objectives

After completing these hardware tasks, you will be able to:

- Home the mill.
- Set the workpiece origin.

3. Required Materials

You need these materials to complete the hardware tasks:

- CNC milling center with installed mechanical vice
- Connected computer with CNCMotion
- 0.125 inch or 3 mm end mill (in a tool holder)
- Hex Allen wrench
- Machinable workpiece
- Small piece of paper

4. Safety and Inventory Checks

Before beginning the hardware task, review this checklist.

- ☐ Ensure that your lab station passes the safety guidelines
- ☐ Complete the inventory and safety checklists for your lab station.
- ☐ If there is a tool in the spindle and you need to construct a vice, remove the tool before constructing the vise.

5. Hardware Tasks

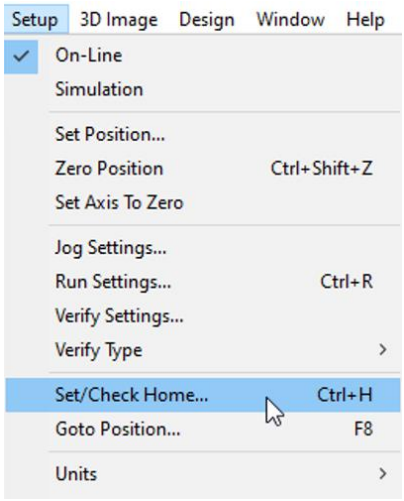
5.1. Preparing the Milling Station

ⓘ ***Note:*** *If required, review the previous activities and hardware tasks for any procedures that are not described in full.*

Follow the steps below to prepare the hardware.

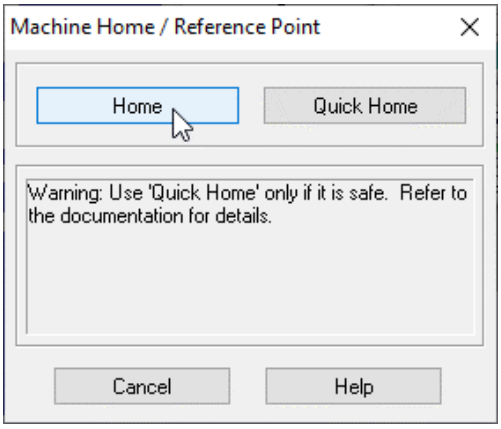
1. Ensure that Emergency Stop button is released.

2. Turn on the power switch.
3. Run CNCMotion (If required, use the launch button in the activity), and ensure that it is connected to the mill (**Setup > On-Line**).
4. Close the safety shield.
5. Select **Setup > Set/Check Home**.



The Machine Home/Reference Point dialog box is displayed.

6. Click **Home**.



The spindle and cross-slide are sent to the top-right-rear corner of the work envelope. The spindle and cross-slide are moved to the home position along the Z, X, and Y-axes, in that order.

7. Open the safety shield.
8. Secure a workpiece to the vise.
9. Secure the end-mill in the tool holder and insert the tool holder into the spindle. Ensure the tool is installed correctly by holding the tool by the flange of the tool holder and turning the tool and spindle. Check to ensure the tool and spindle spin concentrically.

10. Open the Setup Tool Library **(Tools > Setup Library)** and confirm that Tool 01 is defined as an end mill that you installed.

11. Select Tool 01 **(Tools > Select Tool)** for use in the spindle.

5.2. Touching off the top of the stock (Z=0)

You will now touch off the sides of the stock to define the workpiece origin. You should have performed a similar procedure in the online activity.

