



W. W. Hansen Experimental Physics Laboratory  
STANFORD UNIVERSITY  
STANFORD, CALIFORNIA 94305-4085

Gravity Probe B Relativity Mission

# BOARD-LEVEL TEST PROCEDURE FOR THE GYROSCOPE SUSPENSION SYSTEM (GSS) FSU FORWARD COMMUNICATIONS LINK (FCL) BOARD

PWA 8A01891 Rev A S/N:

## GP-B Procedure P0603 Rev A

---

Prepared by: Scott Smader  
RE, FCL

Date

---

Approved by: William Bencze  
RE, Gyroscope Suspension System (GSS) Group

Date

---

Approved by: Dorrene Ross  
GP-B Quality Assurance

Date

**Table of Contents:**

1.0 Revision History\_\_\_\_\_ 2  
2.0 Scope: \_\_\_\_\_ 3  
3.0 Reference Documents \_\_\_\_\_ 3  
4.0 Test Facilities \_\_\_\_\_ 3  
5.0 QA Provisions: \_\_\_\_\_ 3  
6.0 Test Personnel \_\_\_\_\_ 4  
7.0 General Instructions \_\_\_\_\_ 4  
8.0 Hardware Safety Requirements: \_\_\_\_\_ 4  
9.0 Equipment Pretest Requirements: \_\_\_\_\_ 5  
10.0 Additional Test Equipment \_\_\_\_\_ 5  
11.0 Device Under Test (DUT): \_\_\_\_\_ 5  
12.0 Pre-test visual inspection. \_\_\_\_\_ 6  
13.0 Pre-Insertion Static Electrical Tests: \_\_\_\_\_ 7  
14.0 In-System Testing – Flight Configuration \_\_\_\_\_ 8  
15.0 In-System Testing – Ground Test Configuration \_\_\_\_\_ 10  
16.0 Completion of Procedure: \_\_\_\_\_ 11

**1.0 Revision History**

Rev Level	Comments/notes	Date	Revised By
-	First release of this test procedure	29-Feb-00	S Smader
A0	Replace ADDA procedure by Flt Cmd 16,1,0x20E	3-Mar-00	S Smader
A1	Replace 16,1,0x20E by more thorough sequence including initialization	4-Apr-00	S Smader
A2	Typos	6-Apr-00	S Smader
A	Second release	7-Apr-00	S Smader

## 2.0 Scope:

This procedure details the board-level electrical functional tests on the GSS Forward Comm Link (FCL) card. No mechanical or thermal stress testing shall be performed at this time.

This test plan has been written to be run with the GSS "Gold System" test fixture – an electrically and interface equivalent of the GSS flight units. In General, the Device Under Test (DUT) shall be inserted into the Gold System in place of the equivalent Gold System card, any additional electrical connections to the Gold System shall be made, and a set of software-based and possibly manual tests will be run on the board. Upon successful completion of this procedure, this board is considered electrically functional.

All data recorded during this test is recorded in this document; each test of a board will use its own copy of this procedure, and will be identified by serial number in the upper right corner.

## 3.0 Reference Documents

- 3.1. GSS Gold System Hardware and Software Configuration Standard, P0663
- 3.2. PWA Drawing, GSS Forward Comm Link board, 8A01891
- 3.3. PWB Drawing, GSS Forward Comm Link, 8A01876
- 3.4. Board-level test software operational procedure, P0670
- 3.5. Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment, MIL-STD-1686

## 4.0 Test Facilities

HEPL Room 127, Stanford University

## 5.0 QA Provisions:

- 5.1. This procedure shall be conducted on a formal basis to its latest approved and released version. The QA Program Engineer (D. Ross) and the ONR representative (E. Ingraham) shall be notified 24 hours prior to the start of this procedure. QA may monitor the execution of all or part of this procedure should they elect to do so.

Date/time: \_\_\_\_\_  
GP-B QA (D. Ross)

Date/time: \_\_\_\_\_  
ONR (E. Ingraham)

- 5.2. Upon completion of this procedure, the GSS manager and the GP-B QA manager shall certify her/his concurrence that the procedure was performed and accomplished in accordance with the prescribed instructions by signing and dating his approval at the end of this procedure.

## 6.0 Test Personnel

This test procedure is to be conducted only by the following certified personnel:

- 6.1. William Bencze
- 6.2. Scott Smader
- 6.3. Joe Kilner
- 6.4. Lo Van Ho

## 7.0 General Instructions

- 7.1. Redlines can be initiated by the certified test personnel listed in Section 6.0 and must be approved by QA.
- 7.2. Test operators shall read this procedure in its entirety and resolve any apparent ambiguities prior to beginning this test.
- 7.3. Any nonconformance or test anomaly should be reported by a Discrepancy Report. Refer to the Quality Plan, P0108, for guidance. Do not alter or break test configuration if a test failure occurs; notify quality assurance.
- 7.4. Only the following persons have the authority to exit/terminate this test or perform a retest: Certified test operators listed in Section 6.0 and GP-B QA.
- 7.5. In this document, "Perform Flight S/W system test commands:" means to prepare the test system software as described in P0670 Board-Level Test Software Operational Procedure, and then issue the listed commands according to the procedure described in P0670.

