GRAVITY PROBE B

PROCEDURE FOR

PAYLOAD VERIFICATION

(PTP) TRE Temperature Stability Test Procedure

November 15, 1999

Prepared by: *Bob Farley*

Approvals:

Program Responsibility	Signature	Date
Paul Ehrensberger TRE Test Leader		
Bob Farley TRE REE		
M. Taber Payload Test Director		
GP-B System Engineering		
D. Ross GP-B Quality Assurance		
S. Buchman GP-B Hardware Manager		

NOTES:
  Level of QA required during performance of this procedure:
  __4__ Stanford QA Representative

All redlines must be approved by QA

Revision Record:

Rev	Rev Date	ECO #	Summary Description

Acronyms and Abbreviations:

Acronym / Abbreviation	Meaning
GSE	Ground Support Equipment
TRE	Telescope Readout Electronics
AS3	Artificial Star #3

Notify ONR 24 hours prior to beginning testing.

Person Contacted: _____ Date and Time: _____

Table of Contents

1. Scope

This procedure reconnects the TRE to the ground support equipment, verifies initial operation, and then collects data for several periods while monitoring the platform temperature to examine thermal stability without active control.

2. Configuration Requirements

2.1 Probe is installed in the dewar. Probe pressure <1E-5 torr. TRE mounted on dewar, with cables connected to tophat and GSE test support rack.

2.2 Artificial Star #3 is not mounted atop probe. An opaque cover is in place on probe aperture to preclude light from entering the telescope.

3. Hardware Required

3.1 Commercial test equipment

Manufacturer	Model	Serial Number	Calibr. Exp. Date

3.2 Mechanical/Electrical Special test equipment

Description	Part No.	Rev. no.	Serial No.	Certification Date
TRE Ground Support Equipment Rack	na		Unit #1	5/26/99

3.3 Tools

Description	No. Req'd

4. Software Required

4.1 Test Support Software

Test Software Name	Version No.	QA Verification
SQD362.exe, (supports two TREs.)	V3.62	

5. Procedures Required

Procedure Name	Procedure No.

6. Equipment Pretest Requirements
None.

7. Personnel Requirements

7.1 This test to be conducted only by certified personnel. Among those are Howard Demroff, Paul Ehrensberger, John Goebel, and Bob Farley.

8. Quality Assurance

8.1 Testing 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 and shall review any discrepancies noted and approve their disposition. Upon completion of this procedure, the QA Program Engineer, D. Ross or her designate, nominally R. Leese, 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. Discrepancies will be recorded in a D-log or as a DR per Quality Plan P0108.

9. Red-line Authority

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

10. Safety Requirements

10.1 Connection and disconnection shall be performed only when the equipment involved is in a powered-down state.

10.2 Connector savers are to be used on the TRE and tophat connectors.

> **Note: The mating and demating of all flight connectors must be recorded in a log. This procedure does not require removal or replacement of connector savers onto the flight connectors--they should already be in place.**

10.3 Connectors shall be inspected for contamination and for bent, damaged, or recessed pins prior to mating.

10.4 Grounded wrist straps are to be worn prior to removal of connector caps or covers and during mating/demating operations.

10.5 ESD-protective caps or covers are to be immediately installed after demating of connectors.

11. References and Applicable Documents

12. Operations

12.1 Verify that the probe aperture opaque cover is in place.

QA Witness: _____ Date: _____

12.2 Connect and verify that LMMS 8A01948GSE-101 cables are installed between the TRE units and the TRE GSE Test Rack. Cables are to be connected as indicated in the table below. The Test Rack cables are labeled A-Side and B-Side at each end to simplify the tracing. Connectors attach at receptacles as numbered. Tighten the D-shell support screws finger tight only.

12.3 Verify that Cable 8A01288-101 connects TRE-A to Tophat connector I9.

12.4 Verify that Cable 8A01287-101 connects TRE-B to Tophat connector I8.

TRE Assembly **8A00918-101**	GSE Rack Connection A or B	Tophat Connector	Initial and Date	QA Verification
TRE S/N001	Side A	I 9		
TRE S/N002	Side B	I 8		

QA Witness: _____ Date: _____

12.5 Power the GSE Test Rack and boot the computer. Change to directory SQD362 and run program named SQD362.exe. Select MON A in the main menu, and step through the four selections in the Global menu to enable both A and B commands.

12.6 Do not power either TRE until instructed to do so, later.

12.7 Navigate to the Main Menu and select MON B.

12.7.1 Select the X-Axis Controls Menu.

12.7.2 Set the Control Registers as follows:

	Control	DTemp	Heat	Clamp	Bias	Offsets
X-Axis, B-side	0080h	0824h	0006h	9FAAh	AA00h	6589h

12.7.3 Select the Y-Axis Controls Menu.

12.7.4 Set the Control Registers as follows:

	Control	DTemp	Heat	Clamp	Bias	Offsets
Y-Axis, B-side	0080h	0824h	0006h	B7BDh	AA00h	7196h

12.7.5 Power on the B Side TRE using the switch on the B side power supply. Record the time to the nearest minute. _____

QA Witness: _____ Date: _____

12.7.6 Check the B-Side housekeeping display for both X and Y axes. Power supply voltages and Reference voltages should be within 5% of nominal values.

QA Witness: _____ Date: _____

The Heater voltages should increase to cause the platforms to reach temperatures of about 84 K. Proceed with the A-Side setup while the platforms are warming.

12.8 Navigate to the Main Menu and select MON A

12.8.1 Select the X-Axis Controls Menu.

12.8.2 Set the Control Registers as follows:

	Control	DTemp	Heat	Clamp	Bias	Offsets
X-Axis, A-side	0080h	0824h	0006h	A8B0h	AA00h	7B87h

12.8.3 Select the Y-Axis Controls Menu.

12.8.4 Set the Control Registers as follows:

	Control	DTemp	Heat	Clamp	Bias	Offsets
Y-Axis, A-side	0080h	0824h	0006h	A9B1h	AA00h	7E65h

12.8.5 Power on the A Side TRE using the switch on the A side power supply. Record the time to the nearest minute. _____

QA Witness: _____ Date: _____

12.8.6 Check the A-Side housekeeping display for both X and Y axes. Power supply voltages and Reference voltages should be within 5% of nominal values.

QA Witness: _____ Date: _____

12.8.7 The Heater voltages should increase to cause the platforms to reach temperatures of about 84 K.

12.9 Navigate to the Main Menu and select MON B.

12.9.1 Select the X-Axis Controls Menu.

12.9.2 In the following table, record the Platform temperature, the Heater voltage, and the Servo error voltage as displayed on the screen:

12.9.3 Switch to the Y-Axis and record the same values.

B-Side	X-Axis	Y-Axis
Platform Temp	K	K
Heater Voltage	V.	V.
Servo Error Voltage	V.	V.

Date and Time: _____

QA Witness: _____

12.9.4 If the Servo Error Voltages are within 0.25 volts of zero, change the B-side Control words for both the X-Axis and Y-Axis to 1080h. (This sends power to the MOSFETs).

Date and Time: _____

12.10 Navigate to the Main Menu and select MON A.

12.10.1 Select the X-Axis Controls Menu.

12.10.2 Record the Platform temperature, the Heater voltage, and the Servo error voltage as displayed on the screen:

12.10.3 Switch to the Y-Axis and record the same values.

A-Side	X-Axis	Y-Axis
Platform Temp	K	K
Heater Voltage	V.	V.
Servo Error Voltage	V.	V.

Date and Time: _____
QA Witness: _____

12.10.4 If the Servo Error Voltages are within 0.25 volts of zero, change the A-side Control words for both the X-Axis and Y-Axis to 1080h. (This sends power to the MOSFETs).

Date and Time: _____

12.11 Navigate to the Main Menu and select MON B.

12.11.1 Wait until at least ten minutes have passed since turning on the B-side MOSFETs in section 12.9.4.

12.11.2 Select the X-Axis Controls Menu.

12.11.3 Record the Heater voltage for the X Axis: _____V. If it is slowly varying, record the approximate midpoint of its range.

12.11.4 Set the Control word for the B-side X-Axis to 1000h.

12.11.5 Set the B-side X-axis Heat Control word to a value that results in a displayed heater voltage close to that recorded in step 12.11.3. Record the HEAT hexadecimal command value_____h.

12.11.6 Select the Y-Axis Controls Menu.

12.11.7 Record the Heater voltage for the Y Axis: _____V. If it is slowly varying, record the approximate midpoint of its range.

12.11.8 Set the Control word for the B-side Y-Axis to 1000h.

12.11.9 Set the B-side Y-axis Heat Control word to a value that results in a displayed heater voltage close to that recorded in step 12.11.7. Record the HEAT hexadecimal command value_____h.

12.12 Navigate to the Main Menu and select MON A.

12.12.1 Wait until at least ten minutes have passed since turning on the A-side MOSFETs in section 12.10.4.

12.12.2 Select the X-Axis Controls Menu.

12.12.3 Record the Heater voltage for the X Axis: _____V. If it is slowly varying, record the approximate midpoint of its range.

12.12.4 Set the Control word for the A-side X-Axis to 1000h.

12.12.5 Set the A-side X-axis Heat Control word to a value that results in a displayed heater voltage close to that recorded in step 12.12.3. Record the HEAT hexadecimal command value_____h.

12.12.6 Select the Y-Axis Controls Menu.

12.12.7 Record the Heater voltage for the Y Axis: _____V. If it is slowly varying, record the approximate midpoint of its range.

12.12.8 Set the Control word for the A-side Y-Axis to 1000h.

12.12.9 Set the A-side Y-axis Heat Control word to a value that results in a displayed heater voltage close to that recorded in step 12.12.7. Record the HEAT hexadecimal command value_____h.

12.13 Navigate to the Main Menu, then to the Disk Menu.

12.13.1 Set the recording options to record 30 second files Continuously.

12.14 Navigate to the Main Menu and select MON B.

12.14.1 Select the X-Axis Controls Menu.

12.14.2 Check the + Reference TIA current and the + Signal TIA current are within 0.02 μA of each other and that the +X High is positive and less than 8 volts.
                    _____Good, or _____Not Good

12.14.3 Check the - Reference TIA current and the - Signal TIA current are within 0.02 μA of each other and that the -X High is positive and less than 8 volts.
                    _____Good, or _____Not Good

12.14.4 If either of the two previous steps indicate a Not Good condition, perform the Generic balancing procedure for the B-side X-Axis.

                    QA Witness: _____ Date: _____

12.14.5 **Generic Balancing Procedure**

12.14.5.1 Set the CONTROL word to 1500h.

12.14.5.2 Set the BIAS word to 0000h.

12.14.5.3 Set the CLAMP word to 0000h.

12.14.5.4 Set the OFFSET to FFFFh.

12.14.5.5 Observe the value of XPSIG, YPSIG, XNSIG, or YNSIG as appropriate to monitor the progress. It is desired to find the smallest value of the OFFSET bytes that allow the xxSIG voltage to remain greater than zero.

12.14.5.6 Optionally, monitor the corresponding signal outputs (+ and -) with the oscilloscope, Sensitivity 5V per division.

12.14.5.7   Hold the SHIFT key down and depress F1 repeatedly until one of the ?PSIG values or waveforms becomes negative. Release the SHIFT key.

12.14.5.8   Hold the left Ctrl key and depress F1 once, or until the ?PSIG value or waveform is greater than zero volts. Release the Ctrl key.

12.14.5.9   Hold the SHIFT key down and depress F2 repeatedly until the ?PSIG value or waveform becomes negative. Release the SHIFT key.

12.14.5.10   Hold the left Ctrl key and depress F2 once, or until the ?PSIG value or waveform is greater than zero volts. Release the Ctrl key.

12.14.5.11   Hold the SHIFT key down and depress F3 repeatedly until the ?NSIG value or the other waveform becomes negative. Release the SHIFT key.

12.14.5.12   Hold the left Ctrl key and depress F3 once, or until the ?NSIG value or the waveform is greater than zero volts. Release the Ctrl key.

12.14.5.13   Hold the SHIFT key down and depress F4 repeatedly until the ?NSIG value or the waveform becomes negative. Release the SHIFT key.

12.14.5.14   Hold the left Ctrl key and depress F4 once, or until the ?NSIG value or the waveform is greater than zero volts. Release the Ctrl key.

12.14.5.15   Set the CLAMP voltages as follows.   . The adjustment criteria is to achieve a value of X high+, X high-, Y high+, or Y high- that is not railed at +10.00 volts. The desired setting for these monitors is between zero and eight volts positive.

12.14.5.16   Set the CONTROL word to 1000h.

12.14.5.17   Select the CLAMP command. Hold the left Shift key and depress the F1 key repeatedly until the ? high+ monitor or one of the waveforms becomes negative. Release the Shift key.

12.14.5.18   Hold the Ctrl key and depress the F2 key once or until the ? high+ monitor or the level at the start of the waveform is within the desired range. Release the Ctrl key.

12.14.5.19   Hold the left Shift key and depress F2 until the ? high+ monitor is within the desired range or the start of the waveform is between zero and four volts on the oscilloscope display. Back up by using the Ctrl and F2 combination.

12.14.5.20   Repeat for the other signal output, using F3 and F4 in combination with the left Shift or Ctrl keys and observing the ?SIG - value.

12.14.6 Select the Y-Axis Controls Menu.

12.14.7 Check the + Reference TIA current and the + Signal TIA current are within 0.02 µA of each other and that the +Y High is positive and less than 8 volts.

_____Good, or _____Not Good

12.14.8 Check the - Reference TIA current and the - Signal TIA current are within 0.02 µA of each other and that the -Y High is positive and less than 8 volts.

_____Good, or _____Not Good

12.14.9 If either of the two previous steps indicate a Not Good condition, perform the generic balancing procedure from sub-sections following 12.14.5 for the B-side Y-Axis.

QA Witness: _____ Date: _____

12.14.10 Navigate to the Disk Menu and Enable Recording. Record the

File Name: _____ and Start Time: _____

12.14.11 Wait 30 minutes, then Disable the Disk Recording. Record the

Stop Time: _____   **B-Side Record #1**.

12.15 Navigate to the Main Menu and select MON A.

12.15.1 Check the + Reference TIA current and the + Signal TIA current are within 0.02 µA of each other and that the +X High is positive and less than 8 volts.
_____Good, or _____Not Good

12.15.2 Check the - Reference TIA current and the - Signal TIA current are within 0.02 µA of each other and that the -X High is positive and less than 8 volts.
_____Good, or _____Not Good

12.15.3 If either of the two previous steps indicate a Not Good condition, perform the generic balancing procedure from sub-sections following 12.14.5 for the A-side X-Axis.

12.15.4 Select the Y-Axis Controls Menu.

12.15.5 Check the + Reference TIA current and the + Signal TIA current are within 0.02 µA of each other and that the +Y High is positive and less than 8 volts.
_____Good, or _____Not Good

12.15.6 Check the - Reference TIA current and the - Signal TIA current are within 0.02 µA of each other and that the -Y High is positive and less than 8 volts.
_____Good, or _____Not Good

12.15.7 If either of the two previous steps indicate a Not Good condition, perform the generic balancing procedure from sub-sections following 12.14.5 for the A-side Y-Axis.

QA Witness: _____ Date: _____

12.15.8 Navigate to the Disk Menu and Enable Recording. Record the

File Name: _____ and Start Time: _____

12.15.9 Wait 30 minutes, then Disable the Disk Recording. Record the

Stop Time: _____   **A-Side Record #1**.

12.16 Navigate to the Main Menu and select MON B.

12.16.1 Navigate to the Disk Menu and Enable Recording. Record the

File Name: _____ and Start Time: _____

12.16.2 Wait 30 minutes, then Disable the Disk Recording. Record the

Stop Time: _____   **B-Side Record #2**.

12.17 Navigate to the Main Menu and select MON A.

12.17.1 Navigate to the Disk Menu and Enable Recording. Record the

File Name: _____ and Start Time: _____

12.17.2 Wait 30 minutes, then Disable the Disk Recording. Record the

Stop Time: _____   **A-Side Record #2**.

12.18 Navigate to the Main Menu and select MON B.

12.18.1 Navigate to the Disk Menu and Enable Recording. Record the

File Name: _____ and Start Time: _____

12.18.2 Wait 30 minutes, then Disable the Disk Recording. Record the

Stop Time: _____   **B-Side Record #3**.

12.19 Navigate to the Main Menu and select MON A.

12.19.1 Navigate to the Disk Menu and Enable Recording. Record the

File Name: _____ and Start Time: _____

12.19.2 Wait 30 minutes, then Disable the Disk Recording. Record the

Stop Time: _____   **A-Side Record #3**.

QA Witness: _____ Date: _____

12.20 Secure the GSE for turnoff by performing the following steps.

12.20.1 Select the X-Axis Controls Menu.

12.20.2 Set the Control word to 0080h for both the A-side and B-side.

12.20.3 Set the HEAT word to 0006h for both the A-side and B-side.

12.20.4 Select the Y-Axis Controls Menu.

12.20.5 Set the Control word to 0080h for both the A-side and B-side.

12.20.6 Set the HEAT word to 0006h for both the A-side and B-side.

12.20.7 Turn off the A-side TRE using the power switch on the A-Side power supply. Record the turn-off time and date.

Time: _____ Date: _____ QA Verify: _____

12.20.8 Turn off the B-side TRE using the power switch on the B-side power supply. Record the turn-off time and date.

Time: _____ Date: _____ QA Verify: _____

12.20.9 Navigate to the main menu, and select Save/Quit. Follow the prompts to save the setup and exit the program.

12.21 Archive the Data and power off as follows.

12.21.1 Create a subdirectory in the SQD362 directory called p0573. Create two subdirectories in p0573 called a-side and b-side.

12.21.2 Sort the data files from sqd362 by time and move groups into either a-side or b-side as appropriate.

QA Witness: _____ Date: _____

12.21.3 Copy the p0573 directory to a JAZ™ cartridge so the files can be transferred to the payload server. Record the Volume name of the Cartridge

Data stored on _____.

12.21.4 Remove the JAZ™ cartridge and turnoff the computer and GSE support rack.

13. Test completed.

Completed by: _____

Witnessed by: _____

Date: _____

Time: _____

PTD_____   Date _____

QE_____   Date _____