GRAVITY PROBE B

PROCEDURE FOR

PAYLOAD VERIFICATION

(PTP) CONNECT V3 TO SPINUP EXHAUST GSE (-Y AXIS UP)

11/23/99

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		
S. Buchman GP-B Hardware 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

Acronyms and Abbreviations:

Acronym / Abbreviation	**Meaning**
GSE	Ground Support Equipment
IG	Ionization Gauge
LD	Leak Detector
LGS	Leakage Gas System
LV-x	Probe Leakage Gas Valve #x (1 or 2)
PPMS	Probe Pressure Measurement System
RGA	Residual Gas Analyzer
SMD	Science Mission Dewar
UTS	Utility Turbopump System

Table of Contents

A Scope

This procedure effects the connection of the Probe gyro exhaust valve V3 to the exhaust line already installed between V4 and SEV-2.

B Requirements Verification N/A

C Configuration Requirements

Probe-C is integrated into the SMD per drawing 65113-1C34292 and oriented with the -Y axis vertical and the +Z axis facing the LGS. A 2" exhaust line is already installed between SEV-2 and V4 per P0627 performed as Op #1266 (see Fig. 1). The PPMS is installed per P0558. Pressure in the Probe is low enough for the RGA to function for the duration of this procedure. Installed exhaust line is assumed to be evacuated with the Probe valve V4 being closed.

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:

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	LLC9030	3/10/00
Calibrated He leak for alternate LD	F3264302	EBAL5056	3/18/00

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

D.4 GSE / hardware:

Description	No. Req'd
V3 connection assembly, cleaned for use	1
ISO-63/KF-50 adapter	1
EVAC KF-50 aluminum gasket	2
4' x 4' HEPA filter downflow unit with vinyl curtains mounted below gantry	1
Probe Pressure Measurement System with RGA & IG readouts	1
Utility Turbopump System and pumping line	1

D.5 Tools

Description	No. Req'd
misc. wrenches including 17 mm	A/R
Proto 6169A Torque wrench, 0-75 in.-lb. or equivalent	1

D.6 Expendables

Description	Quantity
aluminum foil	A/R

E **Software Required**: N/A

F **Procedures Required**: N/A

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

H **Personnel Requirements**

This test to be conducted only by certified personnel. Persons certified to perform this procedure are Mike Taber, Chuck Warren, Ken Bower, and Tom Welsh with Mike Taber being the leader.

I **Safety Requirements**

These operations are to be performed in the vicinity of flight equipment. 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 are on flight equipment and/or must be sealed with metal gaskets.

J **General Instructions**

J.1 Redlines can be initiated by Mike Taber and must be approved by QA.

J.2 Any nonconformance or test anomaly should be reported per Quality Plan, P0108. Do not alter or break test configuration if a test failure occurs; notify quality assurance.

J.3 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 Verification of V4 closure:

L.1.1 Verify closure of V4 by reference to P0580. Record Op. No. and sequence no. in P0580:_____.

L.1.2 If V4 is not closed, perform P0580 and record Op. No. and sequence. no. _____.

L.2 Gas/Vac GSE preparation (see Fig. 2):

L.2.1 Verify that all GSV, AXV, SEV (except SEV-5) valves are closed.

L.2.2 Turn on SEP-1, -2 and verify that SEG-2 drops to less than 10 millitorr.

L.2.3 Open AXV-8, -6 and pump spinup exhaust manifold until SEG-2 indicates less than 10 millitorr.

L.2.4 Place system in Interlock Defeat mode.

L.2.5 Open SEV-2.

L.2.6 When SEG-2 indicates less than 20 millitorr, close SEV-2 and AXV-8, -6.

L.3 Set up RGA on the PPMS:

L.3.1 Power up RGA and verify connection to a computer equipped with TranspectorWare software.

L.3.2 Start up the TranspectorWare program using a recipe that includes He in the scan list and has an update interval of one minute or less.
Record filename:_____.

L.3.3 Verify that the Probe temperatures are reasonably stable.