## 8.0 Hardware Safety Requirements:

- 8.1. This assembly is ESD sensitive; special care shall be exercised per the "Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment", MIL-STD-1686
- 8.2. Ensure that power is removed from cable assemblies before connecting or disconnecting cable connectors.
- 8.3. Examine all mating connectors before attempting to mate them. Remove any foreign particles. Look for any damaged pins or sockets. Do not force the coupling action if excessive resistance is encountered. Ensure that key-ways are aligned when mating connectors.

Board S/N:

**9.0 Equipment Pretest Requirements:**

9.1. The GSS Gold System in which this board is to be tested must have passed successfully the P0663 – Gold System Certification Procedure prior to the start of this test. Record the Gold System serial number and date of its certification, below

GSS Gold System	SN:	
	Date of Certification	
	Configuration (circle one)	Full    Partial

**Additional Test Equipment**

The following support hardware, test equipment, or software will be used and the applicable information for the instruments shall be recorded below. Hand-written additions to this may be included in the space provided:

Equipment Description	Make	Model	SN	Cal Due
1. Multimeter				
2.				
3.				
4.				
5.				
6.				

**11.0 Device Under Test (DUT):**

Record the serial number of the Device Under Test, or DUT.

PWA 8A01891A GSS Forward Comm Link	SN:	
------------------------------------	-----	--

Test Operator:	Name:	
----------------	-------	--

Start of test:	Date:	
----------------	-------	--

**12.0 Pre-test visual inspection.**

*Note: All handling of this PWA shall be performed using ESD control methods, as outlined in MIL-STD-1686. Unit shall be inspected at an ESD certified station. Wrist straps and/or heel grounding straps shall be used.*

	P/F	Notes
12.1. Remove PWA from storage container.		
12.2. Verify that no parts are missing, unless called out in the assembly drawing.		
12.3. Verify that the following capacitors are installed in the proper orientation: C5.		
12.4. Verify the correct installation of jumper wires as specified in the assy drawing: H1.		
12.5. Verify the proper orientation of pin 1 of all DIP packages: U1 through U29.		

**13.0 Pre-Insertion Static Electrical Tests:**

*Note: All handling of this PWA shall be performed using ESD control methods, as outlined in MIL-STD-1686. Unit shall be inspected at an ESD certified station. Wrist straps and/or heel grounding straps shall be used.*

13.1. Power circuits isolation check

Set meter to "ohms", record indicated resistance between the indicated pins.

	P/F	Notes
13.1.1. P1-28 to P1-122		

DUT passes this section if the measurement is greater than 100 Kohms.

#### 14.0 In-System Testing – Flight Configuration

*Note: Tests run in this section are run with the hardware in “flight” configuration: no external test equipment or cables. The tests here use only the onboard diagnostic facilities of the GSS hardware. These will be the equivalent of the on-orbit tests of this system.*

Except at the discretion of the test director, these tests shall not be run before all Pre-Insertion Static Electrical Tests and all In-System Ground Configuration Tests have successfully completed.

##### 14.1. Board installation:

	P/F	Notes
14.1.1. Install PWA in gold system enclosure per the instructions in P0663 – Gold System certification procedure		
14.1.2. Cable system for “Configuration B” per P0663 – Gold System certification procedure (RAD6000)		



14.2. System Tests:

Record the Pass/Fail return status of each of the following commands.

	P/F	Notes
14.2.1. Perform Flight S/W system test commands: 16, 100 16, 2, 0x0101, 20 1, 1 16, 2, 0x0100, 7 16, 1, 0x020E If the value of "PIT 3-diag. Monitors", "Monitor 3:" is 0x0003, record 'Pass' for this test. Otherwise record 'Fail'.		
14.2.2. Perform Flight S/W system test commands: 14, 1 14, 38 If this completes successfully, record Pass for this test. Otherwise record 'Fail'.		
14.2.3. Perform Flight S/W system test commands: 14, 1 14, 29 If this completes successfully, record Pass for this test. Otherwise record 'Fail'.		

DUT passes this section if all of the return values are Pass.

## 15.0 In-System Testing – Ground Test Configuration

*Note: Tests run in this section require the addition of test cables and external test hardware. They are used to verify the board functioning of the board in fine detail, and are only used at the time of board-level test and acceptance. These may be considered “Engineering Confidence Tests”.*

**This section not applicable**

**16.0 Completion of Procedure:**

	P/F	Notes
16.1. Turn off power to FSU and ACU enclosures.		
16.2. Remove PWA from enclosure per P0663 and return to storage container.		

I certify that the this procedure was performed in whole and that the data recorded above is complete and accurate.

Test Engineer  Date

This is to certify that the information obtained under this test procedure is as represented and the documentation is completed and correct.

GSS Representative  Date

Quality Assurance  Date