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

REPAIR OF QUARTZ BLOCK #3

P0461 Rev -

GP-B SCIENCE MISSION PROCEDURE

20 February, 1999

PREPARED _____ _____
B. Muhlfelder, RE for QB Repair date

APPROVED _____ _____
K. Bower, Test Director date

APPROVED _____ _____
J. Hayden, Repair Engineer date

APPROVED _____ _____
L. Huff, Telescope Engineer date

APPROVED _____ _____
Ben Taller, QA & Safety date

APPROVED _____ _____
S. Buchman, Hwr. Mgr date

TABLE OF CONTENTS

1. SCOPE

This document provides the procedure for repairing the damage to QB #3 (see DR 227) and the related operation to modify the clocking marks for the telescope and QB.

2. APPLICABLE DOCUMENTS

2.1 Plans and Procedures

See DR 227 for information on the QB damage.

3. GENERAL REQUIREMENTS

3.1 Environmental Requirements

The reclocking of the scribe marks shall be done in the class 10 cleanroom.
The lapping operations will be conducted in the general purpose exhausting bench in HEPL 132.

3.1.1. Magnetic Contamination

A quartz coupon lapped with the compounds used in this procedure shall be screened per Procedure P0057. Tools and fixtures shall be cleaned prior to use.

3.1.2 Cleanliness Requirements

Latex cleanroom gloves shall be used by personnel when handling the QB.

3.2 Integration Personnel

3.2.1 Integration and Test Director

The Test Director shall be Ken Bower. He has overall responsibility for the implementation of this procedure and shall sign off the completed procedure.

3.2.2 Authorized Personnel

Lynn Huff
Ken Bower
Barry Muhlfelder
Joe Hayden
Michael Bukshpun
Dale Gill
Paul Bayer
Chris Gray

Doron Bardas

3.3 Safety

3.3.1 General

HF acid is used in this procedure. This acid is a very dangerous. Use appropriate protective equipment and do not allow exposure of personnel to HF fumes.

Safety Engineering has requested notification prior to beginning this procedure.

3.3.2 Hardware Safety

Extreme care must be taken to avoid accidentally bumping or scratching the QB.

Extreme care must be taken to avoid damage to the polished surfaces of the QB. All polished surfaces must be protected with tape to prevent damage from the chemicals used in this procedure.

3.4. Quality Assurance

All work carried out on the QB shall be conducted on a formal basis to an approved and released version of this procedure. A Quality Assurance representative shall review and document any discrepancy noted during the carrying out of this procedure, and approve its disposition. Upon completion of this procedure, the QA representative will certify his/her concurrence that the effort was performed and accomplished in accordance with the prescribed instructions by signing and dating his/her approval line at the end of the procedure.

3.5. Red-line Authority

B. Muhlfelder
K. Bower

3.6. Prerequisites

A dry run of this procedure as specified in Section 5 of this document has been performed using QB #4 (non-flight QB). This dry run minimizes risk to the Quartz block #3.

_____ _____

Ken Bower date complete
(test manager)

4. REQUIRED EQUIPMENT

Flight Hardware

Hardware	Part Number
Quartz Block #3	22770-101

Ground Support Equipment

Green tape (3M)
Rotory tool, speed limited with bits (both brass and phenolic)
Lapping compounds
QB #4
QB plastic fixture
QB roller cart
Exhausting bench in HEPL 132
Inspection glass (3X)
HF etch solution (24 %)
swabs (Polyester)
wooden applicator stick
methanol, low acetone grade (1 ppm) for final cleaning
DI water
Micro sol'n (10%)
Texwipes

5. THE DETAILED PROCEDURE

Record Start Date and Time _____

Notify Safety, ONR, QA and RE prior to starting Section 5.1

Safety: J. Janicki, john.e.janicki@lmco.com, phone 424-2235 *done__ K. B.*

QA: B. Taller, benny@relgyro, 317-2672 *done__ K.B.*

RE: B. Muhlfelder, barry@relgyro, (510) 886-6824 *done__ K.B.*

ONR: E. Ingraham, ingraham@relgyro, 218-3399 *done__ K.B.*

5.0 Modify clocking on QB and telescope using fixed offsets on both the telescope and QB. Marks will be temporary.

5.1 Place the QB plastic fixture on the exhausting clean bench in HEPL 132.

5.2 Roll the QB cart into the HEPL 132. This is accomplished with one person at each end of the cart and a third person (other than QA) to open doors and watch for unexpected problems. The cart is moved adjacent to the exhausting clean bench.

5.3 Apply green tape to the polished surfaces of the QB.

5.4 Remove the clamps which hold the QB to the cart. One person at each end of the block cradles the QB. The QB is transfered onto the QB plastic fixture. A third person monitors the transfer process. The quartz block is rotated on the fixture as needed to allow easy access to one of the damaged areas of the QB. Reference the inspection report for damage locations.

5.5 Secure plastic fixture.

5.6 The lapping compound is applied to the QB at the location of damaged quartz. A lap is used to work the compound into the QB. This lapping process is interrupted as needed to clean the work area on the QB, to apply additional lapping compound, to apply HF acid, and then to remove this acid with a swab. This process is repeated until all of the damage is removed.

5.7 An inspection glass is used as needed to verify that all of the damage has been removed from the first location. Signing here certifies that all damage has been removed from this first location on the QB

_____ _____
test director date

_____ _____
test engineer date

5.8 The QB is rotated as needed to provide access to the second area of damaged quartz. The lapping and etching process as described in the two previous steps is repeated. Signing here certifies that all cracks have been removed from this second location on the QB

_____ _____
test director date

_____ _____

test engineer date

5.9 The QB is rotated to the third area of damaged quartz. The area is lapped, etched and inspected as described above. Signing here certifies that all cracks have been removed from this third location on the QB

_____ _____
test director date

_____ _____
test engineer date

5.10 The QB is rotated to the fourth area of damaged quartz. The area is lapped, etched, and inspected as described above. Signing here certifies that all cracks have been removed from this fourth location on the QB

_____ _____
test director date

_____ _____
test engineer date

5.11 The QB is rotated to the fifth area of damaged quartz. The area is etched with HF and rinsed with microdetergent and methanol. Signing here certifies that all cracks have been relieved by etching from this fifth location on the QB

_____ _____
test director date

_____ _____
test engineer date

5.12 WITH A PERSON CRADLING EACH END OF THE QUARTZ BLOCK, TRANSFER THE QB IS TO ITS SHIPPING CONTAINER, AND COVER WITH PLASTIC. CLOSE SHIPPING CONTAINER.

6. PROCEDURE COMPLETION

Test Manager _____ Date _____

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

Quality Assurance _____ Date _____