SU/GP-B P0738 Rev-

STANFORD UNIVERSITY
W.W. HANSEN EXPERIMENTAL PHYSICS LABORATORY
GRAVITY PROBE B, RELATIVITY GYROSCOPE EXPERIMENT
STANFORD, CALIFORNIA 94305-4085

GMA CLEANING PROCEDURE

GPB SCIENCE MISSION PROCEDURE

P0738 Rev -

August 14, 2000

PREPARED	_____	_____
	A. Halevy , GMA Engineer	Date
CHECKED	_____	_____
	R. Stephenson , GMA Engineer	Date
APPROVED	_____	_____
	G. Asher, GMA REE	Date
APPROVED	_____	_____
	D. Ross, Quality Assurance	Date

APPROVED _____ _____

B. Muhlfelder, Hardware Manager Date

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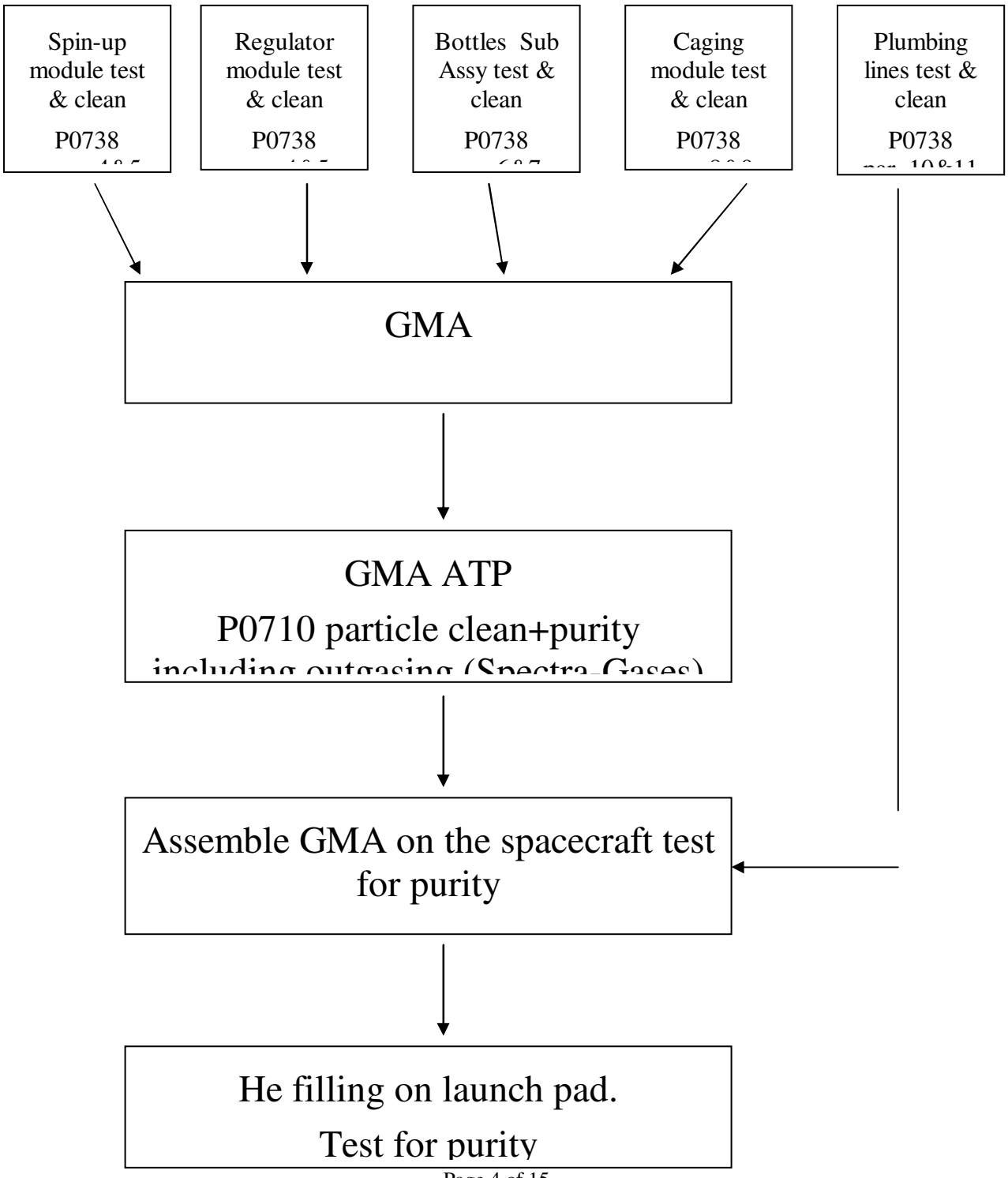
1. GENERAL DESCRIPTION

