EDGECUBE

uStar v 2.0

SN:\_\_\_\_\_\_\_\_\_

Safe to Mate Test Procedure

Doc #: ##

Rev 1.0

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Prepared By: Kevin Zack

Date: 1/1/2018

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Sonoma State University

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CERTIFICATION LOG

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|  |  |
| Electronic Signature on File\* |
| Kevin Zack | Date |
| Author/RE |  |
|  |  |
| Reviewed: |  |
|  |  |
| Electronic Signature on File\* |  |
|  | Date |
| Electrical Engineer |  |
|  |  |
| Approval: |  |
| Electronic Signature on File\* |  |
|  | Date |
| Project Manager |  |
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# Revision Log

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| --- | --- | --- | --- |
| Rev. | Area(s) Affected | Date | Approval |
| 1.0 | Initial Release | 1/1/2018 |  |
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# Scope

This document outlines the uStar safe to mate test procedure for the EDGECUBE mission.

# Test Readiness Review (TRR)

A TRR shall be held prior to execution of this procedure. This review shall include a description of the test article, the levels, inspections, and evaluation criteria.

# Applicable Documents and Standards

The following documents and standards shown form a part of this document to the extent specified. If a revision number is not shown, then it is the issue in effect on the date of this document. In the event of a conflict between this document and the contents of one of the documents or standards listed below, this document shall take precedence.

Table 1 Applicable Documents

|  |  |
| --- | --- |
| **Document Number** | **Document Title** |
| IS-ECAD-0001-S | EPS Schematic |
|  |  |
|  |  |
|  |  |
|  |  |

# Test Documentation and Reporting

## Test Data

Test data will be recorded directly on this procedure or on a computer printout attached to this procedure in Appendix A. Mark front page of this procedure “As-Run Test Report”. Submit completed test report to SSEL Document Control.

## Quality Assurance

An SSEL QA representative will be present and shall monitor part or all of the testing. Prior to the start of the test, SSEL QA shall verify that the test setup and equipment meets the requirements of this document.

## Nonconformances and Failures

Nonconformances, including test failures encountered during the execution of this test shall be documented using the SSEL Nonconformance Reporting System. The reason for any test failure shall be identified. **The hardware under test or the test setup shall not be disturbed in any way that prohibits duplication of the test sequence and configuration that resulted in the failure.** Any corrective actions identified shall be evaluated by the engineering team prior to execution.

## Changes to Test Procedure

Changes to this test procedure may be made in response to last minute changes in test requirements or to correct errors in the test procedure identified after the test has started. Changes are defined as minor or major changes depending upon how much the procedure is changed.

### Minor Changes

Minor changes are defined as those changes that will not significantly change the actual test procedure or affect the results of the test. Such changes as equipment model number changes or corrections of procedural errors are minor changes. Minor changes may be made by the test conductor, with the concurrence of the responsible QA Representative. Changes must be initialed and dated by the test conductor and receive a QA initial and date after approval.

### Major Changes

Major changes are defined as those changes that will significantly change the actual test procedure or affect the test results. Changes to procedure to reduce schedule impact, changes as the result of test failure closeouts, or changes in the scope of the test are defined as major changes and shall be initiated only by the project manager and must have the concurrence of the QA representative.

### Test Configuration Control

Any changes to the test setup after the start of the test shall be documented and permanently attached to this procedure. This should include modifications to the unit under test, GSE, wiring, jumpers, etc. In addition, each time this procedure is performed, a log shall be maintained of any test configuration changes that may have occurred.

## Run Time Log

Throughout the execution of this test procedure, be sure to maintain an accurate log of the run time of the system(s) under test. Enter the start and stop times in the margins of the procedure or another suitable location within this test procedure.

# Constraints

## Cleanliness and Contamination Control

Only qualified personnel wearing appropriate protective garments shall be allowed to handle the IT-SPINS flight hardware. Appropriate garments include an ESD smock with wrist strap and Nitrile gloves.

## Lifting and Handling

Care should be exercised when handling the assembled circuit boards. Lift boards only by their edges and avoid touching the circuitry as much as possible. The boards shall be transported between test benches only when placed within an ESD bag or other suitable ESD-safe container.

## ESD Constraints

Personnel handling IS-SPINS PCBs shall be strap grounded to a suitable grounding point. The SSEL ESD Policy (00A0000) outlines the basics of ESD control and shall be referenced prior to the execution of this test.

## Safety

### Unit Under Test Safety

Utmost care must be taken to avoid physical damage to IS-SPINS PCBs. The use of proper lifting techniques is required. As stated previously, only qualified SSEL personnel shall be allowed to handle the flight article. During work on the flight hardware, two persons are required for all operations.

### Facility and Equipment Safety

Appropriate barriers should be used to separate the area in which flight hardware testing is being conducted.

# Equipment Calibration Requirements

All equipment used to make measurements during the execution of this procedure shall have current calibration certifications. Measuring equipment shall have precision nominally an order of magnitude greater than that required for the measurement data, and not less than a factor of two greater than that required. Record all pertinent calibrated test equipment in Table 2 of this procedure.

