My blocks were the Display and Analog Inputs, which essentially broke down to the way the user would interact with the system directly when not using either the smartphone or serial interface. I utilized a standard 16x2 LCD screen from one of my previous development bards as a screen, as the Arduino has a pre supplied library I knew I could use with it. Then I simply added three buttons which could be used to control both which channel was active and what the current output of that channel was. A small interface board was created to simplify the connection of all parts involved, especially as the display alone has 16 pins, many of which could be simplified using this small PCB. After being combined, each block could be used to prove the functionality of the other, as the buttons are used to control the output of the LCD screen.

Electrical Specifications: USB in power, temperature 0-200F

To set up this system:

1. Plug in Arduino using USB Cable
2. Use System

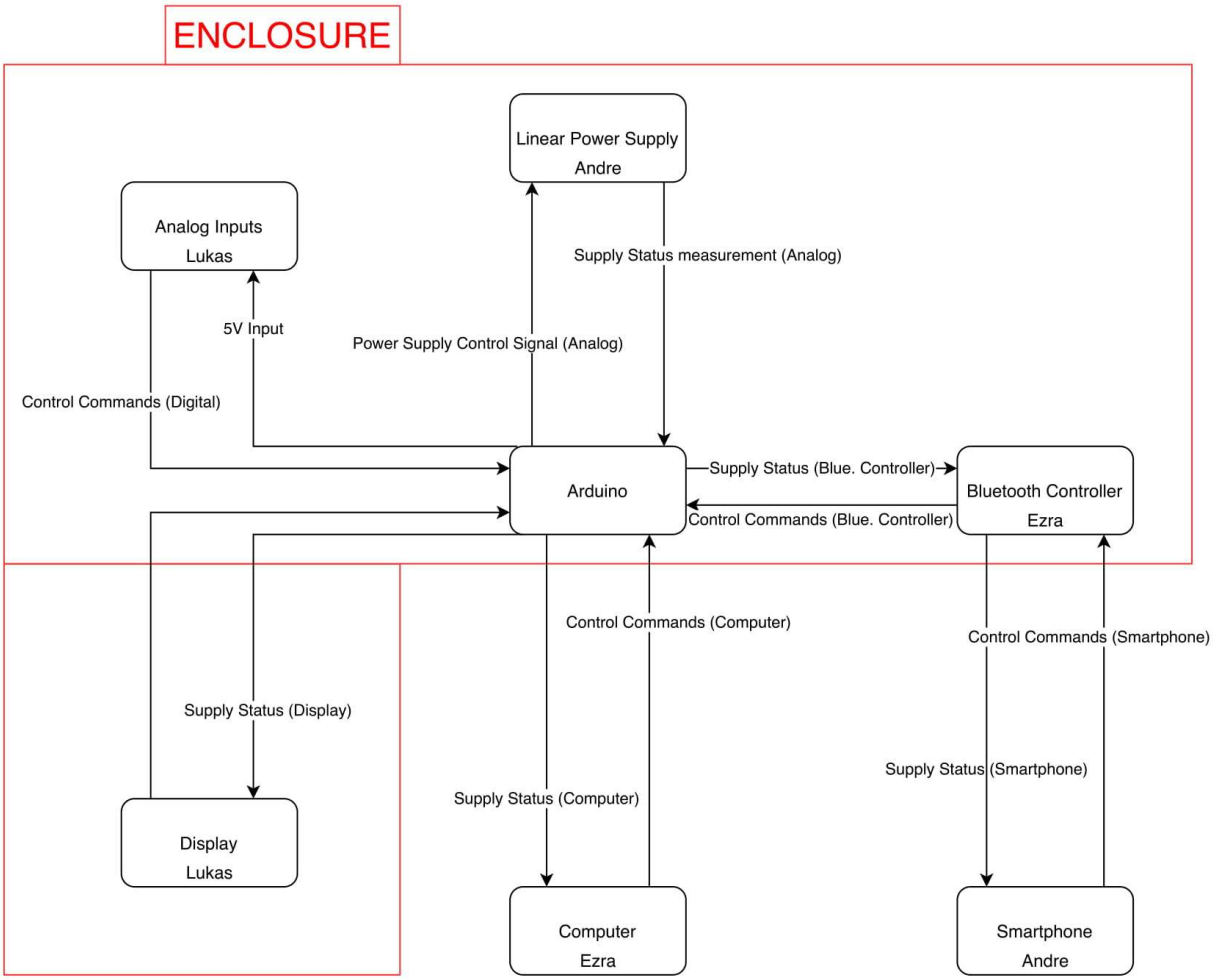

Figure 1. Block Diagram

This figure is the block diagram used by the entire system. The display and analog input blocks both connect directly to the Arduino which allows these two blocks to be tested independent of what other blocks are available. The Arduino controls the screen directly, which makes it very simple to connect analog buttons using digital pins to display the functionality of these two blocks.