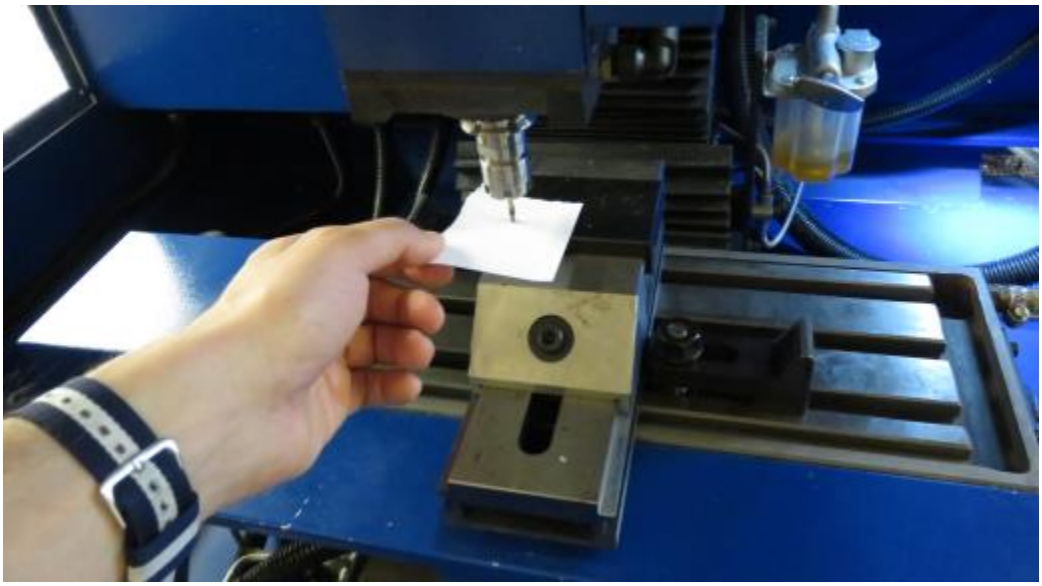
Follow the steps below to touch off the top of the stock (Z=0).

1. Take a small piece of paper and place it on top of the workpiece.

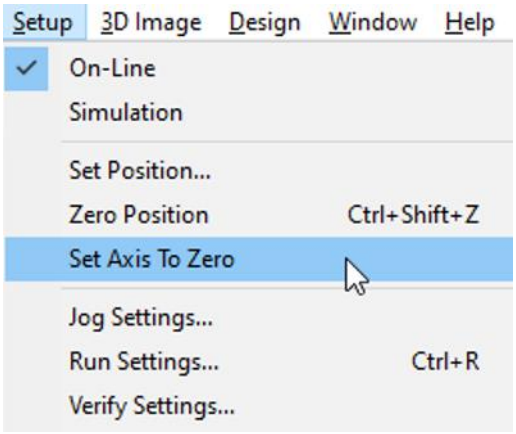
2. At medium speed and continuous motion, carefully jog the tool down until the tool tip is above the top of the workpiece.

3. Switch to the medium step size. Carefully jog downwards until the tool tip is just above the paper.

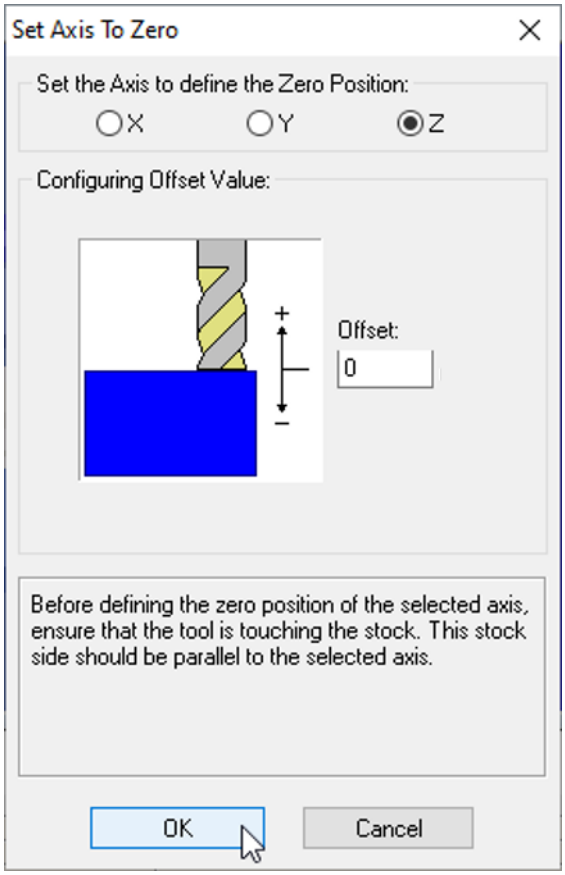
4. Switch to the smallest step size. Carefully jog the tool downward until the tool tip just pinches the paper. Check this point by trying to move the paper after each step. When you can no longer move the paper, you have reached the position.



5. Navigate to **Setup > Set Axis to Zero**.



6. Select **Z** and then click **OK**.



7. In the Actual Position window, verify that the Z value reads 0.

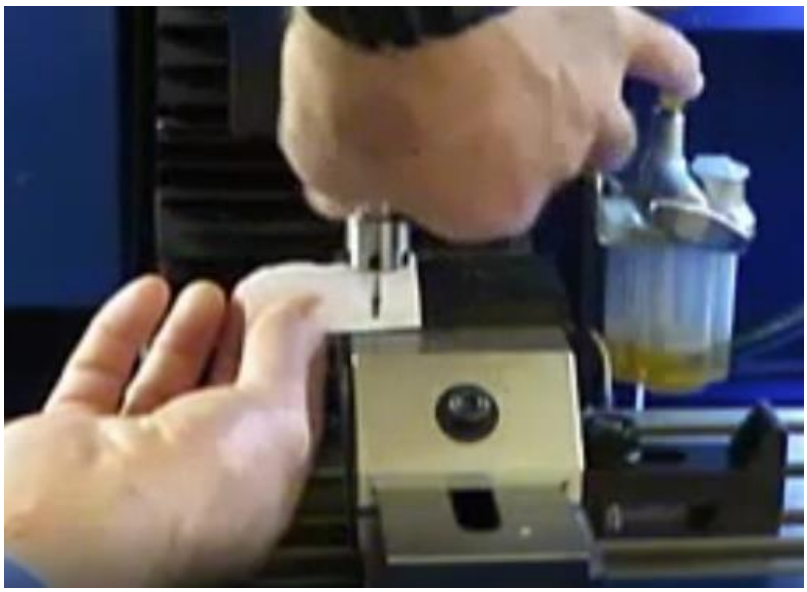
5.3. Touching off the Front of the Stock (Y=0)

Follow this procedure to touch off the front of the stock (Y=0).

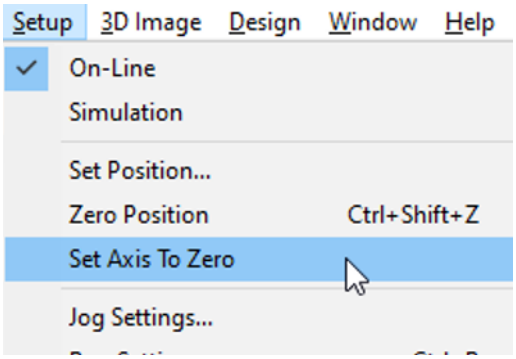
1. Jog the tool up, away from the surface of the workpiece. When you are a small distance away from the workpiece, switch to continuous motion and move the tool about 0.5 inches (13 mm) above the workpiece.
2. Carefully jog the tool along the Y-axis until it is about 0.5 inches (13 mm) in front of the workpiece.
3. Jog the tool down the Z-axis until about half the length of cut is alongside the front of the workpiece.
4. Hold the piece of paper against the front of the workpiece.
5. Switch to the slowest speed and jog the tool closer to the paper. Stop when you are just next to the paper.
6. Switch to the lowest step size and jog the tool as close to the workpiece as you can without causing an impact.

ⓘ ***Note:*** *It is helpful to use a partner for the next step.*

7. Carefully jog the tool toward the stock until the cutting edge just pinches the paper. Check this point by trying to move the paper after each step while rotating the tool manually. When you can no longer move the paper, you have reached the position. You can see a video of this step on the course page.



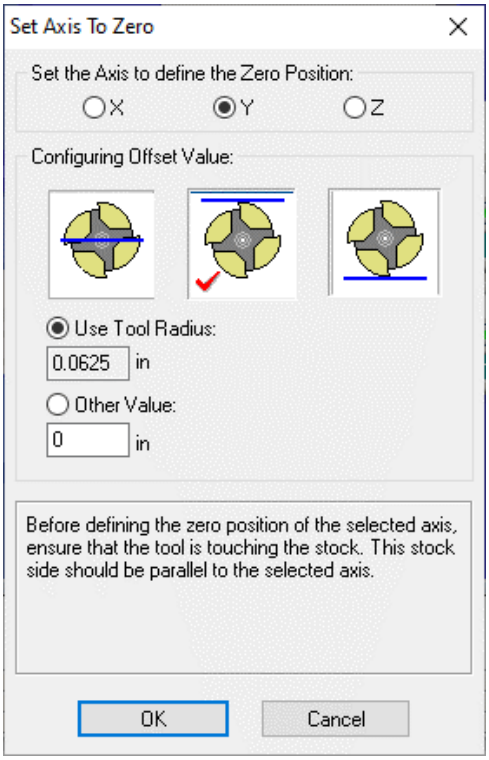
8. Navigate to **Setup > Set Axis to Zero**.



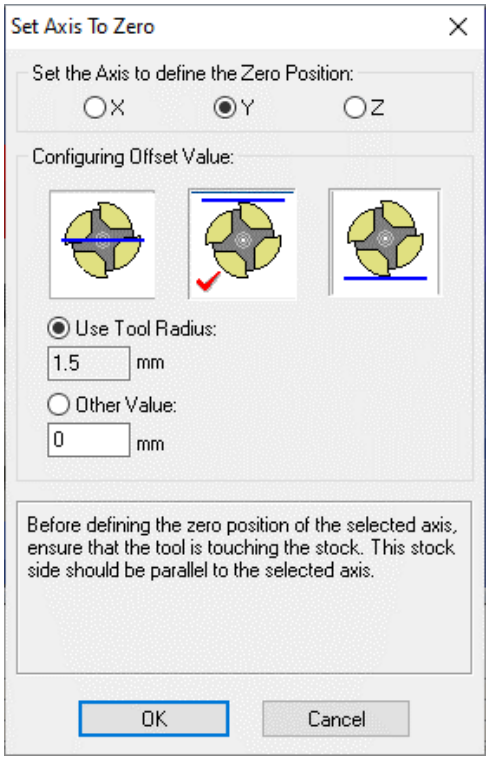
9. Complete the fields in the Set Axis to Zero dialog box as follows:

   - Select **Y**.
   - Select the **middle graphic**, as the back side of the tool (closest to the spindle column) is touching the stock.
   - Select **Use Tool Radius**. The distance from the centerline of the tool to the side of the workpiece on the **Y-axis** is entered **automatically**.

Imperial



Metric



10. Click **OK**.

11. In the **Actual Position** window, verify that the Y value reads **0.0625 in / 1.5 mm**.

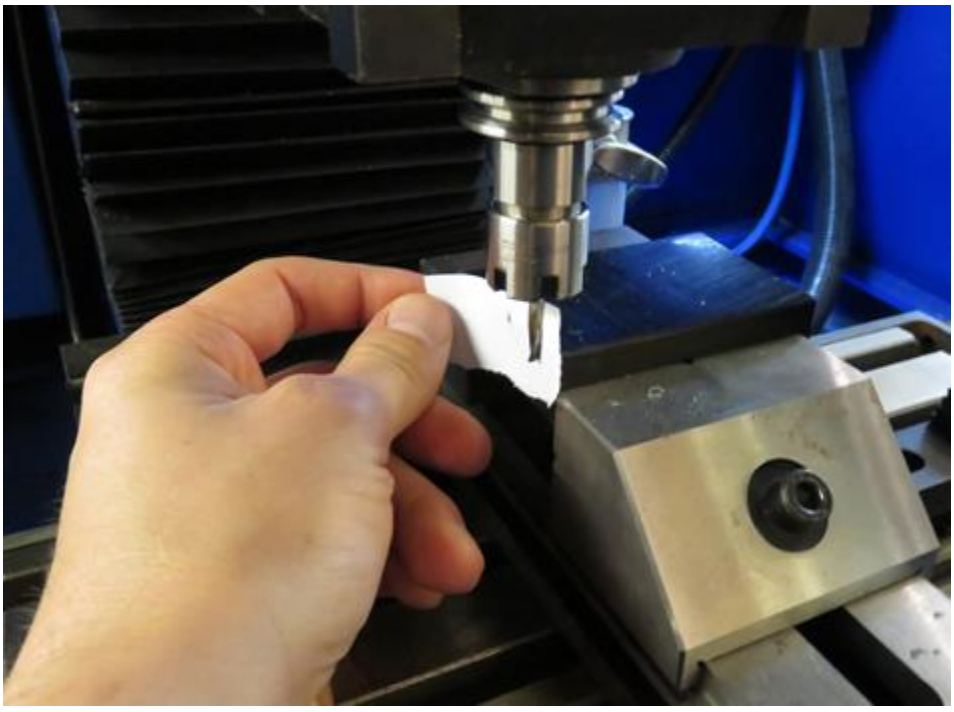
5.4. Touching off the Left Side of the Stock (X=0)

Follow the steps below for touching off the left side of the stock (X=0).

1. Carefully jog the tool forward, away from the surface of the workpiece.
2. Using continuous motion, carefully jog the tool along the X-axis until it is to the left of the workpiece.
3. Jog the tool towards the back of the machine until about half the length of cut is along the left side of the workpiece.
4. Hold the piece of paper against the left side of the workpiece.
5. Carefully jog the tool towards the workpiece.
6. Switch to the medium step size and jog the tool closer to the paper. Stop when the tool is just next to the paper.

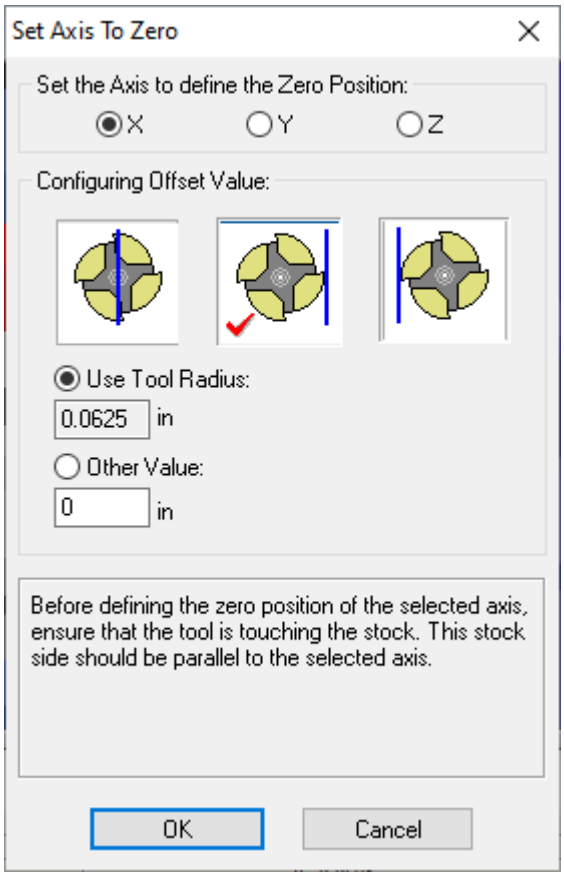
ⓘ ***Note:*** *It is helpful to use a partner for the next step*

7. Switch to the lowest step size. Carefully jog the tool back until the cutting edge just pinches the paper. Check this point by trying to move the paper after each step while rotating the tool manually. When you can no longer move the paper, you have reached the position.



8. Complete the fields in the Set Axis to Zero dialog box as follows:
   - Select **X**.
   - Select the **middle graphic**, as the right side of the tool is touching the stock.
   - Select **Use Tool Radius**. The distance from the centerline of the tool to the side of the workpiece on the **Y-axis** is entered **automatically**.