**Required Equipment: Calibration Required?**

DC Power Supply Yes

Digital Multimeter Yes

PCB Test Stand No

Table 2 Test Equipment Identification

|  |  |  |
| --- | --- | --- |
| Equipment Identification | **Serial Number** | **Last Cal. Date** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Table 3 Units Under Test (Hardware and Software)

|  |  |  |
| --- | --- | --- |
| **Name** | **Serial Number** | **STM Run Date** |
|  |  |  |
|  |  |  |

# Test Preparation

The following steps shall be completed before performing the interface test:

**Initial step when completed**

## Pre-test Operations

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 8.1.1 | Setup Relevant GSE in the test Area (See Figure 1) |  |  |
| 8.1.2 | Verify that cables are out of high traffic areas |  |  |
| 8.1.3 | Verify that the cables are in good condition with no pinches or frays |  |  |
| 8.1.4 | Verify that the Unit Under Test is mounted in a mechanically and electrically safe way, apply Kapton tape to the mounting clamp to avoid contamination |  |  |
| 8.1.5 | Take numerous photos of entire test set up prior to start of test |  |  |
| 8.1.6 | Have QA verify the test setup prior to the start of the test |  |  |

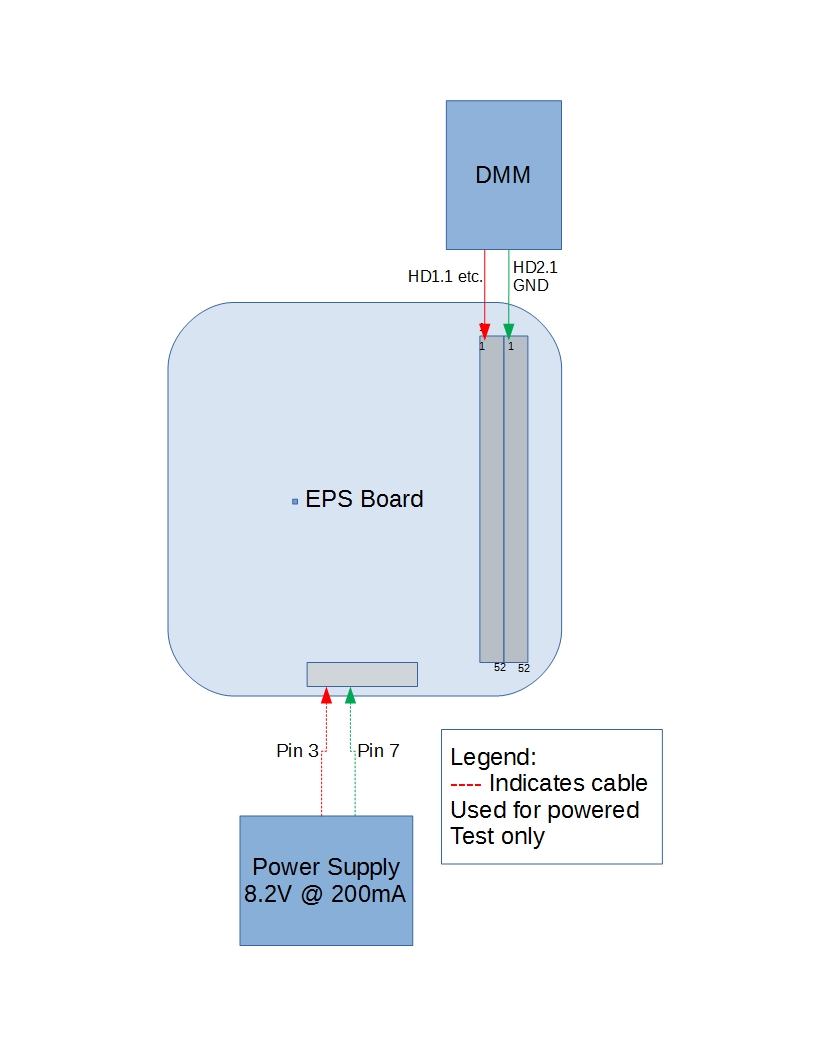


Figure EPS powered and unpowered safe to mate test setup

# Safe to Mate Test

Definitions:

* HD1.10 – Example pin reference, translates to: Header 1, Pin 10.
* Capacitive – Refers to a resistance measurement affected by a large parallel capacitance somewhere in the circuit, the multimeter will change values as the capacitor is charged/discharged through the multimeter probes.
* Floating – Refers to a voltage measurement made on a disconnected pin, the voltage reading will fluctuate near zero, but a precise measurement cannot be made.

## HD1 Unpowered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.1.1 | Ensure all power is off before conducting the test, disconnect all power supplies from the EPS board |  |  |
| 9.1.2 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.1.3 | Use the digital multimeter to measure the resistance from each pin on HD1 to GND (HD2.1), record results in Table 4 below |  |  |

