SwitchStat

Jarred Hare, Max Pourshalchi, Alex Wolf
Mentors: Aaron Rowe, Jim Honea
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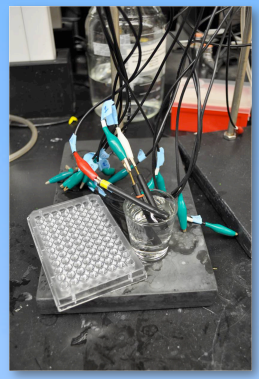
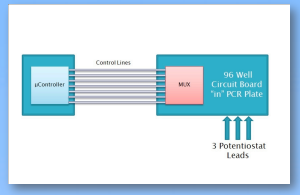
Abstract

The device is an outlet powered switching board designed to be compatible with a three probe potentiostat. The purpose of our device is to facilitate and make electro-analytical experiments much more efficient for biochemists. Our device would allow 96 experiments to be carried out in a standard 96 well plate with minimal operation from the user. The device would be useful to any electrochemists who wish to conduct high-throughput drug screening.





Current method (left) and overview of Switchstat design (right).

Design Challenges

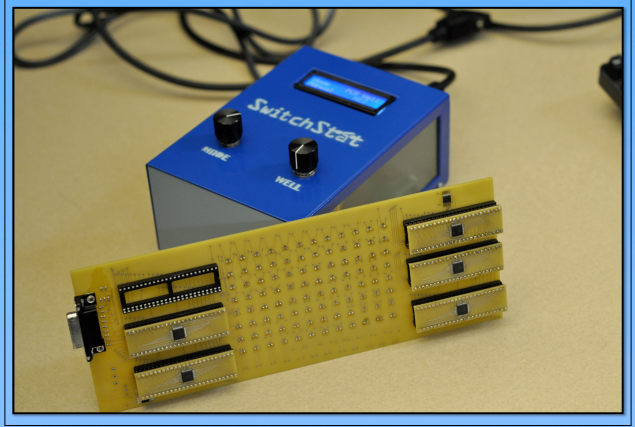
•Connecting the 3 potentiostat electrodes to the 96 different wells.

•Finding a supply of gold and silver pins that are of high enough quality for electrochemical experiments.

•Shifting the position of the output current peak by no more than 5% while experiments are run through the Switchstat system.

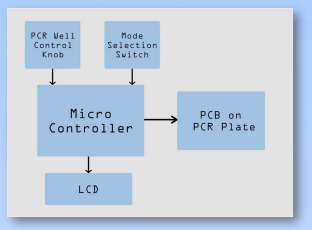
•Reaching compromises between Chemistry department wishes and what is feasible with our resources and timeframe.

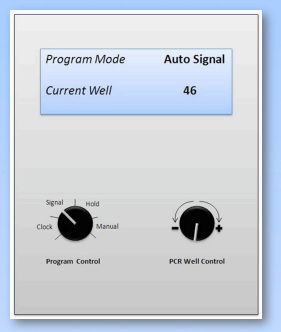
Final Prototype



Operation

There will be four modes of operation that control the behavior of the microcontroller and the multiplexer switching circuit. In order to change the mode of operation, the user simply turns a 4-position rotary switch which selects one of the four modes of operation. Manual mode is the first selection, and is always used first to select either the active or starting PCR Well. The Hold mode activates the PCR Well via the analog multiplexers so that a physical connection between the testing computer and PCR Well is created.

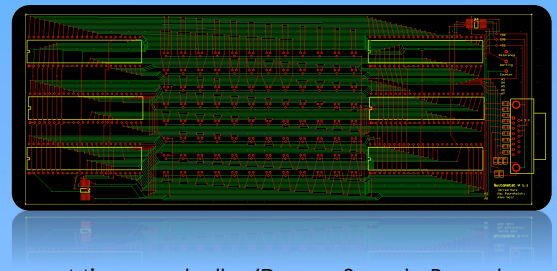




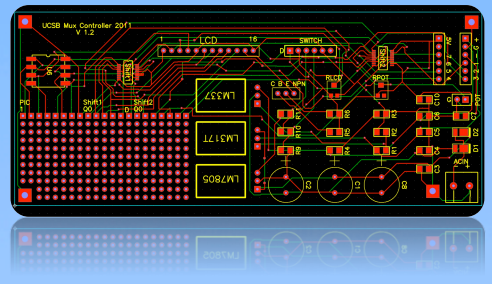
Microcontroller flow chart (left) and box design (right).

PCB Layouts

96 Well Multiplexer Board:



Microcontroller/Power Supply Board:



Future Improvements

•Reduce the overall size of the multiplexer board by providing an alternative to the DIP sockets.

•Potentially use surface pads as opposed to pins to contact the solution from the bottom side.

•Include an enclosure for the multiplexer board so bare components are not exposed to liquid.

•Manufacture a mechanism to lower the pins into the wells so it does not have to be done by hand.

•Have the complete microcontroller boxes manufactured before being shipped to us.

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