GRAVITY PROBE B

PROCEDURE FOR

SCIENCE MISSION DEWAR

PERFORM INITIAL INSPECTION AND RECONFIGURE PAYLOAD AFTER ACOUSTIC TEST

P0800 Rev. A

September 24, 2002
ECO 1388

Revised by: M. Taber

Approvals:

Program Responsibility	Signature	Date
D. Murray Cryo. Test Director		
M. Taber Payload Test Director		
D. Ross GP-B Quality Assurance		
Harv Moskowitz GP-B Product Safety		
B. Muhlfelder Payload Technical Manager		

Revision Record:

Rev	Rev Date	ECO #	Summary Description
A	9/24/2002		Original version was written for payload acoustic test. This version revised to be appropriate for acoustic test at the Space Vehicle level.

List of Abbreviations and Acronyms

AG-x	Gauge x of Gas Module auxiliary section
AMI	American Magnetics Inc.
ATC	Advanced Technology Center
Aux	Auxiliary
AV-x	Valve x of Gas Module auxiliary section
Bot	Bottom
CN [xx]	Data acquisition channel number
DAS	Data Acquisition System
EFM	Exhaust gas Flow Meter
EG-x	Gauge x of Gas Module exhaust section
EM	Electrical Module
ERV-x	Relief valve of Gas Module exhaust section
EV-x	Valve number x of Gas Module exhaust section
FCV	Fill Cap Valve
FGTVL	Flight Guard Tank Vent Line
FIST	Full Integrated System Test
GHe	Gaseous Helium
GM	Gas Module
GP-B	Gravity Probe-B
GSE	Ground Support Equipment
GT	Guard Tank
GTVA	Guard Tank Valve Assembly
GTVC	Guard Tank Vent Cap
GTVC-G	Guard Tank Vent Cap pressure gauge
GTVC-RV	Guard Tank Vent Cap relief valve
GTVC-V	Guard Tank Vent Cap valve
GTV-G	Guard Tank vent pressure gauge
GTV-RV	Guard Tank vent relief valve
GTVSL	Guard Tank vent short line
GTV-V	Guard Tank vent valve
HX-x	Vent line heat exchanger in Gas Module
KFxx	Quick connect o-ring vacuum flange (xx mm diameter)
LHe	Liquid Helium
LHSD	Liquid Helium Supply Dewar
Liq	Liquid
LL	Liquid level
LLS	Liquid level sensor
LMMS	Lockheed Martin Missiles and Space
LMSC	Lockheed Missiles and Space Co.
MT	Main Tank
MTVC	Main Tank Vent Cap
MTVC-G	Main Tank Vent Cap pressure gauge
MTVC-RV	Main Tank Vent Cap relief valve
MTVC-V	Main Tank Vent Cap valve
NBP	Normal boiling point
ONR	Office of Naval Research
PCI	PDU Circuit Instr. Console
PDU	Power Distribution Unit
PFCG	Fill Cap assembly pressure Gauge
PFM	Pump equipment Flow Meter
PG-x	Gauge x of Pump equipment
PM	Pump Module
psi	pounds per square inch
psig	pounds per square inch gauge
PTD	Payload Test Director
PV-x	Valve x of the Pump equipment
QA	Quality Assurance
RAV-x	Remote Actuated Valve-x
RGA	Residual Gas Analyzer
SMD	Science Mission Dewar
STV	SMD Thruster vent Valve
SU	Stanford University
SV	Space Vehicle
SV-x	SMD Valve number x
TG-x	Gauge x of Utility Turbo System
TV-x	Valve x of Utility Turbo System
UTS	Utility Turbo System
Vac	Vacuum
VCP-x	Vent cap pressure gauge
VCRV-x	Vent cap relief valve
VCV-x	Vent cap valve
VDC	Volts Direct Current
VF-x	Liquid helium Fill line valve
VG-x	Gauge x of Vacuum Module
VM	Vacuum Module
VV-x	Valve x of Vacuum Module
VW-x	Valve x of Dewar Adapter

Table of Contents

A Scope

This procedure performs an initial health check of the SMD after the S/V Acoustic Test and prepares it for subsequent cryogenic operations.

This procedure does not include any lifting or tilting operations.

B Safety

B.1 Potential Hazards

Liquid helium used in the SMD represents a hazardous material for the personnel involved in the operations. Cryogenic burns can be caused by contact with the cold liquid or gas, high pressures can result if boiling liquid or cold gas is confined without a vent path, and asphyxiation can result if the vent gas is allowed to accumulate.

The SMD Safety Compliance Assessment, document GPB-100153C discusses the safety design, operating requirements and the hazard analysis of the SMD.

B.2 Mitigation of Hazards

B.2.1 Lifting hazards

There are no lifting operations in this procedure.

B.2.2 Cryogenic Hazards

The LM Building may have an oxygen deficiency monitor that alarms when the oxygen level is reduced to 19.5%. Additional temperature and pressure alarms, provided by the DAS, warn of potential over-pressure conditions. Emergency vent line deflectors are installed over the four burst disks on the SMD vacuum shell.

Only authorized and trained LM and SU personnel are allowed In the LM facilities without escort. All personnel working at a height 30 inches or more off the floor are required to have an LM-approved Emergency Breathing Apparatus (EEBA) within easy reach. In the unlikely event of a large LHe spill all employees have been instructed to evacuate the room and contact LM safety.

The following additional requirements apply to all personnel involved directly in cryogenic operations. Gloves that are impervious to liquid helium and liquid nitrogen are to be worn whenever the possibility of splashing or impingement of high-velocity cryogens exists or when handling equipment that has been cooled to cryogenic temperatures. Protective clothing and full-face shields are to be worn whenever the possibility of splashing cryogens exists.

B.2.3 Other Hazards

When appropriate, tools or other items used with the potential to damage the SMD or Probe shall be tethered.

B.3 **Mishap Notification**

B.3.1 Injury

In case of any injury obtain medical treatment as follows LM **Call 117**.

B.3.2 Hardware Mishap

In case of an accident, incident, or mishap, notification is to proceed per the procedures outlined in Lockheed Martin Engineering Memorandum EM SYS229.

B.3.3 Contingency Response

Responses to contingencies (e.g., power failure) are listed in Appendix 3.

C **Quality Assurance**

C.1 QA Notification

The NASA representative and SU QA shall be notified 24 hours prior to the start of this procedure. Upon completion of this procedure, the QE Manager will certify his/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.

C.2 Red-line Authority

Authority to red-line (make minor changes during execution) this procedure is given solely to the PTD or his designate and shall be approved by the QA Representative. Additionally, approval by the Payload Technical Manager shall be required, if in the judgment of the PTD or QA Representative, experiment functionality may be affected.

C.3 Discrepancies

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. Any time a procedure calls for verification of a specific configuration and that configuration is not the current configuration, it represents a discrepancy of one of three types. These types are to be dealt with as described below.

1. If the discrepancy has minimal effect on procedure functionality (such as the state of a valve that is irrelevant to performance of the

procedure) it shall be documented in the procedure, together with the resolution. Redlines to procedures are included in this category.

2. If the discrepancy is minor and affects procedure functionality but not flight hardware fit or function, it shall be recorded in the D-log. Resolution shall be in consultation with the PTD and approved by the QA representative.
3. All critical and major discrepancies, those that effect flight hardware fit or functions, shall be documented in a D-log and also in a Discrepancy Report, per P0108.

D Personnel Requirements

D.1 Personnel Responsibilities

The performance of this procedure requires a minimum complement of personnel as determined by the Test Director. The person performing the operations (Test Director or Test Engineer) is to sign the "Completed by" sign-off. Any other qualified person or QA person who can attest to the successful performance of this procedure may sign the "Witnessed by" sign-off. ***The Test Director will perform Pre-Test and Post-Test Briefings in accordance with P0875 "GP-B Maintenance and Testing at all Facilities." Checklists will be used as directed by P0875.***

D.2 Personnel Qualifications

The Test Director must have a detailed understanding of all procedures and facility operations and experience in all of the SMD operations. Test Engineers must have SMD Cryogenic operations experience and an understanding of the operations and procedures used for the cryogenic servicing/maintenance of the Dewar.

D.3 Qualified Personnel

The names of those actually performing this procedure are to be initialed and the name of the person acting as Test Director should be circled.

Test Director	***Test Engineer***
Mike Taber	Tom Welsh
Dave Murray	Dave Hipkins
Ned Calder	Bruce Clarke
	Ned Calder

E Requirements

E.1 Electrostatic Discharge Requirements

Anyone working on the Space Vehicle must use a grounding wrist strap that has been tested on the day of use.

E.2 Lifting Operation Requirements

There are no lifting operations in this procedure.

E.3 Hardware/Software Requirements

E.3.1 Flight hardware required

Description	No. Req'd
Space Vehicle per LM Acoustic Test Plan, EM SMS434 *(Acoustic Test Configuration Drawing,* 8A00294)	1

E.3.2 Commercial test equipment:

Manufacturer	Model	Serial Number	Calibr. Exp. Date
Varian He Leak Detector	960	DRAD6002	N/A
Varian Calibrated He leak for LD	K3264302		

E.3.3 GSE / hardware:

Note: Items in parentheses are for reference, their use being described in other procedures.

Description	No. Req'd
(Gas Module, GM)	1
(Electrical Module, EM)	1
Utility Turbopump System, UTS	1
Data Acquisition System, DAS	1
Vacuum Module, VM	1
Ladders, and/or man lifts as required for access	A/R
Main Tank Vent Long Line / Short Line Assembly (optional)	1
Fill Line GSE Vent Cap Assembly	1
Guard Tank Vent Valve Assembly	1
Dust caps for burst disks	A/R
KF-50 elbows	4

The GSE instruments required to perform this procedure are listed in Table 1, together with their serial numbers, where available. Instruments that are required to have current calibrations are indicated in the Cal-Required column. Instruments that do not require calibration are those not used to verify performance requirements and are not connected to flight instrumentation. The status column is to be filled in with the due date of the instrument calibration sticker and verified to be in calibration by QE or QE designee.

Table 1. Required Instrumentation and Calibration Status

No.	*Location*	*Description*	*User Name*	*Serial No.*	*Cal Required*	*Status Cal due date*
1	DAS	Power Supply, H-P 6627A	-	3452A01975	Yes	
2	DAS	Power Supply, H-P 6627A	-	3452A01956	Yes	
3	DAS	Data Acquisition/Control Unit H-P 3497A	-	2936A245539	No	-
4	DAS	Digital Multimeter H-P 3458A	-	2823A15047	Yes	
5	EM	Vacuum Gauge Controller Granville-Phillips Model 316	EG-1a, -1b	2827	No	-
6	EM	Vacuum Gauge Controller Granville-Phillips Model 316	AG-2a, -2b	2826	No	-
7	EM	Vacuum Gauge Controller Granville-Phillips Model 316	EG-3	2828	No	-
8	EM	MKS PDR-C-2C	EG-2, FCG	92022108A	No	-
9	EM	Flow meter – Matheson 8170	EFM-1	96186	No	-
10	EM	Flow meter totalizer Matheson 8124	EFM-1	96174	No	-
11	EM	Liquid Helium Level Controller American Magnetics, Inc. 136	LLS Main Tank	96-409-11	No	-
12	EM	Liquid Helium Level Controller American Magnetics, Inc. 136	LLS Guard Tank	96-409-10	No	-
13	EM	Liquid Helium Level Controller American Magnetics, Inc. 136	LLS Well	96-409-9	No	-
14	EM	Liquid Helium Level Controller American Magnetics, Inc. 136	LLS Axial Lock	96-409-12	No	-
15	EM	Pressure Controller – MKS 152F-92	EV-7a, -7b	96203410A	No	-
16	EM	Power Supply HP 6038A	H08D Tank Heater	96023407A	Yes	
17	EM	Power Supply HP 6038A	H09D Tank Heater	3511A-13332	Yes	
18	EM	Power Supply HP 6038A	RAV Power Supply	3329A-12486	Yes	
19	EM	Vac Ion Pump power supply Varian 929-0910, Minivac	SIP	5004N	No	-
20	EM	Flow meter totalizer Veeder-Root	PFM-1	576013-716	No	-
21	GM	Pressure Gauge, Heise	AG-1	CC-122077	No	-
22	GM	Pressure Gauge, Marshall Town	AG-3	N/A	No	-
23	GM	Main Tank Heat Exchanger: a) Thermocouple, b) Current meter, c) Temperature set point controller	-	C-19950	No	-
24	GM	Guard Tank Heat Exchanger:	-	C-09920	No	-

No.	*Location*	*Description*	*User Name*	*Serial No.*	*Cal Required*	*Status Cal due date*
		a) Thermocouple, b) Current meter, c) Temperature set point controller				
25	VM	Vacuum Gauge readout, Granville-Phillips 316	VG-3 VG-4	2878	No	-
26	VM	Vacuum Gauge readout, Granville-Phillips 360	VG-1, VG-2 VG-5	96021521	No	-

