

**GRAVITY PROBE B
PROCEDURE FOR
PAYLOAD VERIFICATION**

MANUAL FLUX FLUSH

Procedure No. P0570 Rev. -
Test Case ID: *PLGYROFLXFLSH*

1/24/10

Prepared by: *D. Meriwether/D. Murray*

Approvals:

Program Responsibility	Signature	Date
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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:

Stanford QA Representative

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.

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.

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_ GT XXX	GRT type Thermometer
TE_XXXXX_ P TXXX	PRT type Thermometer
TE_XXXXX_ S TXXX	SDT type Thermometer
TE_XXXXX_XXXX D	Dewer located Thermometer
TE_XXXXX_XXXX P	Probe located Thermometer
TE_XXXXX_XXXX Q	Quartz Block located Thermometer
VE _XXXXX_XXXXXX	Voltage Monitor

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A Scope

This document details the GP-B's Science Gyroscopes Trapped Magnetic manual Flux Flushing procedure. The purpose of this operation is to reduce the Science Gyroscope's trapped magnetic flux. The major components used during this operation are the Oasis-CC based FIST Ops Test Set, the ECU Engineering Unit, the QBS (H-05P & H-06P) heaters and their associated temperature monitors.

B Requirements Verification

B.1 Requirements Cross Reference

SCIT-01 Para. 8.2.3

B.2 Expected Data for verification per requirement.

Measured trapped flux in Gyro #1 $\leq 3 \times 10^{-6}$ gauss (Uniform Equivalent Field)

Measured trapped flux in Gyro #2 $\leq 3 \times 10^{-6}$ gauss (Uniform Equivalent Field)

Measured trapped flux in Gyro #3 $\leq 3 \times 10^{-6}$ gauss (Uniform Equivalent Field)

Measured trapped flux in Gyro #4 $\leq 3 \times 10^{-6}$ gauss (Uniform Equivalent Field)

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 an 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 as required by this procedure to the Flight Dewar and Flight Probe.

The ECU EU Heater switch shall remain in the off position when the ECU EU is not in use.

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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	
Interrupt Test Aid Power Supply	WeiTEC		
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 J1 (Fwd Ecu – Top Hat)	8A00532-ECUGSE-101		W356	
Cable J5 (Fwd Ecu – Top Hat)	8A01289-ECUGSE-101		W355	
Cable J7 (Fwd Ecu – Top Hat)	8A01291-ECUGSE-101		W354	
Cable J 11 (Fwd – Aft ECU)	Cable #1		W311P11	
Cable J 12 (Fwd – Aft ECU)	Cable #1		W311P12	
Cable J 13 (Fwd – Aft ECU)	Cable #2		W312P13	
Cable J 14 (Fwd – Aft ECU)	Cable #2		W312P14	

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.
all_htr.prc	V 1.3 : 08/24/99
dwrtemp_br.prc	V 1.1 : 03/07/99
ecumisc_br.prc	V 1.1 : 01/15/99
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
muxio_br.prc	V 1.1 : 02/11/99
probetemp_br.prc	V 1.1 : 01/15/99
Qbstemp_br.prc	V 1.1 : 02/12/99

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:

Dave Meriwether <Beeper 650-317-7912 >

Thomas Wai <Phone 650-354-5644 >

Ken Trieu <Phone 650-424-2346>

Barry Muhlfelder, D. Murray, M. Taber, T. Walsh, B. Oh

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

Should the FIST Ops Test Set stop responding and the Oasis-CC operating system disappear during operations, power off the ECU Power Supply.

CAUTION!

Failure to power off the ECU Power Supply in the event of a Operating system failure could result in anomalous flight hardware temperatures.

Date/time: _____
Operator's initials: _____

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 FIST 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 FIST 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

Payload Cable Interconnect Diagram (GP-B), Drawing 5856124

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.

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Op. Order No. _____
Date Initiated _____
Time Initiated _____

L Operations

Ensure cables J-1, J-5, and J-7 are connected and no other J cables.

Record probe pressure _____. Torr (convectron)

Set the SMD DAS alarm system for the top of the lead bag sensors (T-20 & T-28) to 5.5 K or less and activate it.

WARNING!

Failure to set the SMD DAS alarm system could result in the lead bag going normal.

At any time during the running of this procedure and upon SMD DAS alarm activation, decrease the QBS heaters (H-05P & H-06P) Set Point to Zero and notify the test leader (Dr. Dave Murray <Beeper 650-725-8632 >).

Date/time: _____
Operator's initials: _____

QBS heater verification

Record Date and Time Bridge files started. Date and Time:

Start FIST Ops test set.

Turn on ECU power.

Command on ECU.

Verify heaters are off.

Date/time: _____
Operator's initials: _____

Measure temperatures and record on Table 1. **Note: all grts are operated on gain 1 (1 microampere peak). On this setting the conversion from counts to ohms is 1.356 counts per ohm.**

Issue CSTOL command to set QBS heater mode (Side A & B) to dc open loop (Mode 53).

DE_QBSHOpCILp___A: ___ Mode
DE_QBSHOpCILp___B: ___ Mode

Run CSTOL script all_htr.prc (causes 10 counts or 1.04 volts on the A side). Time _____

Record counts in Table 1. **Note: The scaling for the D/A converter is 0.104 Volts/count.)**

Verify temperature increase on TE_QBS_a__GT-10P _____. Time _____

Issue CSTOL command to turn on side B heater to 10 counts (1.04 volts). Time _____

Record counts in Table 1.

Verify temperature increase on TE_QBS_b__GT-11P _____. Time _____

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Record QBS Heater Set Points and GRT digital counts in Table 1 below.

Record probe pressure (convectron) _____ torr Date/Time _____

QBS Flux Flush

Raise voltages evenly on QBS Heaters H-05P and H-06P as required to increase the QBS temp as measured on TE_QBS_a__GT-10P and TE_QBS_b__GT-11P to 10 K.

Record QBS Heater Set Points and GRT digital counts in Table 1 below.

Record probe pressure (convectron) _____ torr Date/Time _____

Slowly raise voltages evenly on H-5P and H-6P as required to increase the QBS temp as measured on TE_QBS_a__GT-10P and TE_QBS_b__GT-11P to 12 K.

Record QBS Heater Set Points and GRT digital counts in Table 1 below.

Record probe pressure (convectron) _____ torr Date/Time _____

Adjust heater voltages as required to hold QBS temperatures to 12 K for 4 hours.

Slowly lower voltages over the course of 2 hours on H-5P and H-6P as required to reach 10 K as measured on T-10P. The voltage will be decreased every 15 minutes so as to keep the time rate of change in heater power constant.

Set H-5P and H-6P heater voltages to zero volts.

Record GRT digital counts during ramp down and for 3 hours after reaching 0 volts in Table 1 below.

Date/time: _____
Operator's initials: _____

Test completed.

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

Test Leader:
Date:
Time:

Quality Engineer:
Date:
Time:

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Parameter definitions:

<u>Generic</u>	<u>Flight Payload/ECU</u>
GT10P	TE_QBS_a__GT10P
GT11P	TE_QBS_b__GT11P
GT05Q	TE_Q_Aft__GT05Q
T06Q	TE_Q_Flng_GT06Q

	<u>DAS Name</u>
T05P	Station 200/Probe /a
T17Q	QBS forward end
T28P	Station 200/Probe /b
T28D	Top of Lead Bag/a