Mock Design Review

Block Diagram(s)

System Diagram:
Software Flow Diagram:

Block Descriptions

Power Supply:

This will be what powers the entire circuit design. The source will be 4 series AA batteries which will providing roughly 1.5 V each. The power output from the batteries will then be sent into the linear regulator designed as a simple shunt regulator. This will ensure that any minor variations in the voltage brought about by non-idealities in our voltage source will be attenuated. Thus, in this way, a steady and fairly constant DC voltage is available for our microcontroller and its processing capabilities.
Calculation of resistance values using maximum power output theorem:

\[
\frac{VIN \times (R3)}{\left(\frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}\right)} = \frac{VIN}{2}
\]

\[
R1 = R2
\]

\[
6 \times \frac{2000}{2R1 + 2000} = 3
\]

\[
R1 = R2 = 500\Omega
\]
Requirements and Verifications

Power Supply:

The fundamental requirements for our power rest entirely on the establishment of a constant 6 volt potential difference with respect to ground. It is this constant output voltage that will be used to supply power to all other major components in this project and therefore includes the microcontroller, the transducer array, and the DSP. We intent to attach the output voltage of our power supply to a 50 ohm resistor while simultaneously using an oscilloscope to measure and verify that the output voltage across the resistor varies at most between 5.5 volts and 6.5 volts. This concludes our testing methodology designed to verify the functionality of the power supply block of our project.

Safety Statement

Before we begin any physical circuit design or testing. We will compile and read through all relevant data sheets and user manuals for each element of the circuit. Making sure that we fully understand each electrical component that we will work with greatly reduces the risk of errors in design. We will employ a system of checks and balances to ensure that each group member is constantly performing under the proper safety guidelines. Before someone begins working on an electrical component or the full circuit they will have to go through the following checklist:

1. Where is the nearest emergency equipment? Before anything make sure you know where the fire extinguisher, the nearest phone, and power supply OFF switches are located.
2. Is the component live? Make sure to shut off all power to the component/circuit and allow for discharging time before handling.
3. Do I see any frayed wires? If any damaged or frayed elements are observed immediately take them out and replace them prior to any further work.
4. Before turning on any power, is everything properly grounded? If any components that should be grounded are not, be sure to ground them before turning on power.
5. After switching power on, do you smell anything funky or feel heat coming from the circuit? These are common side effects of an electrical short. Immediately turn power off and look for what is wrong.

After going through this checklist, at least one of the other partners will then also check through it. This creates redundancy which can help save mistakes from happening and keep everyone safe. Only one partner should be physically working on the circuit at any one time.

While the power supply will be low voltage and shouldn’t be producing much more than 100 mA at peak performance, it is still one of the most dangerous elements in the design. It must be properly encased to avoid anybody coming in contact with it. The ventilation of the casing must also be taken into account, so that overheating is avoided. Overheating could cause damage to the circuit, even worse it can create the risk of burning somebody or potentially start a fire.

Since each element will be connected through wiring. To further avoid contact with current or fire hazards due to arcing, all wires will be fully insulated. Any exposed wires will be taken care of immediately before continuing on with design.