L.3.4 Determine the stability of the He partial pressure by measuring the partial pressure over a period of a half hour:

Date : _____/ time:				
He partial pressure (torr)				

L.4 Vent spinup exhaust line:

L.4.1 Perform leak-through check of V4:

L.4.1.1 Open / verify open spinup gas supply valves V5, V6 with LGR-1 set to 2-5 psig. (Note: These items are located outside the lab on the east side.)

L.4.1.2 If not already the case, place KS-1 in Interlock Defeat mode.

L.4.1.3 Open SEV-2.

L.4.1.4 Verify that flow controller set point for GSV-5 is set to zero and the mode switch is "off".

L.4.1.5 Open GSV-1, -3.

L.4.1.6 Set the mode switch for GSV-5 to "auto" and start monitoring the He partial pressure with the RGA.

L.4.1.7 Slowly turn up the set point for GSV-5 until a flow rate of ~100 sccm is obtained. Verify that there is no change in the partial pressure of He in the Probe.

L.4.1.8 When the pressure read by GSG-4 reads ~9.5 torr, turn the GSV-5 set point down to zero, and change the mode switch to "off".

L.4.1.9 Measure the He partial pressure on the RGA and the pressure at GSG-4 for a period of at least half an hour and record:

Date : _____/ time:				
He partial pressure (torr)				
GSG-4 (torr)				

L.4.1.10 Verify that the rise in the He partial pressure over a period of half an hour is not more than 10% of the initial value over the rise that would be expected from L.3.4.

L.4.1.11 Verify that the pressure drop at GSG-4 does not exceed 0.02 torr over the last twenty minutes of the above measurements.

L.4.1.12 Set the mode switch for GSV-5 to "auto" and continue monitoring the He partial pressure with the RGA.

L.4.1.13 Bring GSG-4 up to 1 atm. by slowly turning up the GSV-5 set point to ~1000 sccm.

L.4.1.14 When GSG-4 reaches one atmosphere, turn the GSV-5 set point to zero and set the mode switch to "off".

L.4.1.15 Close all GSV and SEV valves and turn off the Interlock Defeat.

L.4.1.16 Measure the He partial pressure on the RGA and the pressure at GSG-4 for a period of at least half an hour and record:

Date : _____/ time:				
He partial pressure (torr)				
GSG-4 (torr)				

L.4.1.17 Verify that the rise in the He partial pressure over a period of half an hour is not more than 10% of the initial value over the rise that would be expected from L.3.4.

L.4.1.18 Verify that the pressure drop at GSG-4 does not exceed 0.2 torr over the last twenty minutes of the above measurements.

L.5 Connection of V3 to the spinup exhaust line:

L.5.1 Position the 4' x 4' HEPA filter downflow unit with vinyl curtains mounted below gantry over the Probe if not already so positioned.

L.5.2 Turn on the HEPA downflow unit and allow to run at least an hour to clean up before performing operations under the downflow unit.

L.5.3 Remove the blankoff cover from the tee in the spinup exhaust line and temporarily over the open KF-50 flange with aluminum foil.

L.5.4 Remove the cap assembly from V3. Wrap the cap in aluminum foil and bag.

L.5.5 Inspect the centering ring o-ring for contamination or damage. Install the ISO-63/KF-50 adapter using the centering ring from the cap assembly.

L.5.6 Using an EVAC aluminum gasket, install the V3 connection assembly onto the exhaust line in best orientation to mate the other end with the 63/KF-50 adapter.

L.5.7 Using a second EVAC aluminum gasket, connect the other end of the V3 connection assembly to the 63/KF-50 adapter.

L.5.8 Install bag(s) to enclose the newly-made vacuum joints.

L.6 Leak check of the spinup exhaust line:

L.6.1 Verify spinup system configuration:

L.6.1.1 Verify that all GSV, AXV, SEV (except SEV-5) valves are closed.

L.6.1.2 Verify that valves LGV-1, -3, -6, -7, LGV-10 are open, all other LGV valves are closed, and pumps LGP-1, -2, -3, -4 are on.

L.6.1.3 Close / verify closed LV1 per P0580, and record closure op. number and sequence number:_____.

L.6.2 Configure for leak check:

L.6.2.1 Turn on SEP-1, -2.

