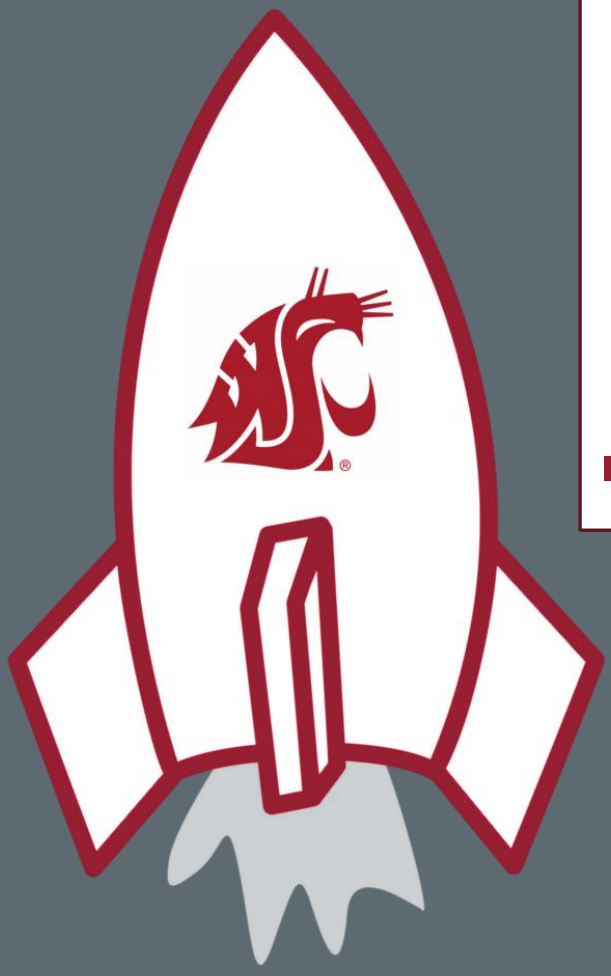
This document explains the function of the -Z Panel, its schematic level design, its board level design, and its functional testing

-Z Panel

Revision: 1.0.6



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1 Introduction

This document explains how the -Z Panel will fulfill the following Functions and conform to the following Requirements. This document refers to the -Z Panel version 1.0.

1.1 Functions

The -Z Panel is responsible for the following:

- Provide the high gain communication antenna
- Provide a Sun sensor for the ADCS

1.2 Requirements

The system requirements and -Z panel requirements can be found here.

2 Detailed Description

This section references the -Z panel schematic. Page numbers will be listed and may have coordinates listed (number and letter combination found around the frame).

2.1 Functional Block Diagram

The block diagram can be found on the first page of the schematic.

2.1.1 Photodiode

The photodiode is used as a sun sensor for the ADCS to determine the location of the sun.

2.1.2 Analog-to-Digital Converter

The analog to digital converter (ADC) converts the photodiode analog signal to a digital signal for the ADCS .

2.2 Schematic

2.2.1 Isolated Grounds

Power ground (PGND) is connected to the EPS circuits for the **Error! Reference source not found.**. Digital ground (DGND) connects to the ADCS connector as the reference for its I²C bus. Analog ground (AGND) connects to analog monitoring circuits including the ADCs, their voltage reference, and the thermistors. Analog ground is connected to digital ground using a 0Ω resistor rated up to $2A$, the expected current is less than $50mA$. Chassis ground (CHASSIS) is connected to the mechanical features including bolt holes.

2.2.2 Photodiode

The photodiode[1] can be found on page 2 (A1) of the schematic connected to the ADC. This photodiode is connected through the ADC to the ADCS system. This photodiode has a spectral sensitivity of $6.3nA/lx$ and the expected illuminance is on the order of < $1Mlx$. This makes the expected voltage drop across the load resistor about $0.9V$.

2.2.3 Analog-to-Digital Converter

The ADC[2] is located on page 2 (A2) of the schematic. The ADC connects the photodiode to the ADCS for determining the location of the sun. The remaining ADC inputs are used to measure temperature at various locations on the board.

2.3 Board

The board shall be double layered with $1oz$ copper, ENIG finish, and $0.6mm$ thick.

[1] CIS PN: 66-0003
[2] CIS PN: 27-0003

2.3.1 Layout Constraints

Unless specified in the following subsections, all signals shall use the default parameters specified below. Signals in the following subsections do not include their sense signals unless specified. Trace width can be broken if a trace needs to bottleneck down to a pin, the bottleneck shall be minimized.

Trace width:	$0.2mm$
Vias:	$0.3mm$, unlimited count
Separation:	$0.2mm$
Length:	unlimited

2.3.1.1 I²C-I2C_[SDA, SCL]

Length:	Each node shall be length matched $\pm 1.0mm$
Stubs:	$< 10.0mm$

3 Testing

All tests shall be performed at room temperature and not under vacuum unless otherwise specified. If any modifications are performed, take note. Include enough information to understand circuit behavior and for others to replicate the results. Include any software written to execute the test and link it in the test notes section. Save all software, waveforms, etc. in a subfolder of the board's test folder for each test.

- Waveforms shall be captured whenever appropriate
- Have the event take fill the screen (for fast events, zoom in; for slow events, zoom out)
- Label each channel accurately
- Only have bandwidth limiting if necessary for the test (this applies to the oscilloscope and probe settings)
- If ringing or overshoot occurs, use a ground spring or differential probe

Results location: https://github.com/CougsInSpace/CougSat1-Hardware/tree/master/CougSat1-RadioBoard/Testing/+XPanel.1.0

Common test instructions can be found on the wiki.

3.1 Photodiode

Results: Pass/Fail
Configuration:

This test evaluates the circuit described in Photodiode.

3.1.1 Test Instructions

Connect the ADC to the ADCS. Illuminate the photodiode with a bright light, measure the output voltage. Repeat with a dim light and a dark room. Verify the voltage changes accordingly

3.1.2 Test Data

Test the photodiode's response			
Light source	Voltage	Passing Criteria	Pass / Fail
Dark room Or shaded		$< 100mV$	
Dim light		$Higher\ than\ V_{dark}$ $< 900mV$	
Bright light		$Higher\ than\ V_{dim}$ $< 900mV$	

3.1.3 Test Notes

Delete me if no notes are required.