

Assignment 3

Final Circuit Schematic and PCB Design

Schematics

Main Circuit schematic, all submodules combined to show integration with one another:

- <https://github.com/ryxcam002/IrrigationPiHat/blob/master/FinalCircuitSchematic%26PCB/Main%20Circuit.sch>

Power Supply Submodule Schematic:

- <https://github.com/ryxcam002/IrrigationPiHat/blob/master/CircuitsV2.0/PowerSubmodule/Power%20Module.sch>

The main switching voltage regulator has not changed since V1.0 to V2.0; however, an extra mini-module has been added to provide -5V to the OpAmp circuits. Since this mini-module provides power, we classified it under this submodule.

Status LEDs Submodule Schematic:

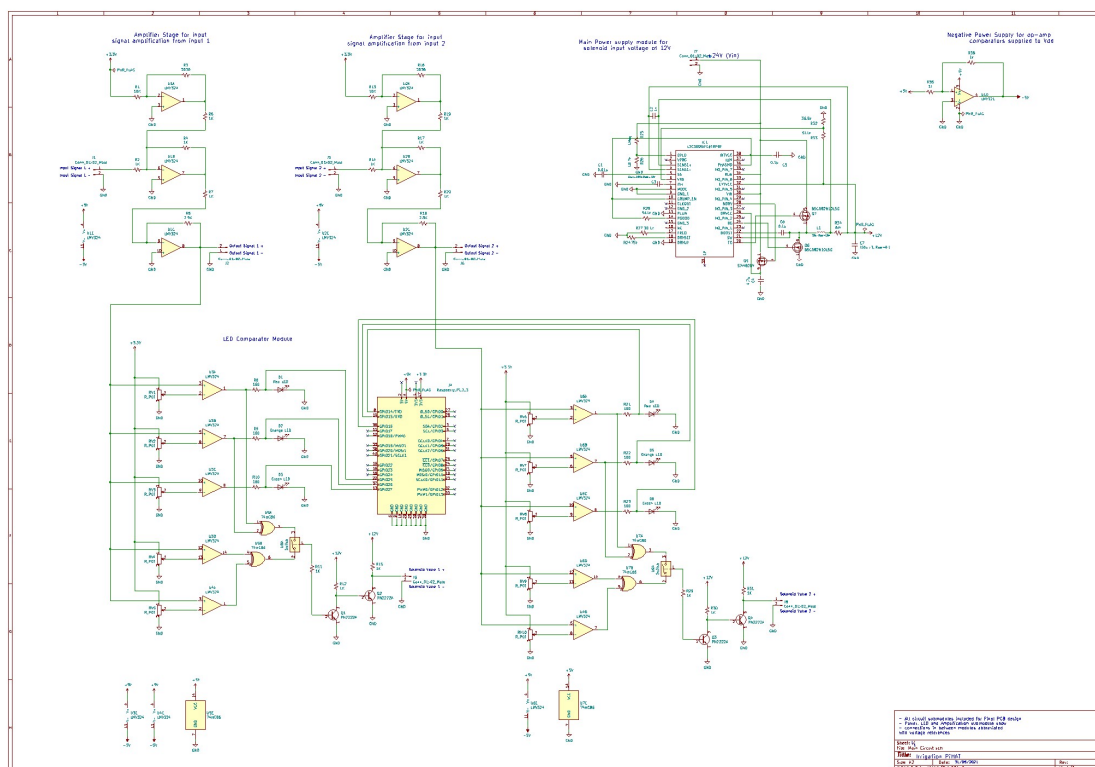
- <https://github.com/ryxcam002/IrrigationPiHat/blob/master/CircuitsV2.0/Led%20Submodule/LED%20Submodule.sch>

The module inputs were labelled to accept input from the amplifier submodule. The components were also selected and their related Vcc and Vdd voltage sources were created. Special consideration for the XOR gates had to be taken as their sources work slightly differently. Finally the screw terminals were replaced with jumper terminals for the final schematic.

Amplifier Submodule Schematic:

- <https://github.com/ryxcam002/IrrigationPiHat/blob/master/CircuitsV2.0/Amplifier%20Submodule/Amplifier%20Submodule.sch>

The amplifier module was modified to accept voltage inputs from jumpers instead of using virtual connections. This prepared the schematic for the final PCB design. Specific OpAmp comparators chosen and related Vcc and Vdd voltage sources created. This led to the inverted -5V source being created in the power module.

