GRAVITY PROBE B

PROCEDURE FOR

PAYLOAD VERIFICATION

(PTP) PROBE-C PUMP OUT PROCEDURE

P0559 Rev. A
5/8/00
ECO 1127

Prepared by: M. Taber

Approvals:

Program Responsibility	Signature	Date
C. Warren Gas/Vac. Engineer		
M. Taber Payload Test Director		
D. Ross GP-B Quality Assurance		
B. Muhlfelder 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	5/8/00	1127	Minor corrections and inclusion of redlines

Acronyms and Abbreviations:

Acronym / Abbreviation	**Meaning**
AXV-#	Auxiliary Valve #
CB	Circuit breaker
GSE	Ground Support Equipment
GSG-#	Gas Supply Gauge #
GSV-#	Gas Supply Valve #
IG	Ionization Gauge
LGG-#	Leakage Gas Gauge #
LGP-#	Leakage Gas Pump #
LGS	Leakage Gas System
LGV-#	Leakage Gas Valve #
PPG-#	Probe Pressure Gauge #
PPMS	Probe Pressure Measurement System
RH/LH	Right hand / left hand
RGA	Residual Gas Analyzer
SEG-#	Spinup Exhaust Gauge #
SEP-#	Spinup Exhaust Pump #
SMD	Science Mission Dewar

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A Scope

This procedure initiates pumping on Probe-C with the Leakage Gas System (LGS).

B Requirements Verification

B.1 Requirements Cross Reference: N/A

B.2 Expected Data for verification per requirement: N/A

C Configuration Requirements

Probe-C is installed in the SMD, and a 8" pumping line has been installed between the LGS and a 6" Vatterfly valve on the Probe per procedure P0557 for the SMD-vertical configurationor P0627 for the SMD-horizontal configuration. The 6" Vatterfly valve is closed and the Vatterfly Valve Controller is connected to the valve connector. (Note: In the LGS schematic, Fig. 1, the Vatterfly valve is labelled PIV-1; the LED on the control panel associated with this valve does not indicate valve state. The state of this valve can be determined by the Vatterfly Valve Controller.)

D Hardware Required

D.1 Flight hardware required

Description	No. Req'd
65113-1C34292 Probe-C / Science Mission Dewar Assembly	1

D.2 Commercial test equipment/instrumentation

Manufacturer	Model	Serial Number	Calibr. Exp. Date
Granville-Phillips ion gauge readout for "Stable-ion" ion gauges (LGG-1A, -1B) designated as LGM-2	360101	94100501	
Granville-Phillips "Stable-ion" ion gauge (IG-1 = LGG-1A)	360120	94063001	
Granville-Phillips "Stable-ion" ion gauge (IG-2 = LGG-1B)	360120	94082405	
Granville-Phillips ion gauge readout designated as LGM-1 (used to read out Convectron gauge LGG-3)	360101	97071702	

D.3 Mechanical/Electrical Special test equipment

Description	Part No.	Rev. no.	Serial No.	Certification No.
Vatterfly Valve Controller		-	8A01145GSE	ETP-029A

D.4 Tools: N/A

D.5 Expendables: N/A

E **Software Required:** N/A

F **Procedures Required:** N/A

G **Equipment Pretest Requirements:**

Equipment	Serial No.	Test Required	Proc. No.	Test Performed	
				Date	By
LGS	-	Certification	P0567	9/7/99	M. Taber

H **Personnel Requirements**

This test to be conducted only by qualified personnel. Chuck Warren, Dave Murray and Mike Taber are qualified to perform this procedure. The QA representative shall be either Russ Leese or Dorrene Ross.

I **Safety Requirements**

This procedure opens the Probe to the LGS. Exposure of the Probe to a sudden inrush of gas could cause significant damage to the Probe and the lead shield. A high degree of care should be taken to make sure that the 6" Vatterfly valve is not opened unless the LGS manifold pressure (as read by LGG-1A/B) is less than 1 mtorr.

J **General Instructions**

J.1 QA Notification: ***The ONR representative and SU QA program office shall be notified 24 hours prior to the start of this procedure.*** Upon completion of this procedure, the QE Manager will certify her concurrence that the effort was performed and accomplished in accordance with the prescribed instructions by signing and dating in the designated place(s) in this document.

J.2 Redlines can be initiated by Mike Taber or Dave Murray and must be approved by QA.

J.3 A Quality Assurance Representative designated by D. Ross shall review any discrepancy noted during this procedure, and approve its disposition. Discrepancies will be recorded in a D-log or a DR per Quality Plan P0108.

J.4 Only the following persons have the authority to exit/terminate this test or perform a retest: Mike Taber, Dave Murray.

K **References and Applicable Documents**

Op. Order No._____
Date Initiated_____
Time Initiated_____

L Operations

L.1 Enter the calibration due dates for the equipment listed in section D.2 and verify that calibrations are current.

L.2 Verify Appropriate QA Notification

- Verify SU QA program office notified.

  Record: Individual notified _____,

  Date/time _____/_____.

- Verify ONR representative notified.

  Record: Individual notified _____,

  Date/time _____/_____.

L.3 Start up of LGS:

This section of the procedure effects the starting up of the LGS pumps from a cold start condition with all power off and valves closed. **Case 1:** The main LGS manifold is already roughed out to < 1 torr as read by LGG-3. **Case 2:** The entire LGS is at atmospheric pressure.

L.3.1 **Case 1:** (LGG-3 <1 torr)

L.3.1.1 Verify that Circuit Breakers (CBs) F3, F15 located on the TCS 120 and the Turbo-1 and Turbo-2 CBs (in the Power Distribution Box) are off.

L.3.1.2 Turn on “Pump Unit Control” (master power) switch.

L.3.1.3 Power up the TCS 120 by pushing the "Pumping Unit" button, and verify that the button annuciator light comes on.

L.3.1.4 Turn on LGP-4 by turning CB F3 on. Verify that the pressure read by LGG-6 is decreasing.

L.3.1.5 Open LGV-10.

L.3.1.6 Turn on LGP-3 by turning on CB F15.

L.3.1.7 When LGG-5 reads <1 torr, open LGV-6, -7.

L.3.1.8 Start up the turbopumps by turning on CBs Turbo-1 and Turbo-2 in the Power Distribution Box.

L.3.1.9 When the turbopump indicator lights stop blinking (indicating that they are >80% of full speed), open LGV-1, 3.

L.3.1.10 Turn on LGG-1A (IG-1 at LGM-2) to verify pump down of the main LGS manifold.

L.3.2 **Case 2:** (LGG-3 >1 torr)

L.3.2.1 Verify that Circuit Breakers (CBs) F3, F15 located on the TCS 120 and the Turbo-1 and Turbo-2 CBs (in the Power Distribution Box) are off.

L.3.2.2 Turn on “Pump Unit Control” (master power) switch.

L.3.2.3 Power up the TCS 120 by pushing the "Pumping Unit" button, and verify that the button annuciator light comes on.

L.3.2.4 Turn the "Interlock Defeat" keyswitch on and verify that the yellow LED is blinking.

L.3.2.5 Start up LGP-4 by turning CB F3 on. Verify that the pressure read by LGG-6 is decreasing.

L.3.2.6 Open LGV-10.

L.3.2.7 Open LGV-6, -7, -1, -3.

L.3.2.8 When LGG-5 reads <100 torr, start up LGP-3 by turning on CB F15. (Note: Operation of this blower may initially produce a buzzing sound which will go away as the system pumps down.)

L.3.2.9 When LGG-5 reads 1 torr or less, start up the turbopumps by turning on CBs Turbo-1 and Turbo-2 on the Power Distribution Box.

L.3.2.10 When the turbopump indicator lights stop blinking (indicating that they are >80% of full speed), turn off the "Interlock Defeat" keyswitch. All valves should remain open and pumps should stay on.

L.3.2.11 Turn on LGG-1A (IG-1 at LGM-2) to verify pump down of the main LGS manifold.

L.4 Verification of Probe pressure:

L.4.1 Verify that LGG-1 is $<10^{-5}$ torr, and record reading:_____torr.

L.4.2 Prepare for Vatterfly valve operation:

L.4.2.1 Plug in the Vatterfly Valve Controller to ac power.

L.4.2.2 Power up the Controller; "AC" and "Motor" lights should come on.

L.4.2.3 Place "Valve Motor Select" RH switch to on; "Motor Enabled" and LV1, EV1, EV3 lights should come on.

L.4.2.4 Place "Enable A" switch to on.

L.4.2.5 To verify that the valve is closed, place both the "Valve State Select: Close" switches to on and activate the "Execute" momentary switch; the "Open" light should go off and “Close” light should be on.

NOTE:

When the Controller is on but not to be used soon, it is prudent to disable all valve operations by placing the "Enable: A" and "Enable: B" switches in theoff position. Both "Valve State" lights should be off.

L.4.3 **Close valves LGV-1, -3.**

L.4.4 Open the Vatterfly valve:

L.4.4.1 Verify / place "Enable: A" switch on.

L.4.4.2 Place both "Valve State Select: Close" switches to off and both "Valve State Select: Open " switches to on.

L.4.4.3 Activate the "Execute" momentary switch; the "Close" light should go off immediately and after a delay the "Open" light should come on. Record the drive time:_____ sec.

L.4.4.4 Place all the Enable switches in the off position.

L.4.5 Record the pressure indicated by LGG-3:_____torr.

L.4.6 If the pressure is low enough ($<10^{-2}$ torr) for LGG-1A to operate, turn it on and record its reading after it stabilizes:_____torr. Note: The gas pressure should be predominantly helium, and if the IG scale factor is set for nitrogen (1.00), it will read low by a factor of about 5.55. If the scale factor is not for nitrogen indicate its value here:_____.

L.4.7 If the pressure indicated by LGG-3 is <1 torr, proceed with the next steps.

L.5 Start pumping on the Probe:

L.5.1 Verify that the LGS system is operating normally: all three pumps are operating and valves LGV-6, -7, -10 are open.

L.5.2 Open LGV-1 and after it has completely opened, open LGV-3.

L.5.3 Verify that the pressure indicated by LGG-3 and/or LGG-1A is decreasing.

L.6 Secure systems:

L.6.1 Power down the Vatterfly Valve Controller.

L.6.2 Verify that the "Interlock Defeated" is off.

Operation completed.

Completed by: _____

QA witness: _____

Date: _____

Time: _____

QA Program Engineer_____**Date**_____

Payload Test Director_____**Date**_____

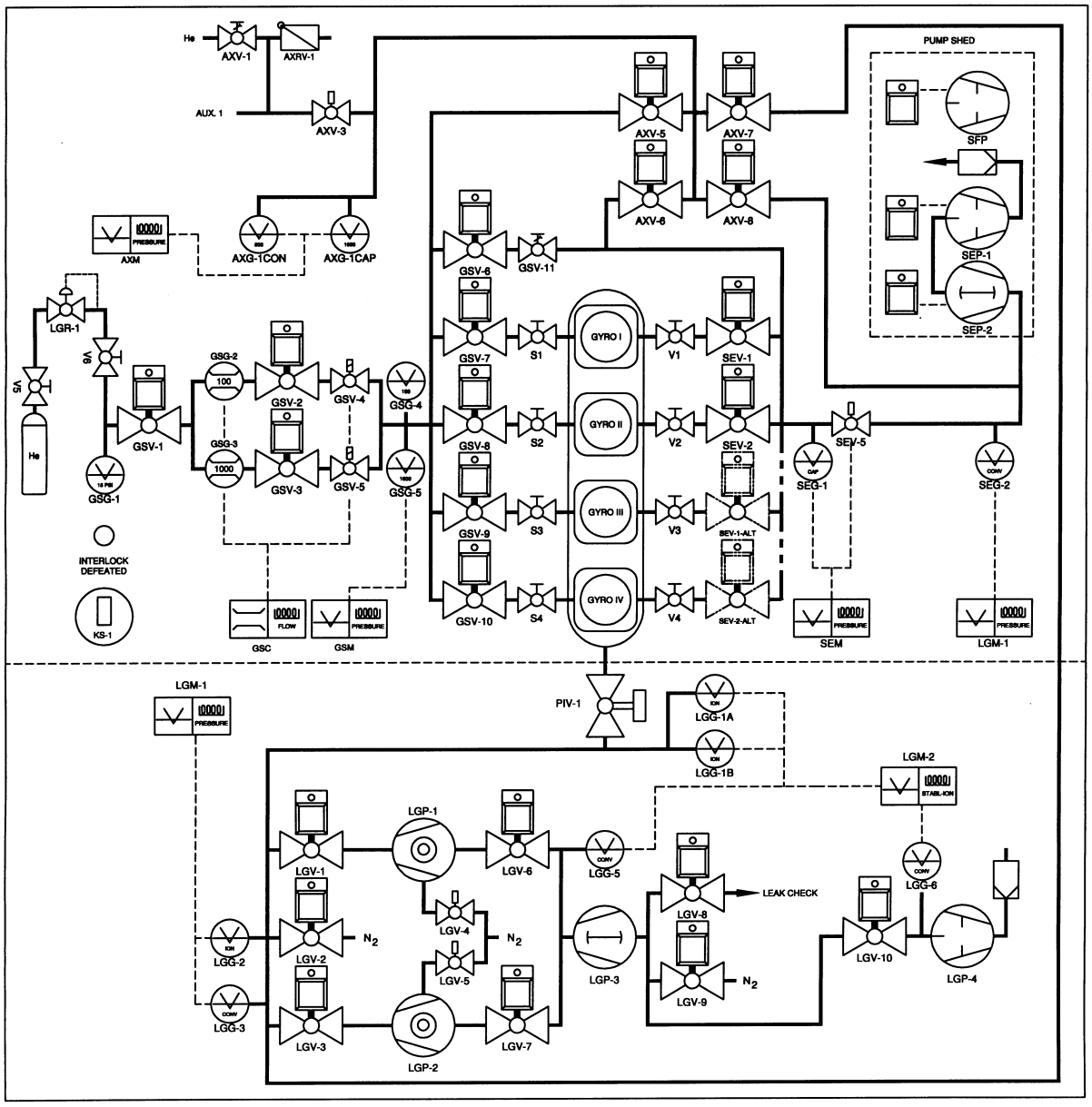

Figure 1 Note: LGM-1 is used for the readout of ion gauges PPG-1, -2 (on PPMS); ion gauge LGG-2 depicted here no longer exists.