A Brief Summary of the BlueSat Battery Charging and Peak Power Tracking Systems

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The purpose of the Peak Power Tracker (PPT) and the Battery Charge Regulator (BCR) is draw the maximum amount of power from the solar cells on the outside of the satellite and to use that power to effectively charge the batteries which power the rest of the systems in the satellite. A more complete summary of the design and testing of this set-up can be found in William Du’s thesis.

The system is comprised of four separate PCBs connected between the solar cell network and the individual battery packs of the satellite. This helps minimize loss of power if this system fails. These four boards draw their power only from the solar cells and can be easily bypassed, which is necessary while performing maintenance on the batteries.

The most important component on each of these PCBs is the Power Tracking 2A Battery Charger, an IC from Linear Technology. This IC combines the PPT and BCR into one. At the front end it makes load adjustments with a digital potentiometer in order to operate the solar array at its maximum power point for a given current. On the other end it senses the current charge of the battery and can both initiate a recharge cycle if the voltage falls to low, as well as cut off or decrease charging current as a maximum charge is reached.

The temperature at the heart of the satellite, where the batteries and the four PCBs will be placed, is not expected to vary as extremely as the temperature of the external surface however, these variations still need to be accounted for. Since charging the batteries when they are either too hot or too cold could cause damage a temperature sensor has been integrated to ensure charging will be cut off above 50o and below 0o. It should also be noted that all of the components have been selected so that their working temperatures fall within our expected temperatures.

Some testing has been done on this set up, however that was mostly concentrated on how effective the system would be in varying light conditions. These tests were performed on the prototype version of the PCB described in the thesis and not one the smaller final design. It would be ideal to conduct more extensive tests of the final system in a range of temperatures.

As various other aspects of the power system are under consideration at this time it is important to note that this system could be easily modified to accommodate different batteries or a different solar cell configuration.