

CAM Blank Manufacturing for ME324

Part 1 – Cut Plexiglas Squares

A sheet of ¼ -inch thick Plexiglas can be purchased from Fort Collins Plastics. A 4' by 8' sheet will make 105 squares.

Contact Information:

Fort Collins Plastics
1101 Academy Ct.
Fort Collins, CO 80524
(970) 225-3835

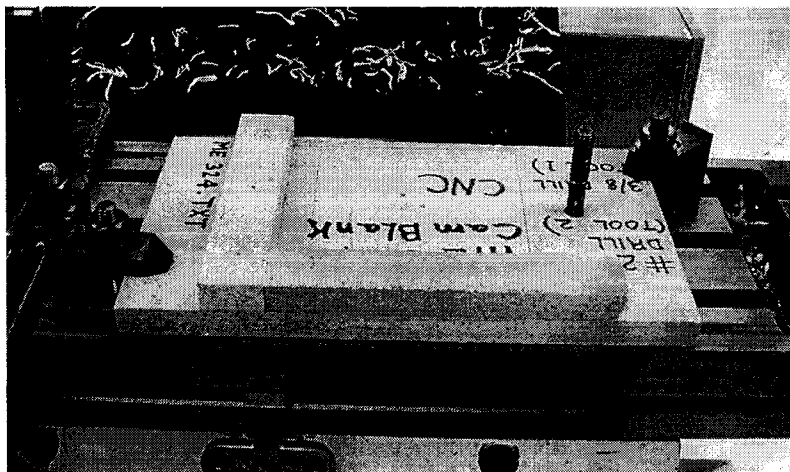
Driving Directions: (From Campus)

Take Prospect east past the light at Riverside Ave.
Turn left on Academy Ct. between Riverside and Timberline.
Fort Collins Plastics is in the cul-de-sac at the end of the street.

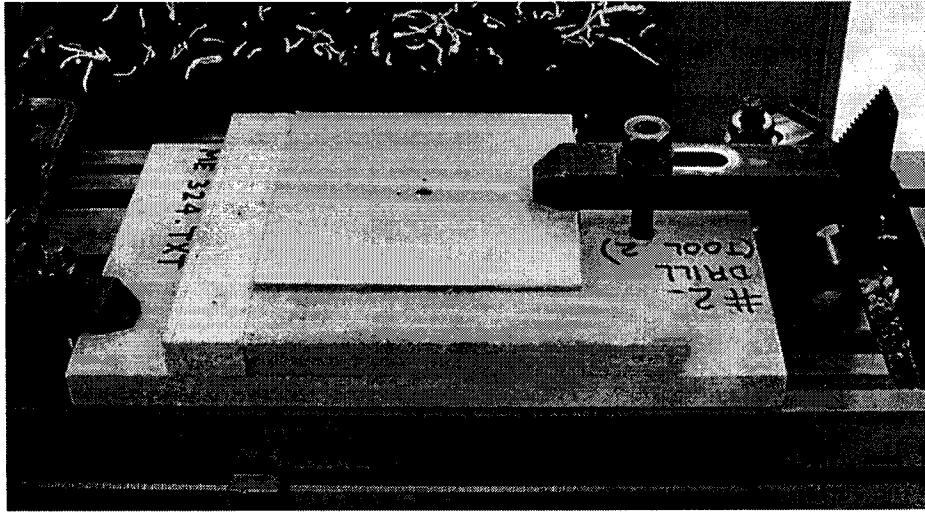
Use a table saw to cut the plastic into 6-inch squares. Be sure to wear long sleeves and a face shield – Plexiglas is known to chip during cutting!

