GRAVITY PROBE B

PROCEDURE FOR

S/V VERIFICATION

CONFIGURE PAYLOAD FOR ACOUSTIC TEST

ECO 1371
7/19/02

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		

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	6/28/02	1371	Updated to conform to configuration for S/V acoustic test. GT vent valve assembly removed and replaced with lighter cap assembly due to inadequate support for the GTVVA. Reduce relief pressure for MT from 10 psid to 1.5 psid. See Scope for items covered by this procedure.

Acronyms and Abbreviations:

Acronym / Abbreviation	**Meaning**
AC	Acoustic Cell
DAS	Data Acquisition System
GSE	Ground Support Equipment
GM	Gas Module
GT	Guard Tank
LD	Leak Detector
LGS	Leakage Gas System
LM	Lockheed Martin
MT	Main Tank
NBP	Normal boiling point
PPMS	Probe Pressure Measurement System
RGA	Residual Gas Analyzer
SMD	Science Mission Dewar
S/U	Spin up
S/V	Space Vehicle (Payload integrated with the Spacecraft)

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A Scope

This procedure effects the preparation of the Payload portion of the Space Vehicle for Acoustic Test following all cryogenic servicing operations. Those aspects of the Payload not covered here are either in flight configuration or are being dealt with by Lockheed Martin as a part Space Vehicle integration. Hardware covered by this procedure:

- Well (pumped, if needed)
- Vacuum jacket (pumped, if needed)
- Vacuum jacket pumpout port (PO)
- Ion pump (IP)
- Fill line relief assembly (BD3)
- Vacuum shell pyrovalve (PV1)
- Fill cap assembly
- Top hat heater/thermocouple wiring
- Well relief valve (RV2) caps
- Well pyrovalve (PV3) caps
- Caging line burst disk covers
- Probe burst disk cover
- Well burst disk cap
- Vatterfly valve caps
- Well pumpout port
- Guard tank vent lines and vent valve assembly (removed and replaced with relief cap)
- Main tank vent lines (removed and replaced with relief cap)
- Main tank and vacuum jacket burst disk deflectors (BD 5/7 A/B).

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 Test Personnel

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

This procedure does not include any equipment sensitive to electrostatic discharge.

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
Fill Valve Weldment Assembly (5833270-101) or equivalent GSE	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	Recorded in proc.	Recorded in proc.

E.3.3 Ground Support Equipment

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
Ladders, and/or man lifts as required for access	A/R
Vent cap assembly for the Guard Tank (Fig. 3)	1
Vent cap assembly for the Main Tank (Fig. 4)	1
Circle Seal 532T1-2MP-4 relief valve with plug installed on exit (Note: a 532B version may be substituted.)	1
# 5 rubber stopper	1

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: a) Thermocouple, b) Current meter, c) Temperature set point controller	-	C-09920	No	-
25	VM	Vacuum Gauge readout, Granville-Phillips 316	VG-3 VG-4	2878	No	-

No.	*Location*	*Description*	*User Name*	*Serial No.*	*Cal Required*	*Status Cal due date*
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
Certified compressed Helium gas	1 "six-pack"

E.4 Instrument Pretest Requirements

Equipment	Test Required	Proc. No.	Test Performed Date	Op No.
Electrical Module, Gas Module, DAS	Certification after transport	P0773		
Utility Turbopump System	Certification after transport	P0787A		

E.5 Configuration Requirements

E.5.1 Integration status:

The Payload is integrated with the Spacecraft in preparation for the S/V acoustic test. Ref. *Acoustic Test Configuration Drawing,* 8A00292. Note: Some items on the drawing will be achieved by this procedure.

E.5.2 Orientation:

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

E.5.3 Main Tank:

The Main Tank is 90 – 100% full of NBP liquid helium and venting to the Gas Module.

E.5.4 Guard Tank:

The Guard Tank is 80 – 100% full and is likewise vented to the Gas Module.

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. Document No. P0213, *Connect Vacuum Module to SMD*, contains the procedure for connecting to and

pumping on the SMD vacuum shell. If performed, P0213 should be completed prior to step G.6 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 28) at $T \leq 6.0$ K.

    b. Top of lead bag temperature set (CN 29) 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. A non-flight 20 psid relief valve is installed at the SMD fill line.

2. The ion-pump magnet is installed.

3. GSE cables connected to the thruster vent pressure transducer (STG) and the guard tank pressure transducers (GTV-Ga/b).

4. A GSE fill cap assembly with Baratron pressure transducer may be installed at the fill bayonet (B3).

5. The Guard Tank Vent Valve Assembly and a vent line are connected to the output of the flight Guard Tank line (Fig. 1).

6. The Main Tank vent line is connected at bayonet B1 and is connected to the Gas Module (Fig. 1).

F **Reference Documents**

F.1 Drawings

Drawing No.	***Title***
LMMS-5833394	*Instrumentation Installation*
LMMS-5833270	*Fill Valve Weldment Assembly*
LMMS-5833919	*Vent Valve Weldment Assembly*
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 P0613C	*Repump Well with Probe Installed*
SU/GP-B P0675B	*Disconnect MT Vent Line from Gas Module – MT at NBP*
SU/GP-B P0677B	*Disconnect GT Vent Line from GM*
SU/GP-B P0879	*Accident/Incident/Mishap Notification Process*

Op. Order No._____
Date Initiated_____
Time Initiated_____

G Operations

G.1 Pre-Operations Verifications

- Verify SU QA notified.

  Record: Individual notified _____,

  Date/time _____/_____.

- Verify NASA representative notified.

  Record: Individual notified _____,

  Date/time _____/_____.

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

Section G.1 complete _____ QA.

G.2 Record initial liquid helium levels.

Main Tank (90 – 100%) _____%

Guard Tank (80 – 100%). _____%

G.3 Ensure DAS alarm system enabled and record set points.

Top of lead bag temperature – ensure [CN 28] and [CN 29]on DAS alarm list and set to alarm at $T \leq 6.0$ K. Record set point. _____K

Relative Guard Tank Pressure – ensure [CN46] on DAS alarm list and set to alarm at $\Delta P \geq 0.3$ torr. Record set point. _____torr

Sections G.2, G.3 complete _____ QA.

G.4 If the Well has not been pumped since the last LHe fill operation, perform P0613, *Repump Well with Probe Installed*. Record Op No.:_____. (Completion and closeout will be verified at G.19.)

G.5 Check pressure in the SMD vacuum jacket prior to disconnection:

G.5.1 Turn on the Ion Pump and record time / date:_____

G.5.2 Initiate [Monitor Data] on the DAS using channel no. 99.

G.5.3 Wait until the pressure stabilizes and record vacuum jacket pressure (IP):_____torr.

G.5.4 Exit [Monitor Data] and collect data with [Set Data Interval] (use existing data interval).

G.5.5 After the data cycle is complete, turn off the Ion Pump.

G.5.6 If the vacuum shell pressure is not less than 5×10^{-5} torr, perform P0213, *Connect Vacuum Module to SMD*, and record Op. No.:_____.

Section G.5 complete _____ QA.

G.6 Verify that the pumpout port (PO, see Fig. 2) is capped and secure. Tape the cap retainer chain to the face of the cap.

Section G.6 complete _____ QA.

G.7 Verify that the Ion Pump power supply is turned off, and disconnect the HV cable from the Ion Pump (IP).

G.8 Remove the IP magnet and shield.

Sections G.7, G.8 complete _____ QA.

G.9 Prepare fill line relief valve assembly:

G.9.1 Verify that there is a 532T1-2MP-20 (20 psid) Circle Seal relief valve currently installed.

G.9.2 Install a pipe thread plug in the exit end of a 532T1-2MP-4 (4 psid) Circle Seal relief valve. Note: a 532B version may be substituted.

G.9.3 Install the relief valve and plug on top of the currently installed relief valve taking care to not disturb the existing seal between the installed relief valve and its mount. (Motion of the existing joint would nullify previous leak check.)

G.10 Verify that the Vacuum Shell Pyrovalve (PV1) has caps installed and taped.

Sections G.9, G.10 complete _____ QA.

G.11 Replace Fill Cap Assembly:

G.11.1 Record Fill Cap pressure (PFCG): _____torr, and record date / time:_____.

G.11.2 Verify that the pressure at PFCG is still above one atmosphere.

G.11.3 Remove the installed Fill Cap.

G.11.4 Install the flight fill cap, “Fill Valve Weldment Assembly” (5833270-101) (or similar) to be used for payload acoustic test.

G.11.5 Install a pumping line between the Nupro valve on the Fill Cap Assembly and the Access Port #1 of the Auxiliary gas section. Provide strain relief as necessary.

G.11.6 Turn on pump AP-1.

G.11.7 Ensure EV-12 closed.

G.11.8 Open AV-8 and AV-3.

G.11.9 Open Nupro valve on the Fill Cap Assembly and evacuate to <25 mtorr as measured at AG-2B.

G.11.10 Close AV-8.

G.11.11 Open AV-1.

G.11.12 Open AV-9 until pressure reaches 1.5 psig as read on gauge AG-1 and then close AV-9.

G.11.13 Close AV-1.

G.11.14 Open AV-8 evacuate to <25 mtorr as measured at AG-2B.

G.11.15 Close AV-8.

G.11.16 Open AV-1.

G.11.17 Open AV-9 until pressure reaches 1.5 psig as read on gauge AG-1 and then close AV-9.

G.11.18 Close the Nupro valve on the fill cap and AV-1.

G.11.19 Close AV-3.

G.11.20 Turn off AP-1.

G.11.21 Disconnect the pumping line at the Nupro valve on the fill cap.

G.11.22 Install a Swagelok plug on the port at the Nupro valve on the fill cap and tighten.

Section G.11 complete _____ QA.

G.12 Disconnect all SMD top hat heaters and thermocouples from external connectors and secure the loose wiring and connectors with tape and/or cable ties.

G.13 Verify that the Well Relief Valve (RV2) has plug tightly installed.

G.14 Verify that the dust caps are installed and securely taped on the Well Pyrovalve (PV3).

G.15 Remove dust caps on the six caging line burst disks.

G.16 Remove the aluminum foil cover (if installed) from the Probe burst disk, BD9.

G.17 Verify that the flight cap (or equivalent) is installed on the Well Burst Disk.

Sections G.12 through G.17 complete _____ QA.

G.18 Install/verify installed bracing material underneath the valve assembly on each of the Vatterfly valve covers.

Section G.18 complete _____ QA.

G.19 Verify that the Well pumpout port is capped. If the Well pumpout port manifold is connected to the port, perform (or complete, if the procedure has not been closed) P0613C, *Repump the Well with Probe Installed*, using option G.7 rather than G.6. Record Op. No.:_____. Tape and/or cable tie the retainer chain to the port cap.

Section G.19 complete _____ QA.

CAUTION:

After the next two steps, there will be no vent cooling of the HEXs until venting is re-established at the new pressure settings. Temperatures should be monitored to ensure that the lead bag temperature does not exceed 6.5 K.

G.20 Replace the Guard Tank Vent Valve Assembly with an acoustic test vent cap as follows:

G.20.1 Verify the availability of the acoustic test GT vent cap assembly as depicted in Fig. 3. Connect the Endevco pressure transducer on to a readout and establish the zero offset with zero pressure differential.

G.20.2 Bench leak check the acoustic test GT vent cap assembly as follows:

G.20.2.1 Plug leak checker port and confirm calibration:
Current LD reading from calibrated leak_____sccs
Calibrated leak value_____sccs
Cal due date_____

G.20.2.2 Using an appropriate adapter, couple the bayonet fitting of the GT vent cap assembly to the leak detector port.

G.20.2.3 Bag the entire assembly.

G.20.2.4 Record Leak Detector background rate: _____scc/s

G.20.2.5 Ensure background on the 10^{-7}scc/s range.

G.20.2.6 Spray helium into bagged assembly for two minutes.

G.20.2.7 Record leak rate after two minutes: _____scc/s.

G.20.2.8 Verify that no rise is detected.

G.20.2.9 Vent the leak checker and remove the cap assembly.

G.20.3 Close GTV-V

G.20.4 Disconnect the Guard Tank Long Vent Line from the GT Valve Assembly.

G.20.5 Let the GT pressure, GTV-G, (CN 46) build to 20 – 25 torr above atmospheric.

G.20.6 Remove the GT Vent Assembly and o-ring and immediately install a number 5 rubber stopper.

G.20.7 Inspect o-ring from bayonet receptacle; clean and lightly lubricate with Apiezon N grease if needed.

G.20.8 Inspect the o-ring groove in the bayonet receptacle and the mating surface on the male bayonet for any scratches. Dress out any scratches before proceeding.

G.20.9 Remove the rubber stopper and immediately install the o-ring and cap assembly.

G.20.10 Connect the Endevco pressure sensor to a readout and verify positive pressure.

Section G.20 complete _____ QA.

G.21 Perform P0675, *Disconnect Main Tank Vent Line from Gas Module – Main Tank at NBP* with the following modifications and options:

G.21.1 Verify that the Main Tank Vent Cap is as configured in Fig. 4 with two relief valves in series (1 + 0.5 psid).

G.21.2 At step 7 of G.7.6, record the leak rate reading obtained after closing the pumpout/leak check valve of the vent cap assembly (designated as MTVC-V in P0675): _____sccs

G.21.3 Skip step 8 of G.7.6 and continue to monitor the LD when SV9 is opened in step G.7.7. Verify that the indicated leak rate does not increase when SV9 is opened.

G.21.4 At step G.8.6, verify that the GT pressure it set to alarm at 30 torr or more above atmospheric pressure instead of 0.3 torr.

G.21.5 Verify that the Guard Tank and Main Tank pressures (CN 46, 49) are being plotted by the DAS. Both pressures will build to the new relief values. When the Main Tank resumes venting, the Guard Tank pressure may decline.

Section G.21 complete _____ QA.

G.22 Remove the elbows from the four burst disks BD5/7 A/B.

Operation completed. Completed by: _____

QA witness: _____

Date: _____

Time: _____

QA Program Engineer_____ **Date**_____

Payload Test Director_____ **Date**_____

Figure 1. Main Tank and Guard Tank venting to Gas Module with Guard Tank Vent Assembly (GTVA) in place. (Initial configuration for this procedure.)

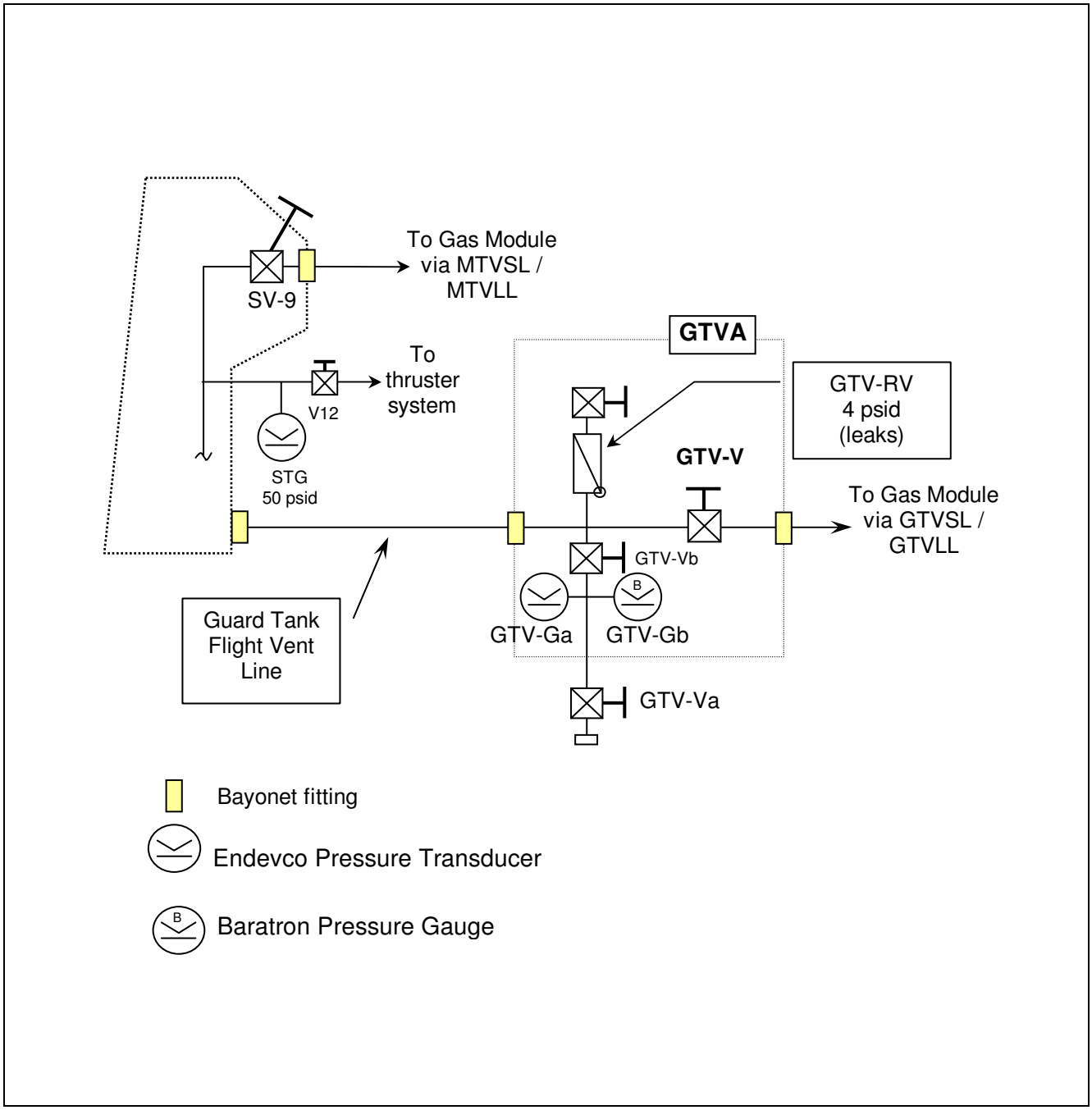

Figure 2. Plumbing schematic of the SMD.

