SU/GP-B P0205(SM)

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

MOUNT PROBE ONTO PRECISION MANIPULATOR

GP-B SCIENCE MISSION PROCEDURE

22 October, 1998

PREPARED	A. Nakashima, Systems	Date
APPROVED	D. Bardas, Integration Manager	Date
APPROVED	J. Stamets, Integration Engineer	Date
APPROVED	J. Janicki, Safety Engineering	Date
APPROVED	B. Taller, Quality Assurance	Date

APPROVED	S. Buchman, Hardware Mgr. (acting)	Date

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1. SCOPE

This procedure describes the method used for mounting the Probe onto the Precision Manipulator (PM). It applies either when 1) the probe is already in position in front of the PM, or 2) when the probe is being brought in from the Class 1000 room with its vacuum shell off and the QBS is clean bagged. The latter occurs after temporary storage of the probe in the Class 1000 room once the vacuum shell has been removed.

These slightly different cases are accommodated in Section 5 of this procedure.

2. REFERENCES

2.1 Plans and Procedures

P0059	GPB Contamination Control Plan
P0057	Stanford Magnetic Control Plan
P0409	Prepare Probe For Class 10 Cleanroom
P0419	Operations Manual for the Precision Manipulator

3. GENERAL REQUIREMENTS

3.1 Environmental Requirements

3.1.1. Cleanliness

This procedure takes place in the Class 1000 and/or the Class 10 Cleanrooms in the HEPL building. Minimum protective garments for personnel working in the clean rooms shall be the standard Tyvek clean room apparel for the Class 1000 cleanroom and certified Class 10 cloth garments for wear during operations in the Class 10 clean room.

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.

When in the Class 10 room, to the maximum extent possible, personnel shall keep all parts of their bodies downstream of the Probe, relative to the HEPA wall.

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. Tools

used must be consistent with the items in the magnetic zones which they are used on which are in this case Zones 5 and SP.

3.2 Integration and Test Personnel

3.2.1 Integration and Test Director

The Integration and Test Director (ITD) is Dr. Doron Bardas or his deputy, Dr. Michael Taber have overall responsibility for the implementation of this procedure and shall sign off the completed procedure.

3.2.2 Personnel

The engineers performing this operation shall nominally be J. Stamets , C. Warren, Gideon Asher. The ITD shall determine which personnel are qualified to participate in this procedure.

3.3 Safety

3.3.1 General

Safety Engineering to be notified prior to the start of this procedure

All participating personnel shall ensure they are aware of the specific and hardware safety concerns indicated in the safety requirements, cautions and warnings in the procedure. Personnel working in the Class 10 Cleanroom must be cognizant of the base of the Precision Manipulator, and take special care to avoid tripping or bumping into it.

3.3.2. Maximum Number of People in Cleanroom

Under normal operating conditions, there shall be no more than 5 people in the Class 10 Cleanroom. This is to avoid violating legal make-up air requirements, and to provide an efficient workspace. Exceptions must be for short periods only, and approved by the ITD.

3.3.3 Hardware Safety

Extreme care must be taken to avoid accidentally bumping the Probe, damaging the connectors, or “cold end” items (in the case of mounting a probe with its vacuum shell off).

3.4 Quality Assurance

This procedure shall be conducted on a formal basis to approved and released procedures. The QA Program Engineer shall be notified of the start of this procedure. A Quality Assurance representative designated by B. Taller shall review any discrepancy noted during assembly or test. Redlines shall be approved by the QA representative. 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 his approval line at the end of the procedure.

3.5 Red-line Authority

Authority to red-line (make minor changes during execution) this procedure is given solely to the ITD or John Stamets. Approval by the Hardware Manager shall be required, if in the judgment of the ITD or QA Representative, experiment functionality may be affected. *For procedures in the cleanroom, "redlines" shall be accomplished using* ***RED BOLD ITALICS*** *and "signatures" in* ***BLACK BOLD ITALICS***.

4 REQUIRED EQUIPMENT

Flight Hardware

Hardware	Part Number
Probe-C Assembly, without sunshade	1C34115-102

Ground Support Equipment

Probe Gurney
Precision Manipulator (PM)

Tools and Miscellaneous

Various Allen and other Wrenches

5 MOUNT PROBE ONTO PRECISION MANIPULATOR

5.1 Move Gurney From Class 1000 Room to Class 10 Room

This part of the procedure (Section 5.1) only applies if this is NOT part of an initial probe entry into the Class 10 room (where procedure P0409 Section 7 applies).