E.3.4 Software:

N/A

E.3.5 Tools

N/A

E.3.6 Expendables

Description	Quantity
Compressed Helium gas	1 “six-pack”

E.4 Instrument Pretest Requirements: N/A

E.5 Configuration Requirements

E.5.1 Integration status:

Space Vehicle is initially configured as described in the LM Acoustic Test Plan, EM SMS434 and Acoustic Test Configuration Drawing, 8A00294. The Payload is configured as specified by P0777A, *Configure Payload for Acoustic Test*. The first part of this procedure (an internal guard tank fill and vacuum shell pressure check) will take place in this configuration. The remainder of this procedure, however, will take place after the S/V has been removed from the acoustic cell, placed on the Assembly Stand, and the first two solar arrays are removed. The portion of the FEE skins which allow access to the dewar vent boss must be removed for the leak check of the main tank vent bayonet.

E.5.2 Orientation:

The S/V is oriented in the vertical orientation (+Z up).

E.5.3 Main Tank:

The Main Tank contains NBP liquid helium and is venting to the room through a relief valve assembly as specified in P0777A.

E.5.4 Guard Tank:

The Guard Tank contains NBP liquid helium and is likewise vented to the room through a relief valve assembly as specified in P0777A.

E.5.5 Well:

The Well must be evacuated.

E.5.6 SMD Vacuum Shell:

The Vacuum Shell pressure must be less than 5×10^{-5} torr. This pressure will be checked as a part of this procedure.

E.5.7 Alarm System

1. The DAS alarm system must be enabled and contain the following alarm set-points:

    a. Top of lead bag temperature set (CN 40) at $T \leq 6.0$ K.

    b. Top of lead bag temperature set (CN 41) at $T \leq 6.0$ K.

    c. Relative Guard Tank Pressure (CN 46) set at $\Delta P \geq 0.3$ torr.

2. The Watch Dog alarm must be armed.

E.5.8 Non-flight hardware installed on the Payload

1. GSE cables connected to the thruster vent pressure transducer (STG) and the guard tank pressure transducer.

2. A GSE vent cap is installed on the flight guard tank vent line as specified in P0777A.

3. A GSE vent cap is installed on the main tank vent bayonet as specified in P0777A.

E.5.9 Helium vent: Helium gas produced by fill operations shall be ducted to the acoustic cell exhaust stack.

E.6 Access requirement: Cryo Operations personnel require access to dewar fill and vent locations as well as other locations on the Payload to perform this procedure. Operation of all scissor lifts, cherry pickers, etc. required for access to the Payload shall be performed by qualified LM personnel.

F Reference Documents

F.1 Drawings

Drawing No.	***Title***
LMMS-5833394	*Instrumentation Installation*
LMMS-8A00292	*Acoustic Test Configuration Drawing*

F.2 Supporting documentation

Document No.	***Title***
LMMC-5835031	*GP-B Magnetic Control Plan*
GPB-100153C	*SMD Safety Compliance Assessment*
LMSC-P088357	*Science Mission Dewar Critical Design Review*
SU/GP-B P0108	*Quality Plan*
LMMS GPB-100333	*Science Mission Dewar Failure Effects and Causes Analysis*
SU/GP-B P059	*GP-B Contamination Control Plan*
EM SYS229	*Accident/Mishap/Incident Notification Process*
EM SMS434	*S/V Acoustic Test Plan*

F.3 Additional Procedures

Document No.	***Title***
SU/GP-B P0213C	*Connect Vacuum Module / Pump on SMD Vacuum Shell*
SU/GP-B P0214C	*Stop Pumping on SMD Vacuum Shell / Disconnect Vacuum Module*
SU/GP-B P0613	*Repump Well with Probe Installed* (optional)
SU/GP-B P0674B	*Connect MT Vent Line to Gas Module – MT at NBP* (optional)
SU/GP-B P0916	*Installation of FEE GTVL and Leak Check*
SU/GP-B P0676	*Connect Guard Tank Vent to Gas Module* (called from P0916)
SU/GP-B P0669A	*Internal Guard Tank Fill – Vent Lines Disconnected*

Op. Order No._____
Date Initiated_____
Time Initiated_____

G **Operations**

G.1 Pre-Operations Verifications

- o Verify SU QA notified.

  Record: Individual notified _____,

  Date/time _____/_____.

- o Verify NASA representative notified.

  Record: Individual notified _____,

  Date/time _____/_____.

- o Record calibration due dates in Table 1 and Sec. E.3.2.
- o Verify that persons actually performing this procedure have initialed their names in Sec. D.3 and the name of the Test Director is circled.
- o Complete pre-operations review. (Meeting of all personnel involved in performing procedure to review primary steps and emergency procedures. See appendix 1.)
- o Verify availability of ladders, lifters or scaffolding as needed for access to the support ring and top plate regions of the SMD.
- o Verify the availability of the procedures listed in F.3
- o Record date/time acoustic test performed:_____

Section G.1 complete _____ QA.

G.2 As soon as possible after completion of the acoustic test, perform the following:

G.2.1 Perform a complete examination of all the external Payload interfaces and record any changes or anomalies which have occurred since the preparations for the acoustic test:
_____
_____
_____
_____Date/time: _____

G.2.2 View the telescope optical path through the Mylar on the top of the sunshade. Note any visible debris or obscuration of the optical path due to frozen air:
_____
_____

G.2.3 Record initial liquid helium levels.

Main Tank _____%

Guard Tank _____%

G.2.4 Ensure DAS alarm system enabled and record set points.

Top of lead bag temperature – ensure [CN 40] and [CN 41] on DAS alarm list and set to alarm at T ≤ 6.0 K. Record set point. _____K

Relative Guard Tank Pressure – ensure [CN46] on DAS alarm list and set to alarm at ΔP ≥ 0.3 torr. Record set point. _____torr

G.2.5 Check the pressure in the vacuum shell by performing the following:

G.2.5.1 Install the Ion Pump (IP) magnet and shield.

G.2.5.2 Verify that the Ion Pump power supply is turned off and unplugged, and connect the HV cable to the IP.

G.2.5.3 Verify that the Ion Pump Power Supply analog output is connected to the DAS.

G.2.5.4 Turn on Vac-ion pump and record date/time: _____

G.2.5.5 Use DAS [Monitor Data] for CN 99.

G.2.5.6 When value is steady, record pressure (IP) _____ torr.

G.2.5.7 Exit [Monitor Data] and collect data with [Set Data Interval] to 15 min.

G.2.5.8 When data cycle is complete, turn off Vac-ion pump.

G.2.6 Remove the fill line relief valve assembly plug.

G.2.7 Install the Fill Cap Assembly GSE as follows:

G.2.7.1 Verify that the Fill Cap Nupro valve is still closed and SV-13 is torqued closed to 60 ±5 in-lbs.

G.2.7.2 Remove the installed Fill Cap.

G.2.7.3 Install the standard Fill Cap assembly GSE (with FCV, etc.)

G.2.8 Perform P0669A, *Internal Guard Tank Fill – Vent Lines Disconnected*, with the following changes (see Fig. 2 for schematic of GT vent cap used for acoustic test):

G.2.8.1 Repetitious data may be transferred from this procedure to P0669A.

G.2.8.2 Verify that the plug has been removed from the fill line relief valve assembly.

G.2.8.3 Delay opening of RAV-2 from G.9.3 to G.10.3. It is probable that the pressure in the guard tank will exceed that of the main tank and opening RAV-2 at the earlier time will cause an initial reverse transfer.

G.2.8.4 When the procedure calls for opening GTVC-V, the guard tank vent cap should be cracked to allow the pressure to bleed down to approximately 30 torr above

atmosphere. The cap should then be removed and a #5 rubber stopper inserted into the bayonet in order to remove the bayonet o-ring. Remove the stopper after RAV-2 is opened.

G.2.8.5 When the procedure calls for closing GTVC-V at G.11.9, reinstall the #5 rubber stopper to allow the guard tank vent bayonet (at the end of the flight guard tank vent line where the thrust nullifier will be installed) to warm up. The o-ring removed in the previous step should be inspected and replaced, if necessary.

G.2.8.6 After the guard tank vent bayonet, reinstall the o-ring. Remove the stopper and then reinstall the combined GTVA/GTVC. This combined assembly should be installed with the valves open to allow purging and then GTVC-V should be closed.

Section G.2 complete _____ QA.

G.3 After the S/V has been mounted on the assembly stand outside of the acoustic cell and the solar arrays and FEE skins relevant to access to the dewar vent boss have been removed, the following steps should be performed. The exact order is not critical.

