HASP Payload Specification and Integration Plan

Payload Title: Passive High Altitude Capture Experiment

Payload Class: Small [Large] (circle one)

Payload ID: 10

Institution: **Montana State University, Bozeman**

Contact Name: Jayson Nissen

Contact Phone: 406-581-1982

Contact E-mail: Jayson_Nissen@yahoo.com

Submit Date: June 1, 2008

I. Mechanical Specifications:

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

Our payload is still under construction. We estimate its weight at ~ 9 kg.

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

A mechanical drawing of our experiment is attached. We intend to drill through the mounting plate, much as we did for our previous flight, so that we can bolt the mounting brackets to the HASP mounting plate. Only the bolt heads will extend beyond the base of the HASP mounting plate.

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.

D. Other relevant mechanical information

The experiment has been modified since last year to allow for the easy removal of the capture box, to allow for cleaning and integration of the capture plates after integration at Palestine TX. ~~t Johnson Space Center~~.

II. Power Specifications:

A. Measured current draw at 28 VDC

Our best estimate of peak current is 850 mA. This will occur when we are operating both the servos and the servo heaters simultaneously.

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.

See the attached drawing. Our system connects to the HASP EDAC via DB9 Connector soldered to our control board. For our control circuitry we regulate the voltage to 5V using a DC/DC converter. We intend to deploy the same DC/DC converter unit that was flown last year.

Other relevant power information:

None

III. Downlink Telemetry Specifications:

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

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

4800 baud

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

Record Length: 7 bytes

Byte 1: Box lid status sensor data

Byte 2: Port servo temperature

Byte 3: Starboard servo temperature

Byte 4: DC-DC converter temperature

Byte 5: Port servo current

Byte 6: Starboard servo current

Byte 7: Number of turns executed by port servo

D. Number of analog channels being used:

None

E. If analog channels are being used, what are they being used for?

N/A

F. Number of discrete lines being used:

Two

G. If discrete lines are being used what are they being used for?

We plan to use the following two command pairs:

"OPEN/NOACTION"

"CLOSED/NOACTION"

These commands will be used to initiate lid opening/closing operations if the serial commands fail to do so.

H. Are there any on-board transmitters? If so, list the frequencies being used and the transmitted power.

No

I. Other relevant downlink telemetry information:

None

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*)

We will use less than ten commands and at least two (one for opening the capture box and one for closing the capture box).

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

HEX Code	***Purpose of Command***
B008	*Opens the box*
B0C1	*Closes the box*
B04B	*Initiates a heat cycle for both servos*
B03F	*Stops the opening or closing of the box*

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

*N*o

F. Other relevant uplink commanding information:

None

V. Integration and Logistics

A. Date and Time of your arrival for integration:

We will arrive in Palestine Texas on Sunday August 3rd and will report to the Columbia National Balloon Center at 9:00 AM Monday morning for our scheduled integration.

B. Approximate amount of time required for integration:

6 hours

C. Name of the integration team leader:

Jayson Nissen

D. Email address of the integration team leader:

jayson_nissen@yahoo.com

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

Tentative list:

Jayson Nissen *jayson_nissen@yahoo.com*

Jennifer Susan Hane *jennifer.hane@myportal.montana.edu*

F. Define a successful integration of your payload:

Box opens via serial command

Box closes via serial command

Box opens via discrete command

Box closes via discrete command

Proper serial downlink of data from sensors

G. List all expected integration steps:

1) Connect to HASP platform

2) Use serial uplink to open and close the box

3) Use discrete uplink to open and close the box

4) Verify download of onboard sensor package

5) Remove experiment from HASP platform and verify performance under simulated flight conditions using the BEMCO environmental chamber.

6) Remove the capture box for transport to clean room for capture plate integration

7) Verify that the remainder of the experiment is in a shippable state

8) Reinstall the baseplate and our experiment, minus the capture box, on the HASP platform.