Imperial



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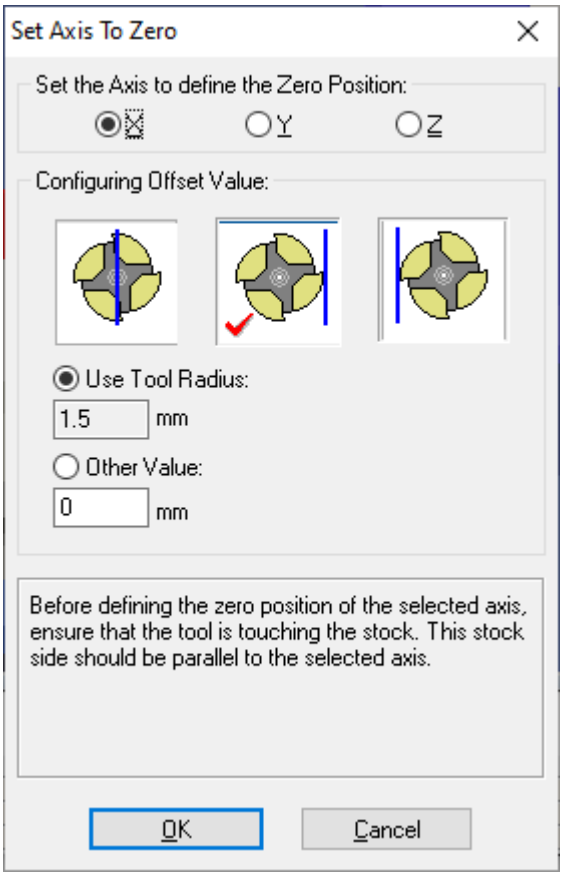


9. Click **OK**.
10. In the **Actual Position** window, verify that the X value reads **0.0625 in / 1.5 mm.**

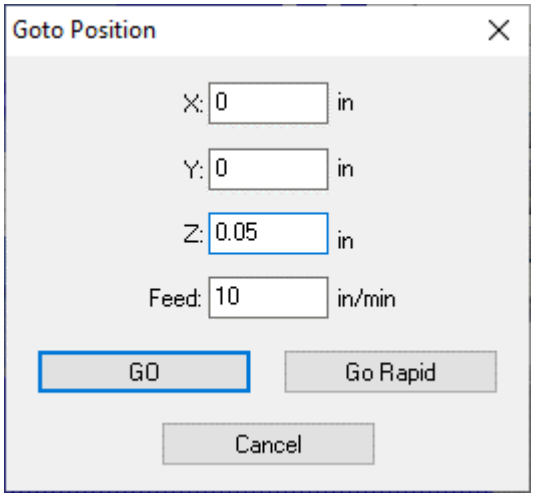
6. Verifying the Workpiece Origin

Follow the steps below to verify the workpiece origin:

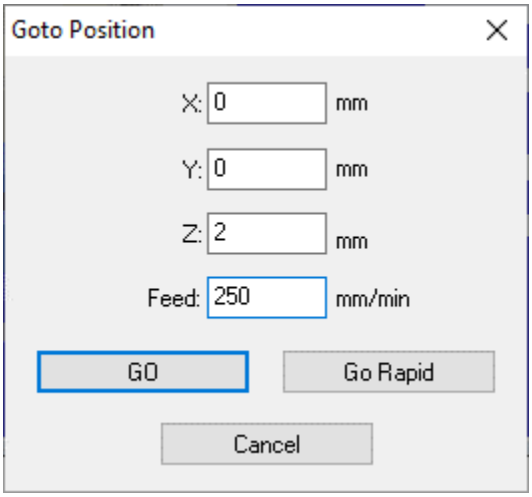
1. Close the safety shield.
2. Switch to continuous motion and carefully move the tool away from the workpiece in all axis directions. Ensure that the tool tip is above the top of the stock.
3. Navigate to **Setup > Goto Position**.

4. Enter the values as shown:

Imperial



Metric



5. With one hand on the Emergency Stop button to prevent potential accidents, click **GO** to move to the specified position.
6. The tool is moved to a position just above the workpiece origin. The X and Y edges of the stock should align with the centerline of the tool.

7. Authentic Skills Assessment

Have your instructor verify that your work meets the requirements in the Performance Objectives and sign below. Keep this hardware task sheet for future reference.

Instructor Signature	Date

8. Inventory and Shutdown

Unless instructed otherwise by your teacher, complete each of the steps below.

1. Home the machine.
2. Open the safety shield.
3. Carefully remove the tool holder with the tool from the spindle and store it away.
4. Remove the workpiece from the vise and store it away.
5. Close the safety shield.
6. Exit CNCMotion and switch off the milling center.