G.3.1 Perform P0916, *Installation of FEE Guard Tank Vent Line and Leak Check,* (Op. No. _____) to leak check the installation of the GTVA with the following modifications:

G.3.1.1 Perform sections G.1 through G.5. Note that this procedure assumes at this point that the GTVA is mounted on the GTVSL, whereas it is mounted on the FGTVL instead. Repetitious data requested in this procedure may be transferred from this procedure. Note that section G.2 calls for the performance of P0676, *Connect Guard Tank Vent to Gas Module.*

G.3.1.2 Skip sections G.6 through G.8 (sections that remove the GTVSL and install the FGTVL).

G.3.1.3 Complete the remainder of P0916, excepting that only the joint between FGTVL and GTVA needs to be bagged and leak checked.

G.3.2 Perform P0213C, *Connect Vacuum Module / Pump on SMD Vacuum Shell* (Op. No._____) with the following modifications and options:

G.3.2.1 Select Initial Configuration 1 (pumping line disconnected), and Final Configuration 3 (actively pumping on SMD vacuum)

G.3.2.2 Skip steps F.7.11 through F.7.17, leaving the leak detector connected to VM and running, and perform F.8.11 (configuration 3) through the remainder of the procedure.

G.3.2.3 To perform a leak check of critical seals on the dewar, open VV-7 and close VV-4 to make the leak checker the backing pump for the Vacuum Module.

WARNING!

Lethal voltage may be present at the Ion Pump when connected to the power supply. Turn off the High Voltage power supply and disconnect the HV cable before

performing any leak checks of the Ion Pump.

G.3.2.4 Flood each of the seals listed below with helium for one minute and verify that no response is observed on the 10^{-7} sccs range. If a response is seen, a bag leak check of sufficient duration to reach steady state value should be performed to verify that the total leak does not exceed 5 x 10^{-6} sccs. Record below:

Location	Date/time	Background (sccs)	Leak after 1 min. (sccs)	Saturation leak (optional)
BD5B*				
BD7B*				
BD7A*				
BD5A*				
Ion Pump				
Main tank bayonet				
Guard tank bayonet				
+Y ARP post				
-Y ARP post				

*Note: The "A" units are on the right side of the +X axis (in the +Y direction). The Main Tank burst disks (BD7A/B) are adjacent to the +X axis.

G.3.3 When it is desired to discontinue pumping on the SMD vacuum shell, perform P0214C, *Stop Pumping on SMD Vacuum Shell / Disconnect Vacuum Module*, (Op. No._____) with the following modifications and options:

G.3.3.1 Use Initial Configuration 1 (actively pumping on SMD vacuum) and Final Configuration 3 (pumping line disconnected)

G.3.3.2 Use options G.5.19, G.5.20, and G.5.27 to perform complete disconnection and shut down.

Section G.3 complete _____ QA.

G.4 Install the KF 50 deflector elbows on the four burst disks BD5/7 A/B (See Fig. 1). Orient the deflectors in the horizontal direction unless work on the vehicle dictates otherwise.

G.5 Optional: Perform P0613B, *Repump Well with Probe Installed*, (Op. No._____). Note: The well will be leak checked when the new well pumping line is installed.

G.6 Reconnect SMD top hat heaters and thermocouples as needed for Main Tank depletion.

G.7 Install dust caps on the six caging line burst disks.

G.8 Install the aluminum foil cover/cap on the Probe burst disk, BD9.

G.9 Optional: Perform P0674B, *Connect MT Vent Line to Gas Module – MT at NBP,* and record the Op. No.:_____. Note that the Main Tank Vent Cap Assembly depicted in P0674B has been replaced (for the acoustic test) by the assembly depicted in Fig. 3. Also note that connection of the main tank vent is necessary to reduce the liquid level in order to tilt the vehicle to the horizontal orientation for transport or other operations. This can be done when operationally convenient and need not be done for the completion of this procedure.

G.10 Complete post-operations review. (See appendix 2.)

Operation completed.

Completed by: _____

Witnessed by: _____

Date: _____

Time: _____

QA Program Engineer_____**Date**_____

Payload Test Director_____**Date**_____

Figure 1. Plumbing schematic of the SMD.

