

CNC CIRCUIT BOARD ENGRAVER

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ABSTRACT

In my project, it can be divided into three major parts, which could be justified as 40% involving mechanical parts, 40% involving electronic and electrical parts, and 20% involving software parts to make the CNC machine possible.

In the **mechanical** part of my project, I have designed and built a CNC machine that houses 3 stepper motors, 3 movable axis, which is X, Y, and Z. A spindle motor having 600W was coupled to a club by a flexible shaft, the club is used to hold a 1 mm diameter or bigger drill or router bit spinning at approximately 30 000 rpm. However, for electricity saving purposes, I have lowered the power of the spindle motor to about 30W by using a secondary spindle motor, thus my CNC machine is having 2 spindle motors currently.

The primary high power spindle motor will be used during the engraving on hard surfaces like aluminum, high density woods, metal plate, and some reinforced plastics. Whereas, the secondary motor will be used during the circuit board engraving, and other engraving which is done on a soft material where the 60W spindle motor could cater with.

In the **electronic** part of my project, I have built a stepper motor driver board to drive 3 stepper motors which are used to control the axis movement of X, Y, and Z. I have wired the primary and secondary spindle motors to an ac power source, added in limit switches in the CNC machine to avoid the movable tray from accidentally collide with the edge of the tray, and connected the stepper motor driver board to a personal computer's parallel port by using a parallel link.

In the **software** part of my project, I am using CAD software to design the circuit to be engraved; it can be done by using Multisim. By developing a CAD format file, next I will utilize CAM software to generate the Gcode based on my CAD drawing/design. Based on Gcode generated, the Gcode will be feed into a CNC controller with Gcode interpreter installed. Therefore the CNC controller will be able to generate the stepping pulses and direction pulses which are required by the stepping motor driver board in order to route. The stepping pulses and direction pulses are transferred by using a parallel link between a personal computer's parallel port and the stepping motor driver board.

The main objective of this CNC machine is to be used as a precision equipment to manufacture circuit boards. Whereby, it can be used as a circuit board fabricator by using the principles of engraving, drilling and milling to make this CNC machine possible. My CNC machine can also be used as an engraver to mill a programmed pattern or text on a piece of wood.