CubeSats provide a cheaper and more accessible means for space exploration. As a result, they have been increasingly gaining attention from the scientific community. CougSat-1 is a 10 cm³ CubeSat being entirely developed by WSU undergraduate students and faculty mentors planned to be launched in 2019/2020. The satellite entirely depends on the batteries and solar panels on board for its energy requirements which brings about the need to assure that the power budget is not exceeded at all times.

**objective**

The objective of this project was to design and implement a test framework capable of measuring the power consumption of subsystem circuit boards on the CubeSat. This allows verification that the collective power consumption across subsystems is within the power budget of the satellite.

**User Flow & Data Processing**

- User Connects Ground and Voltage Source to Motherboard
- User Sets Board to be Tested
- User Applies Source Voltage and LED
- User Runs Program
- User Reads Power and Voltages of the Motherboard
- User Removes SD Card from Motherboard

Measurements Taken → Data Order Manipulation → Data Interpretation

- Current Calculation → Power Calculation → Write to SD Card

**Broader Impacts**

Failure to ensure that the design has been carefully considered in its implementation would negatively impact the satellite’s performance while in orbit. Using a test bench that is either not properly calibrated or gives the user incorrect data could result in the satellite going over its energy budget and permanently running out of power while in the eclipsed state. This would also contribute to creating more space junk in Earth’s orbit, potentially endangering other satellites.

**Design Theory**

Our design uses a Raspberry Pi 3 B+ and two Analog to Digital Converters to measure differential voltages so that we can calculate power consumption of the Cougs in Space CubeSat-1 circuit boards. Using a precision resistor and the differential voltage we can accurately calculate current with .42mA resolution.

**Design Block Diagram**

- Raspberry Pi 3 B+
- Analog to Digital Converters
- Relay
- SD Card

**Results**

In this project, the team was able to successfully design a test framework for measuring the power consumption of the CubeSat with just under a milliwatt of accuracy. What remains is for Cougs in Space to iterate on this project and to test each subsystem to make sure the power budget is met before proceeding with the satellite’s launch. Future work on this task includes using this design as a reference and expanding its capability so as to include other features as will eventually be required by the organization.

**Team Modillion**

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