Table HD1 Unpowered Test Data

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pin | Spacecraft Bus Name | System Name | Type | Resistance Expected | Resistance Measured |
| 1 | NC | NC | Not Connected | Open |  |
| 2 | NC | NC | Not Connected | Open |  |
| 3 | NC | NC | Not Connected | Open |  |
| 4 | NC | NC | Not Connected | Open |  |
| 5 | NC | NC | Not Connected | Open |  |
| 6 | NC | NC | Not Connected | Open |  |
| 7 | NC | NC | Not Connected | Open |  |
| 8 | NC | NC | Not Connected | Open |  |
| 9 | NC | NC | Not Connected | Open |  |
| 10 | RTC\_REG\_ | RTC\_REG\_ | Digital | Capacitive |  |
| 11 | EPS\_SDA | EPS\_SDA | Digital | 1MΩ |  |
| 12 | EPS\_SCL | EPS\_SCL | Digital | 1MΩ |  |
| 13 | ANT\_FIRE\_EN | ANT\_FIRE\_EN | Digital | 10K |  |
| 14 | EPS\_ | EPS\_ | Digital | 1MΩ |  |
| 15 | NC | NC | Not Connected | Open |  |
| 16 | NC | NC | Not Connected | Open |  |
| 17 | COMM\_TBIAS | COMM\_TBIAS | Analog | Capacitive |  |
| 18 | COMM\_TMON | COMM\_TMON | Analog | Capacitive |  |
| 19 | NC | NC | Not Connected | Open |  |
| 20 | NC | NC | Not Connected | Open |  |
| 21 | NC | NC | Not Connected | Open |  |
| 22 | NC | NC | Not Connected | Open |  |
| 23 | NC | NC | Not Connected | Open |  |
| 24 | NC | NC | Not Connected | Open |  |
| 25 | NC | NC | Not Connected | Open |  |
| 26 | NC | NC | Not Connected | Open |  |
| 27 | ADCS\_UART\_TLM | ADCE\_UART\_TLM | Digital | Open |  |
| 28 | NC | NC | Not Connected | Open |  |
| 29 | ADCS\_CSS0 | ADCS\_CSS0 | Analog | 15KΩ |  |
| 30 | ADCS\_CSS1 | ADCS\_CSS1 | Analog | 15KΩ |  |
| 31 | ADCS\_CSS2 | ADCS\_CSS2 | Analog | 15KΩ |  |
| 32 | NC | NC | Not Connected | Open |  |
| 33 | ADCS\_CSS4 | ADCS\_CSS4 | Analog | 15KΩ |  |
| 34 | ADCS\_CSS5 | ADCS\_CSS5 | Analog | 15KΩ |  |
| 35 | NC | NC | Not Connected | Open |  |
| 36 | NC | NC | Not Connected | Open |  |
| 37 | NC | NC | Not Connected | Open |  |
| 38 | NC | NC | Not Connected | Open |  |
| 39 | NC | NC | Not Connected | Open |  |
| 40 | NC | NC | Not Connected | Open |  |
| 41 | GSE\_UART\_TLM | GSE\_UART\_TLM | Digital | Open |  |
| 42 | GSE\_UART\_CMD | GSE\_UART\_CMD | Digital | Open |  |
| 43 | GSE\_PGED | GSE\_PGED | Digital | 1MΩ |  |
| 44 | GSE\_PGEC | GSE\_PGEC | Digital | 1MΩ |  |
| 45 | GSE\_RESET | GSE\_RESET | Digital | 1MΩ |  |
| 46 | GSE\_DISARM | GSE\_DISARM | Digital | Open |  |
| 47 | GSE\_SEL0 | GSE\_SEL1 | Digital | 1MΩ |  |
| 48 | GSE\_SEL1 | GSE\_SEL2 | Digital | 1MΩ |  |
| 49 | GSE\_SEL2 | GSE\_SEL3 | Digital | 1MΩ |  |
| 50 | GSE\_SEL3 | GSE\_SEL1 | Digital | 1MΩ |  |
| 51 | NC | NC | Not Connected | Open |  |
| 52 | NC | NC | Not Connected | Open |  |

Were all resistances within limits? (PASS / FAIL)

Test Conductor Initials: \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_ Time: \_\_\_\_\_\_\_\_\_\_

## HD2 Unpowered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.2.1 | Ensure all power is off before conducting the test, disconnect all power supplies from the EPS board |  |  |
| 9.2.2 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.2.3 | Use the digital multimeter to measure the resistance from each pin on HD2 to GND (HD2.1), record results in Table 5 below |  |  |

Table HD2 Unpowered Test Data

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pin | Spacecraft Bus Name | System Name | Type | Resistance Expected | Resistance Measured |
| 1 | GND | GND | Ground | Short |  |
| 2 | GND | GND | Ground | Short |  |
| 3 | GND | GND | Ground | Short |  |
| 4 | GND | GND | Ground | Short |  |
| 5 | SA\_Y-\_IN | SA\_Y-\_IN | Analog | 85K |  |
| 6 | SA\_Y-\_IN | SA\_Y-\_IN | Analog | 85K |  |
| 7 | CSS\_3V3 | CSS\_3V3 | Power | Capacitive |  |
| 8 | CSS\_3V3 | CSS\_3V3 | Power | Capacitive |  |
| 9 | SCE\_3V3 | SCE\_3V3 | Power | Capacitive |  |
| 10 | SCE\_3V3 | SCE\_3V3 | Power | Capacitive |  |
| 11 | NC | NC | Not Connected | Open |  |
| 12 | NC | NC | Not Connected | Open |  |
| 13 | NC | NC | Not Connected | Open |  |
| 14 | NC | NC | Not Connected | Open |  |
| 15 | GND | GND | Ground | Short |  |
| 16 | GND | GND | Ground | Short |  |
| 17 | CTIP\_5V0 | CTIP\_5V0 | Power | Capacitive |  |
| 18 | CTIP\_5V0 | CTIP\_5V0 | Power | Capacitive |  |
| 19 | NC | NC | Not Connected | Open |  |
| 20 | NC | NC | Not Connected | Open |  |
| 21 | GND | GND | Ground | Short |  |
| 22 | GND | GND | Ground | Short |  |
| 23 | ADCS\_5V0 | ADCS\_5V0 | Power | Capacitive |  |
| 24 | ADCS\_5V0 | ADCS\_5V0 | Power | Capacitive |  |
| 25 | ADCS\_MAG\_3V3 | ADCS\_MAG\_3V3 | Power | Open |  |
| 26 | ADCS\_MAG\_3V3 | ADCS\_MAG\_3V3 | Power | Open |  |
| 27 | SYS\_3V3 | SYS\_3V3 | Power | Capacitive |  |
| 28 | SYS\_3V3 | SYS\_3V3 | Power | Capacitive |  |
| 29 | GND | GND | Ground | Short |  |
| 30 | GND | GND | Ground | Short |  |
| 31 | GND | GND | Ground | Short |  |
| 32 | GND | GND | Ground | Short |  |
| 33 | NC | NC | Not Connected | Open |  |
| 34 | NC | NC | Not Connected | Open |  |
| 35 | NC | NC | Not Connected | Open |  |
| 36 | NC | NC | Not Connected | Open |  |
| 37 | NC | NC | Not Connected | Open |  |
| 38 | NC | NC | Not Connected | Open |  |
| 39 | NC | NC | Not Connected | Open |  |
| 40 | NC | NC | Not Connected | Open |  |
| 41 | GND | GND | Ground | Short |  |
| 42 | GND | GND | Ground | Short |  |
| 43 | NC | NC | Not Connected | Open |  |
| 44 | NC | NC | Not Connected | Open |  |
| 45 | UNREG\_WDT | UNREG\_WDT | Power | Capacitive |  |
| 46 | UNREG\_WDT | UNREG\_WDT | Power | Capacitive |  |
| 47 | UNREG\_WDT | UNREG\_WDT | Power | Capacitive |  |
| 48 | UNREG\_WDT | UNREG\_WDT | Power | Capacitive |  |
| 49 | RTC\_3V3 | RTC\_3V3 | Power | Capacitive |  |
| 50 | NC | NC | Not Connected | Open |  |
| 51 | GND | GND | Ground | Short |  |
| 52 | GND | GND | Ground | Short |  |

