**3.5 POWER SUBSYSTEM**

The power subsystem was designed to power the drawing assist for at least a 30-minute art class. The main device and student input are powered separately. Splitting the power subsystem into these parts allowed the elimination of wiring from the student input on the wheelchair table to the device on a separate table.

**3.5.1 Main Device Power**

The primary power system includes the raspberry pi, teacher input screen, servos for the gripper, and motors. Based on the component specifications, the total current and power were 9.86A and 82.66W, respectively. The device could either plug into a standard outlet or use a rechargeable battery. Due to the size, weight, and cost of the batteries with the required capacity, plugging the device in was the better choice. Additionally, using a 12V battery to power the raspberry pi would require precise conversion to 5V and additional challenges.

A 12V output AC/DC converter was sourced for the conversion of the AC voltage from the wall to DC voltage for the components. The 12V was stepped down to 7.4V for the servos and 3V for the motors using DC/DC buck converters. After the buck converters, the components are fused per their specs to ensure no damage if current spikes. The power for the motors is wired to the motor plate that connects with the raspberry pi.

The raspberry pi gets power via the standard power cord. The standard power cord ensures the pi gets the precise 5V input voltage needed and is properly fused. Finally, both the pi's power cord and the AC/DC converter are plugged into a power strip with a long cord to ensure the device does not need to be next to an outlet. This design choice makes it easier for the teacher, as they will only need to plug in one cord. The final block diagram is shown below in Figure 3.5.1.

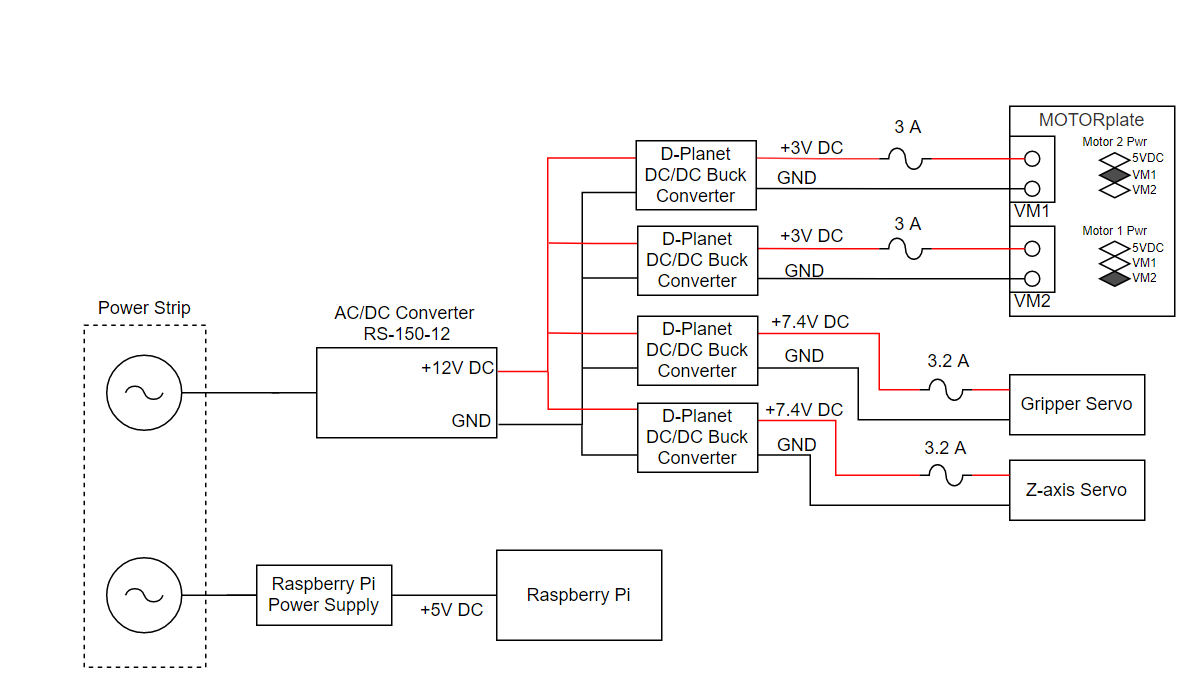


Figure 3.5.1 Main Device Power Block Diagram

**3.5.2 Student Input Power**

The student input system includes only the Arduino Nano. A lithium-ion 5V battery provides power to the Arduino Nano through its USB port. The 5V battery is easy for the user to store, recharge, and plug into the Arduino. The block diagram for the student input power is shown below in Figure 3.5.2.

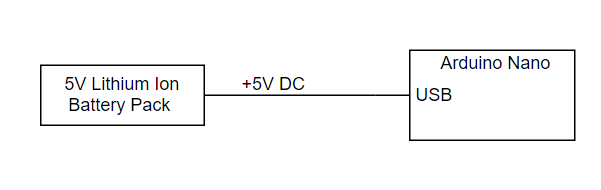


Figure 3.5.2 Student Input Power Block Diagram

**3.5.3 Power/Electronic System Enclosure**

Does this go here?