HASP Payload Specification and Integration Plan

Payload Title: UMD/ABC-2

Payload Class: [✓ Small] Large (circle one)

Payload ID: 05

Institution: University of Maryland, College Park

Contact Name: Dru Ellsberry

Contact Phone: 610-730-0944

Contact E-mail: Dru@UMD.edu

Submit Date: Monday, June 1st 2009

I. Mechanical Specifications:

A. Measured weight of the payload (not including payload plate)

Current estimated mass on the payload booms is ~1 kg. This does not include the mass of the cables or the dangling antennas which should not exceeded 1-2kg.

B. Provide a mechanical drawing detailing the major components of your payload and specifically how your payload is attached to the payload mounting plate

The structure for this year's payload will consist of a commercial extruded aluminum housing that our circuit board will be designed to fit inside. This will reduce the amount of time and effort going into the structures work and provide a more robust design. The standard extruded aluminum housing is sufficient for the experiment being conducted as all the major components are integrated onto a single printed circuit board.

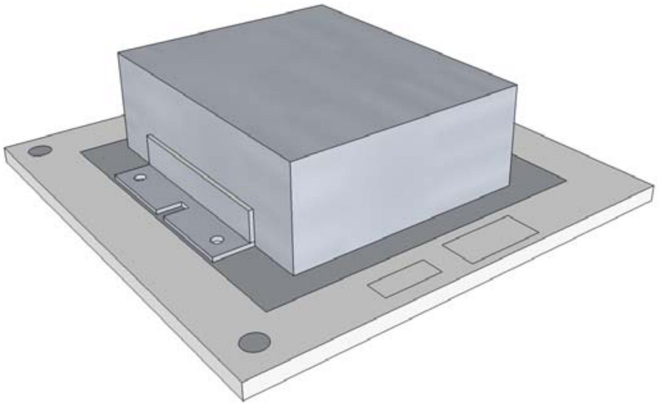


Figure 1: sketch-up dwg of payload

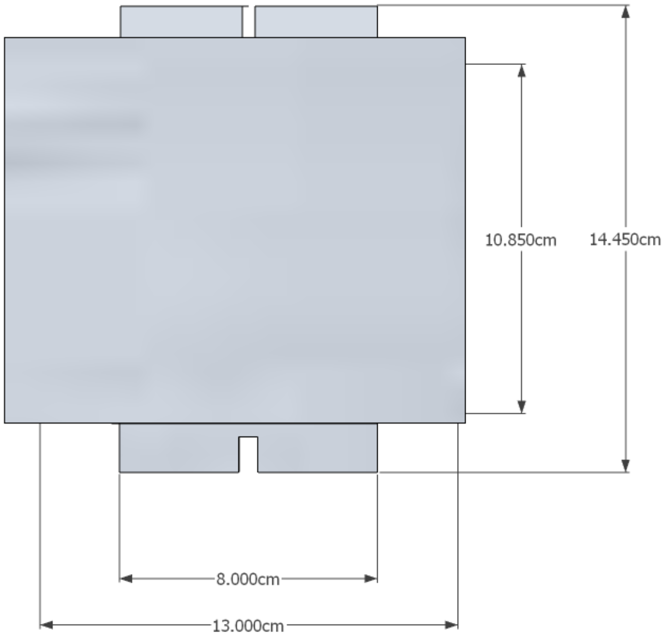


Figure 2: Top down detentions of main housing

C. If you are flying anything that is potentially hazardous to HASP or the ground crew before or after launch, please supply all documentation provided with the hazardous components (i.e. pressurized containers, radioactive material, projectiles, rockets…)

   - No hazardous materials will be flown. Please see the downlink section for information on the radio transmitters.