Were all resistances within limits? (PASS / FAIL)

Test Conductor Initials: \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_ Time: \_\_\_\_\_\_\_\_\_\_

## EGSE Connector Unpowered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.3.1 | Ensure all power is off before conducting the test, disconnect all power supplies from the EPS board |  |  |
| 9.3.2 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.3.3 | Use the digital multimeter to measure the resistance from each pin on EGSE Connector to GND (HD2.1), record results in Table 6 below |  |  |

Table EGSE Unpowered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Resistance Expected | Resistance Measured |
| 1 | BAT\_UNSF | Power | 84K9Ω |  |
| 2 | BAT\_UNSF | Power | 84K9Ω |  |
| 3 | PWR\_SAFE | Power | Capacitive |  |
| 4 | PWR\_SAFE | Power | Capacitive |  |
| 5 | PWR\_UNSF | Power | 84K9Ω |  |
| 6 | PWR\_UNSF | Power | 84K9Ω |  |
| 7 | GND | Ground | Short |  |
| 8 | GND | Ground | Short |  |
| 9 | GND | Ground | Short |  |
| 10 | GND | Ground | Short |  |
| 11 | SYS\_3V3 | Power | Capacitive |  |
| 12 | SYS\_3V3 | Power | Capacitive |  |
| 13 | ADCS\_UART\_TLM | Digital | Open |  |
| 14 | GND | Ground | Short |  |
| 15 | GSE\_UART\_TLM | Digital | 1MΩ |  |
| 16 | GND | Ground | Short |  |
| 17 | GSE\_PGED | Digital | Capacitive |  |
| 18 | GSE\_UART\_CMD | Digital | 1MΩ |  |
| 19 | GSE\_RESET | Digital | Capacitive |  |
| 20 | GSE\_PGEC | Digital | Capacitive |  |
| 21 | GSE\_SEL0 | Digital | Capacitive |  |
| 22 | GSE\_DISARM | Digital | Open |  |
| 23 | GSE\_SEL2 | Digital | Capacitive |  |
| 24 | GSE\_SEL1 | Digital | Capacitive |  |
| 25 | GND | Ground | Short |  |
| 26 | GSE\_SEL3 | Digital | Capacitive |  |

Were all results within limits? (PASS / FAIL)

Test Conductor Initials: \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_ Time: \_\_\_\_\_\_\_\_\_\_

## SA X+ Unpowered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.4.1 | Ensure all power is off before conducting the test, disconnect all power supplies from the EPS board |  |  |
| 9.4.2 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.4.3 | Use the digital multimeter to measure the resistance from each pin on SA X- Connector to GND (HD2.1), record results in Table 7 below |  |  |

Table SA X+ Unpowered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Resistance Expected | Resistance Measured |
| 1 | GND | GND | Short |  |
| 2 | SA\_X+\_IN | Power | Floating |  |
| 3 | SA\_X+\_IN | Power | Floating |  |
| 4 | GND | GND | Short |  |
| 5 | GND | GND | Short |  |
| 6 | GND | GND | Short |  |
| 7 | CSS0\_IN | Power | 0.1Ω |  |
| 8 | GND | GND | Short |  |
| 9 | GND | GND | Short |  |
| 10 | GND | GND | Short |  |

## SA X- Unpowered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.5.1 | Ensure all power is off before conducting the test, disconnect all power supplies from the EPS board |  |  |
| 9.5.2 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.5.3 | Use the digital multimeter to measure the resistance from each pin on SA X- Connector to GND (HD2.1), record results in Table 8 below |  |  |

Table SA X- Unpowered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Resistance Expected | Resistance Measured |
| 1 | GND | GND | Short |  |
| 2 | SA\_X-\_IN | Power | Floating |  |
| 3 | SA\_X-\_IN | Power | Floating |  |
| 4 | GND | GND | Short |  |
| 5 | GND | GND | Short |  |
| 6 | ANT\_FIRE\_UNREG | Power | Float |  |
| 7 | CSS1\_IN | Power | 0.1Ω |  |
| 8 | GND | GND | Short |  |
| 9 | GND | GND | Short |  |
| 10 | GND | GND | Short |  |

## SA Y+ Unpowered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.6.1 | Ensure all power is off before conducting the test, disconnect all power supplies from the EPS board |  |  |
| 9.6.2 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.6.3 | Use the digital multimeter to measure the resistance from each pin on SA Y+ Connector to GND (HD2.1), record results in Table 9 below |  |  |

Table SA Y+ Unpowered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Resistance Expected | Resistance Measured |
| 1 | GND | GND | Short |  |
| 2 | SA\_Y+\_IN | Power | Floating |  |
| 3 | SA\_Y+\_IN | Power | Floating |  |
| 4 | GND | GND | Short |  |
| 5 | GND | GND | Short |  |
| 6 | GND | GND | Short |  |
| 7 | CSS2\_IN | Power | 0.1Ω |  |
| 8 | GND | GND | Short |  |
| 9 | GND | GND | Short |  |
| 10 | GND | GND | Short |  |