L.6.2.2 Open AXV-8, -6.

L.6.2.3 Place KS-1 in "interlock defeat".

L.6.2.4 Open SEV-2.

L.6.2.5 When SEG-2 reads less than 2 milltorr, close AXV-8 and turn off SEP-1, -2 (forcing SEV-5 to close).

L.6.2.6 Open AXV-7 to start pumping on the exhaust gas line with the LGS.

L.6.3 Start up leak detector:

L.6.3.1 Install / verify installed blankoff plug on the LD test port.

L.6.3.2 Start up LD per manufacturer's instructions.

L.6.3.3 Perform LD autocal (if appropriate).

L.6.3.4 Turn on LD calibrated leak and record: _____sccs He

Calibrated leak value: _____sccs He

QA witness:_____

L.6.3.5 Turn off the calibrated leak and vent LD.

L.6.3.6 Connect LD to LGV-8 (leak check access port) with 1" flexible pumping line.

L.6.3.7 Start LD and spray leak check up to LGV-8; increase above background should be $<10^{-7}$ sccs He. Record results:

Background leak rate:_____sccs

Leak rate during test: _____sccs

QA witness: _____

L.6.4 Make the LD the backing pump for the system:

L.6.4.1 Open LGV-8 and close LGV-10. If the leak checker shuts down because of excessive pressure in the foreline, proceed with the next steps; otherwise, skip to L.6.5.

L.6.4.2 Set the transfer pressure of the LD to "hold".

L.6.4.3 Place the LD test switch on "start" and rough pump to ≤10 millitorr.

L.6.4.4 Open LGV-8 and close LGV-10.

L.6.4.5 Wait until the test port pressure drops to ≤10 millitorr.

L.6.4.6 Slowly adjust the transfer pressure upwards until the LD goes into test mode.

L.6.4.7 If the LD does not successfully transfer into test mode, close LGV-8, open LGV-10, put LD Test Switch to its center position (to reset) and return to L.6.4.2 above.

L.6.5 Leak check new joints:

L.6.5.1 Apply He to the bag(s) enclosing the new joints for a period of three minutes for each bag; increase above background should be $<10^{-7}$ sccs He. Record results:

Background leak rate:_____sccs

Leak rate during test: _____sccs

QA witness: _____

L.7 Shut down leak check:

L.7.1 Open foreline valve LGV-10 and close LGV-8.

L.7.2 While monitoring LGG-6, vent the LD.

L.7.3 Disconnect the pumping line from LGV-8 and cap.

L.7.4 Shut down LD per manufacturer's instructions.

L.8 Close / verify closed the following valves:

L.8.1 SEV-2.

L.8.2 All AXV, GSV valves.

L.9 Turn off "Interlock Defeat"

L.10 [Optional] Restore pumping on the Probe with the LGS:

L.10.1 Verify that LGS is operating and the pressure at LGG-1 is less than 10^{-6} torr.

L.10.2 Open LV1 per P0580, and record op. number and sequence number:_____.

Date: _____

Time: _____

Operation completed.