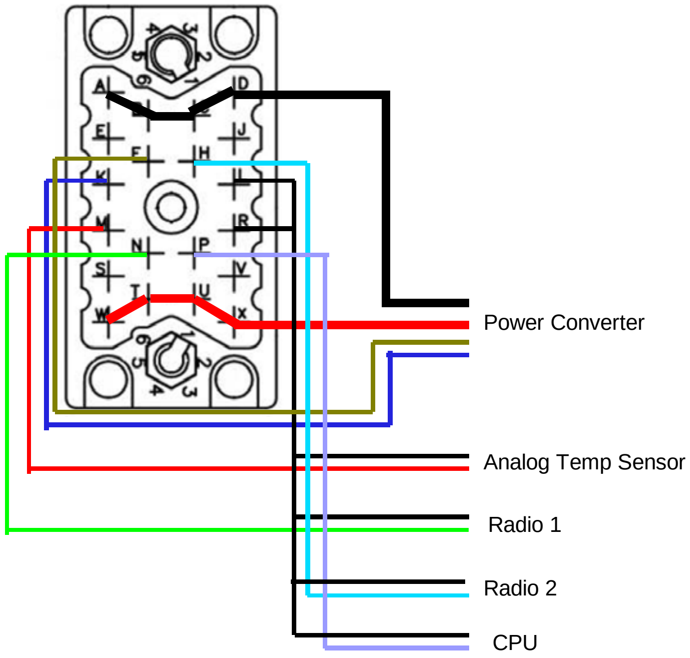
D. Other relevant mechanical information

II. Power Specifications:

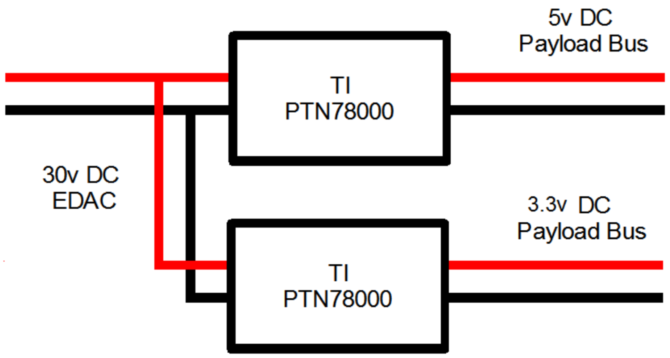
A. Measured current draw at 30 VDC

   - 0.25 Amps (max)

B. If HASP is providing power to your payload, provide a power system wiring diagram starting from pins on the student payload interface plate EDAC 516 connector through your power conversion to the voltages required by your subsystems.



EDAC Connections



Power Conversion Diagram

C. Other relevant power information

III. Downlink Telemetry Specifications:

A. Serial data downlink format: [✓ Stream] Packetized (circle one)

B. Approximate serial downlink rate (in bits per second)

   i. 1200 bps

C. Specify your serial data record including record length and information contained in each record byte

Headers:

- 1-Packet Type
- 2-9 - Time
- 10-11 - Packet Size
- 12 - Checksum
- 13-16 - Error Notification -1 for occurrence ,3 for type
- 17 - …-data

Data Types:

Radio Information Packets (ASCII):

- Total Packets Sent -10+comma
- Packet Number -3+comma
- Total Packet Count Logged -10+comma
- Commands Received -2+comma
- Received Signal Strength -3+comma
- Packets received -3+comma
- Radio Temperature (Xtend) -4+comma
- Radio Temperature (xBee) -4+semi-colon
- =Total of 47

Sensor Data Packets (ASCII):

- Processor Temperature -4+comma
- Board Temperature -4+comma
- Pressure Sensor Temperature -4+comma
- Actual Pressure in Pa -6+comma
- Pressure Altitude -4+comma
- Compass Heading- 3+semi-colon
- Voltage (x2)(4+comma=10)
- =Total of 41

GGA Packet – GPGGA string from GPS, with the GGA header removed ~ 63 bytes

RMC Packet – GPRMC string from the GPS, with the RMC header removed ~61 Bytes

Image Data Packet (ASCII):

- Image Packet Counter -1
- Image Data-200+semi-colon;
- =Total of 202

D. Number of analog channels being used: 2

E. If analog channels are being used, what are they being used for?
  - Internal (5v) bus voltage
  - Internal temperature

