GRAVITY PROBE B

PROCEDURE FOR

PAYLOAD VERIFICATION

(PTP) PROBE PRESSURE MEASUREMENT SYSTEM INSTALLATION AND LEAK CHECK PROCEDURE

P0558 Rev. A

5/08/00
ECO 1125

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	4/20/00	1125	Incorporate redlines from previous use of procedure (op #1218); update Fig. 2a to show leak detector manifold.

Acronyms and Abbreviations:

Acronym / Abbreviation	**Meaning**
GSE	Ground Support Equipment
LD	Leak Detector
LGS	Leakage Gas System
PPMS	Probe Pressure Measurement System
RGA	Residual Gas Analyzer
SMD	Science Mission Dewar
NR	Not required

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A Scope

This procedure effects the installation and leak check of the Probe Pressure Measurement System. It is mounted onto the upper cylinder portion of the SMD and is connected to the interior of the Probe-C via pressure sense port P1.

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 integrated into the SMD per drawing 65113-1C34292 and oriented with the +Z axis vertical. The exchange gas has been pumped out of the Probe. A Convectron pressure gauge (GSE version of P9) is attached to the P1 pressure sense port. (See Fig. 2a.) This gauge is mounted on a small manifold with a Nupro shutoff valve teed into it. The Nupro shutoff valve has a male VCR port.

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
Varian He Leak Detector	960	DRAD6002	N/A
Alternate leak detector: Varian He Leak Detector	636-60	W-161	N/A
Varian Calibrated He leak for LD	F3264302		
Calibrated He leak for alternate LD	F3264302		
Granville-Phillips ion gauge readout for "Stable-ion" ion gauges (PPG-1, -2) designated as LGM-1	360101	97071702	
Granville-Phillips "Stable-ion" ion gauge (IG-1 = PPG-)	360120	99012705	
Granville-Phillips "Stable-ion" ion gauge (IG-2 = PPG-2)	360120	97071808	
Leybold-Inficon	TSPTT100	F8TT11B00155	N/A

D.3 Mechanical/Electrical Special test equipment: N/A

D.4 GSE / hardware:

Description	No. Req'd
PPMS Assembly	1
PPMS / Probe connection line (1/2" Gamah to 1/2" VCR)	1
PPMS mounting bracket (see Fig. 1)	1
10-32 x 3/4" stainless bolts	4
10-32 stainless nuts	4
#10 stainless washers	4
4' x 4' HEPA filter downflow unit with vinyl curtains mounted below gantry	1
1/2" aluminum Gamah gasket	1
Guard valve w/ 2.75" Conflat flange or KF / Conflat adapter (may already be installed on PPMS pumpout valve; see Fig. 2b)	1
1" or 1.5" stainless flexible pumping line (length A/R) w/ KF tee, metering, and isolation valves (see Fig. 2a)	1

D.5 Tools

Description	No. Req'd
wrenches	A/R
75 ft-lb. torque wrench	1

D.6 Expendables

Description	Quantity
Copper gaskets for 2.75" Conflat	A/R
1/2" Ni or Cu VCR gasket	1
1/2" aluminum Gamah gasket	1
Aluminum foil	A/R
Felpro C5-A anti-seize compound or equivalent	A/R
He gas	A/R

E **Software Required**

E.1 Flight Software: N/A

E.2 CSTOL Scripts: N/A

E.3 SPC Scripts: N/A

E.4 Test Support Software

Test Software Name	Version No.
Inficon TranspectorWare (for RGA)	3

F **Procedures Required**: N/A

G **Equipment Pretest Requirements**: N/A

H **Personnel Requirements**

This procedure is to be conducted only by qualified personnel. Chuck Warren, Dave Murray, Tom Welsh, and Mike Taber are qualified to perform this procedure with either Mike Taber or Dave Murray being operations leader. The QA representative shall be either Russ Leese or Dorrene Ross.

I **Safety Requirements**

Movement of the gantry used to support the HEPA downflow booth requires two persons. Care should also be taken to prevent scratching or otherwise damaging vacuum sealing surfaces, particularly those which those which are on flight equipment and/or must be sealed with metal gaskets. General emergency instructions can be found in "FIST Emergency Procedures", P0141.

