GRAVITY PROBE B

PROCEDURE FOR

GSE CERTIFICATION

CERTIFICATION OF THE TM&A

Nov 30, 2001
P0775 B
ECO# 1323

Revised by: *N. Calder*

Approvals:

Program Responsibility	Signature	Date
B. Clarke Test Engineer		
D. Murray Cryogenic Engineer		
M. Taber Payload Test Director		
R. Whelan GP-B System Engineering		
D. Ross GP-B Quality Assurance		
B. Muhlfelder GP-B Payload Technical Manager		

NOTES:
Level of QA required during performance of this procedure:
__X__ Stanford QA Representative
____ Government QA Representative

All redlines must be approved by QA

Revision Record:

Rev	Rev Date	ECO #	Summary Description
A	21 August, 2001	1300	1. Correct pinouts on wiring chart for cables P800, P804 and P801 to reflect actual hardware (rev – was mirror image on all 66-pin connectors). 2. Update limits in step L.5 to agree with SMD simulators as built. 3. Remove channel 13, 'ENDEVCO 3' (not used). 4. Update Labview software with the following: Application version is TM&A_V002.vi Add time of day to front panel. Add header line to data file. Add automatic filename generation and start new datalog file with each system start. Add selective alarm enable from front panel. Set limits from front panel.
B	Nov 30, 2001	1323	Add QA inspection points. Add reference to last certification Add Pre and Post operations checklists

Acronyms and Abbreviations:

Acronym / Abbreviation	**Meaning**
TM&A	Temperature Monitor and Alarm
SMD	Science Mission Dewar

Table of Contents

A Scope

This procedure is used to verify the operation of the Temperature Monitor and Alarm system (TM&A) before it is connected to the Science Mission Dewar (SMD). The TM&A system includes two 10μA battery operated current sources, a battery operated three channel Endevco pressure sensor readout, a battery operated National Instruments SCXI data acquisition chassis (SCXI DC 1000 chassis, SCXI 1200-8 channel A/D, SCXI 1100-32 channel MUX and SCXI 1161-8 channel relay) with both a fast charge and a trickle charge power supply, the associated interface box and cabling and a laptop computer. Successful completion of this procedure certifies that the TM&A is operating normally and is ready to be connected to the SMD.

B Requirements Verification

B.1 Requirements Cross-Reference

None.

B.2 Expected Data for verification per requirement

None.

C Configuration Requirements

None.

D Hardware Required

D.1 Commercial test equipment

Manufacturer	Model	Serial Number	Calibr. Exp. Date

D.2 Mechanical/Electrical Special test equipment

Description	Part No.	Rev. no.	Serial No.	Certification Date
SMD simulator for P800	SP800	N/A	N/A	N/A
SMD simulator for P801	SP801	N/A	N/A	N/A
SMD simulator for P804	SP804	N/A	N/A	N/A
(2) ENDEVCO dummy strain gauge heads	N/A	N/A	N/A	N/A

D.3 Tools

Description	No. Req'd

D.4 Expendables

Description	Quantity

E Software Required

E.1 Flight Software

Flight Software Name	Version No.
MSS (Mission Support Software)	
SUS (Start Up Software)	
BSS (Boot Strap Software)	
OSS (Operating System Software)	
SSW (SQUID/ST Support Software)	
GSW (GSS Support Software)	

E.2 CSTOL Scripts

CSTOL Script Name	Version No.

E.3 SPC Scripts

SPC Script Name	Version No.

E.4 Test Support Software

Test Software Name	Version No.
Labview Data Acquisition	6.0
TM&A_V002.vi	N/A

F **Procedures Required**

Procedure Name	Procedure No.

G **Equipment Pretest Requirements**

Equipment	Serial No.	Test Required	Proc. No.	Test Performed	
				Date	By

H **Personnel Requirements**

Test Leader

The Test Leader shall be Mike Taber, Dave Murray, Bruce Clarke or Ned Calder. He has overall responsibility for the implementation of this procedure.

Other Personnel

All personnel participating in this procedure shall work under the direction of the Test Leader who shall determine whether the person is qualified. Different people will likely be designated at different times. For this procedure, participating engineers are expected to be (at various times) Mike Taber, Dave Murray, Tom Welsh, Ned Calder and Bruce Clarke.

The QA program office shall be notified 24 hours prior to the start of this procedure. A Quality Assurance Representative designated by D. Ross shall review any discrepancy noted during this procedure, and approve its disposition.

I **Safety Requirements**

This procedure deals with GSE only and there fore should pose no hazard to flight hardware. The standard ESD precautions should be used when mating and de-mating connectors and interconnecting any equipment. Connectors should be inspected for bent pins and/or debris prior to mating.

J **General Instructions**

J.1 Redlines can be initiated by the Test Leader or their designate and must be approved by QA.

J.2 Any nonconformance or test anomaly should be reported by a Discrepancy Report. Refer to the Quality Plan, P0108, for guidance. Do not alter or break test configuration if a test failure occurs; notify quality assurance.

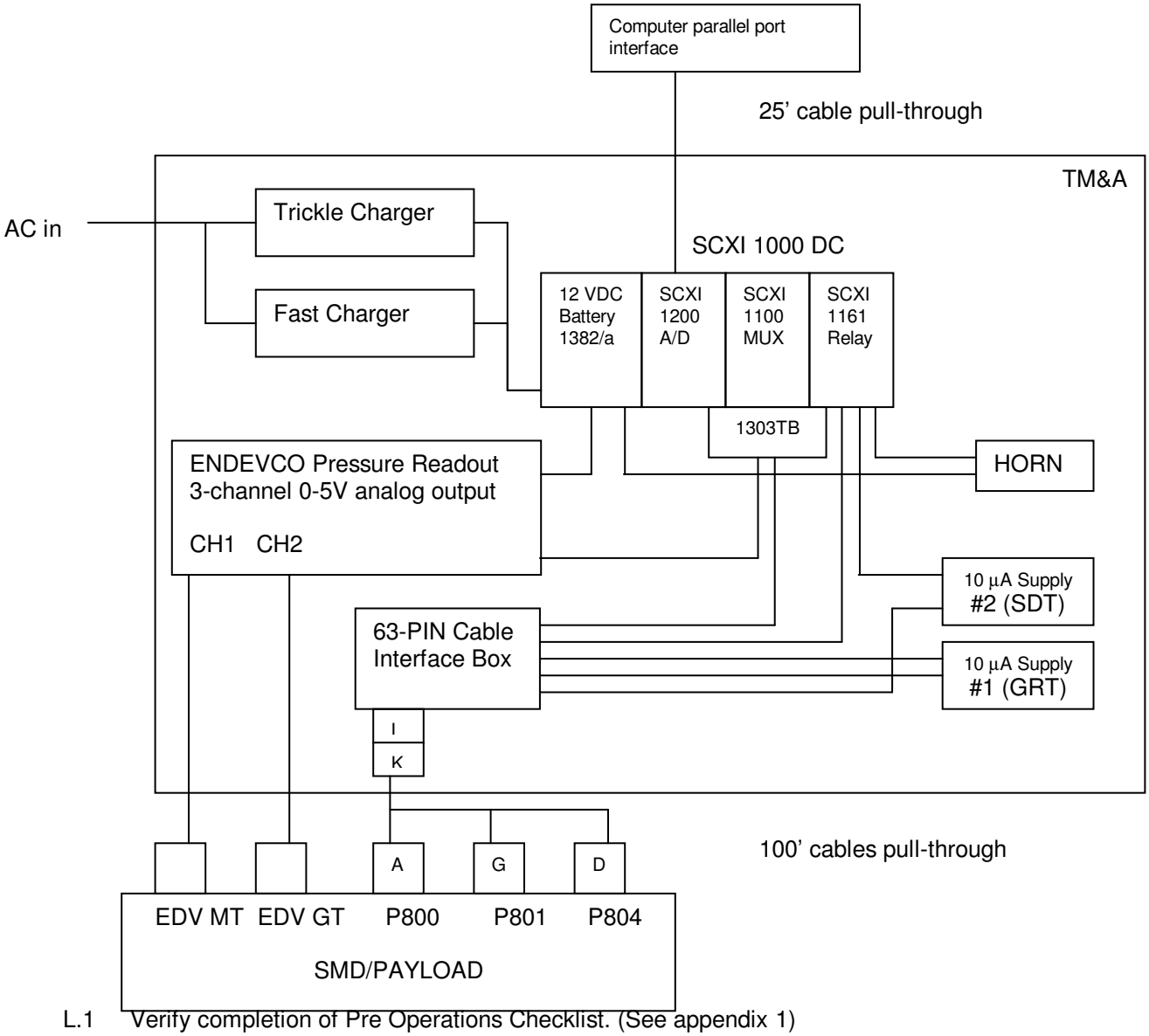
J.3 Only the Test Leader has the authority to exit/terminate this test or to perform a retest.

K **References and Applicable Documents**

L **Operations**

TM&A Configuration

The figure below shows the set-up of the TM&A as it is intended to be used on the SMD/PAYLOAD. The cable connections to the SMD/PAYLOAD are K/A-D-G (K = 63-pin female, A, D and G = 66-pin female) and two 5-conductor ENDEVCO cables (male/female, 9-pin D-style connector).



L.1 Verify completion of Pre Operations Checklist. (See appendix 1)

QA Witness:_____

L.2 Assure that the 1382/a battery has enough charge to run the components of the TM&A. If needed, half an hour on the fast charger should provide enough charge to run this procedure.

L.3 Check that all the TM&A components are powered down and that the horn is switched off.

AC in	unplugged
SCXI DC 1000	OFF
ENDEVCO	OFF
10µA #1 (GRT)	OFF
10µA #1 (SDT)	OFF
Laptop Computer	OFF
Horn defeat	ON

L.4 Connect the TM&A cables to the SMD simulator and to the dummy ENDEVCO heads. Connect the laptop computer interface to the SCXI chassis.

L.4.1 Cable K/A-D-G connects to the interface box (connector K to L) and to the SMD simulators (A to SP800, G to SP801, D to SP804).

L.4.2 Connect the main tank and guard tank ENDEVCO cables to the dummy ENDEVCO heads using the cables EDV MT and EDV GT.

L.4.3 Connect the parallel port of the laptop computer to the SCXI 1200 using the parallel interface cable.

L.5 Power on all the TM&A components in the following order and activate the horn circuit.

SCXI DC 1000	ON	_____
ENDEVCO	ON	
10µA #1 (GRT)	ON	
10µA #1 (SDT)	ON	
Laptop Computer	ON	
Horn defeat	OFF	

L.6 Boot the laptop computer and start the 'TM&A' program, TM&A_V002.vi. Allow the scanner to cycle. This could take between 30 seconds up to several minutes depending on the sampling rate, number of samples to average and the delay between relay pulses. Record the displayed values in the table below.

Device ID	**description**	**channel #**	**Value Read**	**Reference** **Record Last Opt_____**	**acceptable range**	**PASS / fail**
T22D	top lead bag /a GRT	0			4 K – 5 K	
T23D	top lead bag /b GRT	1			4 K – 5 K	
T09D	main tank bot SDT	2			20 K – 30 K	
T15D	guard tank /a SDT	3			20 K – 30 K	
T24D	fill valve V13 SDT	4			20 K – 30 K	
T20D	top lead bag /c GRT	5			4 K – 5 K	
T21D	top lead bag /d GRT	6			4 K – 5 K	
T01D	station 200 /a SDT	7			4 K – 5 K	
T10D	MT top /a GRT	8			4 K – 5 K	
T05D	VCS-1 bot SDT	9			20 K – 30 K	
T08D	HEX-4 SDT	10			20 K – 30 K	
EDV MT	main tank press	11			-100 – 100 torr	
EDV GT	guard tank press	12			-100 – 100 torr	

QA Witness:_____

L.7 Test the horn by causing an out of range condition on any channel. This may be done by simply disconnecting the any cable from the SMD simulator (see TM&A software and wiring chart at the end of this document).

L.8 If all channels above pass and the horn is functional, the TM&A is deemed certified and ready to connect to the SMD/payload per procedure P0789. If any channels do not pass, exit this procedure without certification of the TM&A and proceed to troubleshoot the problem. The wiring chart for the TM&A cables, 1161 relay interface and the 1303 MUX interface is given at the end of this procedure.

L.9 Verify Completion of Post Operations Checklist. (See appendix 2)

QA Witness:_____

Test completed.

