# CNC Milling a PCB

The Uno curve tracer project is simple enough that a single sided (bottom) copper board will suffice. To manufacture the board, you need a FR4 100mm X 70mm x 1.3mm single sided 1/2oz copper board. For drilling, a 0.7mm or 0.8mm bit will work. The connector pins might need a press fit with the 0.7mm bit. The trace cuts can be milled with a 0.1 to 0.2mm engraver bit. The board profile was cut with a 2mm end mill.

I use a CNC 3018 running grbl 1.1 and bCNC to send G-code from a Linux system. Chamfer all board edges at 45 degrees with a file to remove burrs. Also, buff the board with steel wool and wash it prior to cutting. You want the board flat and conductive for probing. The PCB is secured to a ½" backer board with three strips of double sided tape. The board is leveled using a dull engraver bit as the probe. When changing tools, each tool should be zeroed before cutting. Don't be like me and forget to remove the grounding and sense clips before cutting.

The traces are engraved followed by the drilling. Finally, the board shape is routed. After routing the board, steel wool it then wash it to remove any copper burrs. Inspect the trace cuts for any particle shorts or uncut copper. Small patches of bridging copper can be removed with a razor knife. As a final check, use a multi meter to test isolation of traces to the ground plane.
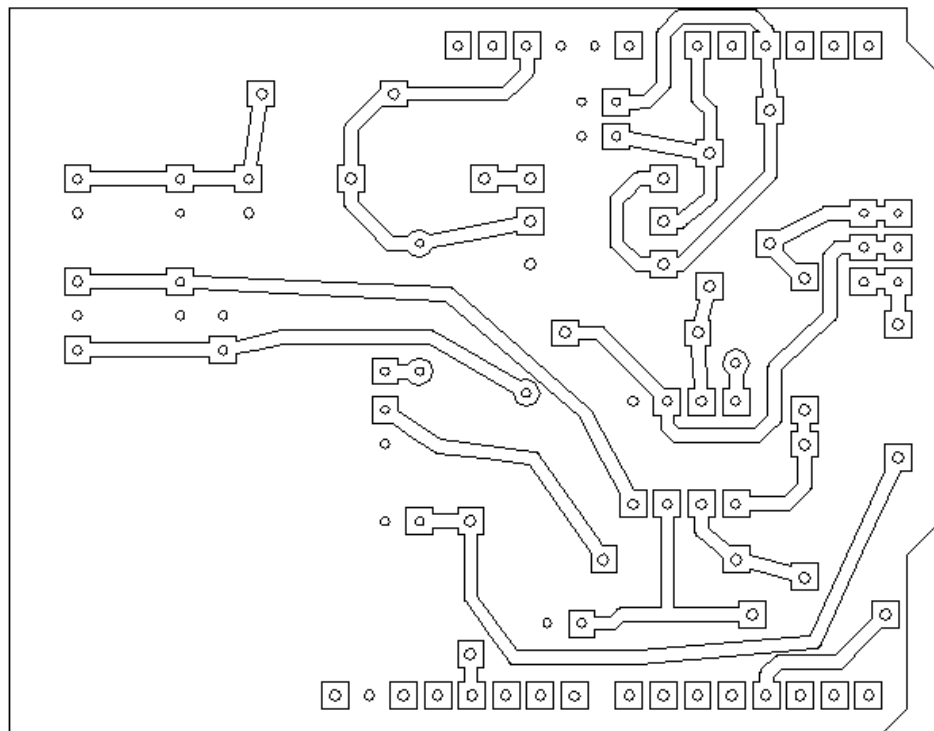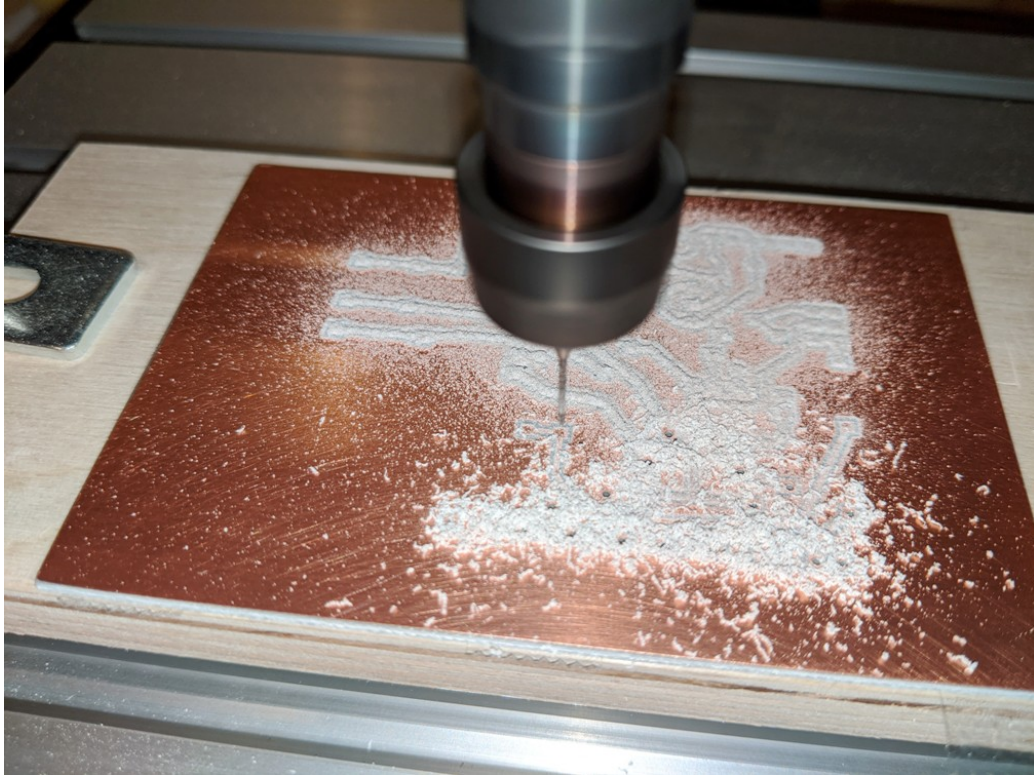

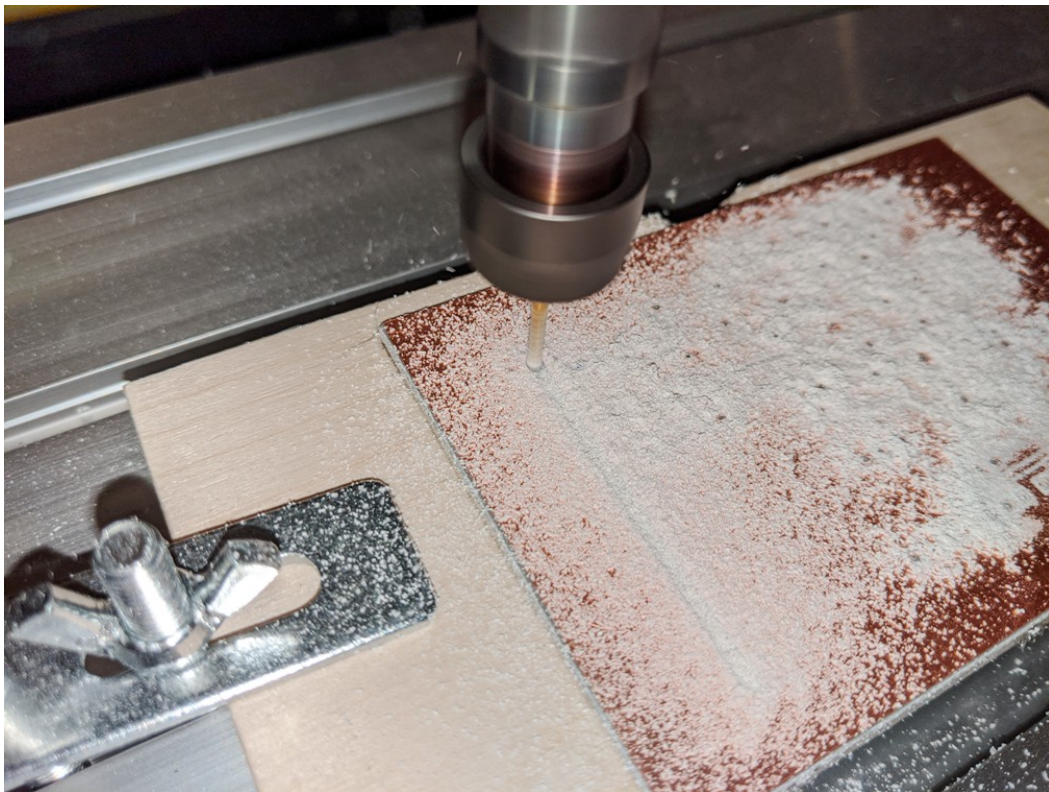Copper Side of Board (Bottom)
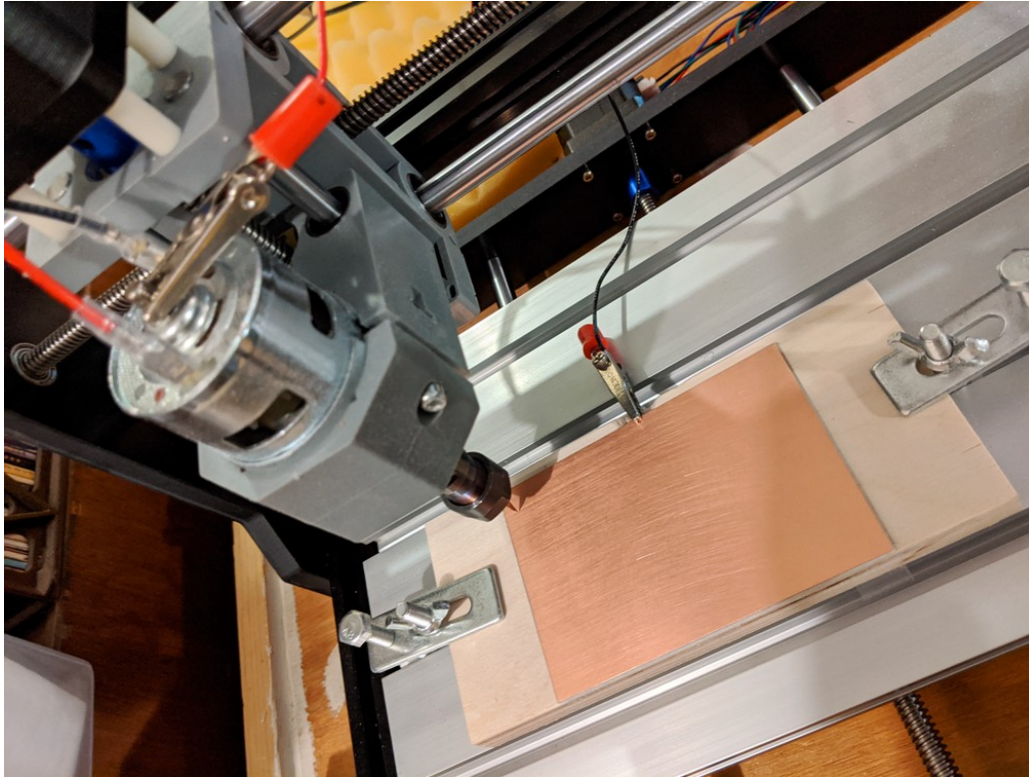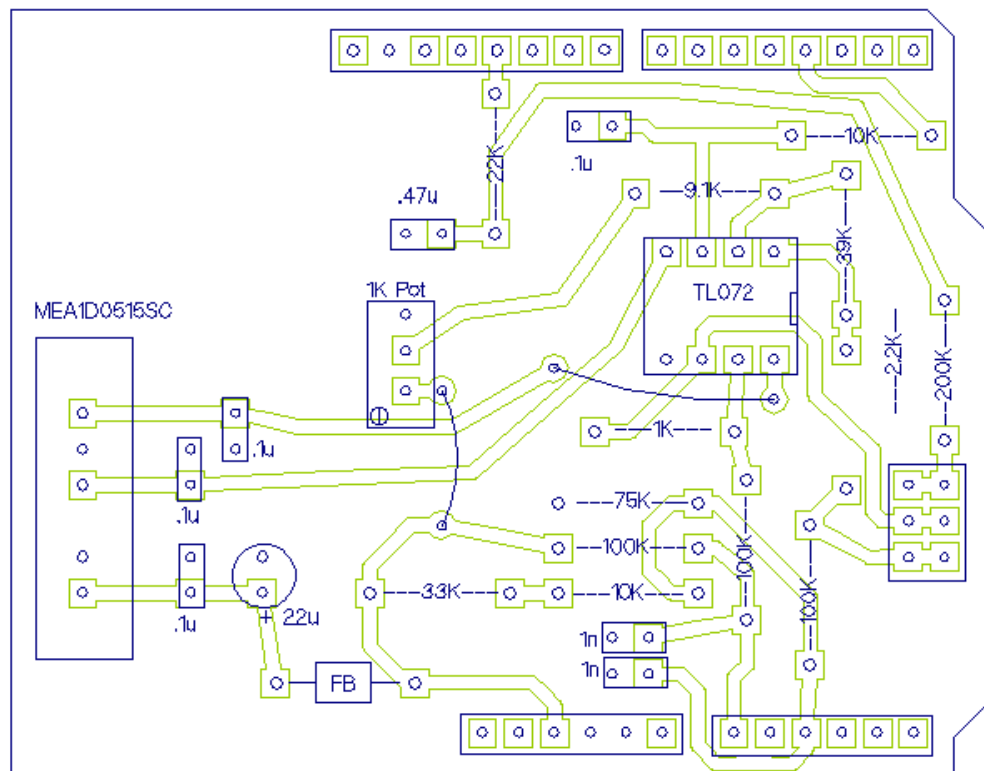
Probing
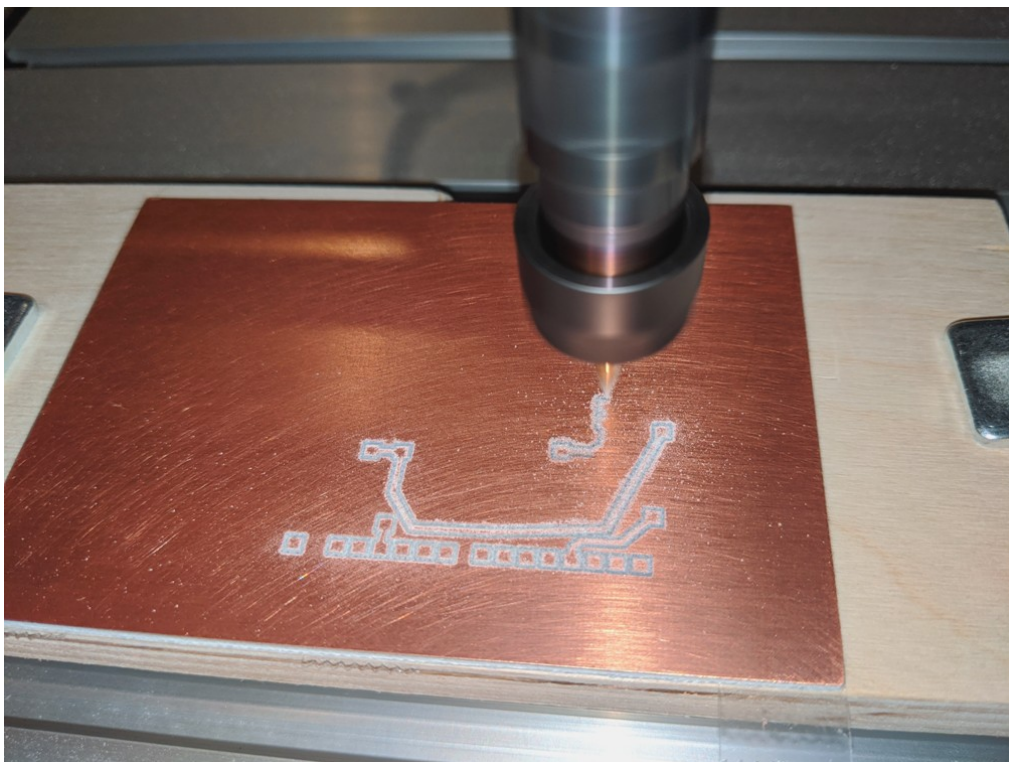
Engrave File: unocttraces.gcode
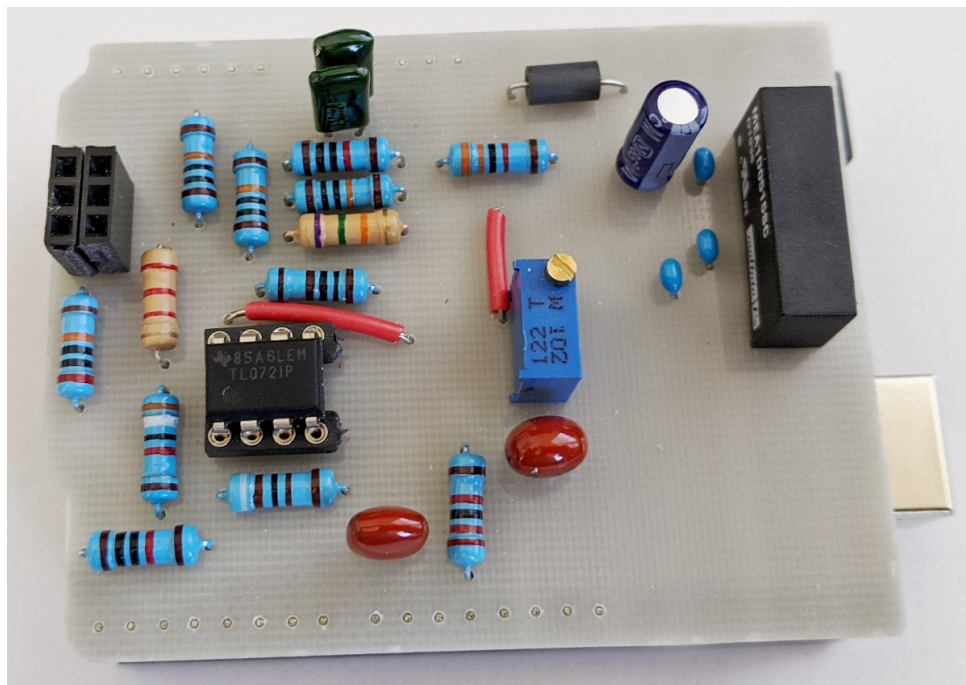
Drill File: unoctdrill.gcode

Board Route File: unoctboard.gcode

This diagram will help with component placement. All parts except the connector pins go on the board side without copper. The pins go on the copper side (bottom).

Bare Side of Board (Top)

Only two board jumpers are needed for additional circuit connection. However, the Uno pins must be soldered to the bottom of the board. By inserting the connector pin strip upside down, the pins may be soldered. After, the insulator strip is pressed down.