SU/GP-B P0394

STANFORD UNIVERSITY
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GRAVITY PROBE B, RELATIVITY GYROSCOPE EXPERIMENT
STANFORD, CALIFORNIA 94305-4085

TRANSFER THE QUARTZ BLOCK/TELESCOPE ASSEMBLY FROM THE X-Y CART TO THE ROLLER MECHANISM CART

GP-B SCIENCE MISSION PROCEDURE

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APPROVED _____
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1. SCOPE

This document provides the procedure for transferring the Science Mission Quartz Block/Telescope Assembly, P/N 23521, from the X-Y Quartz Block Precision Manipulator Cart (abbreviated to X-Y Cart) to the Roller Mechanism (RM) in the Roller Mechanism Cart. This procedure assumes that the Quartz Block and Telescope, have been bonded together and cured, in accordance with P0200 (SM).

1.1 Acronyms

The following acronyms are used in this document

QB	Quartz Block
RM	Quartz Block Roller Mechanism
RM Cart	Roller Mechanism Cart
X-Y Cart	X-Y Quartz Block Precision Manipulator Cart
SIA	Science Instrument Assembly
QB/T	QB and Telescope Assembly, bonded together
QB/T/RM	Quartz Block/Telescope Assembly in Roller Mechanism

2. APPLICABLE DOCUMENTS

2.1 Plans and Procedures

P0059	GPB Contamination Control Plan
P0057	Stanford Magnetic Control Plan
P0200 (SM)	Bonding the Telescope to the Quartz Block

3. GENERAL REQUIREMENTS

3.1 Environmental Requirements

This procedure will be conducted in the Stanford Class 10 Cleanroom in the HEPL facility.

3.1.1. Cleanliness

The Class 10 clean room where this integration takes place shall be maintained at the cleanliness levels per GPB Contamination Control Plan P0059. Certified Class 10 cloth garments shall be worn 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.

To the maximum extent possible, personnel shall keep parts of their bodies downstream of the QB/T, relative to the HEPA wall.

3.1.3. Magnetic Contamination

All parts and tools shall be screened per Procedure P0057. Tools to be sprayed with Freon from pressure can (filtered to < 0.2 micron) prior to use, or when contaminated.

3.1.4. Electrostatic Discharge Control

The particle ionizer should always be upstream of the QB/T relative to the fan wall, to prevent electrostatic charge buildup on the QB/T.

3.2 Integration and Test Personnel

3.2.1 Integration and Test Director

The Integration and Test Director (ITD) shall be Dr. Doron Bardas. He has overall responsibility for the implementation of this procedure and shall sign off the completed procedure.

3.2.2 Personnel

All engineers and technicians participating in this procedure shall work under the direction of the ITD who shall determine whether the person is qualified to participate in this procedure. Personnel participating in this procedure, as determined by the ITD are normallyselected from J. Efraín Alcorta, and J. Stamets,J. Gwo, K. Bower.

3.3 Safety

3.3.1 General

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.

Safety Engineering to be notified prior to any major movement of the Quartz Block or Telescope. (i.e., any movement other than rotations or minor adjustments)

3.3.2 Hardware Safety

Extreme care must be taken to avoid accidentally bumping or scratching the SIA. Extreme care must be taken to avoid touching the polished surfaces of the SIA.

3.3.3 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 be approved by the test director.

3.4 Quality Assurance

Transfer 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 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 his

3.5 Red-line Authority

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

4. REQUIRED EQUIPMENT

Flight Prototype Hardware

Hardware	Part Number
Quartz Block /Telescope Assembly	23521

Ground Support Equipment

QB Roller Mechanism
Roller Mechanism Cart
X-Y Cart (QB Precision Manipulator Cart)
Silver Plated Bolts for clamping halves of Roller Mechanism

Tools and Miscellaneous

Allen wrenches, various

5. TRANSFER THE QB/T FROM X-Y CART TO RM CART

5.1 Initial Positioning

Record Start Date and Time _____

Notify Safety prior to starting Section 5.