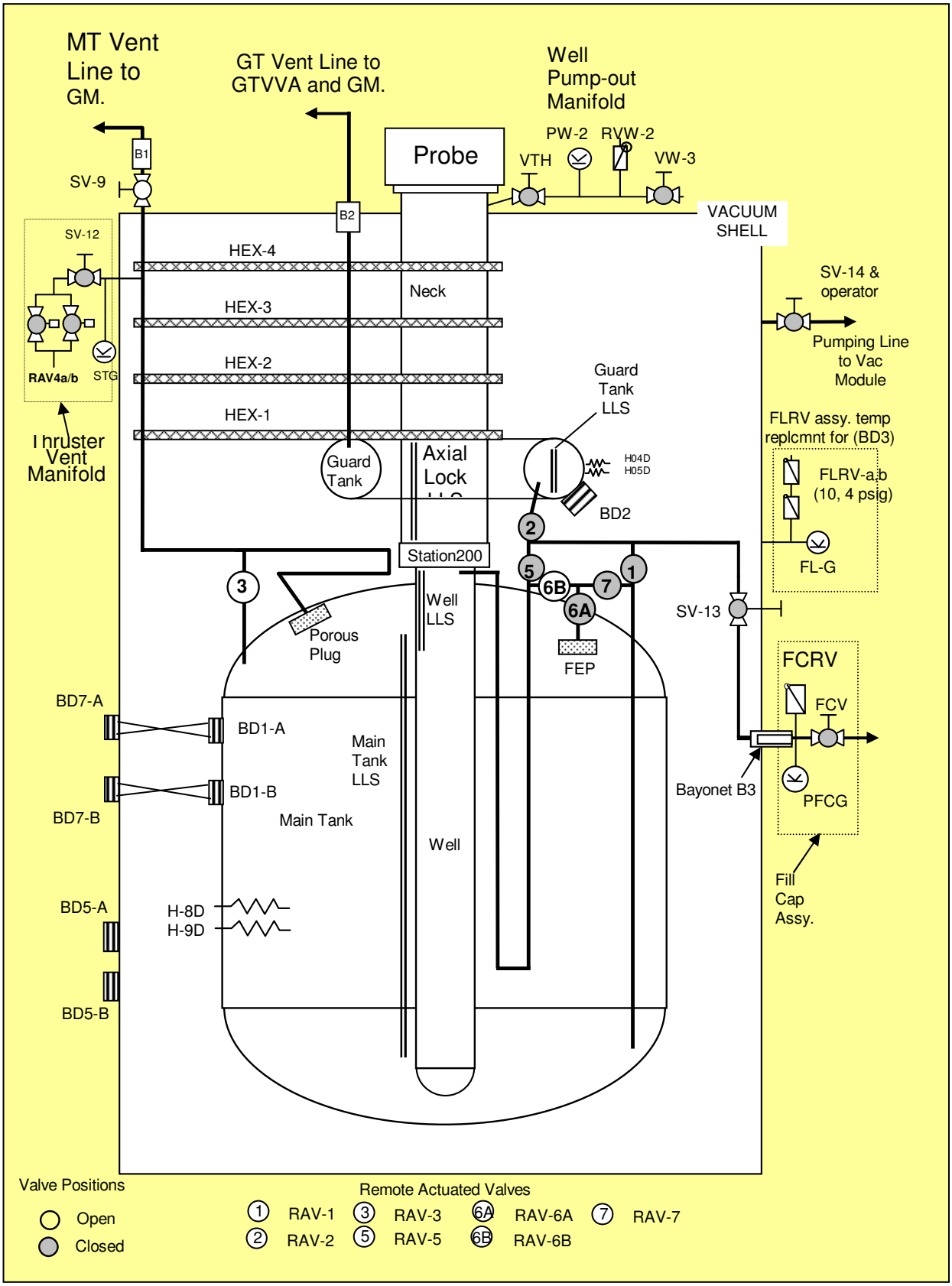


Figure 2. Guard Tank vent cap for acoustic test

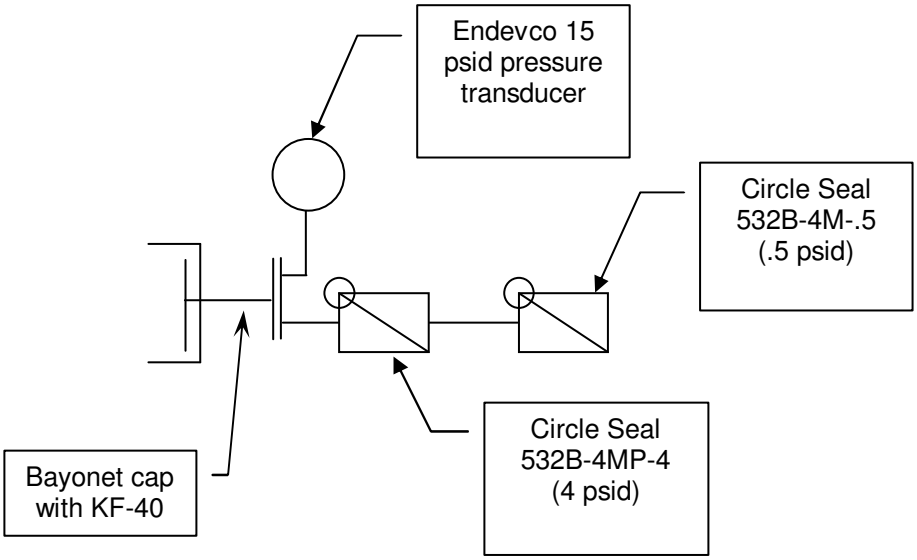
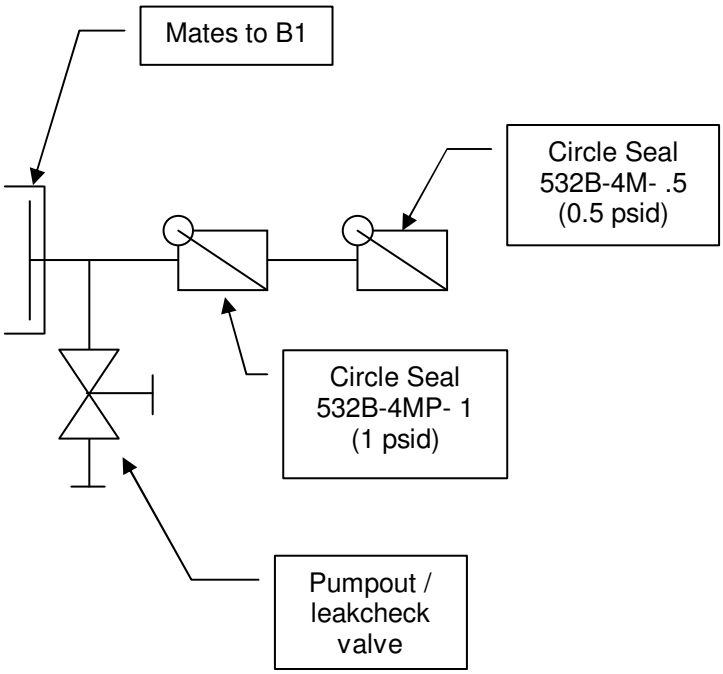


Figure 3. Main Tank vent cap for acoustic test.



H Appendices

H.1 Appendix 1 Pre-Test Check List

DATE	CHECKLIST ITEM	COMPLETED	REMARKS
	1. Verify the test procedure being used is the latest revision.		
	2. Verify all critical items in the test are identified and discussed with the test team.		
	3. Verify all required materials and tools are available in the test area.		
	4. Verify all hazardous materials involved in the test are identified to the test team.		
	5. Verify all hazardous steps to be performed are identified to the test team.		
	6. Verify each team member knows their individual responsibilities.		
	7. Confirm that each test team member clearly understands that he/she has the authority to stop the test if an item in the procedure is not clear.		
	8. Confirm that each test team member clearly understands that he/she must stop the test if there is any anomaly or suspected anomaly.		
	9. Notify management of all discrepancy reports or d-log items identified during procedure performance. In the event an incident or major discrepancy occurs during procedure performance management will be notified immediately.		
	10. Confirm that each test team member understands that there will be a post-test team meeting.		
	Team Lead Signature: _____		

H.2 Appendix 2 Post-Test Check List

DATE	CHECKLIST ITEM	COMPLETED	REMARKS
	1. Verify all steps in the procedure were successfully completed.		
	2. Verify all anomalies discovered during testing are properly documented.		
	3. Ensure management has been notified of all major or minor discrepancies.		
	4. Ensure that all steps that were not required to be performed are properly identified.		
	5. If applicable sign-off test completion.		
	6. Verify all RAV valve operations have been entered in log book		
	7. Verify the as-run copy of procedure has been filed in the appropriate binder		
	Team Lead Signature: _____		