SU/GP-B P0101 Rev ____

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

CAGING BELLOWS FORCE TEST

GP-B SCIENCE MISSION PROCEDURE

18 September, 1998

PREPARED _____
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PREPARED _____
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APPROVED _____
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APPROVED _____
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1 SCOPE

This document provides the procedure for testing the force produced by the Bellows, Caging, P/N 22810-101, when the bellows is compressed to its required travel for caging. This test is an acceptance test for the bellows, prior to its installation into the Caging Assembly. It assumes the bellows have been cleaned, magnetically screened, and released.

2 REFERENCES

Drawing 22810, Bellows, Caging
Drawing 23190, Caging Subassembly

3 GENERAL REQUIREMENTS

3.1 Environmental Requirements

This procedure will be conducted in the Stanford Class 1000 cleanroom, on a HEPA laminar flow bench.

3.1.1 Cleanliness

The Class 1000 clean room where this integration takes place shall be maintained at the cleanliness levels per GPB Contamination Control Plan P0059. Minimum protective garments for personnel working in the clean room shall be the standard Tyvek clean room apparel for room classes from 10,000 to 1000.

3.1.2 Particulate Contamination

All parts and tools shall be cleaned at least to the cleanliness levels of the rooms where they are used for assembly or testing. In addition, all flight parts shall be maintained at level 100 cleanliness per GP-B Contamination Control Plan (P0059). Take all necessary precautions to keep tools and handling equipment free of particulate contamination.

3.1.3 Magnetic Contamination

All parts and tools shall be cleaned using methods consistent with achieving Mil Spec Level 100 cleanliness. In addition, all parts shall be maintained at level 100 cleanliness per GP-B Magnetic Control Plan, P0057. Take all necessary precautions to keep tools and handling equipment free of particulate contamination. Tools to be sprayed with Freon from Pressure can (filtered to < 0.2 micron) prior to use, or when contaminated.

3.2 Personnel

John Stamets is the Caging REE and has overall responsibility for the implementation of this procedure. He shall sign off the completed procedure.

3.3 Safety

3.3.1 Hardware Safety

Special care must be taken not to drop, scratch, or overstress the flight hardware.

3.4 Quality Assurance

Integration shall be conducted on a formal basis to approved and released procedures. A Quality Assurance representative designated by B. Taller shall review any discrepancy noted during this procedure, and approve its disposition. Redlines shall be stamped by the QA rep. The QA representative will nominally be A. Nakashima. Upon completion of this procedure, the QA program engineer, B. Taller or P. Unterreiner, will certify his 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.

3.5 Red-line Authority

Authority to red-line (make minor changes during execution) this procedure is given solely to the REE. Approval by the Hardware Manager shall be required, if in the judgment of the REE or QA program engineer, experiment functionality may be affected.

4 REQUIRED EQUIPMENT

Flight Hardware
Bellows, Caging, P/N 22810-101

GSE
Intercomp VST 20 Spring Tester, Serial Number 900563, Calibrated 6/3/98.
Bronze non-flight Keepers, 2

5 BELLOWS FORCE TEST

- Position the Intercomp VST 20 on the Flow Bench so that the gauges are easily read.
- The Bellows should be in marked, cleanroom bags, in a container on the bench.
- Remove a Bellows from its bag, and rest it on a non-flight, bronze keeper in the center of the spring tester fixed platform. Place the other bronze keeper on the top of the belllows.
- Slowly lower the adjustable upper platform until it just touches the upper Keeper on the Bellows, such that the Force on the Spring Tester Force Gauge reads 0.1 +/- 0.05 lbs.
- Reset the Travel Counter of the Platform to Zero.
- Compress the Bellows by slowly lowering the adjustable platform until the Travel Counter reads 0.133 inch.

  The 0.133 inch travel is taken from Drawing 23190, which shows a relaxed length between the Retainer inside surface, and the Housing outer edge of 2.470 inch, and a compressed length of 2.337 inch.
- Read the Force on the Spring Tester Force Gauge. Record in Table below.

  The Bellows Spring Rate requirement per Drawing 22810 is 150 ± 25 lb/inch. This translates to a force requirement at 0.133 inch between 16.6 and 23.3 lb.
- Repeat for each bellows until all are completed.

BELLOWS Identification	FORCE AT 0.133 inch travel (lb)	PASS / FAIL (16.6 – 23.3 lb)

Table 1. Bellows Force at 0.133 inch Compression Length

6 PROCEDURE COMPLETION

The results obtained in the performance of this procedure are acceptable.

Responsible Engineer _____ Date _____

Integration or Hardware Manager: _____ Date _____

The information obtained under this assembly and test procedure is as represented and the documentation is complete and correct.

QA Representative _____ Date _____

QA Program Engineer_____ Date _____

7 DATA BASE ENTRY

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

1) Name, number and revision of this procedure

2) Date of successful completion of procedure.