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 operation or approve D-Log dispositions: Mike Taber, Dave Murray.

J.5 Work done inside the HEPA filter downflow unit should with proper clean room garb consistent with Class 1000 conditions.

K **References and Applicable Documents**: N/A

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 the 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 Mounting the PPMS:

L.3.1 Verify that all the items identified in section D are available. Enter the calibrated leak serial number and calibration expiration date into the table in section D.2.

L.3.2 Using the 10-32 hardware, secure the PPMS mounting bracket on the SMD per Fig. 1.

L.3.3 Mount the PPMS on the clamp collars on the mounting bracket.

L.3.4 Install / verify installed the HEPA downflow unit over the top of the SMD / probe; at least one hour of operation in this location should elapse before proceeding. Observe General Instruction J.4 in the following steps.

L.4 Removing the Convectron gauge attached to P1:

L.4.1 Connect flexible pumping line to access valve on "P-9" Convectron manifold. (See Fig. 2a.) Connect the other end of the pumping line to the leak checker via a KF tee and isolation valve. Install a metering valve to the other leg of the tee, and connect the metering valve to a source of He gas at 2-5 psig.

L.4.2 Close the P1 isolation valve.

L.4.3 Start up LD per manufacturer's instructions.

L.4.4 Set the LD such that it will rough out the test port without entering into leak check mode. (This means setting the Transfer Pressure to "Hold" on the model 636 and the the Transfer switch / "to fine test" to "No" on the 960.)

L.4.5 Start the LD rough pumping on the pumping line until the LD test port pressure is ~10 mtorr.

L.4.6 Open the "P9" manifold access valve.

L.4.7 Close the LD isolation valve.

L.4.8 Slowly open the He let-up valve until the "P9" Convectron reads ~900 mtorr.

L.4.9 Close the "P9" manifold access valve.

L.4.10 Reopen the LD isolation valve until the test port pressure is ~10 mtorr and again close the LD isolation valve.

L.4.11 Record the Convectron pressure for 15 minutes and verify that the pressure does not drop by more than 10 mtorr during the last 10 minutes.

Time:				
Pressure:				

L.4.12 Vent the LD.

L.4.13 Open the "P9" manifold access valve and disconnect the pumping line.

L.4.14 Remove the "P9" manifold from the P1 isolation valve Gamah fitting.

L.4.15 Inspect the P1 isolation valve Gamah fitting for damage and temporarily cover with clean aluminum foil.

L.5 Connect the PPMS to the P1 port (see Figs. 1, 2b):

L.5.1 Apply / verify applied a small amount of anti-seize compound to the interface between the nut and gland of the PPMS / Probe connection line (see sec. D.6.)

NOTE:

In the following steps involving the mating of VCR and Gamah fittings, care should be taken to avoid twisting the two gland halves with respect to one another. Twisting motion can cause stress on the bellows and may cause damage to the sealing gasket.

L.5.2 Install the Gamah and VCR gaskets on the PPMS / Probe connection line and loosely install the line in place as shown in Fig. 1. It may be necessary to adjust the vertical position of the PPMS.

L.5.3 Tightened the VCR nut finger tight and wrench the Gamah nut until it bottoms out.

L.5.4 Tighten the VCR nut per manufacturer's instructions.

L.6 Leak checking the PPMS:

L.6.1 Verify leak detector operation:

L.6.1.1 Install a blankoff plug on the LD test port.

L.6.1.2 Perform LD autocal (model 960) or manually check LD tuning.

L.6.1.3 Turn on LD calibrated leak and record: _____sccs

He

Calibrated leak value: _____sccs

He

QA witness:_____

L.6.1.4 Turn off the calibrated leak and vent LD.

L.6.2 Install / verify installed a guard valve connected to the PPMS pumpout valve per Fig. 2b. (This may require a KF/Conflat adapter.)

L.6.3 Reconnect the pumping line (including the tee, He let-up, and LD isolation valves) to the LD and connect the other end to the guard valve.

L.6.4 Install a plastic bag around the PPMS including the Conflat joint between the pumpout valve and the guard valve.

L.6.5 Open the PPMS pumpout and guard valves and the LD isolation valve (Fig. 2a).

L.6.6 Start LD and apply He to the bag for three minutes; increase above background should be $<10^{-7}$ sccs He. Record results:

Background leak rate:_____sccs

Leak rate during test: _____sccs

QA witness: _____

L.6.7 Connect ion gauge cables (to controller LGM-1) and RGA cables.

L.6.8 Turn on IG-1 and verify proper operation. Record pressure: ___torr

L.6.9 Turn on RGA and verify operation.

L.6.10 Set up the RGA to monitor He partial pressure with the minimum update delay.

L.6.11 Close PPMS pumpout valve and torque to 25 ft.-lbs.

L.6.12 Verify pumpout valve leak rate is $<10^{-7}$ torr/sec ($\sim 10^{-7}$ sccs assuming a volume of 1 liter) He:

L.6.12.1 Close the LD isolation valve and open let-up valve to vent to 1 atm. He gas.

L.6.12.2 Record the rate of rise of the He partial pressure:
_____ torr in _____sec = _____torr/sec

NOTE:

In the following step the P1 isolation valve is opened to the PPMS. If the outgassing rate is too large relative to the pumping conductance of the P1 pressure sense line, the pressure may exceed that necessary to allow the RGA to operate. If that is the case, reopen the PPMS

isolation valve and close the P1 isolation valve to continue pumping on the PPMS as long as necessary to allow the switchover.

L.6.13 Open the P1 isolation valve and record the following partial pressures:

Mass No. (species)	Partial Pressure (torr)
2 (hydrogen)	
4 (helium)	
18 (water)	
28 (nitrogen)	
32 (oxygen)	
44 (carbon dioxide)	

Record date/time:

L.7 Secure PPMS and LD:

L.7.1 Ensure that the He source valve is closed.

L.7.2 Place the LD on “Hold”.

L.7.3 Open LD isolation valve and and start the LD.

L.7.4 When the LD background indication is $<10^{-4}$ sccs, close the guard valve, and vent the LD.

L.7.5 Disconnect the pumping line from the guard valve and cap the guard valve.

Operation completed. Completed by: _____

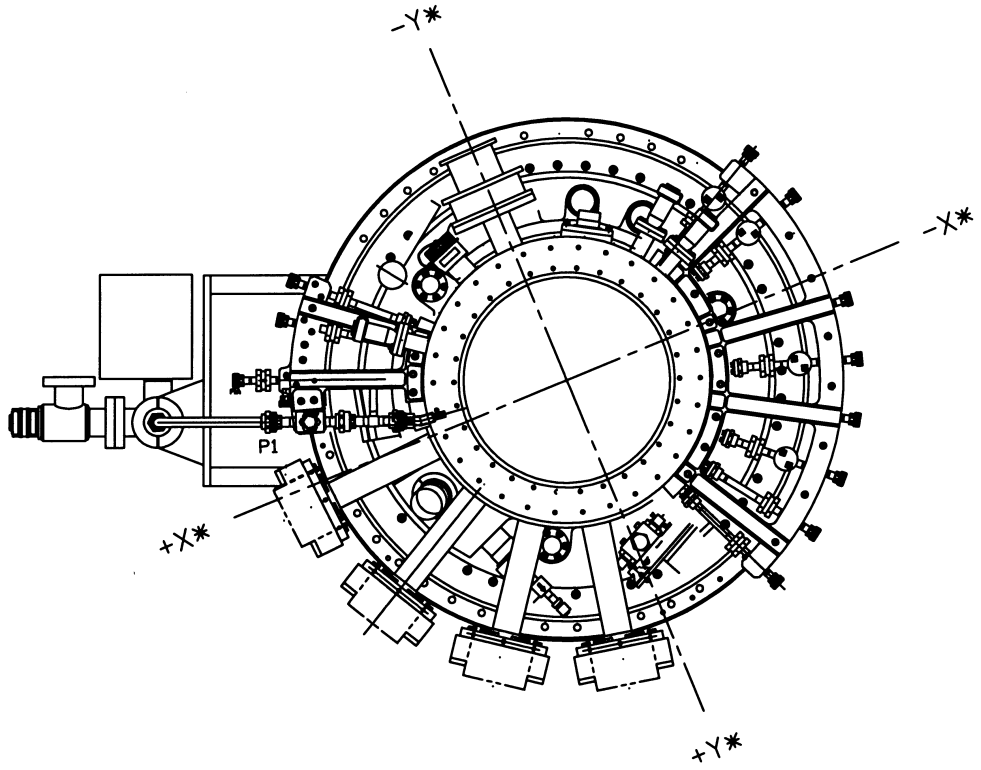
QA witness: _____

Date: _____

Time:

QA Program Engineer_____ **Date**_____

Payload Test Director_____ **Date**_____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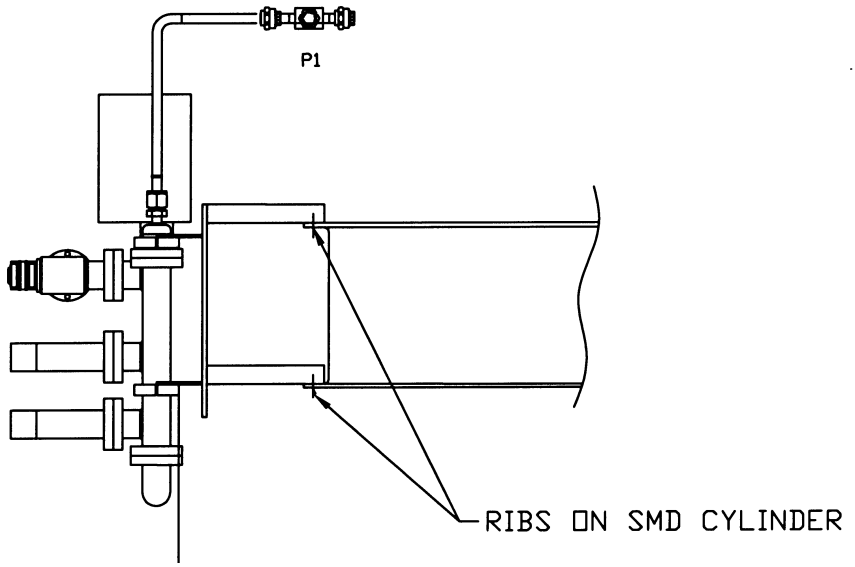
P1
RIBS ON SMD CYLINDER

Figure 2a Initial configuration plus added manifolding used for leak checking

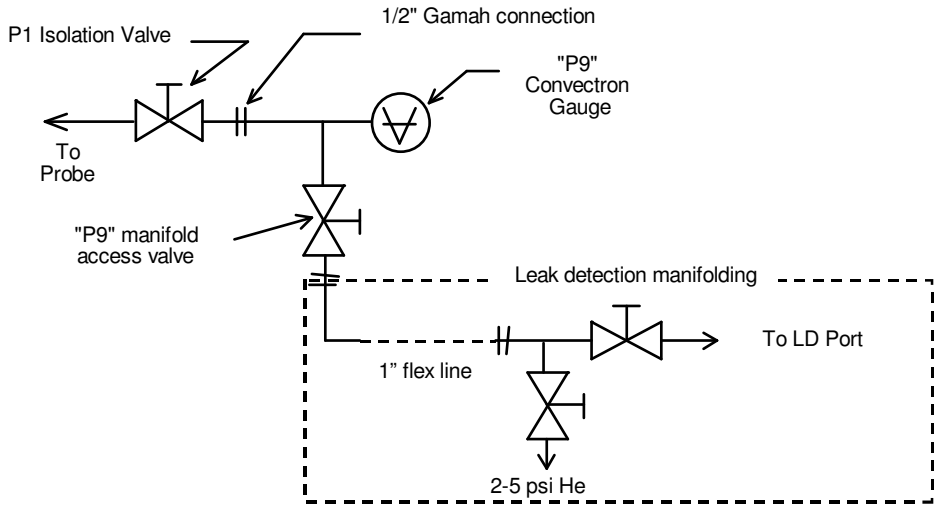

Figure 2b Configuration with PPMS