This procedure describes the GMA test and cleaning operations. Particle cleaning shall be done on the subassemblies as shown on sketch below, followed by bagging. GMA cleaning and testing for gas purity shall be done in the ATP stage at Stanford university, followed by closing add-on valve.



2. TEST INFORMATION

- Proper care should be taken in handling components, and their cleanliness must be preserved.
- Temperature: Room temperature
- Humidity: not critical

2.2 Cleanliness

2.2.1 Normal lab environment when components are double bagged.

2.2.2 Under class 100 hood.

2.3 ESD precautions

2.3.1 None required.

ONR representative, and QA to be notified 24 hours prior to beginning this procedure

SU QA_____time & date ONR_____ time & date

2.4 Personnel, QA, and Documentation

2.4.1 Personnel Integration and Test Director

The Test Director (TD) shall be Aaron Halevy or an alternate that he shall designate. The TD has overall responsibility for the implementation of this procedure and shall sign off the completed procedure and relevant sections within it. The GMA RE shall also sign off the completed "As-Built" procedure.

Testing Engineers and other personnel. All engineers and technicians participating in this procedure shall work under the direction of the TD who shall determine personnel that are qualified to participate in this procedure. Participants in this procedure are to be C. Warren A. Halevy. And Spectra gases personnel.

The test shall be conducted on a formal basis to approved and released procedures. The QA program office shall be notified of the start of this procedure. A Quality Assurance Representative, designated by D. Ross shall be present during the procedure (if deemed necessary) and shall review any discrepancies noted and approve their disposition. Upon completion of this procedure, the QA Manager, D. Ross or her designate, shall certify their 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. Discrepancies will be recorded in a D-log or as a DR per Quality Plan P0108. If a re-test of any or all of the hardware is necessary, the TD will determine the appropriate changes in the procedure, with the QA Manager's approval.

2.5 Red-line Authority

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

3. DOCUMENTS AND EQUIPMENT

3.1 Applicable Documents

SUGPB Gas Management Assembly Drawings #25110 and 25502

Probe C contamination control plan P0059

3.2 Test Equipment

Equipment	Model and Serial Number	Calibration
Nitrogen Grade 6 gas supply with built-in regulator (2000psi)*		
Pressure gage		
Gas particle counter	MET1 217A or equivalent	
Custom bagging and hardware to contain gas exiting		
Moisture probe		
Engineering ECU or multi valve operating panel		
Vacuum pump		
Add-on valves for ports SD1, SD2A, SD2B, G1S to G4S,P1A,CD1,CD2,G1C, G2C, G3C		
Nozzle for bottle purging		
Spectra-Gases equipment as required		
Isopropanol	5 Gallon, semi grade	
0.01µ filter	TEM-715 made by EA	
Flow control meter	KFR-4131-V2 made by Kobold	