5.1.1 Clear the work area such that the room layout is approximately as shown in Figure 1.

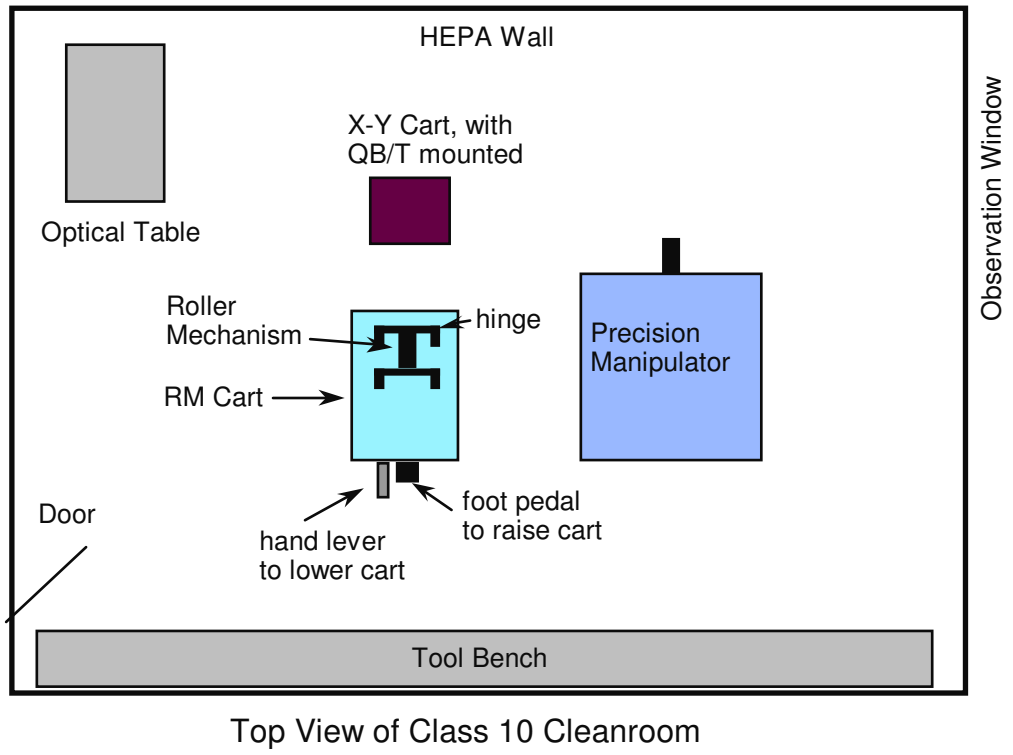

Figure 1. Class 10 Room Layout at Start of Procedure (not to scale)

