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Gravity Probe B Relativity Mission

# FUNCTIONAL TEST PROCEDURE FOR THE GYROSCOPE SUSPENSION SYSTEM (GSS) AFT CONTROL UNIT (ACU) SUBSYSTEM

**26224-101 Rev - S/N:** | |

## GP-B Procedure
## P0715 Rev –
## September 22, 2000

Prepared by: Scott Smader — Date
RE, ABP, ATC and ACL

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

Approved by: Dorrene Ross — Date
GP-B Quality Assurance

**Table of Contents:**



## 1.0 Revision History

| Rev Level | Comments/notes | Date | Revised By |
|---|---|---|---|
| - | First release of this test procedure | 20-Sep-2000 | S Smader |

## 2.0 Scope:

This procedure details the subsystem-level electrical functional tests of the GSS Aft Computer Unit subsystem (ACU). No mechanical or thermal stress testing shall be performed at this time.

This test plan requires a GSS "Gold System" Forward System Unit test fixture – an electrically and interface equivalent of the important subset of a GSS flight unit. Upon successful completion of this procedure, this subsystem is considered electrically functional.

All data recorded during this test is recorded in or attached to this document; each test of a device 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. Procedures:

- 3.1.1. GSS Gold System Hardware and Software Configuration Standard, P0663.
- 3.1.2. Test Set Bring Up Procedure, P0691
- 3.1.3. GSS Aft Control Unit Abbreviated Functional Test, P0692.
- 3.1.4. GSS GSE Electrical Test Procedure, P0758.
- 3.1.5. GSS APU Simulator Electrical Test Procedure, P0759.

3.2. Assembly Drawing for the Aft Computer Unit (ACU), 26224

3.3. 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 he start of this procedure. QA may monitor the execution of all or part of this procedure should they elect to do so.

| | |
|---|---|
| Date/time:_____ | Date/time:_____ |
| GP-B QA (D. Ross) | 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 personnel:

6.1. William Bencze

6.2. Scott Smader

6.3. Lo Van Ho

6.4. Joseph Kilner

## 7.0 General Instructions

7.1. Redlines can be initiated by the 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: test operators listed in Section 6.0 and GP-B QA.

7.5. In this document, “Issue Test Set command(s):” means to prepare the test system as described in P0691 and P0692 procedures, and then issue the listed commands according to the procedure described in P0691.

## 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. Connector savers are to be used on all flight connector interfaces unless otherwise specified.

8.4. 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.

## 9.0 External 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 list may be made in the space provided.

| Equipment Description | Make | Model | SN | Cal Due |
|---|---|---|---|---|
| 1. Multimeter | Fluke | | | |
| 2. Oscilloscope | Tektronix | | | |
| 3. 2 ea. 50 ohm coaxial cables with BNC connectors | Tektronix | | | |
| 4. APU Power Supply Simulator 8A00740GSE-501 Rev- | LMTO | | | |
| 5. GSS S/C emulator | SU | NA | | NA |

## 10.0 Equipment Pretest Requirements:

10.1. The GSS Gold System items with which this subsystem is to be tested must have passed 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 |

| | | P/F | Notes: |
|---|---|---|---|
| 10.2. | Verify P0758 has been run on the Spacecraft Emulator GSE within the past 60 days or since the rack has been moved to the current test location. | | Date: |
| 10.3. | Verify P0759 has been run on the APU simulator GSE within the past 60 days or since the rack has been moved to the current test location. | | Date: |

## 11.0 Device Under Test (DUT):

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

| | | |
|---|---|---|
| 26224-101 GSS Aft Control Unit (ACU) | SN: | |
| Test Operator: | Name: | |
| Start of test: | Date: | |

## 12.0 Pre-test visual inspection.

*Note: All handling of this DUT 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 ACU DUT from storage container. | | |
| 12.2. | Verify that no parts are missing, unless called out in the assembly drawing. | | |
| 12.3. | Verify that all connectors appear undamaged: J3, J4, J5, J6, J12, J7, J22, J23, J51, J53. | | |

