HASP 2010
University of Maryland
April Status Update
4/30/2010

During April, the primary focus of the UMD team had been concentration on power and thermal calculations, completion and ordering of one of our custom PCB's, and completion of the preliminary PSIP document.

Activities of Team Members

The software and electronics team has been working with the flight CPU and SSD's to get the operating system, SSD's, and drivers operational. A preliminary version of flight software for the main CPU is now running. The current board boots off of one of the SSD's and is run off of a breakout from a computer power supply.

The first draft of the flight power board was also completed and ordered. The next items in software and electronics will be making a data transfer from the flight boards, population and testing of the power board, and finishing the design of the communications board.

The power and electronics teams have finished updating our power budget with the current new numbers and is waiting for thermal calculations to be completed. A mechanical detach mechanism has also been machined and is being tested. A new prototype to flight specifications is now being machined.

We have also sent out requests to three companies requesting solid state drive donations. We were lucky enough to have two industrial solid state drives donated to our project, but a test of a less expensive, more accessible, and commercially rated drive would to be good to make the payload more cost-effective for more research groups. Our thermal calculations will be very important for any commercially rated drives.

Issues Encountered During Payload Design

As mentioned in the PSIP document, we have encountered issues with our power and thermal requirements. We are currently doing more detailed thermal and power calculations to try and fix the problem. The current draw comes to approximately .6A at 30V in our worst case power draw scenario when attached to HASP. We are looking at ways to minimize the draw such as under clocking the CPU.

We also discovered another ordering snafu with our department office which has now been resolved and we should receive the final parts we need.

Milestones Achieved

-Completion of flight power board
-Completion of mechanical detach mechanism prototype
-Completion of preliminary flight software and OS for CPU
-Completed tested of preliminary flight software on flight hardware

Current Team Members and Leaders

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Power Systems Supplemental

UMD 2010 HASP Payload

Contact Ratings:

The contacts used in the payload are designed to carry more current than will be used. This is more a factor of the connectors that are convenient to use being larger and thus can carry more current than needed. The multiple pins used to connect to the power coming from the HASP gondola are to accommodate the four power wires trough the EDAC and to eliminate the chances of having a total system failure due to the failure of a single solder joint or crimp failure.

Connector	Pins	Current/Pin	Total Current	Connection
EDAC	4	5 A	20 A	HASP
DA-15	4	5 A	20A	Plate to Servo Board
DE-15	3	5 A	15 A	Detach Connectors
Molex KK	1	7A	7A	Internal Wiring
Mate-N-LOK	1	13A	13A	Solid State Hard Drives

Relays:

The relays used to control and distribute power are variants of the TX-2 signal relay that the UMD team has significant experience with. The signal relays have the advantage of being compact and requiring a relatively small triggering voltage. The maximum current rating for the contacts is 2A which is sufficient for all the scenarios that will be encountered in our payload, although we have the ability to use both throws of a DPDT relay to get a maximum of 4A if it is deemed necessary after the thermal system design is completed. The relays are latching so the state is maintained between switching power sources and to keep the power consumption of the payload lower. The relays and their low power ATMega controller are powered off of a 5v linear regulator to keep them independent of the DC-DC converter that they control.

Linear Regulators:

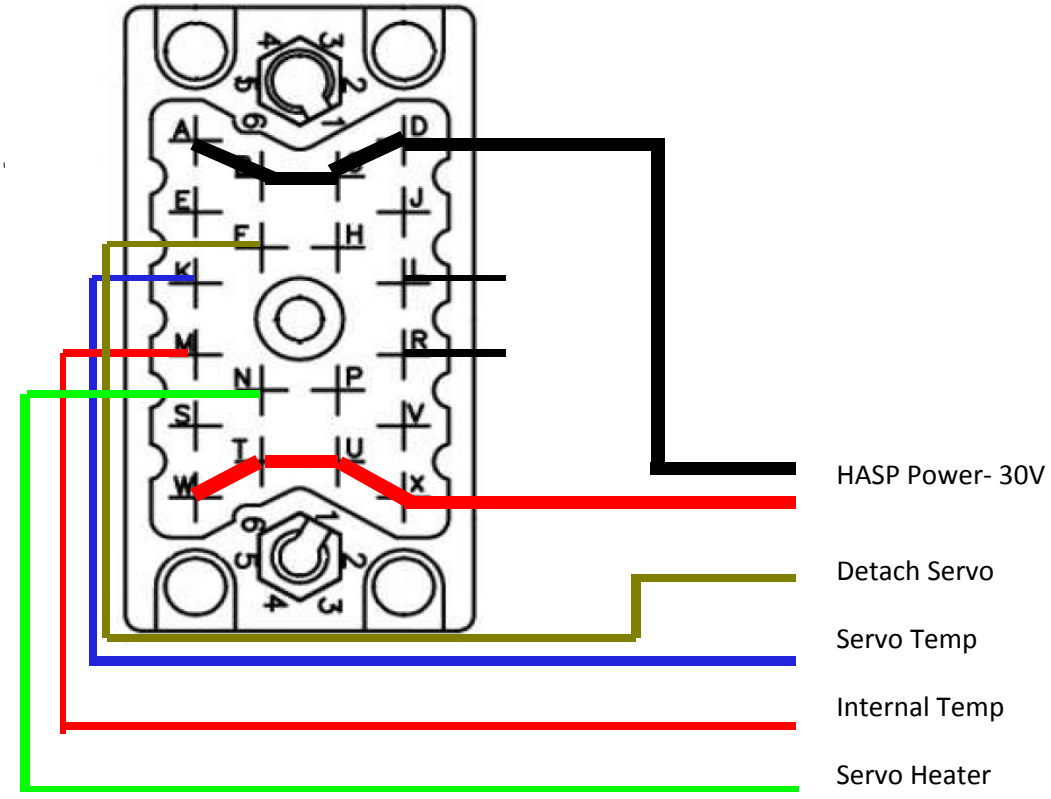
The linear regulators used in the system are variants (3.3v and 5v) of the NCV5501 LDO regulator from OnSemi. These regulators function like any other linear regulator and function over an extended temperature range of -40C to +125C.