Completed by: _____

QA witness: _____

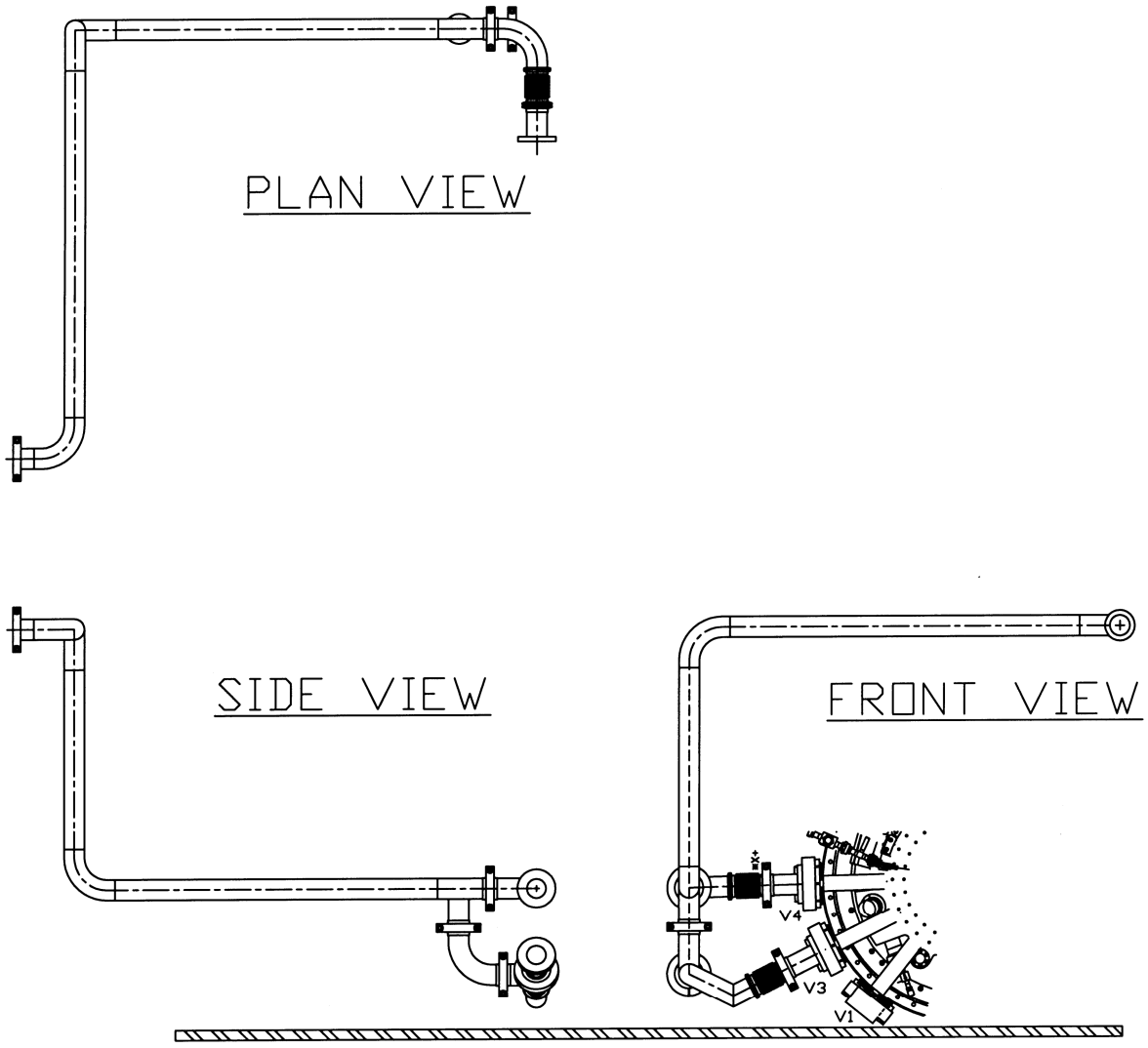
Date: _____

Time: _____

PTD: _____

RQE: _____

Figure 1. Exhaust line connection between SEV-2 and V4 (already installed) and V3 (to be installed in this procedure).