## CSS Z- Unpowered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.7.1 | Ensure all power is off before conducting the test, disconnect all power supplies from the EPS board |  |  |
| 9.7.2 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.7.3 | Use the digital multimeter to measure the resistance from each pin on CSS Z- Connector to GND (HD2.1), record results in Table 10 below |  |  |

Table CSS Z- Unpowered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Resistance Expected | Resistance Measured |
| 1 | GND | GND | Short |  |
| 2 | CSS5\_IN | Power | 0.1Ω |  |
| 3 | SA\_Z-\_TEMP | Power | Capacitive |  |
| 4 | UNREG\_WDT | Power | Capacitive |  |

## CSS Z+ Unpowered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.8.1 | Ensure all power is off before conducting the test, disconnect all power supplies from the EPS board |  |  |
| 9.8.2 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.8.3 | Use the digital multimeter to measure the resistance from each pin on CSS Z+ Connector to GND (HD2.1), record results in Table 11 below |  |  |

Table CSS Z+ Unpowered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Resistance Expected | Resistance Measured |
| 1 | GND | GND | Short |  |
| 2 | CSS4\_IN | Power | 0.1Ω |  |
| 3 | SA\_Z+\_TEMP | Power | Capacitive |  |
| 4 | UNREG\_WDT | Power | Capacitive |  |

## INHIBITS Unpowered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.9.1 | Ensure all power is off before conducting the test, disconnect all power supplies from the EPS board |  |  |
| 9.9.2 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.9.3 | Use the digital multimeter to measure the resistance from each pin on INHIBITS Connector to GND (HD2.1), record results in Table 12 below |  |  |

Table INHIBITS Unpowered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Resistance Expected | Resistance Measured |
| 1 | PWR\_AFT\_INHIB | Power | Floating |  |
| 2 | PWR\_SAFE | Power | Capacitive |  |
| 3 | PWR\_AFT\_INHIB | Power | Floating |  |
| 4 | PWR\_SAFE | Power | Capacitive |  |
| 5 | PWR\_AFT\_INHIB | Power | Floating |  |
| 6 | NC | Not Connected | Floating |  |
| 7 | PWR\_AFT\_INHIB | Power | Floating |  |
| 8 | PWR\_UNSF | Power | Capacitive |  |
| 9 | PWR\_AFT\_INHIB | Power | Floating |  |
| 10 | PWR\_UNSF | Power | Capacitive |  |

## BATTERY Unpowered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.10.1 | Ensure all power is off before conducting the test, disconnect all power supplies from the EPS board |  |  |
| 9.10.2 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.10.3 | Use the digital multimeter to measure the resistance from each pin on BATTERY Connector to GND (HD2.1), record results in Table 13 below |  |  |

Table BATTERY Unpowered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Resistance Expected | Resistance Measured |
| 1 | BAT\_UNSF | Power | Capacitive |  |
| 2 | GND | GND | Short |  |
| 3 | BAT\_UNSF | Power | Capacitive |  |
| 4 | GND | GND | Short |  |
| 5 | BAT\_UNSF | Power | Capacitive |  |
| 6 | GND | GND | Short |  |
| 7 | BATT1\_TEMP | Power | Capacitive |  |
| 8 | UNREG\_WDT | Power | Capacitive |  |
| 9 | BATT2\_TEMP | Power | Capacitive |  |
| 10 | UNREG\_WDT | Power | Capacitive |  |

## HD1 Powered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.11.1 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.11.2 | Connect the +25V output of the power supply to the custom EGSE Cable Pin 3 and GND to Pin 7. Attach the cable to the EGSE Connector |  |  |
| 9.11.3 | Set the power supply limits to 8.2V@200mA, the bus voltage should be approximately 8.2 V |  |  |
| 9.11.4 | Double check the setup, ensure that the positive output of the supply is connected to pin Pin 3 and the common (GND) output of the supply is connected to Pin 7 |  |  |
| 9.11.5 | Enable the output of the power supply, note the supply  Current: \_\_\_\_\_\_\_\_\_\_\_ |  |  |
| 9.11.6 | Use the digital multimeter to measure the voltage from each pin on HD1 to GND (HD2.1), record results in table 14 below |  |  |