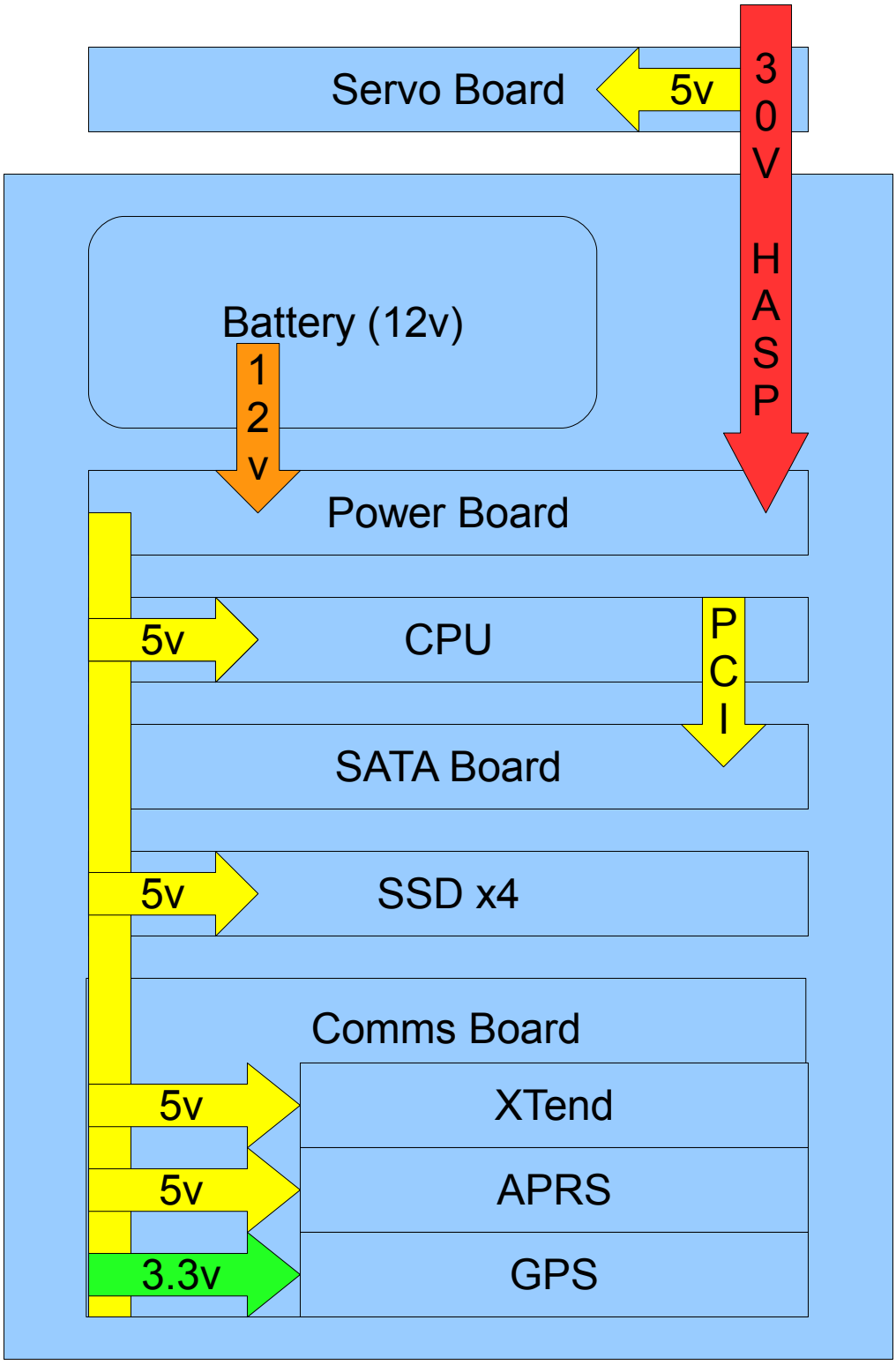
Switching Regulator:

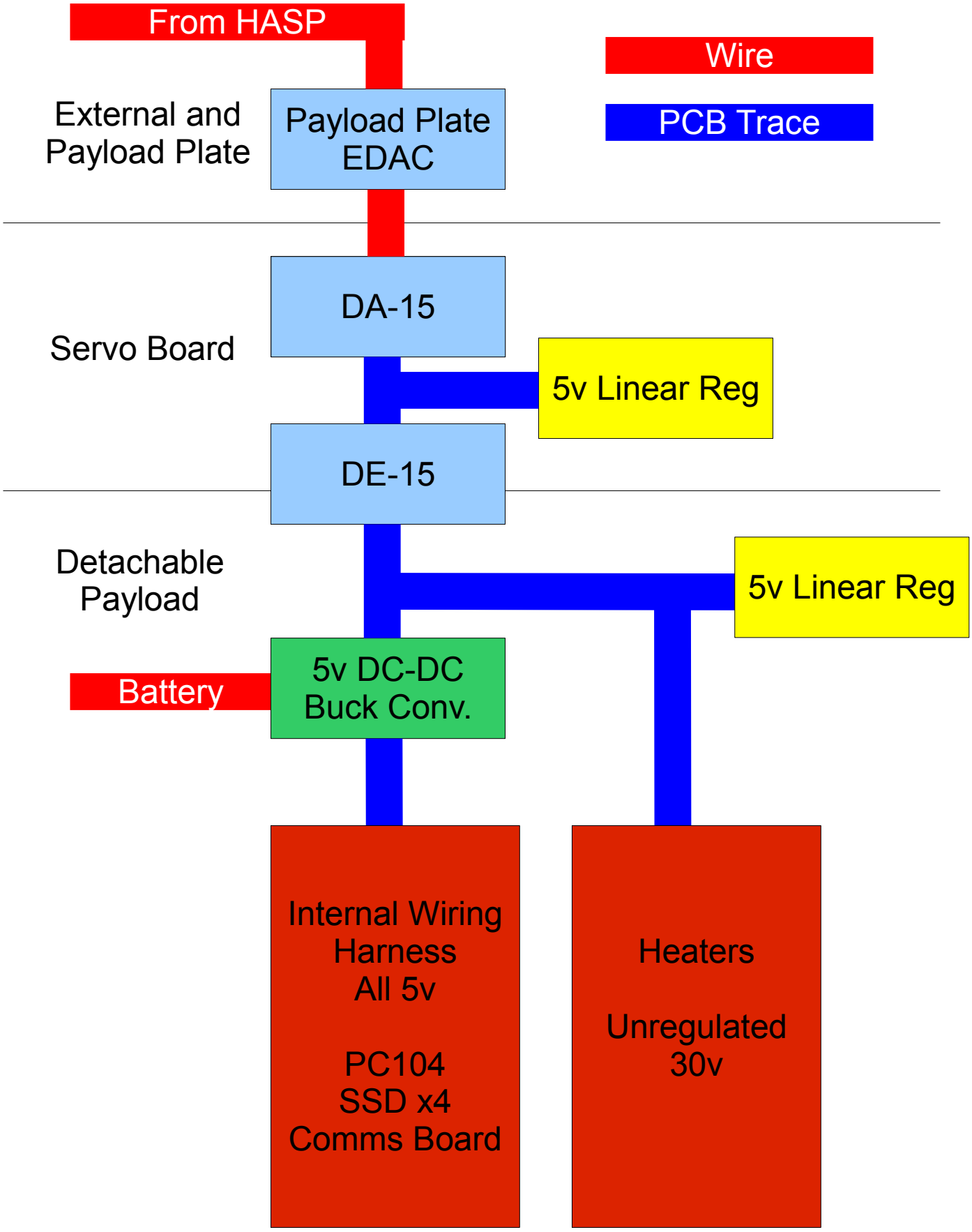
The main supply for the computer (during flight on HASP) and the communication (during independent descent) is the PTN78060W that provides high efficiency conversion from either the 30v HASP source or the 12v batteries to 5v DC. This is a larger 3A version of the PTN78000W (1.5A) that was flown on the two previous UMD HASP flights. Efficiency for this converter is expected to be close to 90%.

EDAC Connector:

The EDAC Connector is used in the specified manner with all 4 power and ground lines being used to power the payload. The discrete signals will be used to activate the detach servo and to turn the heater on and off. The analog lines will both be used for LM19 (or similar) temperature sensors as used on previous UMD payloads. One of these sensors will be positioned next to the detach servo and the other will read the ambient temperature internal to the main payload.




Servo Board
5v
30V HASP
Battery (12v)
12v
Power Board
5v
CPU
PCI
SATA Board
5v
SSD x4
Comms Board
5v
XTend
5v
APRS
3.3v
GPS


From HASP
Wire
PCB Trace
External and Payload Plate
Payload Plate EDAC
DA-15
Servo Board
5v Linear Reg
DE-15
Detachable Payload
5v Linear Reg
Battery
5v DC-DC Buck Conv.
Internal Wiring Harness All 5v
PC104 SSD x4 Comms Board
Heaters
Unregulated 30v