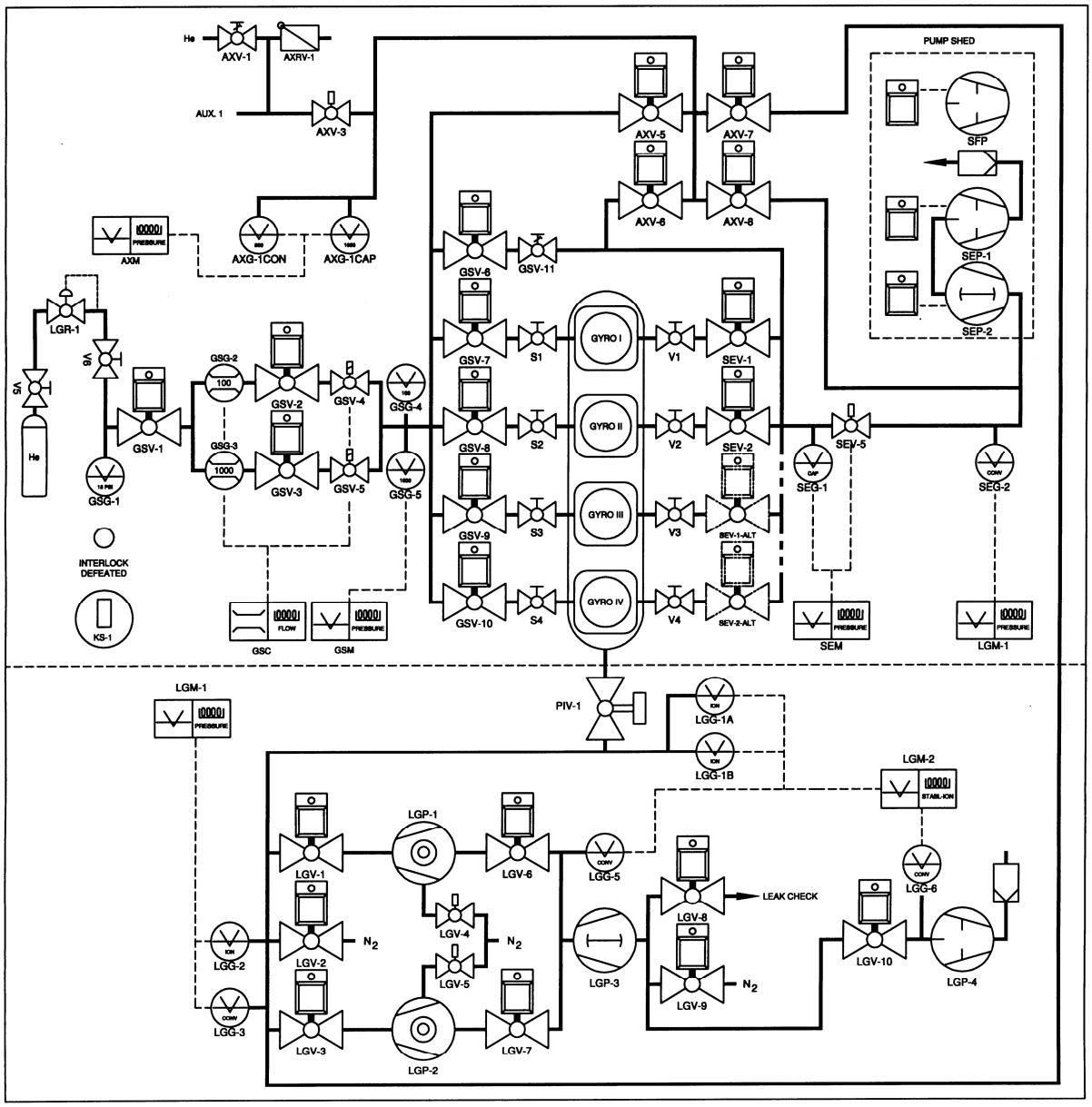

He
AXV-1
AXRV-1
AUX. 1
AXV-3
AXV-5
AXV-7
AXV-6
AXV-8
PUMP SHED
SFP
SEP-1
SEP-2
AXM
AXG-1CON
AXG-1CAP
GSV-6
GSV-11
LGR-1
V6
V5
GSG-2
GSV-2
GSV-4
GSG-4
GSV-1
GSG-3
GSV-3
GSV-5
GSG-5
GSG-1
He
INTERLOCK DEFEATED
KS-1
GSV-7
GSV-8
GSV-9
GSV-10
S1
S2
S3
S4
GYRO I
GYRO II
GYRO III
GYRO IV
V1
V2
V3
V4
SEV-1
SEV-2
SEV-1-ALT
SEV-2-ALT
SEV-5
SEG-1
SEG-2
GSC
GSM
SEM
LGM-1
PIV-1
LGG-1A
LGG-1B
LGM-2
LGP-1
LGV-1
LGV-6
LGG-5
LGV-8
LEAK CHECK
LGG-6
LGV-2
LGV-4
LGV-5
LGG-2
LGG-3
LGV-3
LGV-7
LGP-2
LGP-3
LGV-9
LGV-10
LGP-4
N_2

Figure 2