## 13.0 Functional Testing

*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.*

13.1. Installation and Configuration:

*Important: Ensure that power is removed from cable assemblies before connecting or disconnecting cable connectors.*

| | | P/F |
|---|---|---|
| 13.1.1. | Ensure that APU Simulator circuit breakers CB1 through CB5 are in the OFF position. | |
| 13.1.2. | Cable system for as shown in Figure 1. Numbers in square brackets refer to item numbers as listed in P0663 – Gold System certification procedure, Table 1. | |

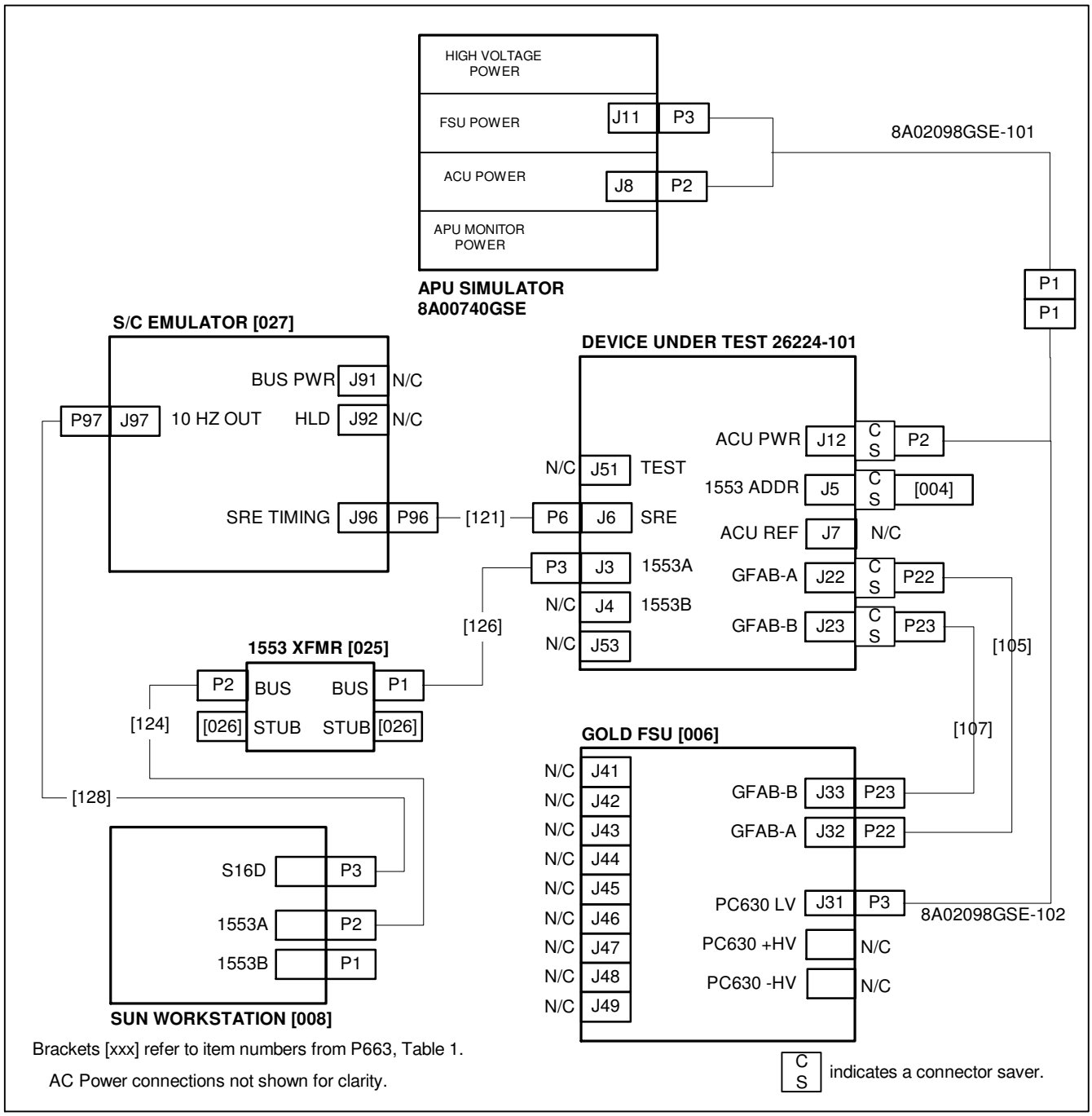


**Figure 1: Connection Diagram for ACU Subsystem Test**

13.2. Power On Procedure

| | | P/F |
|---|---|---|
| 13.2.1. | Ensure that APU Simulator circuit breakers CB1 through CB5 are in the OFF position. | |
| 13.2.2. | Toggle CB1 to the ON position. | |
| 13.2.3. | On the AC POWER panel, press MASTER CONTROL POWER ON pushbutton switch on, and confirm that the green ON indicator lights. | |
| 13.2.4. | Toggle CB2 to the ON position. | |
| 13.2.5. | Press the LAMP TEST pushbutton switch, and confirm that all indicator lamps on the APU MONITOR PANEL, the ACU POWER, and the FSU POWER panels are lit while the LAMP TEST switch is pressed, and extinguished when the LAMP TEST switch is released.<br><br>Note: CBx, 725V OFF/RESET, FSU OFF/RESET, ACU OFF/RESET, EMERGENCY OFF, and MASTER CONTROL POWER ON indicator lights are not affected by the LAMP TEST pushbutton. | |
| 13.2.6. | Toggle CB3 to the ON position. | |
| 13.2.7. | Press the ACU ON pushbutton switch, and confirm that the indicator lights for +3.3V POWER, +5V POWER, +15V POWER, and –15V POWER are lit. | |
| 13.2.8. | Record the current for each ACU POWER supply voltage in the table below. | |
| 13.2.9. | Toggle CB4 to the ON position. | |
| 13.2.10. | Press the FSU ON pushbutton switch, and confirm that the indicator lights for +12V POWER and -12V POWER light. (+50V POWER and –50V POWER are ignored during this test procedure.) | |

| +3.3V POWER (A) | +5V POWER (A) | +15V POWER (A) | -15V POWER (A) |
|---|---|---|---|
| | | | |

13.3. APU Clocks Test:

Note the results of this test in the table below.

A. Set the oscilloscope vertical amplitude to 5 volts per division, and trigger on the rising edge of Channel 1.

B. Connect BNC cable from oscilloscope Channel 1 to APU MONITOR PANEL, DC/DC SYNC MONITOR, CUSTOM.

C. Confirm that the signal voltage swings between – 5V and +5V (minor overshoots and/or significant ringing allowed) at 136.4 KHz +/- 1 KHz.

D. Connect BNC cable from oscilloscope Channel 1 to APU MONITOR PANEL, DC/DC SYNC MONITOR, INTERPOINT.

E. Confirm that the signal voltage swings between – 5V and +5V (minor overshoots and/or significant ringing allowed) at 545.6 KHz +/- 1 KHz.

| Assertion | P/F | Notes |
|---|---|---|
| 13.3.1. CUSTOM voltage is (approximately) –5V to +5V | | |
| 13.3.2. CUSTOM frequency is (approximately) 136.4 KHz | | |
| 13.3.3. INTERPOINT voltage is (approximately) –5V to +5V | | |
| 13.3.4. INTERPOINT frequency is (approximately) 136.4 KHz | | |

If all of the above assertions are confirmed, the DUT passes this test.

## 13.4. System Functional Tests:

| | P/F | Notes |
|---|---|---|
| 13.4.1. Perform P0692, G.S.S. Aft Control Unit Abbreviated Functional Test. | | |

If all of the above assertions are confirmed, the DUT passes this test.

**14.0 Completion of procedure:**

| | | P/F | Notes |
|---|---|---|---|
| 14.1. | On the APU Simulator, toggle CB4 to the OFF position. | | |
| 14.2. | On the APU Simulator, toggle CB3 to the OFF position. | | |
| 14.3. | On the APU Simulator, toggle CB2 to the OFF position. | | |
| 14.4. | On the APU Simulator, toggle CB1 to the OFF position. | | |
| 14.5. | Disconnect DUT, and return to storage container. | | |

I certify that 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 _____