Part 2 – Drill Holes using CNC Mill

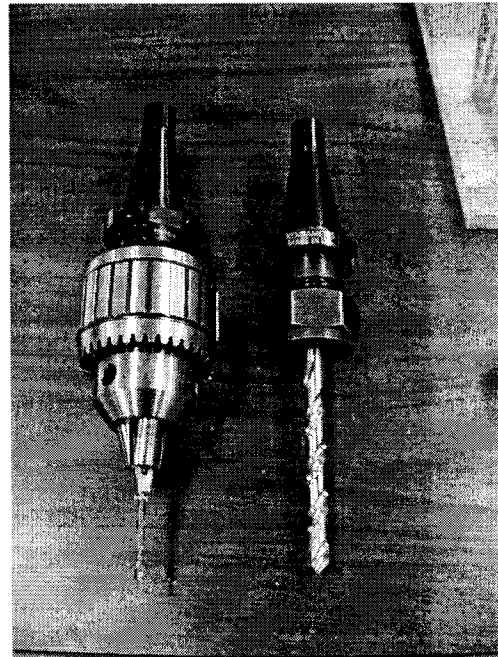
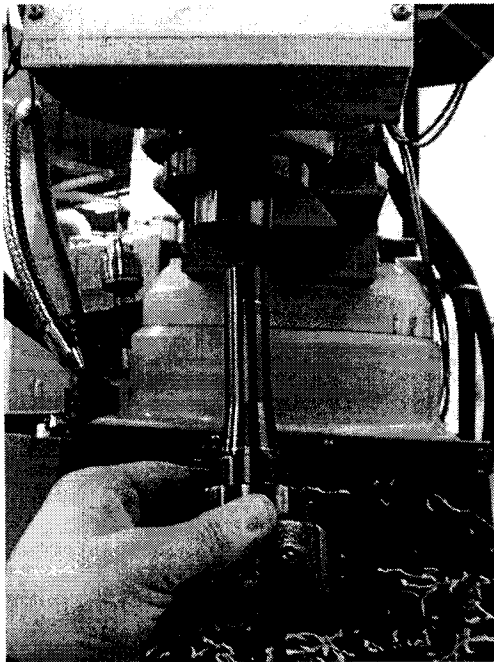
There is a wooden jig located in the metal cabinet in the MIL office. The name of the program and size of the drills necessary are clearly labeled on the jig. Mount the wooden jig to the CNC table as shown. A shop assistant can help if you are unfamiliar with the hardware.



Four Plexiglas pieces can be mounted in the jig at one time. They are held in place using the center bolt and another strap clamp as shown below.



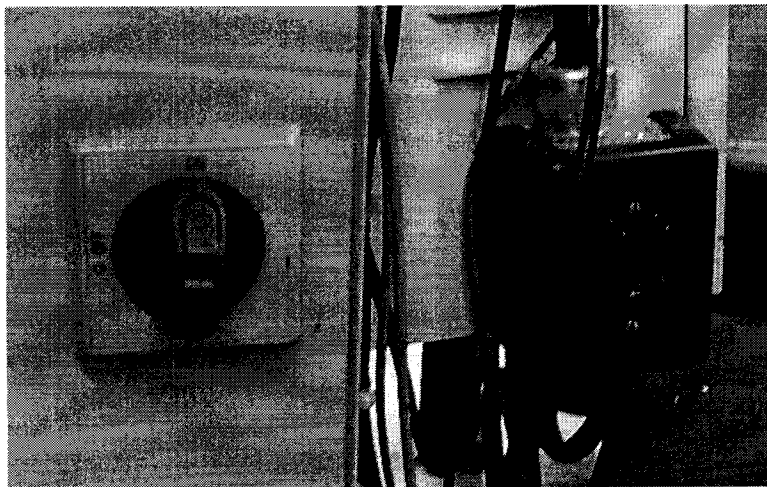
Use the quick-change chuck in the milling machine, with the two drills mounted in quick-change collates as shown below.



The table to the right of the milling machine has a jig for assembling these collates.



The power switches are located on the right side of the mill. Turn on both the milling machine (black) and the computer (red).



* The password for the computer is “bozo”.

If the mill was powered down completely, the machine will need to be calibrated. If the x,y, and z coordinates show up on the monitor as dashed lines, this is the case. Press start to allow the mill to begin its calibration procedure (you will see movement of the mill table and quill). When finished, the dashed lines of the coordinate system should be replaced by actual values.

The program ME 324.txt is located on the hard drive of the mill's computer. Press F2 (load) and select it from the default directory by pressing F10 (accept).



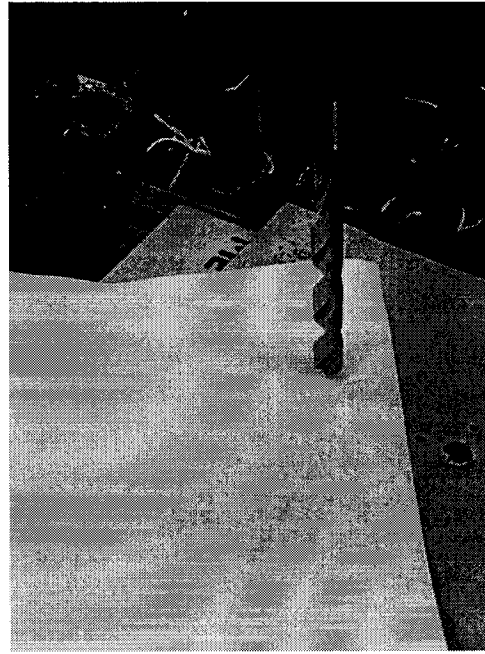
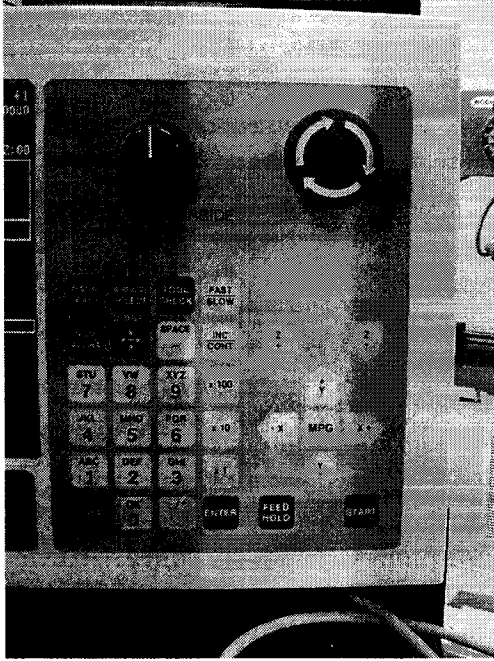
Now, you must set the origin for this particular program (not the same as calibration). The z-axis is done first.

Insert the longer drill bit into the mill chuck and tighten as shown.



Use the arrows on the right side of the consol to position the bit over the Plexiglas pieces. Adjust the height of the table if necessary. For example, if you raise the drill bit as high as possible using the consol and still don't have enough room to clear the pieces, lower the table.