F. Number of discrete lines being used: 4

G. If discrete lines are being used what are they being used for?
  - Payload power (voltage regulator enable)
  - CPU reset
  - Radio sleep (on/off)

H. Are there any on-board transmitters? If so, list the frequencies being used and the transmitted power.
  - Yes
  - 902-928 (ISM) FHSS - 1 W
  - 902-928 (ISM) FHSS - 100 mW

I. Other relevant downlink telemetry information.
  - These are the same type of radio modules flown last year.
  - We will be mounting external antennas where they hang under the payload during the flight.

IV. Uplink Commanding Specifications:

A. Command uplink capability required: [✓ Yes] No (circle one)

B. If so, will commands be uplinked in regular intervals: Yes [✓ No] (circle one)

C. How many commands do you expect to uplink during the flight (can be an absolute number or a rate, i.e. *n commands per hour*)
  - ~6/Hour

D. Provide a table of all of the commands that you will be uplinking to your payload

Command (Binary)	Checksum	ID #	Description
0000	0	05	Run Startup Diagnostics
0001	D	05	Radio 1 9.6 Kbps

0010	7	05	Radio 1 115 Kbps
0011	E	05	Radio 2 9.6 Kbps
0100	6	05	All Radios Off
0101	0	05	Radio 1 Receive 9.6
0110	A	05	Radio 1 Receive 115
0111	1	05	Radio 2 Receive 9.6
1000	F	05	Run In-Flight Diagnostics
1001	0	05	Payload Mode 1
1010	1	05	Payload Mode 2
1011	2	05	Payload Mode 3
1100	3	05	Payload Mode 4
1101	4	05	Payload Mode 5
1110	5	05	Payload Mode 6

E. Are there any on-board receivers? If so, list the frequencies being used.

- Yes
- 902-928 (ISM) FHSS (2 Radios)

F. Other relevant uplink commanding information.

V. Integration and Logistics

A. Date and Time of your arrival for integration:

B. Approximate amount of time required for integration:

- 6 hours (our expectation based on last year)

C. Name of the integration team leader:

- Dru Ellsberry

D. Email address of the integration team leader:

- Dru@UMD.edu

E. List **ALL** integration participants (first and last names) who will be present for integration with their email addresses:

- Dru Ellsberry dru@umd.edu

- Mary Bowden bowden@umd.edu
- Connie Ciarlegio cciarleg@umd.edu
- We would like to keep open the posibility of adding an agitional team member, but many of our summer interns are just starting June 1st.

F. Define a successful integration of your payload:

  i. Secures mechanically to the HASP boom

  ii. Payload powers up and interfaces with mini-SIP
    1. Discrete I/O (systems enabled)
    2. Analog signals
    3. Uplink
    4. Telemetry

  iii. CPU is operational
    1. Runs program
    2. Logs Data

  iv. Radios working
    1. Uplink/downlink working
    2. Reasonable signal strength reading

  v. Non-mission critical items functioning
    1. Digital temperature sensors
    2. Camera
    3. Compass unit

G. List all expected integration steps:

  1. Attach payload mechanically and electrically
  2. Test discrete and analog I/O through the mini-SIP
  3. Test serial uplink and downlink through mini-SIP
  4. Test RF communications
  5. Run payload on ground and ensure overall operation as time permits

H. List all checks that will determine a successful integration:

  i. Analog signals received

  ii. Power converter produces 5v

  iii. CPU powers on

  iv. Mini-SIP uplink successful
  v. Mini-SIP downlink received
  vi. Test program loads
  vii. Radio 1 TX/RX test
  viii. Radio 2 TX/RX test
  ix. Camera takes image
  x. Temperature sensors and compass working

I. List any additional LSU personnel support needed for a successful integration other than directly related to the HASP integration (i.e. lifting, moving equipment, hotel information/arrangements, any special delivery needs…):

J. List any LSU supplied equipment that may be needed for a successful integration: