GRAVITY PROBE B

PROCEDURE FOR

PAYLOAD VERIFICATION

(PTP) QBS AC CLOSED LOOP TEMPERATURE CONTROL TEST

Procedure No. P*0546 Rev. –*
Test Case ID:

1/24/10

Prepared by: *D. Meriwether*

Approvals:

Program Responsibility	Signature	Date
D. Meriwether ECU Procedure Author		
B. Muhlfelder ECU Integration Manager		
D. Murray Test Leader		
M.R.Anderson GP-B System Engineering		
D. Ross GP-B Quality Assurance		
S. Buchman GP-B Hardware Manager		

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

- Any red lines to the procedure shall require the approval and initial of the Test Author and Stanford QA prior to implementation.
- Stanford and ONR QA must be notified at least 24 hour before beginning this procedure.
- A Quality Assurance representative or their designated representative shall review any discrepancy noted during assembly or test.
- Upon completion of this procedure, Quality Assurance will certify his/her concurrence that the effort was preformed and accomplished in accordance with the prescribed instructions by signing and dating.

Revision Record:

Rev	Rev Date	ECO #	Summary Description

Acronyms and Abbreviations:

Acronym / Abbreviation	**Meaning**
ECU Monitor Mnemonics	
BE_XXXXX_XXXXXX	Binary Word Monitor
CE_XXXXX_XXXXXX	Current Monitor
DE_XXXXX_XXXXXX	Digital Word Monitor
TE_XXXXX_XXXXXX	Temperature Monitor
TE_XXXXX_X**GT**XXX	GRT type Thermometer
TE_XXXXX_X**PT**XXX	PRT type Thermometer
TE_XXXXX_X**ST**XXX	SDT type Thermometer
TE_XXXXX_XXXXX**D**	Dewer located Thermometer
TE_XXXXX_XXXXX**P**	Probe located Thermometer
TE_XXXXX_XXXXX**Q**	Quartz Block located Thermometer
VE_XXXXX_XXXXXX	Voltage Monitor

Table of Contents

A Scope

This measurement is intended to test the temperature stability of the QBS AC Closed Loop Temperature Control using the ECU EU during Payload Verification testing.

B Requirements Verification

B.1 Requirements Cross Reference

B.2 Expected Data for verification per requirement

C Configuration Requirements

- *The FIST Ops Test set shall be connected to the ECU EU via a 1553 bus for data transmission and a timing signal supplied across a S16D connection.*
- *The FIST Ops Test set and ECU EU shall be provided power through a Uninterruptible Power Supply providing 110 VAC for more than one minute off the commercial power grid and additional signal conditioning.*
- *The ECU EU shall be provided with a 1553 bus connection, a timing signal (10 Hz) and a 28.0 Volt power supply.*
- *The ECU EU Power Supply shall be the sole provider of Heater Power to ECU controlled Heaters.*
- *The Aft ECU EU shall be attached via cables to the Forward ECU EU.*
- *The Forward ECU EU shall be attached via cables to the Flight Dewer and Flight Probe.*
- *The ECU EU Heater switch shall remain in the off position when the ECU EU is not in use.*

D **Hardware Required**

D.1 Flight hardware required

Description	Finite Lifetime Object	No. Req'd
Flight GP-B Dewar	N/A	1
Flight GP-B Probe	N/A	1

D.2 Commercial test equipment

Manufacturer	Model	Serial Number	Calibr. Exp. Date
SUN Workstation	Ultra 1 3D Creator	637F09FB	
ECU EU Power Supply	Lambda LA 250	LA2-AA25-859	
Wavetek 10 Hz Oscillator	GDM-20E20	297101	

D.3 Mechanical/Electrical Special test equipment

Description	Part No.	Rev. no.	Serial No.	Certification Date
Engineering Unit ECU – Fwd	8A01313-ECU GSE			
Engineering Unit ECU – Aft	8A00922-ECU GSE			
Interrupt Test Aid	S16D			
Cable J5 (Fwd Ecu – Top Hat)	8A01289-ECUGSE-101		W355	

D.4 Tools

Description	No. Req'd
8 mm tape drive	1

D.5 Expendables

Description	Quantity
8 mm tape	1

E Software Required

E.1 Flight Software

Flight Software Name	Version No.
MSS (Mission Support Software)	3.0.4S

E.2 CSTOL Scripts

CSTOL Script Name	Version No.
ecu_test_set.prc	
Ecumisc_br.prc	V 1.1 : 01/15/99
f3040ecu32a.prc	
f3040ecu32a_r.prc	V 1.1 : 02/18/99
htr1_br.prc	V 1.1 : 01/15/99
htr2_br.prc	V 1.1 : 01/15/99
htr3_br.prc	V 1.1 : 01/15/99
htr4_br.prc	V 1.1 : 01/15/99
load_br.prc	V 1.4 : 04/06/99
qbs.prc	V 1.1 : 11/11/99

E.3 SPC Scripts

SPC Script Name	Version No.
N/A	

E.4 Test Support Software

Test Software Name	Version No.
Oasis (Operating System Software)	V 2.4.5
Framex (front end software)	framexs

F Procedures Required

Procedure Name	Procedure No.

G Equipment Pretest Requirements

Equipment	Serial No.	Test Required	Proc. No.	Test Performed	
				Date	By
ECU EU		EU Certification			

H Personnel Requirements

- As a general requirement, all operations involving flight equipment require at least two persons at all times.
- The test leader for this procedure is Dr. Dave Murray <Beeper *650-725-8632 >*, or his appointed representative.
- The Payload Test Director for all activities conducted in FIST Ops is Dr. Mike Taber <Beeper *650-725-4136 >*, or his appointed representative. The Payload Test Director is also responsible in general for the coordination of all payload tests, and will therefore schedule appropriate times for the performance of this procedure.
- The ECU EU REE is Byron Oh <Beeper *650-723-6586 >.*
- The Stanford Quality Assurance representative is Doreen Ross <Beeper *650-725-6403 >* or her appointed representative.
- The Office of Naval Research representative is Ed Ingraham <Beeper *650-723-6586 >* or his appointed representative.
- The following personnel are qualified to perform this procedure using the FIST Ops test set:
  - *Dave Meriwether* <Beeper *650-317-7912 >*
  - *Thomas Wai* <Phone *650-354-5644 >*
  - *Ken Trieu* <Phone *650-424-2346>*

I Safety Requirements

- *Standard safety practices to ensure safety of personnel and prevent damage to equipment shall be observed during performance of this test.*
- *Protect all electrical connections and/or Connector Savers with ESD dust caps when the connectors are not mated.*
- *Ensure that power is removed from cable assemblies before connecting and disconnecting cable connections.*
- *Grounded wrist straps are to be worn prior to removal of connector caps or covers and during mating/demating operations.*
- *Examine all mating connections before attempting to mate them. Remove any foreign particles. Look for any damaged pins or sockets. Do not force the coupling action if excessive resistance is encountered. Ensure that key ways are aligned.*
- *Special care shall be exercised when handling ECU EU printed wiring assemblies to prevent damage caused by Electrostatic Discharge.*

J General Instructions

- This procedure shall be conducted on a formal basis to its latest approved and released version.
- Tests will be conducted under the environmental conditions existing in the FIST Ops at Stanford University, HEPL.
- This procedure operates Flight Hardware. All use of software associated with this procedure must conform to the GP-B Configuration Control process.
- In order to expedite test operations, unless specifically noted, the sequence in which major sections or subsections are preformed may be altered at the discretion of the Test Leader or his representative.
- Upon completion of the test, all data on the FISP Ops test set under the /opt/usr6/lab and sub-directories shall be archived onto an 8mm tape and transferred to the data archive on the Payload Server.
- Upon confirmation that the FISP Ops test set data has been successfully archived onto 8 mm tape, the data in the /opt/usr6/lab/bridge, /opt/usr6/lab/snaps, /opt/usr6/lab/messages and /opt/usr6/lab/oasis_raw_data directories shall be deleted for space considerations.
- Test operators shall read this procedure in its entirety and resolve any apparent ambiguities prior to beginning this test.

K References and Applicable Documents

- SCIT-01 System Design, Verification, Integration & Test Plans
- SCSE 06 Command and Telemetry Handbook, App B sw_cmd 3.0.4
- SCSE 16 SECTION 9, Flight Software Design Specification, External Interface Detailed Design.

Op. Order No._____
Date Initiated_____
Time Initiated_____

L **Operations**

L.1 Connect ECU EU cable I1, I5 to the Top Hat. Verify pressure in probe is below 5e-6 torr _____.

L.2 Power on ECU EU

L.3 Turn on ECU EU

L.3.2 *bridge file name and directory path:*

_____

L.4 Side A QBS Heaters

i) Set Mux 3 Gain to 16 µA (Gain_Address 3). Record temperature of T10-P _____ and T-11P_____.

ii) Set QBS Mode to AC Closed Loop Control.

iii) Command QBS Heater to Zero.

iv) Monitor Pb bag temperature during QBS heating operations to ensure bag safety.

v) Raise QBS Heater setpoint until QBS Heater (H-05P/06P) voltage takes on a non-zero value. Verify controller has adequate authority for given set point. Record set point _____, heater average heater voltage _____, temperature of T-10P _____ and temperature of T-11P _____.

vi) Monitor the A and B side QBS Temperature stability for 5 hours

vii) Command QBS Heater to Zero

L.5 Side B QBS Heaters (Optional)

viii) Set Mux 3 Gain to 16 µA (Gain_Address 3). Record temperature of T10-P _____ and T-11P_____.

ix) Monitor Pb bag temperature during QBS heating operations to ensure bag safety.

x) Set QBS Mode to AC Closed Loop Control

xi) Command QBS Heater to Zero

xii) Raise QBS Heater setpoint until QBS Heater (H-05P/06P) voltage takes on a non-zero value. Verify controller has adequate authority for given set point. Record set point _____, heater average heater voltage _____, temperature of T-10P _____ and temperature of T-11P _____.

xiii) Monitor QBS Temperature stability for 5 hours

xiv) Command QBS Heater to Zero

L.6 Set Mux Gain to default (Gain_Address 1)

L.7 Set QBS Mode to OFF

L.8 Turn off ECU

L.9 Power off ECU EU

L.10 Disconnect ECU EU cable I1, I5 to the Top Hat and reconnect the SMD DAS cable I5

L.11 *Data recording:*

Record QBS Mode (DE_QBSHOpClLp_A, B), Heater Setpoint (DE_HSP_QBS____A, ____B), Temperature (TE_QBS_a__GT10P, TE_QBS_b__GT11P, T-6Q, T5Q) and Voltages (VE_QBS_H_a_H05P, VE_QBS_H_b_H06P) upon change and in a bridge file during the test.

Test completed.

Completed by: _____
Witnessed by: _____
Date: _____
Time: _____

Test Leader:_____
Date:
Time:

Quality Engineer:
Date:
Time: