STEREO

IMPACT

SWEA/STE-D Comprehensive Performance Test Procedure

IMPACT-SWEA-CPT_B.doc
Version B – 2004-Jul-02

____
David Curtis, UCB IMPACT Project Manager

Date Run:________________________________

Test Reference:____________________________

Document Revision Record

Rev.	Date	Description of Change	Approved By
A	2004-Jun-30	Preliminary Draft	-
B	2004-Jul-2	Update per comments from CESR	

Distribution List

Dave Curtis, UCB
Steve McBride, UCB
Davin Larson, UCB
Claude Aoustin, CESR

Table of Contents

1. Overview

1.1. *Introduction*

SWEA/STE-D is part of the STEREO IMPACT instrument suite. It consists of two instruments (SWEA and STE-D) sharing a common chassis, power converter, and interface electronics. It resides at the end of the IMPACT boom.

This document describes the Comprehensive Performance Test to be performed on SWEA/STE-D during testing to ensure the hardware is performing correctly. It is assumed that SWEA/STE-D are connected to the IDPU to perform these tests, with commands and telemetry provided by the IDPU GSE (Emulator and C&T GSE).

1.2. *Document Conventions*

In this document, TBD (To Be Determined) means that no data currently exists. A value followed by TBR (To Be Resolved) means that this value is preliminary. In either case, the value is typically followed by a code such as UCB indicating who is responsible for providing the data, and a unique reference number.

Commands to be typed into the C&T GSE (stgsect) are indicated as follows: ***/SystemNOP.*** After typing the command hit the Enter key to send.

1.3. *Applicable Documents*

The following documents are closely interrelated with this specification. All documents can be found on the Berkeley STEREO/IMPACT FTP site unless otherwise indicated:

http://sprg.ssl.berkeley.edu/impact/dwc/

1. ICD/IMPACTSerialInterfaceG (instrument interface spec)
2. ICD/IMPACT_CTM_M (command & telemetry database)
3. ICD/SWEAICD_F (SWEA UCB/CESR ICD)
4. Specifications/SSF04 (SWEA/STE-D Interface Actel specification)

2. Test Setup

This CPT has been modularized to allow it to be used in a variety of configurations, either in vacuum (where high voltage can be exercised) or out.

2.1. *Test Equipment*

1. SWEA/STE-D Serial Number__________
   Configuration issues:____________________________
2. IDPU Serial number__________.
   Configuration issues:____________________________
3. PROM version number:_______, Date: _________
4. EEPROM code version number:______, Date:_____________
5. 28V Bench Power Supply________________________
6. Spacecraft Emulator connected to DCB 1553 interface
   Emulator software version_______________
7. Command & Telemetry GSE connected to spacecraft emulator via TCP/IP
   C&T GSE version date_____________
   C&T Database version:__________, Date:________________
8. MAG Sensor (ETU, FM1, FM2, none):__________
9. STE-U Preamp/Sensor:____________________
10. Boom harness (ETU/FM1/FM2)________________
11. SEP sensor/simulator_________________
12. PLASTIC sensor/simulator______________
13. SWEA HV Enable Plug Type__________________
    NOTE: MCP HV should not be enabled except in vacuum.

2.2. *Startup GSE*

DO NOT POWER ON THE IDPU OR MAG HEATER CIRCUIT WITHOUT THE MAG SENSOR CONNECTED.

1. Power up Spacecraft Emulator PC and start Emulator software (Emulator may be configured to auto-start; if not, select IMPACT and start).
2. Power up C&T GSE PC and start C&T GSE software (stgse-ct).
3. Select the PROM display from the C&T GSE Display/Recall Display menu
4. Connect C&T GSE to Emulator – push the TCP/IP next to the TLM display on the Received Data Panel:
   Verify the TLM light comes on:____________
5. On the C&T GSE push the Record button. Determine the name of the telemetry file (in the scgse\log directory)
   File Name:__________________________________

2.3. *Startup IDPU*

1. Verify bench supply is connected and configured correctly to power the IDPU: 28V, 500mA current limit to the IDPU service (for now do not power the MAG heater service).
   LVPS OK_____________
2. Power-on the bench supply to turn on the IDPU. If the supply current limit is reached, power off the supply immediately.
   Measure bench supply current ______________________
3. Verify Spacecraft Emulator receives telemetry: On Displays/Counters display, Bus Errors should stop counting and Valid Telemetry Packets should start counting at ~0.5Hz
   Verify Emulator getting telemetry _____________
4. Verify C&T GSE is getting telemetry. On IDPU SOH panel, UTC time should correspond to time on Emulator PC (typically set to UTC), and should be incrementing every two seconds.
   Verify C&T GSE getting telemetry _____________
5. After 10 seconds ISoftwareVersion should change to correspond to the EEPROM software version number. Verify no errors are reported and the version changes
   Record value of ISoftwareVersion _____________
   Record value of IERRORCount _____________
   Record value of IBootSelect _____________

2.4. *Startup SWEA*

1. Verify bench supply is connected and configured correctly to power the SWEA/STE-D: 28V, 300mA current limit to the SWEA service.
   LVPS OK_____________
2. Record the SWEA enable connector used in SWEA-J2.
   SWEA Enable_____________

DO NOT POWER ON SWEA WITH THE MCP HV ENABLED EXCEPT IN VACUUM, P < 1E-5 TORR. POWERING ON WITH THE ENABLE PLUG IN, WHILE STILL PROTECTTED BY THE ENABLE COMMAND, IS RISKY.

3. Power-on the bench supply to turn on the SWEA/STE-D. If the supply current limit is reached, power off the supply immediately.
   Measure bench supply current ______________________
4. On the spacecraft emulator 1553 spacecraft status page turn off the SWEA/STE power shutdown warning. Verify that on the C&T GSE ISCStatus display the SWEA Power display shows On (1), and on the Interface Active display, SWEAInterface shows active (1).
   Verify___________

3. STE-D Test

Record Start Time____________________

3.1. *STE-D Housekeeping*

- Verify on the C&T GSE InterfaceActive display that the SWEA interface is active (1)

  Verify___________
- Turn on the SWEA/STE-D SOH display on the C&T GSE. Verify no red/yellow limits, and the STE-D front end is powered on (AFEPWR on the ISWEASTEDDig display = 1).

  Verify___________
- Verify the STE-D door position telemetry corresponds to the door position (STECOVSTAT under ISWEASTEUDig)

  Open/Closed___________
- Record the following SOH values from the C&T GSE SWEA/STE-D SOH panel.

  ISWEASTEDCur___________
  ISTEDTemp___________
  ISWEADACTemp___________
- If available, record the spacecraft-monitored SWEA temperature

  SWEA Temp___________

3.2. *STE-D Instrument*

STE is light sensitive, so a dark bag over the sensor will be needed to avoid light saturation. The STE-D door should be closed.

Verify___________

If the instrument is not in its default (power-on) mode, return it to that mode. On the C&T GSE do:

- ***Start STENormalResLoad*** Verify___________
- ***/SetSTEThreshold 4 22 22 22 22*** Verify___________

3.3. *STE-D Background*

- If the door is closed, run step 3.7.1 to open it

  Verify___________
- Start the STGSE-STE GSE (ste.exe). Enable the C&T GSE telemetry server and connect the STE gse (TCP/IP button). Verify that the Connect light comes on on the STE GSE.

  Verify___________
- Speed up the Monitor Rates accumulation interval to 2 seconds. Send ***/SetSTERateInt 2***. Verify the accumulation interval as displayed on the STE Rates Panel reads 2 seconds:

  Verify___________

- Display the STE Rates panel and wait for it to update. Set to Raw Counts, so it reads counts per accumulation interval (2 seconds). Record the rates:

	LLD	ULD	RESET
STED Det0	_________	_________	__________
STED Det1	_________	_________	__________
STED Det2	_________	_________	__________
STED Det3	_________	_________	__________

- Enable the STE Spectra display on the STE GSE and wait for the display to update. Verify no more than a few counts per interval, except perhaps at the lowest few energy channels (depending on the STE temperature). Append a snap of the spectra.

Verify___________

3.4. ***STE-D Threshold Test***

In the following steps adjust the STE thresholds with the command ***/SetSTEThreshold <n> <v>***, where <n> is the detector number (0-3 for STE-U), and <v> is the desired value. You can set 4 thresholds at once with the command ***/SetSTEThreshold 4 <v1> <v2> <v3> <v4>***. The DAC settings are ~100eV per step, with the default value set to 22 (~3.5keV).

- Record the detector temperature

ISTEDTemp___________

- Adjust the threshold for each detector while monitoring the LLD rates. Find the lowest threshold value at which the LLD count rate is < 10/sec (20/sample). Record the threshold setting and count rate below. From the spectra display note the lowest energy bin receiving counts. After all thresholds are adjusted snap the display and attach to this proc.

	Threshold	LLD	Energy Bin
STED Det0	_________	_________	__________
STED Det1	_________	_________	__________
STED Det2	_________	_________	__________
STED Det3	_________	_________	__________

3.5. ***STE-D Test Pulser***

- Enable the STE test pulser. Send command ***/STEDPulserEnable***. Verify that the ENBSTETP bit comes on the ISWEASTEDDig SOH display.

Verify___________

- The test pulser in default mode ramps up in amplitude over an interval of 32 seconds, followed by 8 seconds of dead time before it starts again. Looking at the monitor rates you should see the LLDs firing at 2KHz for 32 out of each 40 seconds, dropping down to the background rate for the other 8 seconds. The reset rates should follow the same cycle, but the 2KHz counts shall be distributed amongst the resets. Turn on the Monitor Rates vs time plot, select a representative LLD, ULD, and RESET rate counter and run a few cycles. The ULD rates should see 2KHz for a short time in each 40-second interval, just before the LLD rates drop. Snap the STE GSE display and append to this proc if possible.

Verify___________

- Set the STE binning mode to linear (with ~1.56keV resolution, mode 1). Send the command ***Start STELinear***. Wait 1-2 minutes for the new LUT to load. On the STE GSE Spectra panel enable the Accumulate mode and accumulate a few test pulser cycles. Verify that the counts are spread evenly across the channels except the first few (below the LLD). Snap the GSE display and append to this proc if possible.

Verify___________

- Set the test pulser to discrete amplitude mode. Send the command ***/SetSTEDCtrl 0xF2F6***. Wait ~40 seconds for a new test pulser cycle and reset the spectra accumulator. Verify that the counts now appear in ~7 discrete lumps, and the STE Mode ID indicates 1. Snap the STE GSE display and append to this proc if possible

Verify___________

- Increase the resolution of the display 4x (~0.39Kev/bin, mode 2). ***Start STEHiResCycle***. This will use all 256 energy channels for one detector, cycling through the 4 detectors for 4 minutes each. In this mode the 4 curves on the spectra display that normally represent the 4 detectors now represent the four quarters of the spectra for the first detector. Snap the STE GSE displays for each detector if possible and append to this proc. (wait for the second half of each 4 minute delay to be sure that the LUT is loaded). Verify that STE mode cycles through mode 2,3,4, and 5, returning to mode 0 at the end.

Verify___________

- Disable the STE test pulser: send commands ***/STEDPulserDisable*** and ***/SetSTEDCtrl 0xF0F4.*** Verify that the ENBSTETP bit goes off (0) on the ISWEASTEDDig SOH display. Verify the spectra and monitor rates return to background levels.

Verify___________

3.6. *STE-D Door Source*

- If the door is open, run step 3.7.2 to close it

Verify___________

- Set the STE GSE Spectra display to accumulate, and accumulate a few minutes of data to get reasonable statistics on the STE door source. There should be peaks at 82keV from the Cd109 source and at 5keV from the Fe55 source. There will also be a number of florescence lines excited by the Cd109 source in the instrument. Snap the STE GSE if possible and append to this proc.

Verify___________

- Start STEHiResCycle. This will use all 256 energy channels for one detector, cycling through the 4 detectors for 4 minutes each. In this mode the 4 curves on the spectra display that normally represent the 4 detectors now represent the four quarters of the spectra for the first detector. Snap the STE GSE displays for each detector if possible and append to this proc. (wait for the second half of each 4 minute delay to be sure that the LUT is loaded). Record the centroid and FWHM of the 6keV and 22keV peak on the display. Snap the STE GSE displays if possible and append to this proc. Verify that STE mode cycles through mode 2,3,4, and 5, returning to mode 0 at the end.

  Verify___________

- Set to hi res door monitor mode. ***Start STEDoorLUT***. Wait 2 minutes and start an accumulation. Accumulate for at least 10 minutes. Snap the STE GSE displays if possible and append to this proc.

  Verify___________

Completion Time_____________________

3.7. ***STE-D Door Test:***

This proc test the STE-D door open/closed proc. It assumes the door is closed to begin with.

TO BE PERFORMED ONLY IF STE-D IS IN A CLEAN ROOM, VACUUM, OR BAGGED TO AVOID CONTAMINATION TO STE DETECTOR.

BE SURE BAG, BLANKETS, ETC DO NOT IMPEDE THE COVER ACTION.

3.7.1. Door Open

- Verify that the SWEA Enable plug in SWEA-J2 supports opening the STE-D Door.

  Verify___________
- Verify that the Emulator Spacecraft Status has IDPU Power and Thruster Warnings OFF (they will inhibit opening of the STE door)

  Verify___________
- Record the state of the STE-D door housekeeping on the STEDoor SOH display. If ISTEDCovStat is not CLOSED skip this proc:

  ISTEDDoorCount___________
  ISTEDDoorStart___________
  ISTEDDoorDone___________
  ISTEDCovStat___________
  ISTEDCovSW___________
- Command the door open. Send the command ***/STEDDoorOpen***. Verify by inspection that the cover opens and no instrument error occurs:

  Verify___________
- If the GSE indicates an STE AFE trip (STE housekeeping goes blue), send ***/STEDAFEOn***

  Verify___________
- Record the STED Door housekeeping.

  ISTEDDoorCount___________
  ISTEDDoorStart___________
  ISTEDDoorDone___________
  ISTEDCovStat___________
  ISTEDCovSW___________
- Verify that the DoorCount increases by 1, the start and done times are in limit (not red/yellow), ISTEDCovStat is now OPEN, and ISTEDCovSW is now OFF.

  Verify___________

3.7.2. Door Close

- Command the door closed. Send the command ***/STEDDoorClose***. Verify by inspection that the cover closes:

  Verify___________
- If the GSE indicates an STE AFE trip (STE housekeeping goes blue), send ***/STEDAFEOn***

  Verify___________
- Record the STEU Door housekeeping.

  ISTEDDoorCount___________
  ISTEDDoorStart___________
  ISTEDDoorDone___________
  ISTEDCovStat___________
  ISTEDCovSW___________
- Verify that the ISTEDDoorCount increases by 1, the start and done times are in limit (not red/yellow), ISTEDCovStat is now OPEN, and ISTEDCovSW is now OFF.

  Verify___________

4. SWEA Test

Record Start Time____________________

4.1. *SWEA Housekeeping*

- Verify on the C&T GSE InterfaceActive display that the SWEA interface is active (1)

  Verify___________
- Turn on the SWEA/STE-D SOH display on the C&T GSE. Verify no red/yellow limits, and the STE-D front end is powered on (AFEPWR on the ISWEASTEDDig display = 1).

