Operation Order No.

GRAVITY PROBE-B

Payload Testing

Procedure

DETERMINE THE THERMAL RESISTANCE OF PROBE-C WINDOW / HEX UNITS

September 13, 1999

Originator
D. Murray

Approvals:

_ Date _____	_ Date _____
Mike Taber	Dave Murray
Test Director	Test Director
_ Date _____	_ Date _____

Dorrene Ross	Sasha Buchman
Quality	Harware Manager

A SCOPE

Determine the thermal resistance of Window numbers 1, 2, 3 using the window heaters.

B CONFIGURATION

B.1 Probe-C is installed in the SMD with liquid helium in the Well.
B.2 The Probe vacuum space is being pumped with the Leak Gas Pump Station.

C REFERENCE DOCUMENTS

C.1 Procedures:

Procedure No.	Title
None	

C.2 Drawings

LMSC Drawing No.	Title
None	

D Supporting documentation

GP-B Magnetic Control Plan, LMSC-5835031
GP-B (FIST) Preliminary Hazards Analysis, LMSC-F314446
GP-B (FIST) Safety Plan, LMSC-F314447
FIST Emergency Procedures SU/GP-B P0141

E SAFETY

E.1 In case of any injuries obtain medical treatment at:
LMMS Call 117 Stanford University Call 9-911

E.2 Safety

The GP-B (FIST) Safety Plan, LMSC-F314447, discusses safety design, operating and maintenance requirements which the R&DD program office has adhered to. These requirements should be reviewed for applicability at any facility outside of R&DD (e.g. Stanford University) where FIST hardware is operated.

E.3 Hazards Analysis

The GP-B (FIST) Preliminary Hazards Analysis, LMSC-F314446, discusses hazards inherent in R&DD-developed FIST hardware in greater detail.

F REDLINE AUTHORITY

The persons authorized to create and sign-off on redline modifications of the procedure as it is performed are the test directors, M. Taber and D. Murray. The redlines will be reviewed and approved by the RQE during or after the performance of the redline.

G CRITICAL OPERATIONS

All operations which are deemed critical by the test director(s), e.g., any moving or lifting of the Probe, shall have one Test Director in attendance.

H Quality Assurance

Quality Assurance engineering shall be notified at least 24 hours prior to the start of this procedure. In the event of a failure during the execution of testing, Quality Assurance shall be contacted. Any redlines made to this procedure shall be initialed by a program RQE prior to his/her final sign off.

I OPERATIONS

1 Prepare data recording:

1.1 Set up the Facility DAS to collect data from I5, I6, I7 and I7H using configuration 3z.

1.2 Set up plotter to display all Windows heaters an d temperatures and the Probe heat exchangers.

1.3 Set up SMD DAS to record and plot the Dewar heat exchanger temperatures.

1.4 Record start temperatures of Windows and Probe HEXs:

HEX4 / Probe T04P[144] _____

HEX4 Internal T27P[159] _____

SMD HEX4 T08D[008] _____

Window #3: T25P[157] _____ T26P [158] ____

HEX3 : T03P[143]

SMD HEX3 T07D[007] _____

Window #2 T23P[155] _____ T24P [156] ____

HEX2 : T02P[142]

SMD HEX2 T06D[006] _____

Window #1: T21P[153] _____ T22P [154] ____

HEX1: T01P[141]

HEX0: T05P[118]

SMD HEX1 T05D[005] _____

SMD S200 T01D[001] _____

1.5 Connect each of the four heater input plug-ins (for Heaters: H16P, H18P, H20P and H22P) to

a power supply output (in Power Distribution Box) and record the power supply identification used for each heater in Table 1.

1.6 Verify all power supply channels have had the over voltage (OVset) set to 10 volts and Iset, maximum current output, set to (default) 0.05 amp.

1.7 Begin recording temperature and heater data in Table 2.

2 Measurement of Window #1:

2.1 First Equilibrium:

2.1.1 Adjust Window #1/a heater (H16P) (See Table 1) to 0.01 watt.

2.1.2 Record: Time/Date

_____ Watt _____ volt

2.1.3 When satisfied heater is operating correctly proceed with next steps.

2.1.4 Adjust heater until temperature reaches 2-5K above the initial value.

2.1.5 Record equilibrium data: Time/date

Window #1: T21P[153] _____ T22P [154] _____

HEX1: T01P[141]

SMD HEX1: T05D[005]

HEX0: T05P[118]

2.2 Second Equilibrium:

2.2.1 Record: Time/Date

_____ Watt _____ volt

2.2.2 Adjust heater until temperature reaches 2-5K above the first value.

2.2.3 Record equilibrium data: Time/date

Window #1: T21P[153] _____ T22P [154] _____

HEX1: T01P[141]

SMD HEX1: T05D[005]

HEX0: T05P[118]

2.3 Third Equilibrium (Optional):

2.4 Record: Time/Date

_____ Watt _____ volt

2.5 Adjust heater until temperature reaches 2-5K above the third value.

2.6 Record equilibrium data:

Time/date

Window #1: T21P[153] _____ T22P [154] _____

HEX1: T01P[141]