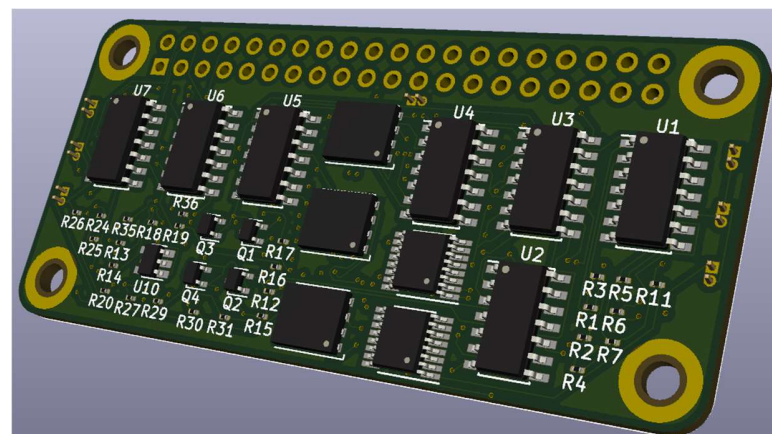
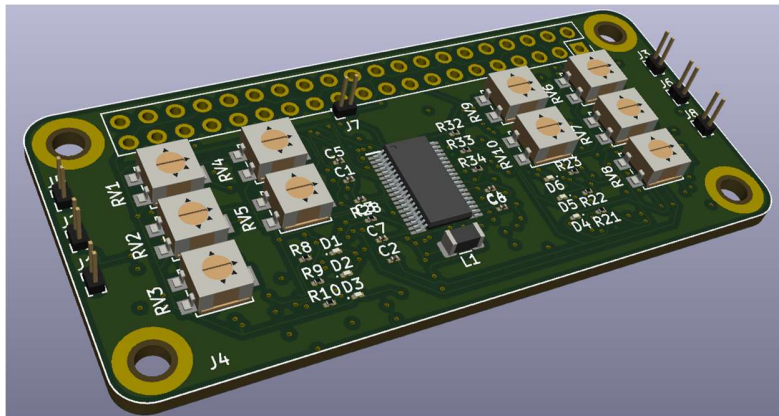
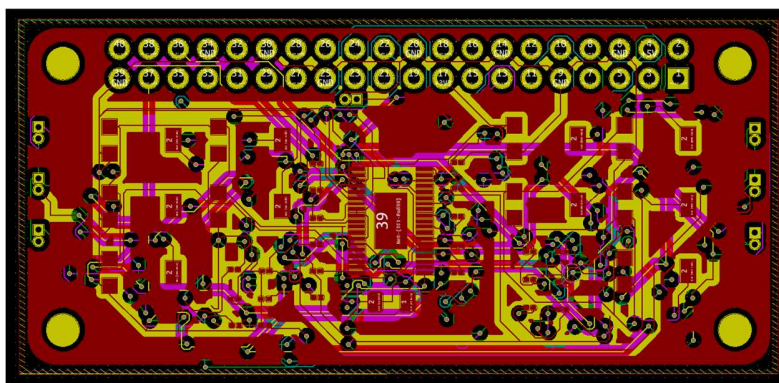


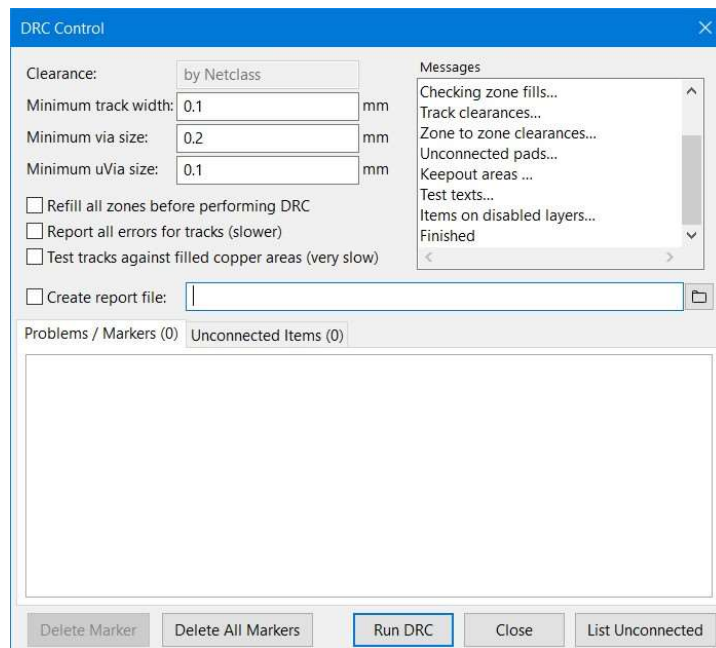
PCB

Micro PiHAT:

<https://github.com/ryxcam002/IrrigationPiHat/tree/master/FinalCircuitSchematic%26PCB>

The PiHAT mechanical specifications are based off of the generic PiHAT specifications provided by KiCAD. Jumper pins are used as the connector type as they provide an easy way to connect external devices while saving space on the board. SMD components are selected so that more complex sub-modules could be attached to the board as well as keeping the stand-off height fairly low. By having a low stand-off height we can also mount components underneath the PiHAT. These components have enough clearance between the main Raspberry Pi Zero board and their extremities.



DRC:

The following report was generated by the DRC tool in KiCAD:

```
** Drc report for Main Circuit.kicad_pcb **  
** Created on 05/03/2021**  
** Found 0 DRC errors **  
** Found 0 unconnected pads **  
** End of Report **
```

There are no DRC errors as tolerances were fine tuned to meet manufacturing standards and to ensure that there were no errors. Since PCB manufacturing at small sizes has become more accurate, these tolerances can be small.