

Performance and Verification Testing of an Electrical Power System for a CubeSat

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The Miniature X-ray Solar Spectrometer, otherwise known as MinXSS, is a 3U CubeSat, 30cm x 10cm x 10cm, that will measure the intensity of the soft x-ray spectrum from 0.6 keV (20 Å) to 25 keV (0.5 Å). This CubeSat initiative involves graduate students working with engineers and scientists to develop a successful CubeSat and its many subsystems. My goals for this project are (1) to develop monitoring software for the Electric Power System (EPS) and (2) to test and verify the performance of the EPS. The EPS unit, developed this spring by MinXSS graduates students, is made up of multiple components that regulate and control the power being used by the entire CubeSat. I tested these components of the EPS board and batteries using the monitoring code in the MinXSS Command & Data Handling (C&DH) processor, which retrieved data from several different analog devices on the EPS board. Data include temperatures, voltages, and currents from the 3 solar panels, battery pack, and regulated 5V and 3.5V power supplies on the EPS board. This EPS tests have various setups to confirm predicted values and to evaluate extrema of the system. I developed the EPS monitoring software and I learned how to communicate to hardware, primarily using Inter-Integrated Circuit (I2C) interfaces that include writing address bytes on the 2-wire I2C bus and then reading data from the specific device. The test results and comparisons to predicted performance for the five different regulators on the EPS board and battery pack will be presented.