* Check regulator cleanliness and clean if needed

3.3 Preparations

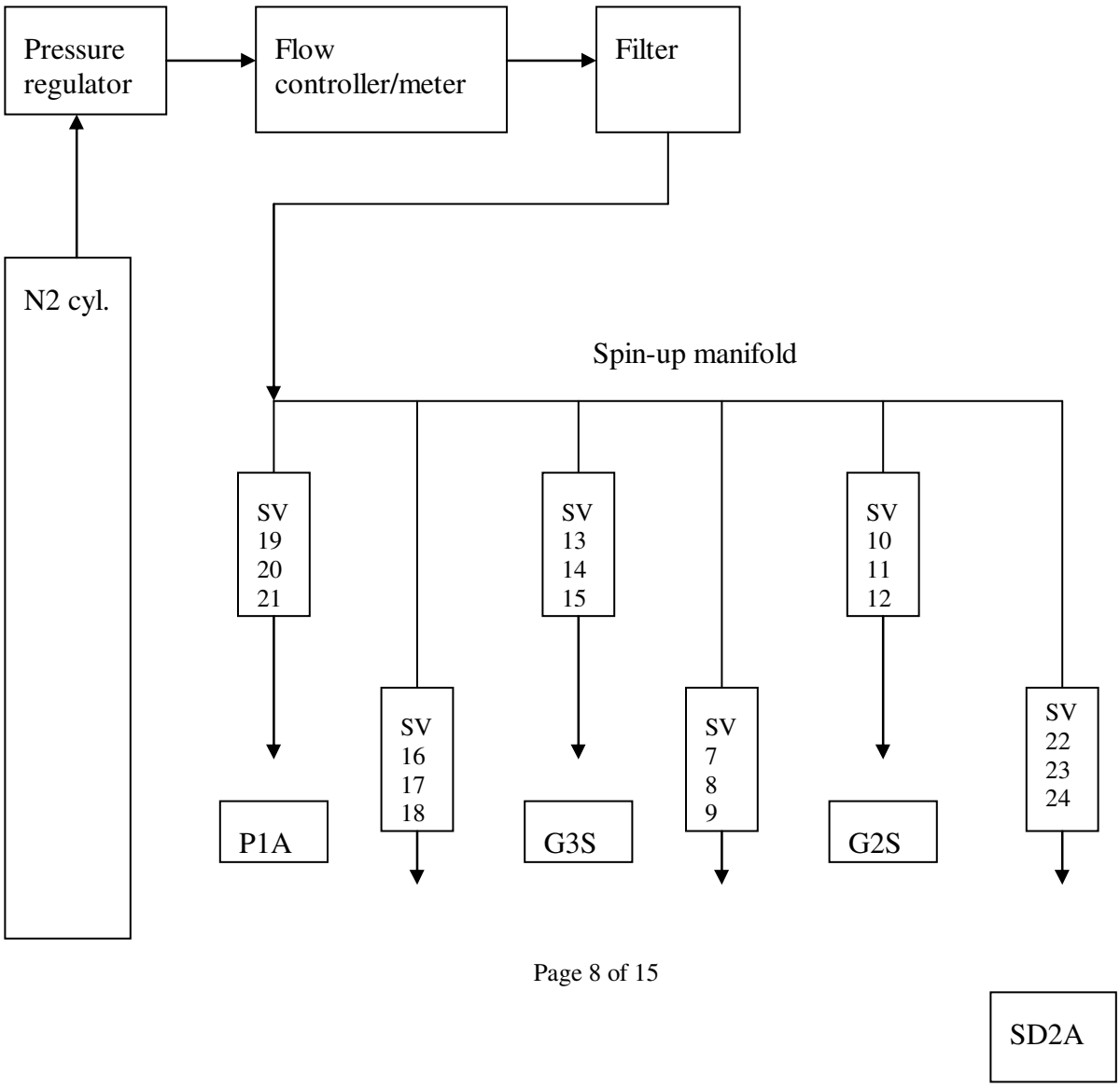
3.3.1 Place the particle counter in the area of the test. Check the hood cleanliness by counting 0.5µm for one minute increments. The count should be less than 100. The particle counter should typically read 3 counts per scfm.

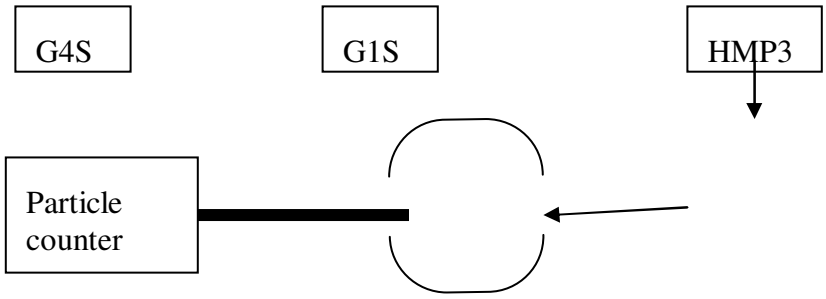
4. PARTICLE CLEANLINESS TEST OF SPIN-UP MODULE ON THE SHIPPING PLATE.

Started on: _____

4.1 Set up dry nitrogen cylinder with regulator, Connect the line from regulator to the input of the flow controller/meter. Connect the 0.01 micron final filter to the output of the flow controller/meter. see sketch 1.

Sketch 1





4.2 Connect the gas supply line to the spinup manifo (after removing part #9 in drawing # 25110).

4.3 Fasion clean bag of approximately one liter of volume with small openings at opposite ends. This will attached to the gas source tube and the inlet of the particle counter respectively.

4.4 Place the plastic bag opening at the SD2A exit, tape the end for sealing. Open Sv22, 23 & 24 and nitrogen valve. Set the gas flow at about 2830 sccm (0.1 scfm) by adjusting the flow controller/meter.

4.5 Carefully insert the sampling tube of the particle counter, as shown in into the exit hole of the bag and tape in place. Do not seal this opening. Verify that the bag is loosely inflated which ensures that the pressure in the bag is approximately at ambient pressure. Check counting data after at least 2 minutes. Take 3 readings and record in table 1. Pass number is 100.

4.6 If pass, remove the particle counter, close SV22, 23& 24 and double bag SD2A port.

4.7 If more purge required (per para.5.1) continue per para.5.2.

4.8 If par. 5.3 applies than continue to the next port.

4.9 Test the other lines, valve status per test line in the matrix below:

Test line	Open valves	Closed valves
SD2A	SV22, 23 &24	SV7 to 21
G1S	SV7,8 and 9	SV10 to 24
G2S	SV10,11 and 12	SV7,8,9 and13 to 24
G3S	SV13,14 and 15	SV7 to 12 and 16 to 24
G4S	SV16,17 and 18	SV7 to 15 and 19 to 24

P1A	SV19, 20 and 21	SV7 to 18 and 22 to 24

Table 1

Checked section	Counts of particle per scfm			Particle size	remarks
Spin-up SC1				2µ	
Spin-up SC2				2µ	
Spin-up SC3				2µ	
Spin-up SC4				2µ	
Spin-up P1A				2µ	
Spin-up bottle 1				5µ	
Spin-up bottle 2				5µ	
Ballast bottle 1				5µ	
Ballast bottle 2				5µ	
Ballast bottle 3				5µ	
Plumbing line S1				2µ	
Plumbing line S2				2µ	
Plumbing line S3				2µ	
Plumbing line S4				2µ	
Plumbing line P1A				2µ	
Plumbing line CC1				2µ	
Plumbing line CC2				2µ	
Plumbing line CC3				2µ	
Caging line G1C				2µ	
Caging line G2C				2µ	
Caging line G3C				2µ	

5. SPIN-UP MODULE PARTICLE CLEANING

5.1 If in any of the check point fail but the result is less than 200 particles size 2µ, or particles size 5µ are less than 5 then keep on purging with the same setting.

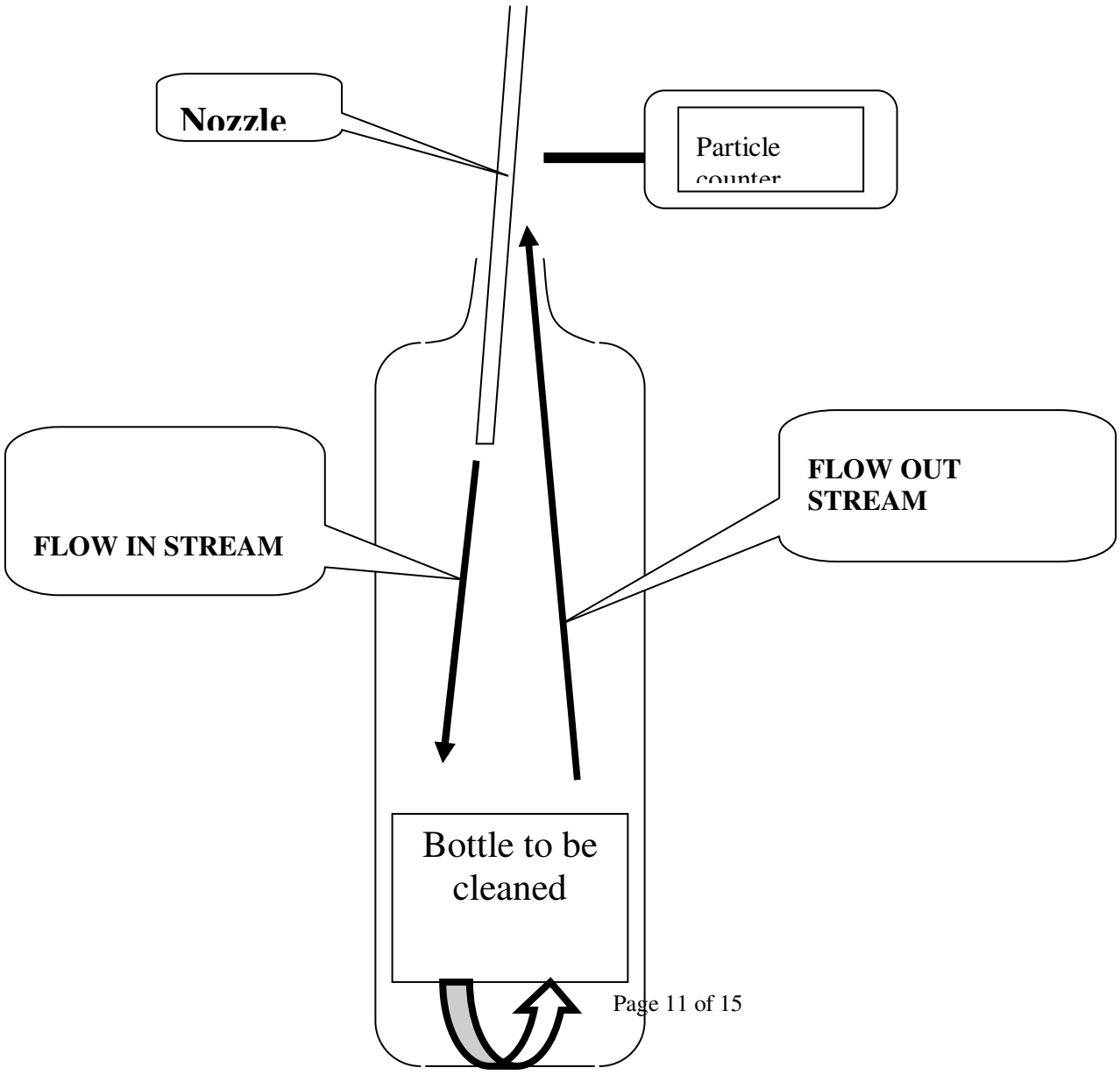
5.2 Purge for 30 minutes per line and repeat paragraph 4.5.

5.3 If in any of the check point the result is fail and there are more than 200 particles size 2µ, or particles size 5µ are more than 5 then more energetic cleaning operation should be perform.

5.4 Send the whole assembly to Lockheed for liquid (water, alcohol freon etc.) clean. In this case the regulator module should be cleaned also. The cleaning operation should be done after removing the components.

5.5 Use Lockheed cleaning procedure.

5.6 Double bag each end, use clean room adhesive tape.



6. **BOTTLES PARTICLE CLEANLINESS TEST**.(2+1 spin-up bottles and 3 cagingballast bottles).

6.1 Place the bottle in horizontal position and purge thoroughly with clean dry nitogen. The purged nitrogen will flow through a nozzle that will be inserted into the bottle (sketch 2).

6.2 Place the particle counter at the exit, control the nitrogen valve to receive an adequate flow.(2830 sccm=0.1scfm)

6.3 Pass criteria for the bottles: less than100 particles of 5µ is allowed.

6.4 Record particle cleanliness level in Table1. If pass, double bag the ports.

7. BOTTLES PARTICLE CLEANING.

7.1 If fail but the result is less than 200 particles size 5µ, or particles size 10µ are less than 5 then keep on purging with the same setting for 30 minutes.

7.2 Test again per para. 6.

7.3 If fail and there are more than 200 particles size 5µ, or particles size 10µ are more than 5 then more energetic cleaning operation should be perform.

7.4 Fill bottle with Isopropanol to about half of it's volume. Shake well for two minutes and drain. Repeat this operation three times. Purge again to dry the inside and check particle cleanliness again (paragraph 6).

7.5 When pass criteria achieved, double bag the end.

8. CAGING SECTION TEST.

8.1 Connect dry nitrogen bottle to CD2, while placing the particle counter at port G1C. Open valves CV4,3 and 3A.

8.2 Open nitrogen valve and start the particle cleanliness counting.

8.3 Pass criteria is less than 100 particles of size 2µ.

8.4 Record the results in table 1.

8.5 If pass, double bag G1C.

8.6 If fail continue to par. 9.

8.7 Close CV3 and CV3A, open CV1 and CV1A. Particle test ports G2C and record.

8.8 Close CV1 and open CV1A, particle cleanliness test port G2C.

8.9 Record and double bag.

8.10 CloseCV4,1 and 1A, and the nitrogen bottle valve. Disconnect the nitrogen bottle from CD2. Double bag CD2.

8.11 Connect nitrogen bottle to CD1, open Cv5, 2 and 2A. Test port G3C/G4C, and record.

8.12 Close all valves, disconnect nitrogen and verify that all open ports are bagged

9. CAGING SECTION CLEAN.

9.1 Clean the corresponding line per paragraph #5.

10. PLUMBING SECTION PARTICLE TEST.

10.1 Ballast bottles test according to paragraphs 6. Pass criteria: less than 100 particles 5µ size allowed

10.2 Plug the bottle ports on the plumbing lines.

10.3 Connect dry nitrogen to G1C, open LPM5.

10.4 Open slowly nitrogen valve and test particle cleanliness in port CG5 and record. If pass, double bag. If fail continue to par. 11.

10.5 Repeat last operation in CG6 port.

10.6 Connect dry nitrogen to G2C, open LPM3. Test ports CG3 and CG4 respectively. If pass, double bag. If fail continue to par. 11.

10.7 Connect dry nitrogen to G3C, open LPM1. Test ports CG1 and CG2 respectively. If pass, double bag. If fail continue to par. 11.

11. PLUMBING SECTION PARTICLE CLEANING.

11.1 Clean the corresponding line per paragraph #5.

12. GMA CLEANLINESS ACCEPTANCE TEST.

12.1 Use P0710 for ATP gas purity tests.

13. PROCEDURE COMPLETION

13.1 The results obtained in the performance of this procedure are acceptable:

Done by:

_____ date: _____
A. Halevy, GMA Engineer

_____ date: _____
Q.A representative

Discrepancies if any:

Approved: _____ date: _____
G. Asher GMA RE

Approved: _____ date: _____
D. Ross, QA Manager

14. DATA BASE ENTRY

The following data shall be entered into the GP-B Data base:

- Name, number and revision of this procedure
- Date of successful completion of procedure.
- Part numbers and serial numbers of Vatterfly valve and their components