



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

-Z Panel

High Gain Communication
Antenna

Revision: 1.0.3

Joshua Lungstrom

Table of Contents

1	Introduction	2
1.1	Functions.....	2
1.2	Requirements.....	2
2	Detailed Description	3
2.1	Functional Block Diagram	3
2.1.1	High Gain 230mm Antenna.....	3
2.1.2	Antenna Deploy Release	3
2.1.3	Photodiodes	3
2.1.4	Analog-to-Digital Converter	3
2.2	Schematic.....	3
2.2.1	Isolated Grounds.....	3
2.2.2	Photodiode.....	3
2.2.3	Analog-to-Digital Converter	4
2.2.4	Antenna Deploy Release	4
2.2.5	High Gain 230mm Antenna.....	4
2.3	Board.....	4
2.3.1	Layout Constraints	4
3	Testing.....	5
3.1	Antenna Deploy Release	5
3.1.1	Test Instructions.....	5
3.1.2	Test Data	5
3.1.3	Test Notes	5
3.2	Photodiode.....	5
3.2.1	Test Instructions.....	5
3.2.2	Test Data	5
3.2.3	Test Notes	5
3.3	Deployment System	6
3.3.1	Test Instructions.....	6
3.3.2	Test Data	6
3.3.3	Test Notes	6

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](#).

2.1 Functional Block Diagram

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

2.1.1 High Gain 230mm Antenna

The high gain antenna is responsible for transmitting large data files and is controlled by the [Comms](#) system.

2.1.2 Antenna Deploy Release

The antenna deploy release is responsible for deployment of the high gain antenna and is controlled by the [EPS](#) system.

2.1.3 Photodiodes

The photodiodes are used as sun sensors for the ADCS system to determine the location of the sun. There is one photodiode on the -Z Panel and the datasheet can be found [here](#).

2.1.4 Analog-to-Digital Converter

The analog to digital converter (ADC) is meant to convert the photodiode analog signal to a digital signal for the ADCS system. The ADC datasheet can be found [here](#).

2.2 Schematic

2.2.1 Isolated Grounds

On page 2 of the schematic (D1), are the four isolated grounds found on the board. Power ground (PGND) is directly connected to the backplane and most of the power chain. The other grounds are shorted to PGND using a 0Ω resistor rated up to 2A, the expected current is less than 50mA each. Digital ground (DGND) connects to the digital circuitry including Monitoring circuits. Analog ground (AGND) connects to analog monitoring circuits including the ADCs, their voltage reference, and the thermistors. Chassis ground (CHASSIS) is connected to the Mechanical Features including bolt holes.

2.2.2 Photodiode

The photodiode can be found on page 2 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 $< 1\text{mV}$. This makes the expected voltage drop across the load resistor about 0.9V .

2.2.3 Analog-to-Digital Converter

The ADC is located on page 2 of the schematic. The ADC connects the photo diode to the ADCS system so the ADCS system can determine the location of the sun. The rest of the ADC inputs are used to measure temperature at various locations on the board.

2.2.4 Antenna Deploy Release

The deploy release system is located on page 2 of the schematic. Four flaps function to hold the antenna down before release that are loaded with springs. There are contacts on the springs to verify if the flaps have been opened. The springs are part of RF ground and when deployed the contacts will read high. The deployment system functions by cutting the plastic line used to tie the flaps together with high temperature 15Ω resistors. When the line is cut the springs push the flaps to swing out and the antenna is deployed.

2.2.5 High Gain 230mm Antenna

The antenna contact is located on page 2 of the schematic. The antenna is helically shaped with a circular polarization. The antenna is held down by 4 flaps ready for an irreversible deployment. Directivity of the antenna is 48.5669 and the gain is 11.8.

2.3 Board

The board shall be double layered with 1oz copper and ENIG finish.

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 $\pm 1.0\text{mm}$
Stubs:	$< 10.0\text{mm}$

2.3.1.2 RFTraces - LOW_GAIN_[P,N, COAX], GPS_COAX

Track Width:	1.5 mm
--------------	--------

Gap Width: 0.5 mm
 Impedance: 50Ω

2.3.1.3 RF Ground

There will be a ground pour for RF ground.

3 Testing

3.1 Antenna Deploy Release

Results: Pass/Fail

3.1.1 Test Instructions

Measure resistance of R_{knife} . Calculate current through thermal knife resistors when applied voltage, 3.7V. Measure temperature and test melting the wire. Verify sensing of open deployment contacts as high when in deployment state.

3.1.2 Test Data

V_{knife}	R_{knife}	I_{knife}	T_{knife}	Pass/Fail

3.1.3 Test Notes

Delete me if no notes are required.

3.2 Photodiode

Results: Pass/Fail

3.2.1 Test Instructions

Verify the spectral sensitivity of 6.3nA/lx, and verify the voltage drop at 0.9V at $\leq 1\text{Mlx}$. Measure lux applied I_i . Measure voltage drop at levels of luminescence.

3.2.2 Test Data

V_{diode}	I_i	Sensitivity	Pass/Fail

3.2.3 Test Notes

Delete me if no notes are required.

3.3 Deployment System

Results: Pass/Fail

3.3.1 Test Instructions

Verify the deployment system functions correctly. Set up antenna to be deployed and apply 3.7V to the contact nodes.

3.3.2 Test Data

V_{knife}	Pass/Fail

3.3.3 Test Notes

Delete me if no notes are required.