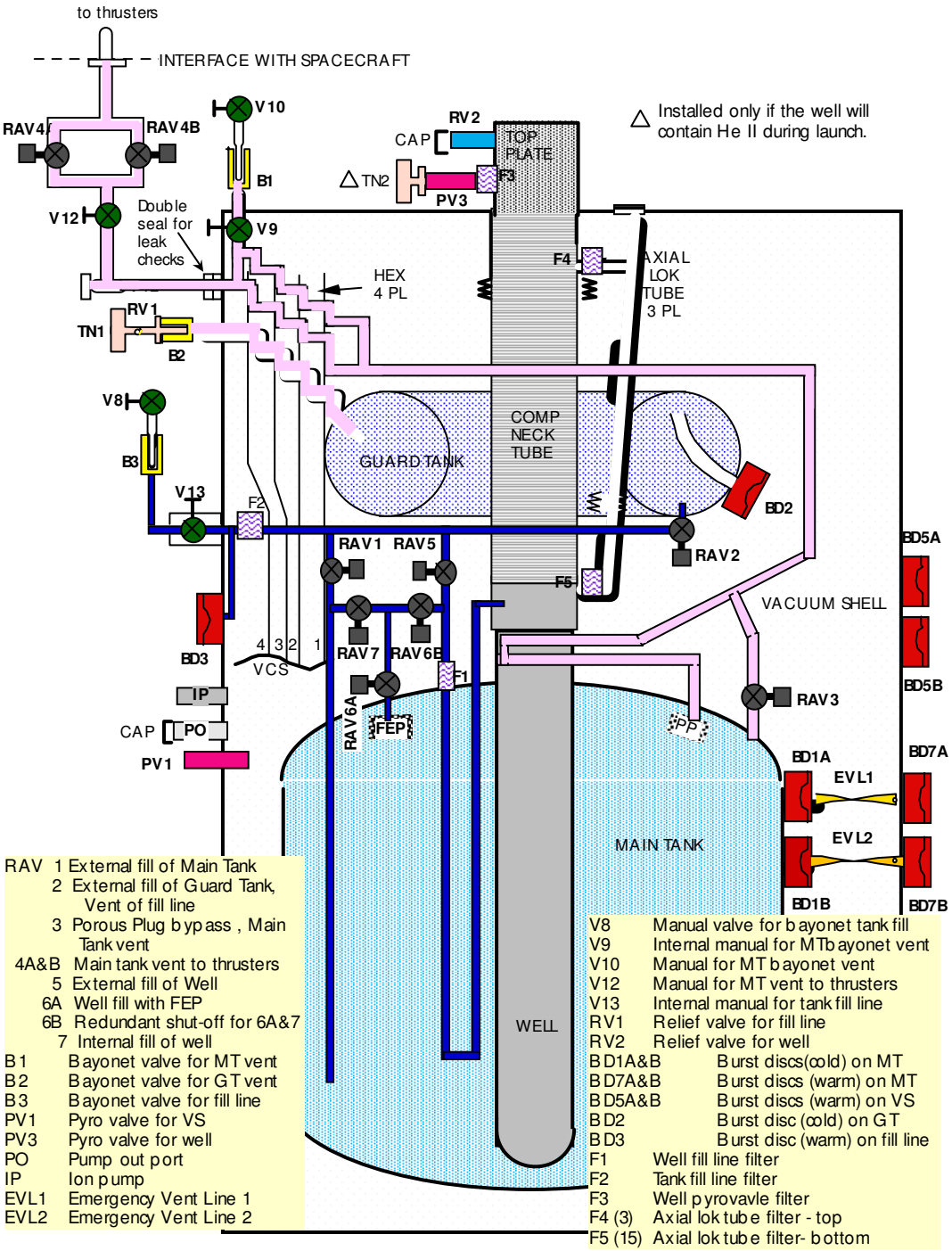

Figure 3. Guard Tank vent cap for acoustic test

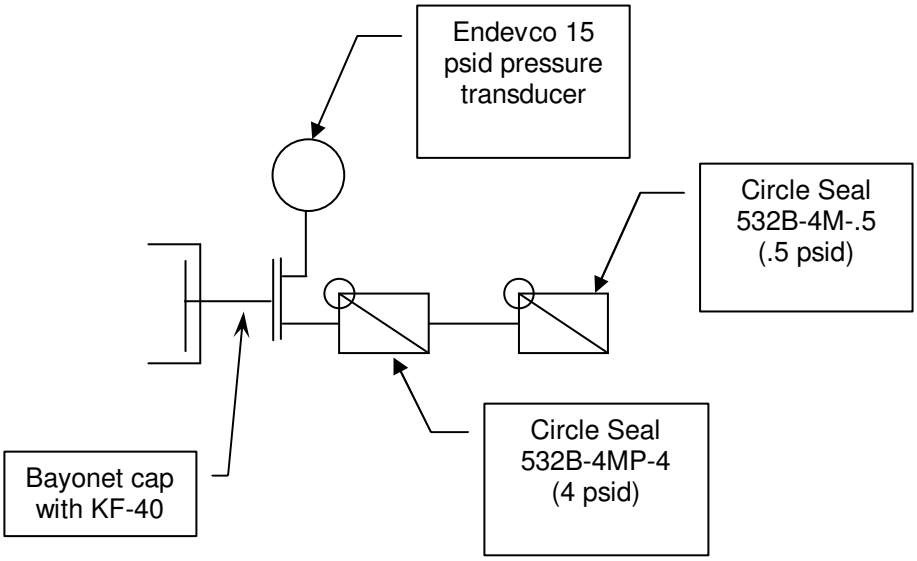

Figure 4. Main Tank vent cap for acoustic test.