5.1.1 Ensure that the wheels on the Gurney are cleanroom wheels.

5.1.2 Two people (min.) carefully roll the Gurney into Class 10 Room, Top Hat end first.

5.1.3 Position the Gurney such that the Yoke Ring Collar on the Probe is near the PM Interface Plate, with Top Hat facing the observation window.

5.1.4 If not proceeding with Section 5.2, immobilize the gurney by raising it on its jacks.

Completed:

Integration Engineer(s) Date:

Date:

Date:

Discrepancies if any:

Disposition./.sign-off: Date:
ITD

Concurrence: Date:
QA Designated Representative

5.2 Mount Probe onto Precision Manipulator

5.2.1 Ensure that the gurney is free to roll, i.e. retract the jacks. Remove the clamp half which secures the spool on top of the x-flange to the gurney.

5.2.2 Remove or loosen any other impediment to yoke rotation (around the Z* axis), and any other constraints to raising the probe (except for the steel rod which locks the yoke to the gurney). Make sure that there is no constraint to prevent the probe from sagging slightly under its own weight. Ensure that the lock between the yoke and probe is engaged to prevent the probe from being able to rotate within the yoke. Also ensure that the locks on the ring gear which controls probe tilt are securely locked.

5.2.3 Lower the plate on the Precision Manipulator so that it is aligned with the STA200 yoke interface block, and that the "support shelf" on the PM interface plate is comfortably below the yoke interface block. Use the PM in accordance with P0419.

5.2.3 Translate the probe towards the PM interface plate until it touches and is centered on the PM interface plate.

5.2.4 Raise the PM interface plate slowly, aligning the bolt patterns on it with those of the STA200 yoke interface block, until the "support shelf" is in contact with the block. If necessary, rotate the block (using the big gear crank) so that contact is uniform across the "support shelf".

5.2.5 While watching that the yoke interface block does not loose contact with the PM interface plate, slowly raise the latter until the top two 1/2-13 bolts can be installed into the yoke interface block. During this process, watch that the yoke hole, which engages the locking rod, has not moved so far that the gurney could rotate. Engage the bolts finger tight as far as they can be installed

5.2.6 Continue to raise the PM interface plate while further engaging the top bolts. Similarly, engage the lower two bolts as soon as that is possible. During this process, watch that the yoke hole, which engages the locking rod, has not moved so far that the gurney could rotate. Engage the bolts finger tight as far as they can be installed.

5.2.7 When the back of the yoke interface plate is parallel to the PM interface plate, tighten all four bolts as tight as possible by hand using an Allen wrench or a 3/8 inch drive ratchet wrench.

5.2.8 If the yoke locking pin is now removable, remove it. If not, carefully raise the probe slightly while watching the locking pin until it can be removed. Do not allow the yoke to rise high enough before the pin is removed, that it could begin to lift the gurney.

5.2.9 Raise the probe up to comfortably clear the gurney (at least 1 ft).

5.2.10 Roll the gurney out of the Class 10 cleanroom. Store in the Class 1000 cleanroom.

Completed: (Section 5.2)

Integration Engineer(s) Date:

Date:

Date:

Discrepancies if any:

Disposition./.sign-off: Date:
ITD

Concurrence: Date:
QA Designated Representative

5.3 Remove Spool on Probe

5.3.1 Raise the probe and begin to tilt (unlock the brakes slightly on the tilt gear) the probe vac shell towards the floor. This is an iterative process in order to accomplish a 180 degree tilt rotation so that the probe vac can is pointing towards the observation window.

Take great care that the vac shell is never closer than six inches to the floor

5.3.2 Lower the probe to a comfortable working height , and approximately parallel to the floor.

5.3.3 Remove the Spool from the Probe by removing the eight 10-32 stainless steel bolts which hold the Spool onto the Window 4 blank-off plate. One person supports the spool, while another loosens the bolts.

5.3.4 Store the Spool in the Class 10 cleanroom for future use.

Completed:

Integration Engineer(s) Date:

Date:

Date:

Discrepancies if any:

Disposition./.sign-off: Date:
ITD

Concurrence: Date:
QA Designated Representative

6. PROCEDURE COMPLETION

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

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

ITD: Date:

QA Representative: Date:

QA Program Engineering: Date:

7. DATA BASE ENTRY

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

Name, number and revision of this procedure

Take a picture (if digital, imbed in this document)