Low Cost Method for Prototyping Printed Circuit Boards

R. M. Geethanjana Wanigasekara[1], J. C. Agalawaththa[1],
B. G. D. R. Chrandrasena[1], N W K Jayatissa[1*]

Printed Circuit Boards (PCBs) are very commonly used in almost all of the electronic applications, due to ease of use. There are several modern methods of transferring circuit wiring diagrams to circuit board. Many of these methods are good for only producing large number of PCBs because making one or two PCB is very expensive. However, in an electronic research laboratory needed for producing various type of prototype boards is much needed. There are several difficulties in fulfilling this need; time to produce, cost of production, difficulty to produce large and complicated PCBs. The PCB drawing machine is designed to overcome these difficulties in prototyping PCBs for electronic laboratory use.

The three dimensional axis of the designed machine is controlled by three independent stepper motors. A drawing pen holder is attached to the z-axis control and any permanent marker pen can be attached to the holder. The accuracy of the z-axis is 0.1 mm. Initially, the user designed circuit diagram (drawing) should be loaded to the computer which is connected to the drawing machine. The computer reads the drawing and replicate it on the copper board using the permanent marker pen. The total area of the x-y plane is 300mm x 200 mm. The required software for this operation is a development of an open source, which can send G-code (RS-274) protocol commands to the device. Generally, RS-274 or G-code is known as numerical control (NC) programming language. This machine uses both computer numerical control (CNC) technique and CAD software to complete the task.

The machine could also be used to remove the unwanted copper areas of a circuit board by connecting special carving bits to the machine instead of the pen. This method is much faster than the previous drawing method to replicate circuit to the copper board but more costly due to rapid wear of the milling bits. Finally, the designed drawing machine is able to draw 300 x 200 mm^2 size circuit layouts with 0.1 mm line separations.

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[1]Department of Physics, University of Kelaniya, Sri Lanka * jayatissa@kln.ac.lk