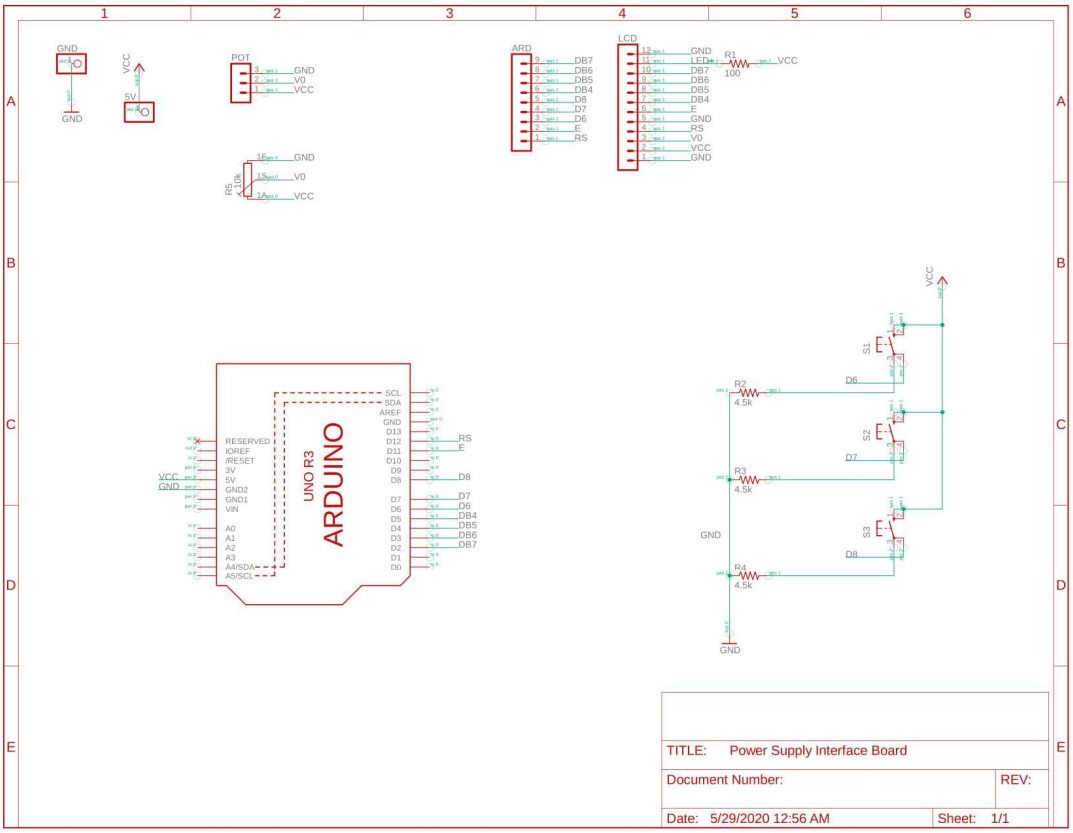

Figure 2. Circuit Diagram

This is the circuit diagram used in the design of the analog inputs and display blocks. Bottom left is the Arduino, which receives input from the header pins labeled ARD at the top middle of the figure. Directly next to this is all pins connected directly to the LCD screen. Bottom right is the assembly for all three analog buttons, where pull down resistors can be seen. Top left is simply ground and VCC for the system, along with pins for the potentiometer which controls the brightness of the LCD screen.

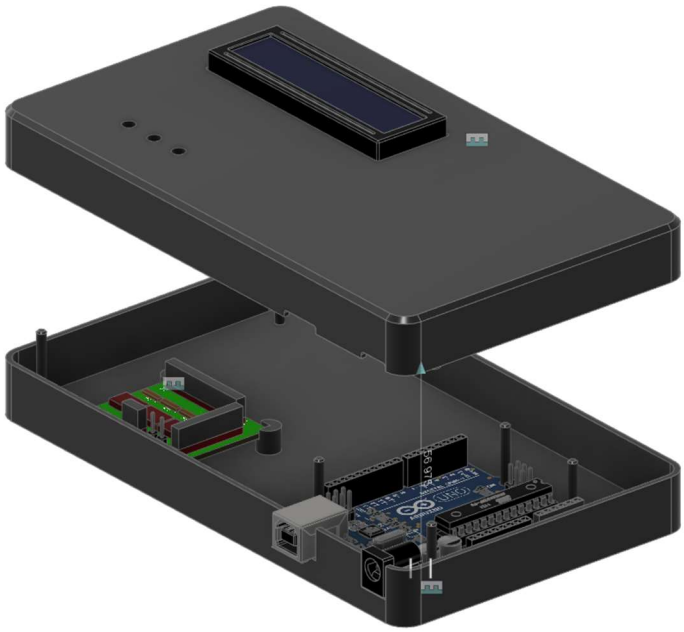

Figure 3. System model with enclosure

This figure shows the 3D model created of the entire system including the enclosure which was designed specifically for it. The Arduino features cutouts for both power connectors to allow the box to stay closed at all times. All boards and components have a mounting location which allows the system to remain operational even when jostled. The top half of the case snaps into the lower, which allows the box to be opened easily when repairs need to be made but otherwise remains closed. The LCD screen is directly on top of the box which allows for easy readability for the end user.