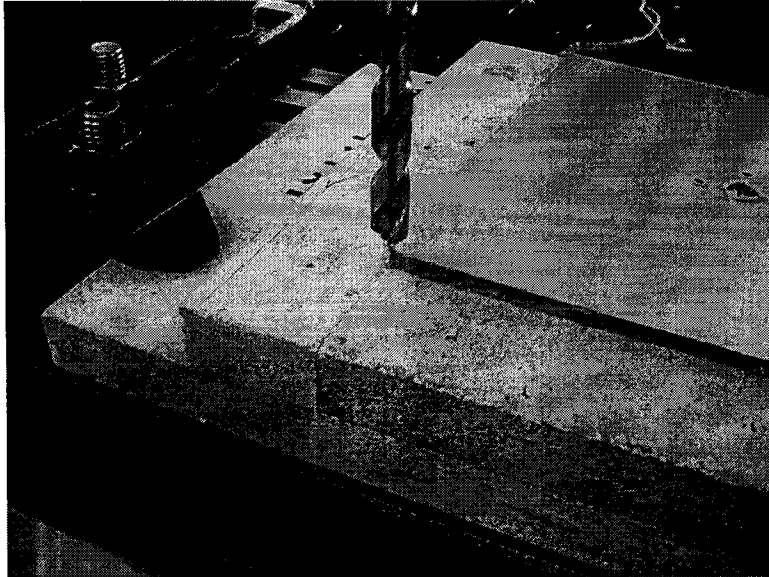
Now, use the z-arrow again on the consol to lower the bit towards the top Plexiglas piece. Use the fast/slow button and the feedrate override knob to SLOW the rate of decent until the bit is almost touching the surface. Then, press the inc/count button to lower the bit 0.001" at a time. Slide a piece of paper between the bit and the piece as you continue to lower the bit. When you can no longer move the paper, stop your decent.



This position is zero for the z-axis. To set, press Setup (F1), Part (F1) and Next Axis (F1) until "z" is displayed on the screen. To finish, press Set (F10). Pressing the Esc key twice will then return you to the first menu.

Now, set the offset distance for the shorter drill bit. Begin by inserting the new bit into the chuck and lowering it to the top surface of the Plexiglas, using the sheet of paper as before. Press Setup (F1), Tool (F2), Offset Lib (F1) and find the line labeled H002. Change the value here to the z-value displayed on the screen above by highlighting the line and typing in the new value. This tells the program how much further it will have to lower the second bit to reach the zero plane of the first bit. Press Save (F10) and again return to the main menu by pressing the Esc key twice. Replace the larger bit in the chuck as you will need it first during cutting.

Next, set the zero positions of the x and y axes. Since only the hole placements relative to each other are critical, the exact location of the origin is not essential. Consequently, use the arrows on the consol to position the inside corner of the jig below the drill bit as shown below.



Again, press Setup (F1), Part (F1) and Set (F10) for the x-axis. Press Next Axis (F1) and Set (F10) again for the y-axis. Return to the main menu.

At this point, the machine is ready for action. As a final check, press the Graph button to display the motion of the mill during the program. Have a MIL lab assistant run through this with you and give you the okay to begin machining. A common error may be displayed “X/Y/Z axis travel exceeded, line --”. This occurs when the origin was set too close to one of the limits of motion for the CNC. A lab assistant may be able to modify the program to correct for such an error, but the origin may have to be relocated if not. Proceed when there are no errors displayed by the Graph function. When ready, press the Forward Button on the blue panel at the top of the milling machine. This is to set the rotation of the bit to forward, since it’s default is reverse. Press start on the same panel, and use the knob to adjust the speed to 2000 RPM.



When the machine is fully on, press “Start” back on the computer control monitor and follow the prompts. First, the table will move to a default position to allow you to change bits when necessary. Press start again. You should receive a prompt asking you to insert tool one. If you currently have the longer bit in the chuck, press start one more time and the mill will drill the first hole. When it finishes, the table will move back to the neutral position, and the computer will prompt you for tool 2. Turn off the milling machine and apply the brake to stop the spindle. Change tools to the shorter drill bit. Turn the milling machine back on, and press start at the computer. The mill will drill the two smaller holes and again return to the neutral position. Turn the mill off once again and exchange bits. Remove the finished parts and add a new set of blanks. Turn the machine back on and start all over.

Emergency Stop

In addition to the red emergency stop button on the mill consol, pulling the brake downwards will stop rotation and cause an alarm to sound. This sometimes occurs if you let the brake fall too hard after changing a tool. If this happens, press the cancel button on the computer consol to stop the table from moving. To stop the alarm, press and hold the right arrow button in the bottom right corner of the mill control consol. Remove the bit from the current hole, turn the machine back on, and press start on the computer to resume cutting.