Completed by:_____

Witnessed by:_____

Date: _____

Time:_____

Quality Manager_____**Date**_____

Payload Test Director_____**Date**_____

Appendix 1 **Pre Operations Checklist**

DATE	CHECKLIST ITEM	COMPLETED	REMARKS
	1. Verify the test procedure being used is the latest revision.		
	2. Verify all critical items in the test are identified and discussed with the test team.		
	3. Verify all required materials and tools are available in the test area.		
	4. Verify all hazardous materials involved in the test are identified to the test team.		
	5. Verify all hazardous steps to be performed are identified to the test team.		
	6. Verify each team member knows their individual responsibilities.		
	7. Confirm that each test team member clearly understands that he/she has the authority to stop the test if an item in the procedure is not clear.		
	8. Confirm that each test team member clearly understands that he/she must stop the test if there is any anomaly or suspected anomaly.		
	9. Notify management of all discrepancy reports or d-log items identified during procedure performance. In the event an incident or major discrepancy occurs during procedure performance management will be notified immediately.		
	10**.** Confirm that each test team member understands that there will be a post-test team meeting.		
	Team Lead Signature: _____		

Appendix 2 **Post Operations Checklist**

DATE	CHECKLIST ITEM	COMPLETED	REMARKS
	1. Verify all steps in the procedure were successfully completed.		
	2. Verify all anomalies discovered during testing are properly documented.		
	3. Ensure management has been notified of all major or minor discrepancies.		
	4. Ensure that all steps that were not required to be performed are properly identified.		
	5. If applicable sign-off test completion.		
	Team Lead Signature: _____		

TM&A CABLING

		A	K	L		1303	1161	other
Device	**function**	**P800/P1**			**L jumpers**			
T22D	-	-	1	1		GND		
top lead	V+	60	2	2		CH0+		
bag /a	V-	53	3	3		CH0-		
	-	-	4	4	10	GND		
GRT	I+	64	5	5			NO(0)	
	I-	59	6	6	11			
T23D	shield	-	7	7		GND		
top lead	V+	37	8	8		CH1+		
bag /b	V-	38	9	9		CH1-		
	shield	-	10	10	34			
GRT	I+	45	11	11	6			
	I-	46	12	12	35			
T09D	shield	-	13	13		GND		
main tank	V+	57	14	14		CH2+		
bottom	V-	49	15	15		CH2-		
	shield	-	16	16		GND		
SDT	I+	63	17	17			NO(1)	
	I-	56	18	18				10uA(-) SDT
T15D	shield	-	19	19		GND		
guard tank /a	V+	61	20	20		CH3+		
	V-	62	21	21		CH3-		
SDT	shield	-	22	22		GND		
	I+	65	23	23			NO(2)	
	I-	66	24	24				10uA(-) SDT
T24D	shield	-	25	25		GND		
fill valve V13	V+	52	26	26		CH4+		
	V-	44	27	27		CH4-		
SDT	shield	-	28	28		GND		
	I+	58	29	29			NO(3)	
	I-	51	30	30				10uA(-) SDT
		D	K	L		1303	1161	other
Device	**function**	**P804/P5**			**L jumpers**			
T20D	-	-	31	31		GND		
top lead bag	V+	26	32	32		CH5+		
/c	V-	27	33	33		CH5-		
	-	-	34	34	40			
GRT	I+	35	35	35	12			
	I-	36	36	36	41			
T21D	shield	-	37	37		GND		
top lead bag	V+	57	38	38		CH6+		
/d	V-	49	39	39		CH6-		
	shield	-	40	40	46			
GRT	I+	63	41	41	36			
	I-	56	42	42	47			
		D	K	L		1303	1161	other
Device	**function**	**P801/P2**			**L jumpers**			
T01D	-	-	43	43		GND		
station 200 /a	V+	57	44	44		CH7+		
	V-	49	45	45		CH7-		
GRT	-	-	46	46	52			
	I+	63	47	47	42			
	I-	56	48	48	53			
T10D	shield	-	49	49		GND		
MT top /a	V+	8	50	50		CH8+		