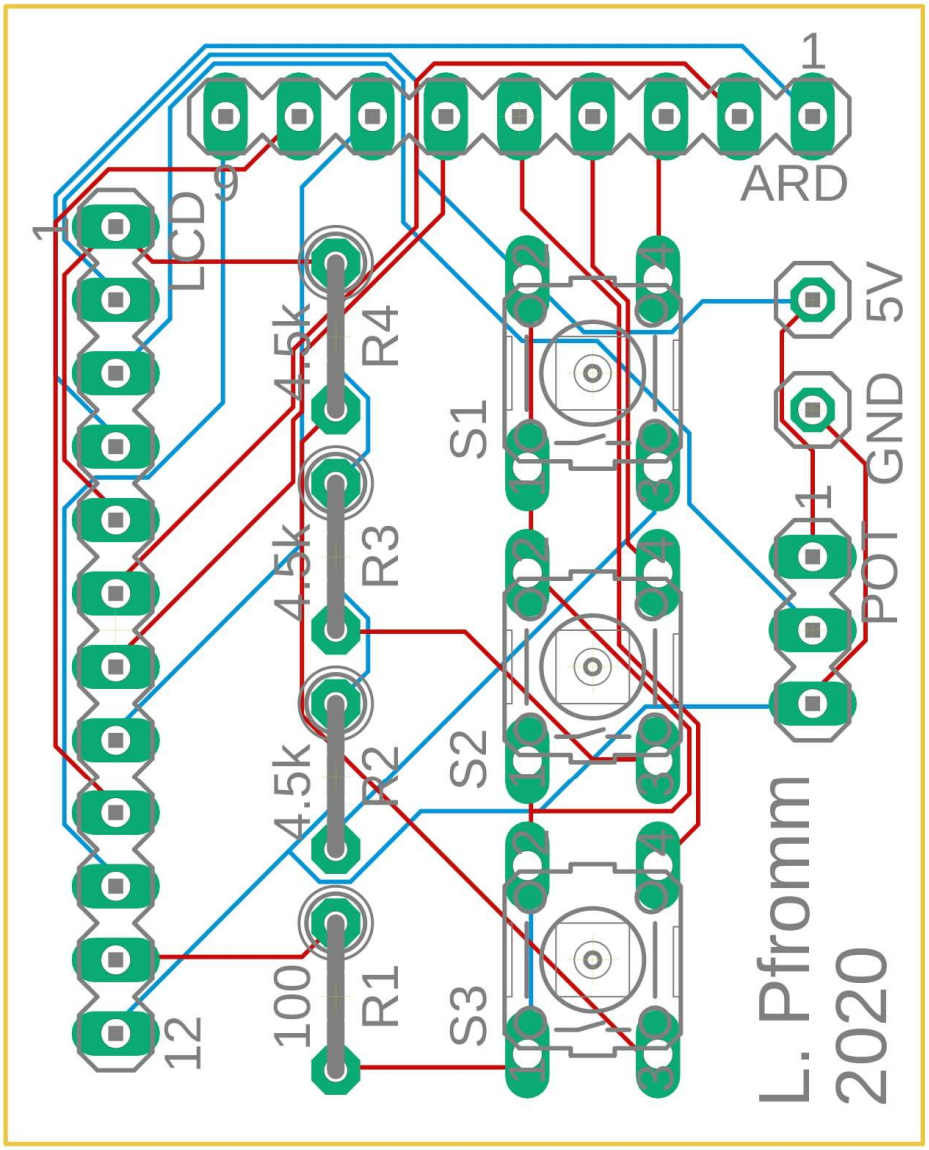

Figure 4. Circuit Board

The circuit board dimensions are 31.75 x 39.37 mm. Layout can be seen above with LCD pins on the left hand side, Arduino pins lining the top, power and potentiometer pins along the right hand side, and all button components in the middle. This distribution allows for cleaner wiring inside the final case, to make adjustments easier and accidental disconnects less likely.

Component	Description	Part	References	Value	Footprint	Quantity Per PCB	MPN	DigiKey Part Number / Supplier link
1	Push Buttons	Push Button	S1, S2, S3	N/A	Through Hole	3	B3F-1050	SW404-ND
2	Arduino UNO Microcontroller	Microcontroller	UNO1	N/A	N/A	1	UNO	1050-1024-ND
3	Resistor	Resistor	R1	100 Ohm	Through Hole	1	CF12JT2K00	CF12JT2K00CT-ND
4	Resistor	Resistor	R2, R3, R4	4.5k Ohm	Through Hole	3	MFR-25FBF52-4K53	4.53KXBK-ND
5	Potentiometer	Potentiometer	R5	10k	Header Pin	1	P160KNP-0EC15A10K	987-1718-ND
6	LCD Display	LCD Display	LCD	N/A	Through Hole	1	NHD-0216XZ-FSW-GBW	NHD-0216XZ-FSW-GBW-ND

Component Groups:	6
Component Count:	10
Fitted Components:	10
Number of PCBs:	1
Total components:	10
Schematic Version:	v.1.0
Schematic Date:	05/29/2020
BoM Date:	05/29/2020

Figure 5. Part List