Table HD1 Powered Test Data

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Pin | | Spacecraft Bus Name | System Name | Type | Voltage Expected | Voltage Measured |
| 1 | NC | | NC | Not Connected | Floating |  |
| 2 | NC | | NC | Not Connected | Floating |  |
| 3 | NC | | NC | Not Connected | Floating |  |
| 4 | NC | | NC | Not Connected | Floating |  |
| 5 | NC | | NC | Not Connected | Floating |  |
| 6 | NC | | NC | Not Connected | Floating |  |
| 7 | NC | | NC | Not Connected | Floating |  |
| 8 | NC | | NC | Not Connected | Floating |  |
| 9 | NC | | NC | Not Connected | Floating |  |
| 10 | RTC\_REG\_ | | RTC\_REG\_ | Not Connected | 2V6 |  |
| 11 | EPS\_SDA | | EPS\_SDA | Digital | 0V |  |
| 12 | EPS\_SCL | | EPS\_SCL | Digital | 0V |  |
| 13 | ANT\_FIRE\_EN | | ANT\_FIRE\_EN | Not Connected | 0V |  |
| 14 | EPS\_ | | EPS\_ | Not Connected | 3V3 |  |
| 15 | NC | | NC | Not Connected | Floating |  |
| 16 | NC | | NC | Not Connected | Floating |  |
| 17 | COMM\_TBIAS | | COMM\_TBIAS | Not Connected | 8V2 |  |
| 18 | COMM\_TMON | | COMM\_TMON | Not Connected | Floating |  |
| 19 | NC | | NC | Not Connected | Floating |  |
| 20 | NC | | NC | Not Connected | Floating |  |
| 21 | NC | | NC | Not Connected | Floating |  |
| 22 | NC | | NC | Not Connected | Floating |  |
| 23 | NC | | NC | Not Connected | Floating |  |
| 24 | NC | | NC | Not Connected | Floating |  |
| 25 | NC | | NC | Not Connected | Floating |  |
| 26 | NC | | NC | Not Connected | Floating |  |
| 27 | ADCS\_UART\_TLM | | ADCE\_UART\_TLM | Not Connected | Floating |  |
| 28 | NC | | NC | Not Connected | Floating |  |
| 29 | ADCS\_CSS0 | | ADCS\_CSS0 | Analog | 0V |  |
| 30 | ADCS\_CSS1 | | ADCS\_CSS1 | Analog | 0V |  |
| 31 | ADCS\_CSS2 | | ADCS\_CSS2 | Analog | 0V |  |
| 32 | NC | | NC | Not Connected | Floating |  |
| 33 | ADCS\_CSS4 | | ADCS\_CSS4 | Analog | 0V |  |
| 34 | ADCS\_CSS5 | | ADCS\_CSS5 | Analog | 0V |  |
| 35 | NC | | NC | Not Connected | Floating |  |
| 36 | NC | | NC | Not Connected | Floating |  |
| 37 | NC | | NC | Not Connected | Floating |  |
| 38 | NC | | NC | Not Connected | Floating |  |
| 39 | NC | | NC | Not Connected | Floating |  |
| 40 | NC | | NC | Not Connected | Floating |  |
| 41 | GSE\_UART\_TLM | | GSE\_UART\_TLM | Not Connected | Floating |  |
| 42 | GSE\_UART\_CMD | | GSE\_UART\_CMD | Not Connected | Floating |  |
| 43 | GSE\_PGED | | GSE\_PGED | Not Connected | Floating |  |
| 44 | GSE\_PGEC | | GSE\_PGEC | Not Connected | Floating |  |
| 45 | GSE\_RESET | | GSE\_RESET | Not Connected | Floating |  |
| 46 | GSE\_DISARM | | GSE\_DISARM | Not Connected | Floating |  |
| 47 | GSE\_SEL0 | | GSE\_SEL1 | Not Connected | Floating |  |
| 48 | GSE\_SEL1 | | GSE\_SEL2 | Not Connected | Floating |  |
| 49 | GSE\_SEL2 | | GSE\_SEL3 | Not Connected | Floating |  |
| 50 | GSE\_SEL3 | | GSE\_SEL1 | Not Connected | Floating |  |
| 51 | NC | | NC | Not Connected | Floating |  |
| 52 | NC | | NC | Not Connected | Floating |  |

Were all voltages within limits? (PASS / FAIL)

Test Conductor Initials: \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_ Time: \_\_\_\_\_\_\_\_\_\_

## HD2 Powered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.12.1 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.12.2 | Connect the +25V output of the power supply to the custom EGSE Cable Pin 3 and GND to Pin 7. Attach the cable to the EGSE Connector |  |  |
| 9.12.3 | Set the power supply limits to 8.2V@200mA, the bus voltage should be approximately 8.2 V |  |  |
| 9.12.4 | Double check the setup, ensure that the positive output of the supply is connected to pin Pin 3 and the common (GND) output of the supply is connected to Pin 7 |  |  |
| 9.12.5 | Enable the output of the power supply, note the supply  Current: \_\_\_\_\_\_\_\_\_\_\_ |  |  |
| 9.12.6 | Use the digital multimeter to measure the voltage from each pin on J2 to GND (J2.30), record results in table 15 below |  |  |

Table HD2 Powered Test Data

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Pin | | Spacecraft Bus Name | System Name | Type | Voltage Expected | Voltage Measured |
| 1 | GND | | GND | Ground | 0V |  |
| 2 | GND | | GND | Ground | 0V |  |
| 3 | GND | | GND | Ground | 0V |  |
| 4 | GND | | GND | Ground | 0V |  |
| 5 | SA\_Y-\_IN | | SA\_Y-\_IN | Analog | Floating |  |
| 6 | SA\_Y-\_IN | | SA\_Y-\_IN | Analog | Floating |  |
| 7 | CSS\_3V3 | | CSS\_3V3 | Power | 3V3 |  |
| 8 | CSS\_3V3 | | CSS\_3V3 | Power | 3V3 |  |
| 9 | SCE\_3V3 | | SCE\_3V3 | Power | 0V |  |
| 10 | SCE\_3V3 | | SCE\_3V3 | Power | 0V |  |
| 11 | NC | | NC | Not Connected | Floating |  |
| 12 | NC | | NC | Not Connected | Floating |  |
| 13 | NC | | NC | Not Connected | Floating |  |
| 14 | NC | | NC | Not Connected | Floating |  |
| 15 | GND | | GND | Ground | 0V |  |
| 16 | GND | | GND | Ground | 0V |  |
| 17 | CTIP\_5V0 | | CTIP\_5V0 | Power | 0V |  |
| 18 | CTIP\_5V0 | | CTIP\_5V0 | Power | 0V |  |
| 19 | NC | | NC | Not Connected | Floating |  |
| 20 | NC | | NC | Not Connected | Floating |  |
| 21 | GND | | GND | Ground | 0V |  |
| 22 | GND | | GND | Ground | 0V |  |
| 23 | ADCS\_5V0 | | ADCS\_5V0 | Power | 5V |  |
| 24 | ADCS\_5V0 | | ADCS\_5V0 | Power | 5V |  |
| 25 | ADCS\_MAG\_3V3 | | ADCS\_MAG\_3V3 | Power | 0V |  |
| 26 | ADCS\_MAG\_3V3 | | ADCS\_MAG\_3V3 | Power | 0V |  |
| 27 | SYS\_3V3 | | SYS\_3V3 | Power | 3V3 |  |
| 28 | SYS\_3V3 | | SYS\_3V3 | Power | 3V3 |  |
| 29 | GND | | GND | Ground | 0V |  |
| 30 | GND | | GND | Ground | 0V |  |
| 31 | GND | | GND | Ground | 0V |  |
| 32 | GND | | GND | Ground | 0V |  |
| 33 | NC | | NC | Not Connected | Floating |  |
| 34 | NC | | NC | Not Connected | Floating |  |
| 35 | NC | | NC | Not Connected | Floating |  |
| 36 | NC | | NC | Not Connected | Floating |  |
| 37 | NC | | NC | Not Connected | Floating |  |
| 38 | NC | | NC | Not Connected | Floating |  |
| 39 | NC | | NC | Not Connected | Floating |  |
| 40 | NC | | NC | Not Connected | Floating |  |
| 41 | GND | | GND | Ground | 0V |  |
| 42 | GND | | GND | Ground | 0V |  |
| 43 | NC | | NC | Not Connected | Floating |  |
| 44 | NC | | NC | Not Connected | Floating |  |
| 45 | UNREG\_WDT | | UNREG\_WDT | Power | 8V2 |  |
| 46 | UNREG\_WDT | | UNREG\_WDT | Power | 8V2 |  |
| 47 | UNREG\_WDT | | UNREG\_WDT | Power | 8V2 |  |
| 48 | UNREG\_WDT | | UNREG\_WDT | Power | 8V2 |  |
| 49 | RTC\_3V3 | | RTC\_3V3 | Power | 3V3 |  |
| 50 | NC | | NC | Not Connected | Floating |  |
| 51 | GND | | GND | Ground | 0V |  |
| 52 | GND | | GND | Ground | 0V |  |