	V-	9	51	51		CH8-		
GRT	shield	-	52	52	46			
	I+	15	53	53	48			
	I-	16	54	54				10uA(-) GRT
T05D	shield	-	55	55		GND		
VCS-1 Bottom	V+	37	56	56		CH9+		
	V-	38	57	57		CH9-		
SDT	shield	-	58	58		GND		
	I+	45	59	59			NO(4)	
	I-	46	60	60				10uA(-) SDT
T08D	shield	-	61	61		GND		
HEX-4	V+	25	62	62		CH10+	NO(5)	
	V-	17	63	63		CH10-		10uA(-) SDT
SDT	shield	-						
	I+	43						
	I-	34						

ENDEVCO and Spare A/D CHANNELS

		1303			**1303**
spare 63-pin	**ENDEVCO**		**spare 63-pin**	**ENDEVCO**	
	CH1-pin	CH11+	24		GND
	CH1-shield	CH11-	25		CH22+
		GND	26		CH22-
	CH2-pin	CH12+	27		GND
	CH2-shield	CH12-	28		CH23+
		GND	29		CH23-
	CH3-pin	CH13+	30		GND
	CH3-shield	CH13-	31		CH24+
		GND	32		CH24-
1		CH14+	33		GND
2		CH14-	34		CH25+
3		GND	35		CH25-
4		CH15+	36		GND
5		CH15-	37		CH26+
6		GND	38		CH26-
7		CH16+	39		GND
8		CH16-	40		CH27+
9		GND	41		CH27-
10		CH17+	42		GND
11		CH17-	43		CH28+
12		GND	44		CH28-
13		CH18+	45		GND
14		CH18-	46		CH29+
15		GND	47		CH29-
16		CH19+	48		GND
17		CH19-	49		CH30+
18		GND	50		CH30-
19		CH20+	51		GND
20		CH20-	52		CH31+
21		GND	53		CH31-
22		CH21+	54		GND
23		CH21-			

CURRENT SOURCE AND BATTERY TO 1161 RELAY

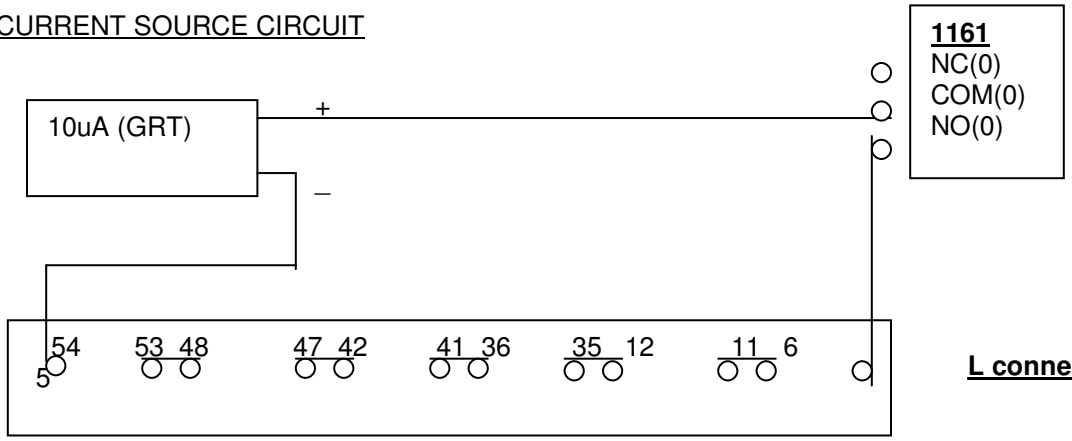
1161		**10 uA GRT**	**10uA SDT**	**12VDC**
	1161 jumper			
NC(0)				
COM(0)		10 uA (+)		
NO(0)				
NC(1)				
COM(1)	COM(2)		10 uA (+)	
NO(1)				
NC(2)				
COM(2)	COM(3)			
NO(2)				
NC(3)				
COM(3)	COM(4)			
NO(3)				
NC(4)				
COM(4)	COM(5)			
NO(4)				
NC(5)				
COM(5)	COM(4)			
NO(5)				
NC(6)				
COM(6)				
NO(6)				
NC(7)				
COM(7)				12 V (+)
NO(7)				

ENDEVCO CABLES

pin #	function	color
4		white
5		green
7		red
8		black
9	shield	none

Sensor end = female 9-pin D-style
Readout end = male 9=pin D-style

GRT CURRENT SOURCE CIRCUIT



SDT CURRENT SOURCE CIRCUIT