The QB/T is in the X-Y Cart, as shown in Figure 2. below

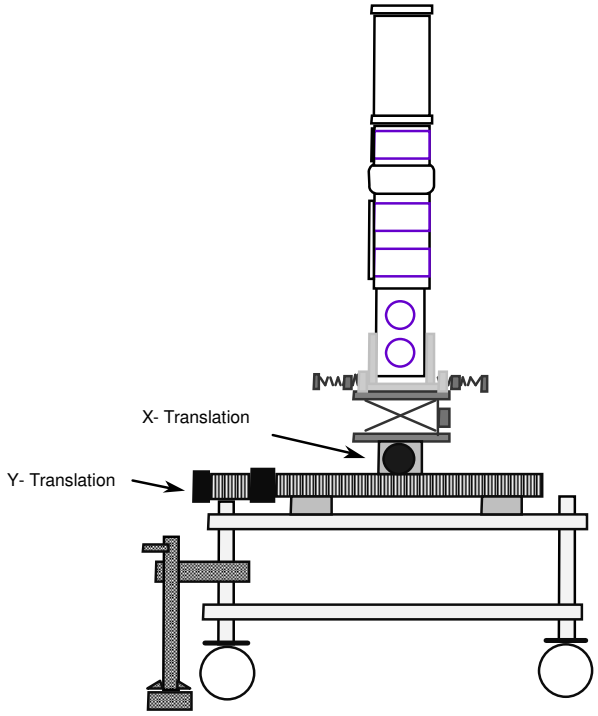

Figure 2. QB / T Assembly in X-Y Cart

5.1.2 Slowly move the QB/T in X-Y cart to the vicinity of the Roller Mechanism Cart by loosening the rubber stops on the stabilizer legs of the X-Y Cart. Position the X-Y Cart such that the QB/T Unit faces the Roller Mechanism Cart, then stabilize by tightening the rubber stops.

CAUTION: Extreme Care must be taken not to touch or jar the QB/T

5.1.3 Raise or lower the RM cart platform with the foot pedal to a height of approximately 2 ft. Remove the upper semicircular halves of each roller, and lay them on the cart.

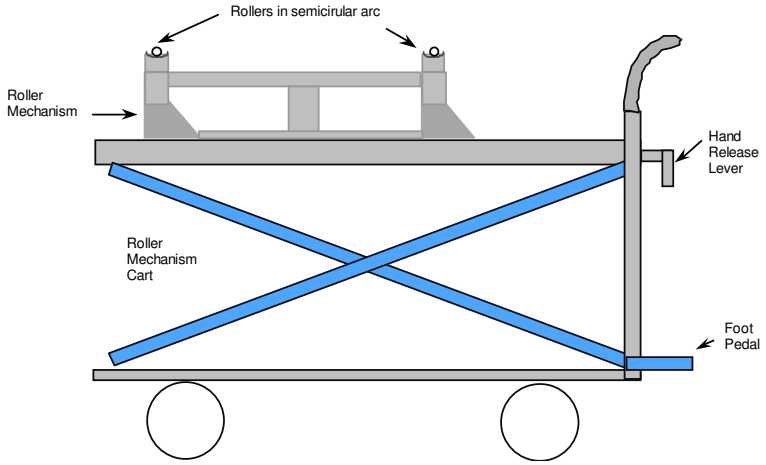

Figure 3. Sketch of Roller Mechanism in RM Cart - not to scale

5.2 Transfer QB/T to Roller Mechanism

5.2.1 Rotate the RM about its hinge on the cart so that the RM base is vertical. Lock the RM in place with the platform bar lock.

5.2.2 Roll the RM cart toward the QB/T, carefully watching the spacing between them. **Do not bring the QB roller surfaces closer than 2 inchs to their respective RM rollers.** Position the RM in height with the foot pedal so that the two rollers are opposite the surfaces on which they must travel on the QB. The upper roller aligns with the neck on the telescope side of the QB flange, while the lower roller aligns with the round disk at the aft end of the QB. Lock the RM Cart in place being careful not to jar the QB.

5.2.3 Slide the X-Y cart over to the RM until the QB/T is nearly touching the RM at the proper locations.

5.2.4 Move the QB/T into the halves of the two rollers by gently translating the X-Y cart and ensuring that the QB support post does not interefere with the RM frame.

5.2.5 Back off the two side plates which clamp the QB until the block is slightly loose but still secure. Keep gloved hands in position around the QB at all times.

5.2.6 Install the second half of the upper roller over the QB rolling surface near the telescope flange. Tighten bolts securely.

CAUTION: Avoid touching the QB/T unless necessary.
DO NOT touch the aperture or polished surfaces of the QB/T.

5.2.7 Install the top half of the small roller over the QB and tighten securely.

5.2.8 Carefully remove the two side plates on the X-Y cart which clamp the bottom of the QB by loosening the Hex bolts which hold the side plates, being careful not to let the side plates drop. Slide out the plates when the bolts are sufficiently loosened.

5.2.9 Lower the X-Y stand until the QB support post is below the RM mechanism; then carefully move the X-Y cart clear of the QB/T.

CAUTION: Ensure that the QB/T is secure in the RM, by checking that the upper semicircular halves of the two rollers are securely bolted together.

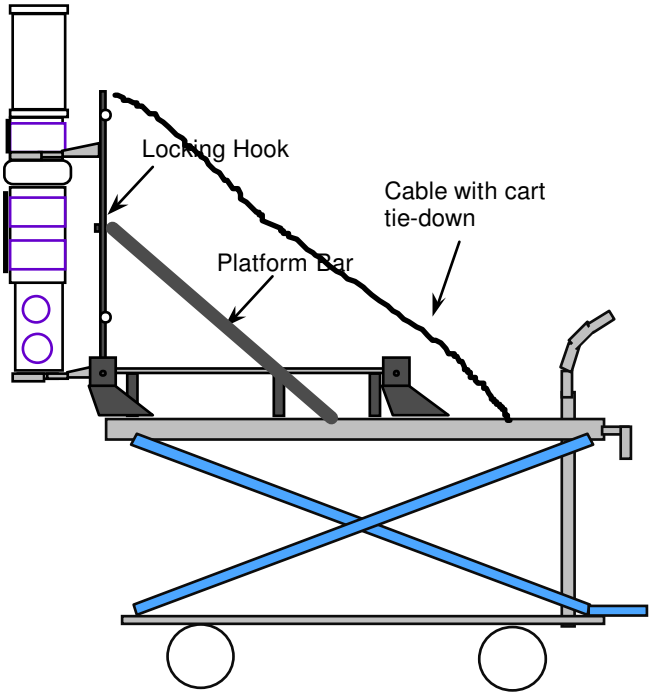

Figure 4. Side View of RM Cart with QB/T/RM Vertical (not to scale)

5.3 Lower QB/T/RM to Horizontal

5.3.1 With a person on each side securely supporting the QB/T/RM, a third person disengages the platform bar from the locking hook on the RM.

5.3.2 The two people on each side of the RM, slowly lowers the QB/T/RM onto the RM Cart. Lock the hinges on the front of the RM.

5.3.3 Lock the wheels of the RM Cart.

5.3.4 Check the following on the RM and RM cart:

- Hinges on front of RM are locked
- Restraining cable ends are firmly attached to RM and cart
- Adjustment lever is attached to cart

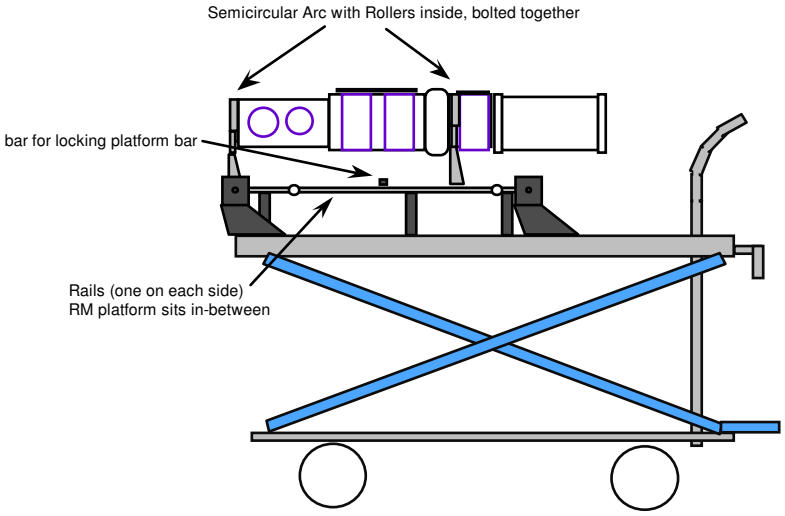

Figure 5. Side View of RM Cart with QB in RM (not to scale)

6. PROCEDURE COMPLETION

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

Integration Engineer _____Date _____

Integration and Test Director: _____Date _____

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

QA Representative _____Date _____

QA 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.

3) Part numbers and serial numbers of QB and Telescope.