Were all resistances within limits? (PASS / FAIL)

Test Conductor Initials: \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_ Time: \_\_\_\_\_\_\_\_\_\_

## SA X+ Powered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.13.1 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.13.2 | Connect the +25V output of the power supply to the custom EGSE Cable Pin 3 and GND to Pin 7. Attach the cable to the EGSE Connector |  |  |
| 9.13.3 | Set the power supply limits to 8.2V@200mA, the bus voltage should be approximately 8.2 V |  |  |
| 9.13.4 | Double check the setup, ensure that the positive output of the supply is connected to pin Pin 3 and the common (GND) output of the supply is connected to Pin 7 |  |  |
| 9.13.5 | Enable the output of the power supply, note the supply  Current: \_\_\_\_\_\_\_\_\_\_\_ |  |  |
| 9.13.6 | Use the digital multimeter to measure the voltage from each pin on J2 to GND (J2.30), record results in table 16 below |  |  |

Table SA X- Powered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Voltage Expected | Voltage Measured |
| 1 | GND | GND | 0V |  |
| 2 | SA\_X+\_IN | Power | Floating |  |
| 3 | SA\_X+\_IN | Power | Floating |  |
| 4 | GND | GND | 0V |  |
| 5 | GND | GND | 0V |  |
| 6 | GND | GND | 0V |  |
| 7 | CSS0\_IN | Power | 0V |  |
| 8 | GND | GND | 0V |  |
| 9 | GND | GND | 0V |  |
| 10 | GND | GND | 0V |  |

## SA X- Powered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.14.1 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.14.2 | Connect the +25V output of the power supply to the custom EGSE Cable Pin 3 and GND to Pin 7. Attach the cable to the EGSE Connector |  |  |
| 9.14.3 | Set the power supply limits to 8.2V@200mA, the bus voltage should be approximately 8.2 V |  |  |
| 9.14.4 | Double check the setup, ensure that the positive output of the supply is connected to pin Pin 3 and the common (GND) output of the supply is connected to Pin 7 |  |  |
| 9.14.5 | Enable the output of the power supply, note the supply  Current: \_\_\_\_\_\_\_\_\_\_\_ |  |  |
| 9.14.6 | Use the digital multimeter to measure the voltage from each pin on J2 to GND (J2.30), record results in table 17 below |  |  |

Table SA X- Powered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Resistance Voltage | Voltage Measured |
| 1 | GND | GND | 0V |  |
| 2 | SA\_X-\_IN | Power | Floating |  |
| 3 | SA\_X-\_IN | Power | Floating |  |
| 4 | GND | GND | 0V |  |
| 5 | GND | GND | 0V |  |
| 6 | ANT\_FIRE\_UNREG | Power | Floating |  |
| 7 | CSS1\_IN | Power | 0V |  |
| 8 | GND | GND | 0V |  |
| 9 | GND | GND | 0V |  |
| 10 | GND | GND | 0V |  |

## SA Y+ Powered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.15.1 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.15.2 | Connect the +25V output of the power supply to the custom EGSE Cable Pin 3 and GND to Pin 7. Attach the cable to the EGSE Connector |  |  |
| 9.15.3 | Set the power supply limits to 8.2V@200mA, the bus voltage should be approximately 8.2 V |  |  |
| 9.115.4 | Double check the setup, ensure that the positive output of the supply is connected to pin Pin 3 and the common (GND) output of the supply is connected to Pin 7 |  |  |
| 9.15.5 | Enable the output of the power supply, note the supply  Current: \_\_\_\_\_\_\_\_\_\_\_ |  |  |
| 9.15.6 | Use the digital multimeter to measure the voltage from each pin on J2 to GND (J2.30), record results in table 18 below |  |  |

Table SA Y+ Powered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Voltage Expected | Voltage Measured |
| 1 | GND | GND | 0V |  |
| 2 | SA\_Y+\_IN | Power | Floating |  |
| 3 | SA\_Y+\_IN | Power | Floating |  |
| 4 | GND | GND | 0V |  |
| 5 | GND | GND | 0V |  |
| 6 | GND | GND | 0V |  |
| 7 | CSS2\_IN | Power | 0V |  |
| 8 | GND | GND | 0V |  |
| 9 | GND | GND | 0V |  |
| 10 | GND | GND | 0V |  |