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

1) Completion of all steps in part F successfully

2) Successful system operation in the BEMCO environmental chamber

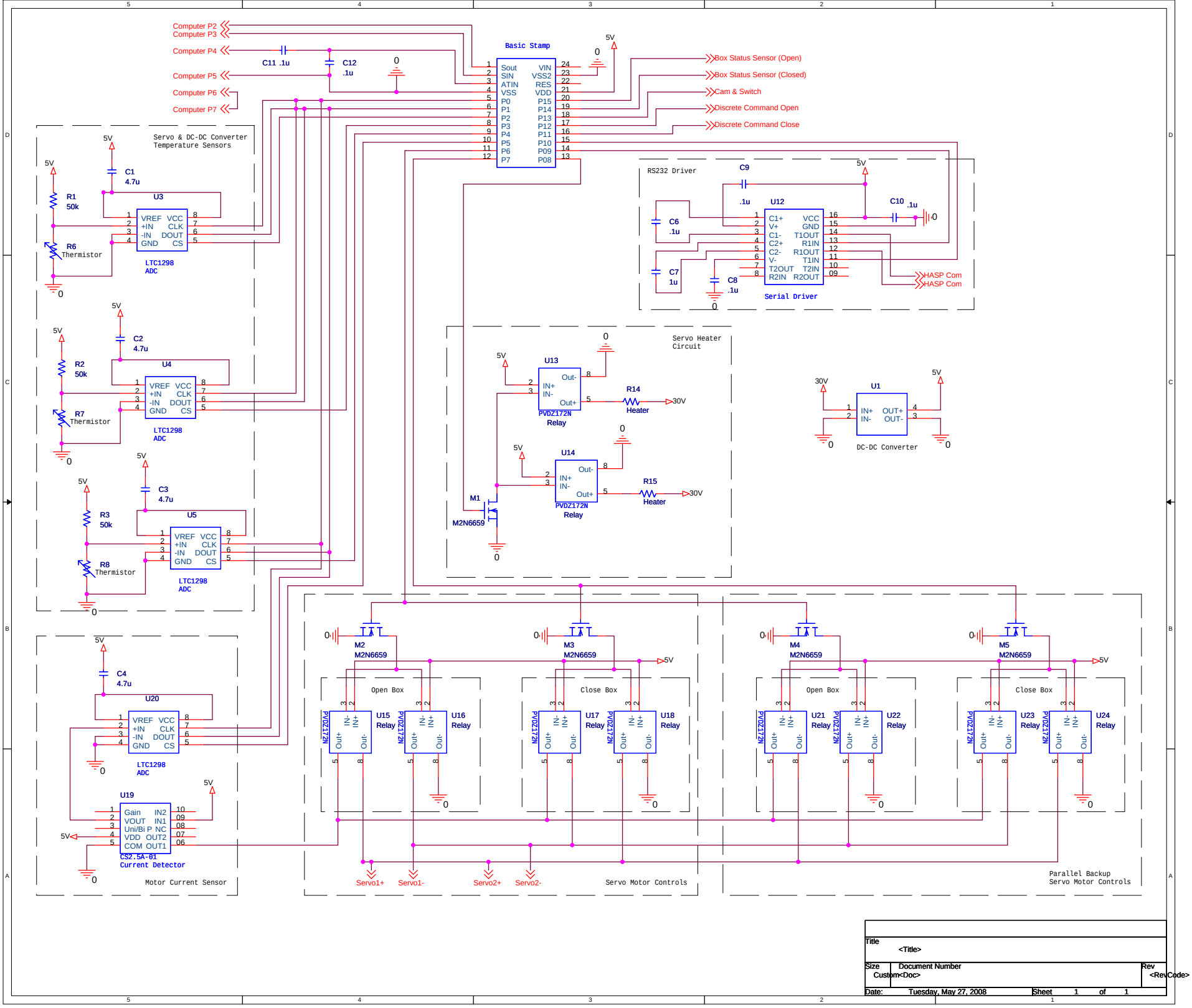
3) Removal of the capture box for transportation to a clean room facility

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…):

Last year Michael Stewart assisted us in modifying the programming code on our basic stamp microprocessor to convert from communication via hyperterminal to the protocol used by HASP. We may need his assistance in this regard again this year.

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

None


Computer P2
Computer P3
Computer P4
Computer P5
Computer P6
Computer P7
C11 .1u
C12 .1u
Basic Stamp
Sout VIN
SIN VSS2
ATIN RES
VSS VDD
P0 P15
P1 P14
P2 P13
P3 P12
P4 P11
P5 P10
P6 P09
P7 P08
Box Status Sensor (Open)
Box Status Sensor (Closed)
Cam & Switch
Discrete Command Open
Discrete Command Close
Servo & DC-DC Converter Temperature Sensors
C1 4.7u
R1 50k
U3
R6 Thermistor
LTC1298 ADC
C2 4.7u
R2 50k
U4
R7 Thermistor
C3 4.7u
R3 50k
U5
R8 Thermistor
RS232 Driver
C9 .1u
U12
C10 .1u
C6 .1u
C7 1u
C8 .1u
HASP Com
HASP Com
Serial Driver
Servo Heater Circuit
U13
R14
Heater
30V
PVDZ172N Relay
U14
R15
M1
M2N6659
U1
DC-DC Converter
C4 4.7u
U20
U19
CS2.5A-01 Current Detector
Motor Current Sensor
M2 M2N6659
M3 M2N6659
M4 M2N6659
M5 M2N6659
Open Box
Close Box
U15 Relay
U16 Relay
U17 Relay
U18 Relay
U21 Relay
U22 Relay
U23 Relay
U24 Relay
Servo1+
Servo1-
Servo2+
Servo2-
Servo Motor Controls
Parallel Backup Servo Motor Controls
Title
<Title>
Size
Custom<Doc>
Document Number
<Doc>
Rev
<RevCode>
Date: Tuesday, May 27, 2008
Sheet 1 of 1

To: Dr. Gregory Guzik
From: Jayson Nissen
Attn: Specification and Integration Plan for MSU's Passive High Altitude Particle Capture Experiment
Date: May 28, 2008

Dr. Guzik,

Attached are a copy of our integration plan and a schematic of the electronics for our experiment. Please note that the experiment is still under construction and minor design changes are expected. We have taken this into consideration with all of the figures and estimates provided and expect no major deviations. All required parameters will be within the limits required.

In regards to your comments of 02/08/08:

- Backup operation of the box will no longer be based on pressure. Discrete commands will be used to backup the operation of the experiment.
- The new mounting plate will be used.
- The weight estimate is based on weight of the current experiment plus the estimated weight of the new components.
- The plates do not need to be level.
- There has been a significant increase in downloaded telemetry.
- Discrete commands have been implemented as well as an increase in the number of commands to allow for trouble shooting during flight operations.
- A list of the expected commands is incorporated in the document.
- Testing of command lines will be accomplished after experiment construction which is currently on going.
- Sensors have been integrated into key operating components.

The MSU experiment is currently under construction are we are integrating several backup features into the electronics. No major changes to the physical layout of the experiment are expected. Our current timeline allows for four weeks of trouble shooting between completion of construction and integration.

Sincerely,
Jayson Nissen