  Verify___________
- Record the SWEA door position (SWEACOVSTAT under ISWEASTEUDig)

  Open/Closed___________
- Record the SWEA HV Enables state (under ISWEASTEUDig)

  NRHVENB___________

  MCPHVENB___________
- Record the following SOH values from the C&T GSE SWEA/STE-D SOH panel.

  ISWEASTEDCur___________

  ISWEAMCPTemp___________

  ISWEADACTemp___________
- If available, record the spacecraft-monitored SWEA temperature

  SWEA Temp___________

4.2. *SWEA Test Pulser*

- Start the STGSE-SWEA GSE (swea.exe). Enable the C&T GSE telemetry server and connect the SWEA gse (TCP/IP button). Verify that the Connect light comes on on the SWEA GSE.

  Verify___________
- On the SWEA GSE turn on the 3D master and 3D numeric displays. Verify that the UTC time code updates every 30 seconds, indicating 3D SWEA data flowing.

  Verify___________
- Page through the 16 energies on the SWEA Numeric display and verify the 3D data is all zeros.

  Verify___________
- Turn on the SWEA test pulser using the command ***/SWEAPulserEnable.*** Verify that the ENBSWEATP bit comes on (1) in the ISWEASTEDDig display on the C&T GSE.

  Verify___________
- The SWEA test pulser should stimulate counts in all anodes, energies, and deflections. Counts should fall off with increasing energy (decreasing energy bin number). Counts for different deflections should be about the same except at the lowest energies (highest energy bin numbers). Counts should be highest

for anodes 0 and 8, down a factor of ~2 for anodes 1 and 9, another factor of ~2 for anodes 2 and 10, etc. Using the 3D numeric and various graphic displays on the SWEA GSE verify this pattern. In particular verify counts in all anodes at least at low energies (high energy bin number).

Verify___________

- Turn off the SWEA test pulser using the command ***/SWEAPulserDisable.*** Verify that the ENBSWEATP bit goes off (0) in the ISWEASTEDDig display on the C&T GSE.

  Verify___________

4.3. *SWEA V0*

V0 is a programmable voltage in the analyzer that effects the operation of the instrument.

- Set the software to allow manual control of V0. Send ***/SWEAManualV0.*** Verify the ISWEAAUTOV0 (bit 2) is off (0) in the IAUTOLUT display on the C&T GSE.

  Verify___________
- Send the following commands to set the V0 voltage and record the resulting values of ISWEAV0 in the SWEA/STE-D housekeeping display of the C&T GSE.

Command	Measured ISWEAV0 value	Nominal V0 value
/SetSWEAManualV0 0xFF		-25 V
/SetSWEAManualV0 0x80		-12.5 V
/SetSWEAManualV0 0x00		0 V

4.4. *SWEA MCP Heater*

The SWEA MCP heater is software controlled to a ground-set power level. The power is pulse-width modulated on a 20 second period, so operation of the heater can be verified by watching the current consumption on the SWEA primary 28V supply.

- Set the SWEA MCP Heater to 10%: Send ***/SetSWEAMCPHeater 1.*** Verify that the SWEA primary power increases by ~30mA for 2 seconds out of every 20 seconds.

  Verify___________
- Record the SWEA MCP Temperature

  ISWEAMCPTemp___________
- Set the SWEA MCP Heater to 100%: Send ***/SetSWEAMCPHeater 10.*** Verify that the SWEA primary power increases by ~30mA continuously.

  Verify___________
- Measure how long it takes the MCP to rise 2 degrees C from the starting temperature recorded above.

  Minutes___________

- Set the SWEA MCP Heater off. Send ***/SetSWEAMCPHeater 0.*** Verify that the SWEA primary power drops ~30mA and stays steady.

  Verify___________

4.5. *SWEA NRHV*

The SWEA Non-Regulated High Voltage (NRHV) supply is used to generate the analyzer deflector and sweep supply voltages. It operates at ~1500V, and is protected by a number of hardware and software protections against accidental turn-on. Generally on the bench this supply is safe to be powered up. However, ensure that the MCP is not enabled except in vacuum.

- Verify a high voltage enable plug or enable GSE in installed in SWEA-J2. If not in vacuum, ensure that the MCP HV is not enabled by the plug used.

  Enable Type___________

- Enable NRHV by sending the following two commands separated by no more than 15 seconds.

  /SWEAArmNRHV
  /SWEANRHVOn

  Verify no commanding errors reported on the C&T GSE

  Verify___________

- Verify that the SWEA NRHV state is On (on the C&T GSE ISWEASTEDDig display, NRHVENB = 1).

  Verify___________

- Record the following high voltage values from the C&T GSE SWEA/STE-D Housekeeping display:

  ISWEANR5V___________
  ISWEAAnal___________
  ISWEADefl1___________
  ISWEADefl2___________

- Send ***/SWEAFHKPAnal*** to request a readout of the analyzer HV waveform. Later use DECOM to display the waveform and append to this proc. Verify two ApID 201 packets are sent.

  Verify___________

- Send ***/SWEAFHKPDef1*** to request a readout of the Deflector 1 HV waveform. Later use DECOM to display the waveform and append to this proc. Verify two ApID 201 packets are sent.

  Verify___________

- Send ***/SWEAFHKPDef2*** to request a readout of the Deflector 1 HV waveform. Later use DECOM to display the waveform and append to this proc. Verify two ApID 201 packets are sent.

  Verify___________

4.6. *SWEA MCP HV*

TO BE PERFORMED ONLY IF SWEA IS IN VACUUM < 1E-5 TORR TO AVOID DAMAGE TO SWEA MCP DETECTOR.

- Verify the SWEA door has been open for at least 30 minutes. If not, use 4.9 to open it.

  Verify______________
- Record the vacuum chamber pressure

  Pressure (<1e-5 Torr)____________
- Verify a high voltage enable plug or enable GSE in installed in SWEA-J2

  Enable Type____________
- Enable MCPHV by sending the following two commands separated by no more than 15 seconds.

  /SWEAArmMCPHV
  /SWEAMCPHVOn

  Verify no commanding errors reported on the C&T GSE

  Verify____________
- Verify that the SWEA MCPHV state is On (on the C&T GSE ISWEASTEDDig display, MCPHVENB = 1).

  Verify____________
- Record the following high voltage value from the C&T GSE SWEA/STE-D Housekeeping display:

  ISWEAMCP (0V)____________

4.6.1. SWEA MCP HV Ramp Up

Ramp the SWEA MCP HV up to its nominal level through a few steps. Record the indicated data at each step. Note that the IDPU will ramp the voltage up to the desired setting at ~100V/second. Wait for ramping to complete before taking the measurement.

Command	Nominal Voltage	Instrument Current	ISWEAMCP (C&T GSE)	Moment N (SWEA GSE)
/SetSWEAMCP 0	0			
/SetSWEAMCP 36	500			
/SetSWEAMCP 73	1000			
/SetSWEAMCP 109	1500			
/SetSWEAMCP 146	2000			
/SetSWEAMCP 182	2500			
/SetSWEAMCP 190	2600			
/SetSWEAMCP 197	2700			
/SetSWEAMCP 201	2760			

4.7. *SWEA Source Test*

This test uses a Ni63 radiation source or electron gun to stimulate the instrument with electrons during a vacuum test.

- Indicate type of source or gun used:

  ____

- Verify NRHV and MCPHV have been powered on using 4.4 and 4.5.

  Verify___________

- Power on the gun and verify it is taking current. Adjust to generate ~50eV electrons.

  Verify___________

- Using the SWEA GSE 3D Numeric display, verify that counts are seen in the expected anodes and energy:

  Max Anodes Count Rate_____________

  Anode Counting Highest_____________

  Energy Bin counting highest_____________

- Power off the gun.

  Verify___________

4.8. *SWEA Shutdown*

- Power off the high voltage supplies: Send ***/SWEAMCPHVOff***, ***/SWEANRHVOff***. Verify MCPHVENB and NRHVENB are off (0) in ISWEASTEDDig on the C&T GSE.

  Verify___________

Completion Time______________________

4.9. *SWEA Door*

TO BE PERFORMED ONLY IF SWEA IS IN A CLEAN ROOM, VACUUM, OR BAGGED/PURGED TO AVOID CONTAMINATION TO SWEA MCP DETECTOR.

The SWEA door is actuated by a 1-time TiNi mechanism powered by an instrument-controlled circuit. Re-closing the door requires access to the instrument by IMPACT personnel. The door can only be opened if an appropriate enable connector is installed in SWEA-J2. The door must be opened in order to allow electrons to enter the instrument (only an issue during vacuum tests and in flight). While the door is open, the Microchannel Plate (MCP) detector is exposed to contamination.

4.9.1. SWEA Door Open

- Verify that an appropriate enable plug or the enable GSE is installed to allow the SWEA door to be activated. Ensure that the MCP HV is NOT enabled if not in vacuum.

  Enable Type___________
- Verify that the SWEA instrument is powered on and generating telemetry (on the C&T GSE InterfaceActive display, SWEA interface is active (1)).

  Verify___________
- Verify that the SWEA door state is closed (on the C&T GSE ISWEASTEDDig display, SWEACOVSTAT = CLOSED).

  Verify___________
- Verify that the SWEA 28V supply current limit is > 1.5 amp if on a bench supply. If on the spacecraft, verify the autonomy rule for SWEA current is disabled or set to >1.5 Amp (this current will be drawn for <100ms when the door is opened).

  Verify___________
- If practical, set up to monitor the current profile on the SWEA 28V supply during door opening. Set to trigger on current > 0.3A with a time scale covering ~200ms.

  Verify___________
- Send the following two commands separated by no more than 15 seconds.

  /SWEAArmCover

  /SWEACoverOpen

  Verify no commanding errors reported on the C&T GSE

  Verify___________
- Verify that the SWEA door state is open (on the C&T GSE ISWEASTEDDig display, SWEACOVSTAT = OPEN).

  Verify___________
- If the current profile was monitored, record the amplitude and duration of the measured current pulse during the door actuation.

Before/After actuation (Amps)___________
During actuation (Amps)___________
Actuation time (msec)___________

4.9.2. SWEA Door Close

Only authorized IMPACT personnel should perform this action.

Operator______________________

- Verify the SWEA instrument is unpowered.

  Verify___________

- Insert the actuator reset tool into the SWEA cover and push to close the cover. Verify the cover appears to close normally by inspection and feel

  Verify___________

- If the instrument is powered on, Verify that the SWEA door state is closed (on the C&T GSE ISWEASTEDDig display, SWEACOVSTAT = CLOSED).

  Verify___________

5. Power Converter Tests

These tests may be done when SWEA/STE-D is not connected to the spacecraft. This is an optional subset of the CPT that requires special test equipment (current probe, oscilloscope, DVM).

5.1. *Ground Isolation Test*

5.1.1. Stand Alone Isolation

SWEA/STE-D should be disconnected from the bench supply. Measurements will be taken with a DVM using a break-out.

- Verify power return to SWEA chassis isolation. SWEA-J1 pin 14 to SWEA chassis:

  Resistance (> 1M ohm):___________
- Verify SWEA Heater power return to SWEA chassis isolation. SWEA-J1 pin 15 to SWEA chassis:

  Resistance (> 1M ohm):___________
- Verify digital signal return connected to SWEA chassis return. SWEA-J1 pin 2 (TLM Return) to SWEA Chassis:

  Resistance (< 1 ohm):___________

5.2. *Turn-on Transients*

Connect SWEA to a bench supply set to 28V with a current limit set to 5 amps. Connect a >10,000uF capacitor in parallel with the supply and provide a switch with <20mOhm on resistance between the supply/capacitor and SWEA (use the Power Switch Box GSE).

Connect a current probe over the primary power line. Connect the current probe to an oscilloscope and set the vertical axis to record a range of 10 amps with a time range of at least 200ms (no bandwidth limit). Set the scope to trigger and record on a current increase.

Apply power to the SWEA power service by turning on the switch. Make a hard copy of the measured current profile and attach to this document. Verify the current profile fits the profile in the environmental spec; <10 amps in the first 10us, less than 2.5 amps in the next 200ms, within 10% of nominal after 200ms (For SWEA, nominal is ~100 ma at 28V).

Verify:___________

5.3. *Turn-off Transients, Discharge*

Attach a digital oscilloscope to monitor the primary power voltage (SWEA J1 pin 8 to SWEA J1 pin 14 on a breakout box, or directly on the switch box at the jumpers). Set to capture the transient when the power switch is turned off. Record the turn-off waveform on the SWEA side. Verify that the voltage does not exceed the range +56V to minus 2 V. Attach a snap of the waveform to this procedure.

Verify voltage range:___________

Verify that the voltage on the SWEA service has discharged to <5V after 2 seconds.

Verify discharge:___________

5.4. *Hard Short*

This is a stressful test and should be executed only a few times on the flight hardware.

Power-on the SWEA at 28V. Set the bench supply current limit to 0.5A and remove any external capacitor that may be on the primary bus. Simulate a short with a jumper on the switch box. Measure and record the current through the jumper with a current probe on a digital oscilloscope (expected currents are ~20A for ~100microseconds; no bandwidth limit on the measurement). Record the peak current:

Max Current:___________

Remove the short and verify SWEA comes up normally.

Verify:___________

5.5. *Ripple & Transients*

Monitor the SWEA primary current with a current probe (bandwidth > 50MHz). With the instrument powered up and running (at 28V) measure the maximum peak-to-peak current ripple and transients.

Current Ripple (< 500mA):___________

Measure the spectrum of the current ripple. Snap the spectra and append to this procedure. Verify no current peaks above 20dBuA above 2MHz.

Verify:___________

Set the scope to trigger above the peak ripple measured above. Look for current transients associated with the following events/commands and record their amplitude.

/STEDAFEOFF:___________

/STEDAFEON:___________

/SWEAArmCover, /SWEACoverOpen:___________

/STEDDoorOpen:___________

/STEDDoorClose:___________

5.6. *Voltage Range*

Remove any external capacitor from the power bus. Set the supply current limit to 2A. Slowly (~1V/sec) ramp up the SWEA primary bus voltage from 0V to 40V while monitoring the voltage and current (on a digital oscilloscope). Discontinue and turn-off if the current exceeds 1Amp for more than a few hundred millisceconds. Record at what voltage the instrument starts functioning.

Ramp-up Voltage when instrument starts:___________

Verify no unusual instrument properties (errors, etc) during ramp-up or at 40V.

Verify:___________

Slowly (~1V/sec) ramp down the SWEA primary bus voltage from 0V to 40V while monitoring the voltage and current (on a digital oscilloscope). Record at what voltage the instrument stops functioning.

Ramp-down voltage where instrument stops:___________

Verify no unusual instrument properties (errors, etc) during ramp-down

Verify:___________

Power on SWEA at a bus voltage of 24V. Record the bus current:

Primary current at 24V:___________

Verify that instrument housekeeping is flowing to the C&T GSE and that the secondary voltages as monitored on the SWEA SOH panel are nominal:

ISWEASTEDVCCA (2.5V):___________
ISWEASTED5VD (5V):___________
ISWEASTED5VA (5V):___________
ISWEASTED12V (13V):___________

Power off, and power back on at a bus voltage of 35V. Record the bus current:

Primary current at 35V:___________

Verify that instrument housekeeping is flowing to the C&T GSE and that the secondary voltages as monitored on the SWEA SOH panel are nominal:

ISWEASTEDVCCA (2.5V):___________
ISWEASTED5VD (5V):___________
ISWEASTED5VA (5V):___________
ISWEASTED12V (13V):___________