STEREO PROJECT

SUPRATHERMAL-ION-TELESCOPE

TIME OF FLIGHT BOARD TEST PROCEDURE

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INTRODUCTION

PURPOSE

The purpose of this document is to verify the correct operation of the Flight Time of Flight (TOF) Boards with the other components of the Suprathermal Ion Telescope (SIT).

PROCEDURE OVERVIEW

The following will be verified.

- Functional test of the TOF Boards with the SIT
- Calibration of the TOF Boards with the SIT
- Alpha Source test of the TOF Boards with the SIT

PRECAUTIONS

- ESD – take standard ESD precautions when handling the equipment involved in this test
- Cleanliness – The equipment under test is to be handled only with approved gloves and kept bagged and boxed when not installed in the test setup
- Radioactive Source – This test makes use of a 500uC Am241 radioactive source mounted inside the vacuum chamber wall. There is no radiation hazard outside the chamber. The source is vacuum qualified, is mounted within a collimator preventing access to the active portion, and is periodically checked for leaks. Nevertheless, prudence suggests handling the source holder with gloved hands and washing hands thoroughly after contact.
- High Voltage – Voltages up to 5000v and 10's of uA of current are generated inside the vacuum chamber during operation of the instrument. Some of these voltages are brought out to SHV connectors in the chamber wall to allow monitoring during test. These connectors will not be used during this test procedure, so contact with them during the test should be avoided. The possibility of shock is remote and the shocks themselves are not life threatening but could be unpleasant.
- Vacuum – Proper operation of the SIT telescope and HVPS requires that they operate in a good, clean vacuum. IT IS IMPORTANT THAT THE HVPS NOT BE TURNED ON EXCEPT IN A VACUUM OF LESS THAN 1 x 10-5 Torr. ALWAYS VERIFY ACCEPTABLE PRESSURE IN THE VACUUM CHAMBER BEFORE ENABLING HVPS OUTPUTS. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN DAMAGE TO THE FLIGHT HVPS, TELESCOPE AND TO THE TOF ELECTRONICS. Be sure to turn off ion gauge after checking the pressure as its operation interferes with the testing.

  SSD Bias – The SSD requires 50V bias when operating, obtained from output #1 of the Ortec 210 unit. THE SSD BIAS MUST BE SET TO 0V WHENEVER CONNECTING OR DISCONNECTING FROM THE ENERGY BOARD INPUTS. FAILURE TO OBSERVE THIS PRECAUTION MAY DESTROY THE ENERGY BOARD FET.

TEST EXECUTION

1 _____Set up the Bench Functional and Bench Calibration Test per Figure 1A.

2 _____Before Connecting the TOF inputs, verify that the Delay unit, DG535 is setup as follows:

- AB Output: variable, 50 ohm, 1.0V, -1.0V offset

- CD Output: variable, 50 ohm, 1.0V, -1.0V offset

- Trigger – External, hi Z, positive edge

- Delay Settings:

    a. $A = T + 0$
    b. $B = A + 3nS$
    c. $C = A + 20nS$
    d. $D = C + 3nS$

- External attenuators are set to 20dB

3 _____Install the ETU TOF Boards

4 _____Record the Test Configuration

- Date: _____

- Actel ID: _____

- S/W Version Numbers**: Lab View VI _____ Communicator _____**

5 _____ Using the HP34401A multimeter, measure and verify the output voltages of the GSE LVPS. Adjust the output voltages as necessary.

Supply Voltage	13.0	6.0	5.1	5.1	3.4	2.6	- 5.2	- 6.0	- 13.0
Required	12.9 to 13.1	5.9 to 6.1	5.0 to 5.2	5.0 to 5.2	3.3 to 3.5	2.5 to 2.7	-5.1 to -5.3	-5.9 to -6.1	-12.9 to -13.1
Measured									

6 _____ Turn on LVPS Power to the test setup and load the flight software into the MISC.

7 _____ Record the following Currents from the readout of "VICHECK_TREND" program.

Supply Currents	+6	+5Analog	+5Digital	+3.3	+2.5	-5.2	-6
Required mA	13.5 to 16.5	45 to 55	43.7 to 52.8	33.3 to 41.7	48.6 to 59.4	93.6 to 111.4	12.6 to 15.4
Measured mA							

8 _____ Verify that the measured currents are within required values.

9 _____ Turn off the LVPS power.

10 _____ Remove the ETU TOF Boards and install the Flight TOF Boards.

11 _____ Turn on LVPS power and load the flight software.

12 _____ Record the LVPS power supply currents:

Supply Currents	+6	+5Analog	+5Digital	+3.3	+2.5	-5.2	-6
Required mA	13.5 to 16.5	45 to 55	43.7 to 52.8	33.3 to 41.7	48.6 to 59.4	93.6 to 111.4	12.6 to 15.4
Measured mA							

13 _____ Verify that the measured currents are within required values.

Bench Calibration Test

14 _____ Set the Energy Pulser (Ortec 448) to 5.0 MeV.

15 _____ Using the Communicator software, verify and record that the **Cal Gain = 9 to 10** and **Cal Offset = -16 to -15**. It may require five minutes in order to reach the required values.

CalGain=
CalOffset=

16 _____ From the display of "SIT_FSW.VI" Table 4, change the C delay setting of the DG535 for each value of **C= TOF (nS)** listed in the table.

TABLE 4   Bench Calibration Data

Samples/Point = _____   _____

C=TOF(nS)	Avg Chan	Sigma (chan)	C=TOF(nS)	Avg Chan	Sigma (chan)
0			50		
1			55		
2			60		
4			65		
6			70		
8			75		
10			80		
12			85		
14			90		
16			95		
18			100		
20			105		
22			110		
24			115		
26			120		
28			122		
30			124		
35			126		
40			128		
45			130		

17 _____ Perform linear regression on the data from Table 4 and obtain a slope and intercept.

TOF Slope (nS/chan) =
TOF Intercept (nS) =

18 _____ Turn Power off.

Alpha Test

19 _____ Set up the Alpha Test using Fig 1B.

20 _____ Verify and record the vacuum chamber pressure. Pressure is required to be
1 x 10-5 Torr. or less.

Pressure =

21 _____ Turn off the Ion Gauge.

22 _____ Power on the system and load the Flight Software.

23 _____ Send the following Commands:

- **Immed 1**

- **Hvlevel 0**

- **Hvenable 1**

- **Tmode 0**

24 _____ Slowly command the High Voltage level up using the command:

- **hvramp c8**

25 _____ Record the final high voltage level from the software display

Final Voltage =

21 _____ From the software display, verify and record that the **Cal Gain** = **9-10** and
Cal Offset = **-16 to -15**.

CalGain=
CalOffset=

-

22 _____ Observe the data on the SIT_FSW.VI program display. When it appears acceptable, begin to record data.

22 _____ Record the Data File Name.

Data File Name =

23 _____ Store Data file on ULEIS computer in directory $PROD:[SIT] and request analysis of the data file. Record the average and sigma for the mass histogram:

Average Mass =
Mass Sigma =

24 _____ Slowly decrease the High Voltage level to 0, using the command:

- **hvramp 0**

24 _____ Power down. Slowly decrease the SSD Bias voltage to 0 volts.

25 _____ Secure setup, remove the Flight TOF Boards and store them in approved ESD protective container.