## CSS Z- Powered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.16.1 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.16.2 | Connect the +25V output of the power supply to the custom EGSE Cable Pin 3 and GND to Pin 7. Attach the cable to the EGSE Connector |  |  |
| 9.16.3 | Set the power supply limits to 8.2V@200mA, the bus voltage should be approximately 8.2 V |  |  |
| 9.16.4 | Double check the setup, ensure that the positive output of the supply is connected to pin Pin 3 and the common (GND) output of the supply is connected to Pin 7 |  |  |
| 9.16.5 | Enable the output of the power supply, note the supply  Current: \_\_\_\_\_\_\_\_\_\_\_ |  |  |
| 9.16.6 | Use the digital multimeter to measure the voltage from each pin on J2 to GND (J2.30), record results in table 19 below |  |  |

Table CSS Z- Powered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Resistance Voltage | Voltage Measured |
| 1 | GND | GND | 0V |  |
| 2 | CSS5\_IN | Power | Floating |  |
| 3 | SA\_Z-\_TEMP | Power | Floating |  |
| 4 | UNREG\_WDT | Power | 8V2 |  |

## CSS Z+ Powered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.17.1 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.17.2 | Connect the +25V output of the power supply to the custom EGSE Cable Pin 3 and GND to Pin 7. Attach the cable to the EGSE Connector |  |  |
| 9.17.3 | Set the power supply limits to 8.2V@200mA, the bus voltage should be approximately 8.2 V |  |  |
| 9.17.4 | Double check the setup, ensure that the positive output of the supply is connected to pin Pin 3 and the common (GND) output of the supply is connected to Pin 7 |  |  |
| 9.17.5 | Enable the output of the power supply, note the supply  Current: \_\_\_\_\_\_\_\_\_\_\_ |  |  |
| 9.17.6 | Use the digital multimeter to measure the voltage from each pin on J2 to GND (J2.30), record results in table 20 below |  |  |

Table CSS Z+ Powered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Expected Voltage | Voltage Measured |
| 1 | GND | GND | 0V |  |
| 2 | CSS4\_IN | Power | Floating |  |
| 3 | SA\_Z+\_TEMP | Power | Floating |  |
| 4 | UNREG\_WDT | Power | 8V2 |  |

## INHIBITS Powered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.18.1 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.18.2 | Connect the +25V output of the power supply to the custom EGSE Cable Pin 3 and GND to Pin 7. Attach the cable to the EGSE Connector |  |  |
| 9.18.3 | Set the power supply limits to 8.2V@200mA, the bus voltage should be approximately 8.2 V |  |  |
| 9.18.4 | Double check the setup, ensure that the positive output of the supply is connected to pin Pin 3 and the common (GND) output of the supply is connected to Pin 7 |  |  |
| 9.18.5 | Enable the output of the power supply, note the supply  Current: \_\_\_\_\_\_\_\_\_\_\_ |  |  |
| 9.18.6 | Use the digital multimeter to measure the voltage from each pin on J2 to GND (J2.30), record results in table 21 below |  |  |

Table INHIBITS Powered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Voltage Expected | Voltage Measured |
| 1 | PWR\_AFT\_INHIB | Power | Floating |  |
| 2 | PWR\_SAFE | Power | 8V2 |  |
| 3 | PWR\_AFT\_INHIB | Power | Floating |  |
| 4 | PWR\_SAFE | Power | 8V2 |  |
| 5 | PWR\_AFT\_INHIB | Power | Floating |  |
| 6 | NC | Not Connected | Floating |  |
| 7 | PWR\_AFT\_INHIB | Power | Floating |  |
| 8 | PWR\_UNSF | Power | Floating |  |
| 9 | PWR\_AFT\_INHIB | Power | Floating |  |
| 10 | PWR\_UNSF | Power | Floating |  |

## BATTERY Powered Test

|  |  |  |  |
| --- | --- | --- | --- |
| # | Step Description | Time | Initials |
| 9.19.1 | Ensure the EPS board is properly mounted and all ESD precautions have been taken, ground the multimeter probe between each measurement |  |  |
| 9.19.2 | Connect the +25V output of the power supply to the custom EGSE Cable Pin 3 and GND to Pin 7. Attach the cable to the EGSE Connector |  |  |
| 9.19.3 | Set the power supply limits to 8.2V@200mA, the bus voltage should be approximately 8.2 V |  |  |
| 9.19.4 | Double check the setup, ensure that the positive output of the supply is connected to pin Pin 3 and the common (GND) output of the supply is connected to Pin 7 |  |  |
| 9.19.5 | Enable the output of the power supply, note the supply  Current: \_\_\_\_\_\_\_\_\_\_\_ |  |  |
| 9.19.6 | Use the digital multimeter to measure the voltage from each pin on J2 to GND (J2.30), record results in table 22 below |  |  |

Table BATTERY Powered Test Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin | Name | Type | Voltage Expected | Voltage Measured |
| 1 | BAT\_UNSF | Power | Floating |  |
| 2 | GND | GND | 0V |  |
| 3 | BAT\_UNSF | Power | Floating |  |
| 4 | GND | GND | 0V |  |
| 5 | BAT\_UNSF | Power | Floating |  |
| 6 | GND | GND | Short |  |
| 7 | BATT1\_TEMP | Power | Floating |  |
| 8 | UNREG\_WDT | Power | 8V2 |  |
| 9 | BATT2\_TEMP | Power | Floating |  |
| 10 | UNREG\_WDT | Power | 8V2 |  |

# Test Closeout

Perform the following steps in closing out the board level interface test.

1. Ensure all test documentation are properly annotated and permanently attached to this procedure and that all witness signatures are in place.

Performed / Reviewed by:

Test Engineer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

QA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Appendix A: Test Data