SMD HEX1: T05D[005]

HEX0: T05P[118]

3 Measurement of Window #2:

3.1 First Equilibrium:

3.1.1 Adjust Window #2/a heater (H18P) (See Table 1) to 0.01 watt.

3.1.2 Record: Time/Date

_____ Watt _____ volt

3.1.3 When satisfied heater is operating correctly proceed with next steps.

3.1.4 Adjust heater until temperature reaches 2-5K above the initial value.

3.1.5 Record equilibrium data:

Time/date

Window #2 T23P[155] _____ T24P [156] _____

HEX2 : T02P[142]

SMD HEX1: T06D[006]

3.2 Second Equilibrium:

3.2.1 Record: Time/Date

_____ Watt _____ volt

3.2.2 Adjust heater until temperature reaches 2-5K above the first value.

3.2.3 **Record equilibrium data:**

Time/date

Window #2 T23P[155] _____ T24P [156] _____

HEX2 : T02P[142]

SMD HEX1: T06D[006]

3.3 Third Equilibrium (Optional):

3.3.1 Record: Time/Date

_____ Watt _____ volt

3.3.2 Adjust heater until temperature reaches 2-5K above the third value.

3.3.3 **Record equilibrium data:**

Time/date

Window #2 T23P[155] _____ T24P [156] _____

HEX2 : T02P[142]

SMD HEX2: T06D[006]

4 Measurement of Window #3:

4.1 First Equilibrium:

4.1.1 Adjust Window #3/a heater (H20P) (See Table 1) to 0.01 watt.

4.1.2 Record: Time/Date

_____ Watt _____ volt

4.1.3 When satisfied heater is operating correctly proceed with next step.

4.1.4 Adjust heater until temperature reaches 2-5K above the initial value.

4.1.5 **Record equilibrium data:**

Window #3: T25P[153] _____ T26P [154] ____

HEX1: T01P[141]

SMD HEX3: T07P[007]

4.2 Second Equilibrium:

4.2.1 Record: Time/Date

_____ Watt _____ volt

4.2.2 Adjust heater until temperature reaches 2-5K above the first value.

4.2.3 **Record equilibrium data:**

Time/date

Window #3: T25P[153] _____ T26P [154] ____

HEX1: T01P[141]

SMD HEX3: T07P[007]

4.3 Third Equilibrium (Optional):

4.4 Record: Time/Date

_____ Watt _____ volt

4.5 Adjust heater until temperature reaches 2-5K above the third value.

4.6 Record equilibrium data:

Time/date

Window #3: T25P[153] _____ T26P [154] ____

HEX1: T01P[141]

SMD HEX3: T07P[007]

5 Shutting down Window heaters.

5.1 Record temperatures of Windows and Probe HEXs:

Window #3: T25P[157] _____ T26P [158] _____

HEX3: T03P[143]

Window #2 T23P[155] _____ T24P [156] _____

HEX2 : T02P[142]

Window #1: T21P[153] _____ T22P [154] _____

HEX1: T01P[141]

HEX0: T05P[118]

5.2 Turn all heaters off, record: Time

5.3 Continue data recording including video until temperatures are within 3 K of start temperatures.

5.4 Verify all heaters are off and turn off Power supply.

6 Complete Window Thermal Test.

Completed by:

Payload Test Director:

Quality Engineering:

Time:

Date:

Table 1 Temperature Sensor and Heater Data

Window	Htr/a	Htr/b	Temp/a	Temp/b	$T_{bakeout}$	Pmax	10% P	P.S. ID	P.S. ID
--	-- (Ohms)[1]	-- (Ohms)[1]	K [Ch No]	K [Ch No]	K	W (volt)	W (volt)	#=s 16, 18 & 20	#=s 17, 19 & 21
No. 1	H16P [35] (400)	H17 [36] (400)	T20P [153]	T21P [154]	40K	1.966 (28)	.20 (8.6V)		
No. 2	H18 [37] (400)	H19 [38] (400)	T22P [153]	T23P [154]	90K	1.96 (28)	0.20 (8.6V)		
No. 3	H20P [39] (180)	H17 [40] (180)	T24P [153]	T25P [154]	170K	4.36 (28)	0.44 (8.6V)		

1. The heater resistances are nominal design values from the Payload Specification, Rev 4.

Note: Htr/a is the primary heater and Htr/b is the backup heater.

Table 2 Temperature and Heater Data

	Window #1					Window #2					Window #3					Heat Station 4			LLG1
TIME/ DATE	T21P [153]	T22P [154]	T01P [141]	**SMD** HX1 [05]	H16P (35)	T23P [155]	T24P [156]	T02P [142]	**SMD** HX2 [06]	H18P [37]	T25P [157]	T25P [158]	T03P [143]	**SMD** HX3 [07]	H20P [39]	HX4 Int [159]	HX4 Probe [144]	**SMD** HX4 [08]	-
	K	K	K	K	W	K	K	K	K	W	K	K	K	K	W	K	K	K	Torr
