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Gravity Probe B Relativity Mission

FULL FUNCTIONAL TEST PROCEDURE FOR THE GYROSCOPE SUSPENSION SYSTEM (GSS) AFT SUSPENSION UNIT (ASU) SUBSYSTEM USING THE GSS TEST ENVIRONMENT

GP-B Procedure
P0772 Rev B
March 28, 2001

DUT PN: 26226-101 REV
SN:

Date Performed:

Prepared by: Scott Smader   Date
RE, Aft Backplane, Aft Comm Link

Approved by: William Bencze   Date
Payload Electronics Manager.

Approved by: Dorrene Ross   Date
GP-B Quality Assurance

Called From Procedure: Section: Ref Date:
P0772 Start Time: Voltage (if applicable):

Table of Contents:

1.0 Revision History

Rev Level	Comments/notes	Date	Revised By
-	First release of this test procedure	20-Nov-2000	S Smader
A	Clarify 12.4, add 12.5	1-Dec 2000	S Smader
B	This revision was created to fix some typos and expedite some procedures. Added Called from info on cover sheet. Revised end-of-test instructions at end because calling procedures supercede.	28-Mar-2001	R Zilm/S Smader

2.0 Scope:

This procedure details the operations required to perform a box-level full functional test on a GSS aft unit, PN 26226-101 using the GSS Software Test Environment as described in P0670.

3.0 Formal Requirements Verification

This procedure verifies by test and/or inspection the following GSS box-level requirements:

Item	Spec Paragraph PLSE 13-1 Rev A	Requirement Title	Verified via test item in this procedure:
3.1.	3.2.8.1	SRE Interfaces	12.5
3.2.	3.2.8.2	Operation during clock switching	12.5
3.3.	3.2.8.4.1	Recovery from missed timing pulses	12.5
3.4.	3.2.8.4.2	Recovery from extra timing pulses	12.5

4.0 Reference Documents

4.1.	PLSE 13-1 Rev A	GSS Specification
4.2.	P0663	GSS Gold System Hardware and Software Configuration Standard
4.3.	P0670	Board-Level Test Software Operational Procedure
4.4.	P0695	Aft Full Functional Software Test Procedure
4.5.	P0758	GSS GSE Electrical Test Procedure
4.6.	26224	Assembly Drawing for the Aft Computer Unit (ACU)
4.7.	26226	Assembly Drawing for the Aft Suspension Unit (ASU)
4.8.	MIL-STD-1686	Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment
4.9.	pitView4 Documentation	GSS Board-Level Test software operations manual

5.0 Test Facilities (Check One)

5.1. HEPL Room 127, Stanford University	
5.2. ES3 Room 175, Stanford University	
5.3. Building #244, Ames Research Center	
5.4. Other (specify):	

6.0 QA Provisions:

6.1.   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)

6.2.   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.

7.0 Test Personnel

This test procedure is to be conducted only by the following personnel, or others designated by the GSS RE at the time of test (redline names in below as required)

7.1.   William Bencze

7.2.   Ron Zilm

7.3.   Scott Smader

7.4.   Lo Van Ho

8.0 General Instructions

8.1.   Redlines can be initiated by the test personnel listed in Section 7.0 and must be approved by QA.

8.2.   Test operators shall read this procedure in its entirety and resolve any apparent ambiguities prior to beginning this test.

8.3.   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.

8.4.   Only the following persons have the authority to exit/terminate this test or perform a retest: test operators listed in Section 7.0 and GP-B QA.

8.5.   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.

8.6.   All software used in this procedure shall be released and under configuration control prior to the start of this procedure.

9.0 Hardware Safety Requirements:

9.1.   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

9.2.   Ensure that power is removed from cable assemblies before connecting or disconnecting cable connectors.

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

9.4.   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.

10.0   Test Software

Fill in the version of software used in this test.

Name and Description	Version Number / Date, Time & Size
SUN Solaris Operating System*	5.6
GSS System software (GSW)	2.0.2.1
gssloader - The shell script to load GSS software into SRAM memory on gss flight processor via 1553 bus. Runs on SUN Solaris OS	1.2
gss1553ramload - The executable that loads the GSS software into SRAM memory on gss flight processor via 1553 bus. This executable is launched by the gssloader shell script and receives its setup values via rtloader_setup data file.	1.1
rtloader_setup - Is a data file containing necessary setup information to configure gss1553ramload.	1.2
ShmServer - Shared Memory Telemetry Server	1.5
cmdClient - Command Client	1.3
pitView4 – PitView window interface	1.4
pitView3.pV3 - PitView database file	1.1
startall - C shell script	1.1
shmsmon – shared memory script	1.1
772.r6s – script file for this test	1.1

Notes:

Current Version numbers for all GSS products will be provided by the test director to fill in the blanks, along with the products on a storage medium (CD or floppy or tape).

11.0   Device Under Test (DUT):

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

26226-101 GSS Aft Suspension Unit (ASU)	SN:	

Test Operator:	Name:	

Start of test:	Date: Time:	

12.0   System Functional Tests

Note: Tests run in this section are run with the hardware in "flight" configuration. The tests will be run using the GSS board-level and system test environment. This environment provides for commanding, scripting, data display and data recording for the GSS subsystem.

This test sequence is a scripted sequence of commands that launches software commands which reside in the memory systems of the GSS payload processor onboard the Aft unit of our GSS under test. The input and output data can be viewed using screen displays and by looking at a log file. Data is selected and processed to obtain a useful report. This report is recorded to a file on the Sun workstation. The filename for each run of this procedure shall be unique. A paper copy shall be attached to this test procedure upon completion.

12.1.   Summary of testing activity

Test Name	Commands	Relevant Test Case	Success Criteria
Initialization	14,1 16,100	Software Initialization	Completion Status = Success
ADDA Hardware Triggers Test	16,1:0x20e 16,2:0x100,7 16,1:0x20e 16,2:0x100,0	Aft Comm Link	Diagmon #3 = xxxx xxxx xxxx xSAD S: A/D Status is latch-up (ignore) A: 1 = A/D Hw trigger is present D: 1 = D/A Hw trigger is present
ACS 16 f0 AB Detection	14,20:1	Aft Clock Support	Diagmon #4 = xxxx xxxx xxxx xxBA B: 1 = SRE Clock B is on A: 1 = SRE Clock A is on
ACS 10 Hz SRE input detect	14,20:2	Aft Clock Support	Completion Status = Success
ACS 16f0 is functional	14,20:3	Aft Clock Support	Completion Status = Success
ACS PLL control effort is in range	14,20:4	Aft Clock Support	Completion Status = Success
ACS SRE Clock off	1,6 14,20:5 1,5	Aft Clock Support	Completion Status = Success
AMT monitors in range	14,21:1	Aft Monitor and Timing	Completion Status = Success Diagmon #4 = 0xFFFF
AMT Register Tests	14,21:2	Aft Monitor and Timing	Correct Mask Value
AMT Interrupts Off Test	14,21:3	Aft Monitor and Timing	Completion Status = Success
AMT Alternate 10 Hz Presence Test	14,21:4	Aft Monitor and Timing	Completion Status = Success
AMT Tri-State Logic Test	14,21:5	Aft Monitor and Timing	Completion Status = Success
AMT Interrupt Periodicity Test	14,21:6	Aft Monitor and Timing	Completion Status = Success
AMT Interrupt Delay Test	14,21:7	Aft Monitor and Timing	Completion Status = Success
AMT Alternate 10 Hz Error Count Test	14,21:8	Aft Monitor and Timing	Completion Status = Success
Burst Bit Error Rate Test	14,38	Aft Comm Link	Completion Status = Success
Forward Mode Register Diagnostic	14,29	Aft Comm Link	Completion Status = Success Note: Tests GFAB
SRE Clocks Test	See Sec 12.4	Aft Monitor and Timing	See Section 12.4 for details
1553 A/B Test	See Sec 12.5	1553 Buses	See Section 12.5 for details

12.2.   Pre-test:

Prepare 1 formatted IBM floppy double-sided, high density for the end of the test. This is to collect the output of the test for documentation purposes. Label the disk with the information: GSS AFT Unit Test MMDDYY <Operator Name> <test location>. Note also the purpose of the test. Note any other pertinent information in an additional log, to be attached to printout of test data for records. Multiple log files may be collected on one floppy if the disk label information is the same for all log files on the disk.

12.3.   1553 Buses:

Section 12.3 must be performed when **startall** command is not executing on the Sun workstation. Refer to P0670. It is not necessary to turn power off, then on, to perform Section 12.3.

	P/F	Notes
12.3.1. In a terminal window on the Test Set, perform the **testrts** command. If the address matches the address plug attached to ASU J6, this test passes.		
12.3.2. Switch to other 1553 bus by disconnecting 1553 terminal cable (connected to ASU J3 or J4) at the bus coupler or TVAC chamber feed-through, then reattaching it to the opposite coupler or feed-through.		
12.3.3. In a terminal window on the Test Set, repeat the **testrts** command. If the address matches the address plug attached to ASU J6, this test passes.		

End of Section

12.4.   Run Automated Test Script:

12.4.1.   Confirm that the GSE has both A and B SRE clocks turned on.

12.4.2.   If GSW software is not already loaded into target hardware, load GSW software into target hardware per P0670.

12.4.3.   Prepare to run script file

    12.4.3.1.   In Command Client window, select "Run script", and press <Enter>.

    12.4.3.2.   Enter the script file name, 772.r6s, followed by <Enter>.

12.4.4.   Prepare for Data Logging

    12.4.4.1.   Using **startall**, bring up the **pitView** environment per P0670

    12.4.4.2.   Open the "PIT 3 diag. monitors" window (Window 7)

    12.4.4.3.   Press the El key ('l')

    12.4.4.4.   Refer to pitView4 Documentation by Eino-Ville Talvala dated 091900. Do not use periodic logging. Turn on logging for any change greater than 1.000 for the following quantities:

        12.4.4.4.1.   Pit Counter

        12.4.4.4.2.   Monitor 3

        12.4.4.4.3.   Monitor 4

        12.4.4.4.4.   Monitor 5

        12.4.4.4.5.   Monitor 6

        12.4.4.4.6.   Monitor 7

        12.4.4.4.7.   Monitor 8

        12.4.4.4.8.   Status

        12.4.4.4.9.   Cmd No

        12.4.4.4.10.   App No

        12.4.4.4.11.   Param

    12.4.4.5.   Press the Cue key ('q')

    12.4.4.6.   Change the default filename for the log file to an unique, valid filename for the floppy (colons are not permitted), and record it here. Recommended filename is MMDDHHMM.log, referred to the start of this procedure, where MM is the 2-digit month, DD is the 2-digit day, HH is the hour in 24-hour notation, and MM is the minutes.

LOG FILE NAME: _____

12.4.5. Turn on Data Logging in the "PIT 3 diag. monitors" window by pressing the Pee key ('p').

12.4.6. In the Command Client window, wait at least one second, and then select "Run script" and press <Enter>.

12.4.7. When the script completes, turn off Data Logging in the "PIT 3 diag. monitors" window by pressing the Pee key ('p'). The Command Client window will display "STOP" in the lower left corner.

12.4.8. Analysis

On the Sun workstation, open the log file in a text editor.

	P/F	Notes
12.4.8.1. The result of the second 16,1:0x20E command for Diagmon3 must be 3. (Only the two least significant bits matter.) If so, this section has passed.		
12.4.8.2. In test 14,20:1 check the final value of Diagmon4. If the two least significant bits are both 1, this section has passed.		
12.4.8.3. Scan the file for the occurrence of the word "failure". If "failure" does not appear in the log file, this section has passed.		

12.4.9. If the word failure occurs in the file, it is up to the Test Director to determine whether the failure is significant. Specifically acceptable "failure" occurrences include:

12.4.9.1. Analog Monitor out of range if sensor not installed.

12.4.9.2. Operator errors that in the judgment of the Test Director do not have a material influence on testing.

12.4.10. Copy the log file to the labeled floppy.

12.4.11. Print the log file and attach it to this procedure.

End of Section

12.5.   SRE Clock Switching Test

	P/F	Notes
12.5.1. Confirm GSE clock simulator settings: **16fo:** **A** **10 Hz:** **A** **Sun 10 Hz:** **A**		
12.5.2. Perform Flight S/W system test commands: 1, 6 16, 1: 261 If bit 15 (LSB) is set in Diagmon 3, record 'Pass' for this test. Otherwise record 'Fail'.		
12.5.3. Set GSE clock simulator: **16fo:** **B** **10 Hz:** **B** **Sun 10 Hz:** **B**		
12.5.4. Perform Flight S/W system test commands: 16, 1: 261 If bit 14 (next to LSB) is set in Diagmon 3, record 'Pass' for this test. Otherwise record 'Fail'.		
12.5.5. Set GSE clock simulator: **16fo:** **A & B** **10 Hz:** **A & B** **Sun 10 Hz:** **A & B**		
12.5.6. Perform Flight S/W system test commands: 16, 1: 261 If bits 15 and 14 (LSBs) are set in Diagmon 3, record 'Pass' for this test. Otherwise record 'Fail'.		
12.5.7. Perform Flight S/W system test commands: 1, 5 16, 1: 263		
12.5.8. Wait 2 seconds, then perform Flight S/W system test command: 16, 1: 263 Record the value from Diagmon 3. If error count in Diagmon 3 is 0, proceed to 12.5.11.		Diagmon 3 =
12.5.9. If 12.5.8 result is not 0, invert clock phase by performing Flight S/W system test command: 16, 2: 263 0x700		

12.5.10. Wait 2 seconds, then perform Flight S/W system test command twice: 16, 1: 263 Record the value from Diagmon 3 after the Second run. If Diagmon 3 is not 0, this test fails.		Diagmon 3 =
12.5.11. Push "10 hz advance" button on GSE.		
12.5.12. Wait 2 seconds, then perform Flight S/W system test command: 16, 1: 263 Record the value from Diagmon 3. If Diagmon 3 is approximately equal to the number of button pushes, this test passes.		Diagmon 3 =
12.5.13. Push "10 hz delay" button on GSE.		
12.5.14. Wait 2 seconds, then perform Flight S/W system test command: 16, 1, 263 Record the value from Diagmon 3. If Diagmon 3 is approximately equal to the number of button pushes, this test passes.		Diagmon 3 =

End of Section

13.0   Completion of Procedure:

Do not perform sections 13.1 through 13.6 if the calling procedure conflicts.

	P/F	Notes
13.1. Turn off power via LabView *GSE Test* window		
13.2. Record power off time		End Time:
13.3. Record total power on time on cover sheet of procedure.		
13.4. Remove all external cables from ASU		
13.5. Return DUT to storage container.		
13.6. Attach test results from Section 7		

End of Section

14.0   Certification:

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	