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Gravity Probe B Relativity Mission

ABBREVIATED FUNCTIONAL TEST PROCEDURE FOR THE GYROSCOPE SUSPENSION SYSTEM (GSS) FORWARD SUSPENSION UNIT (FSU) SUBSYSTEM

GP-B Procedure
P0707 Rev –

DUT PN: 26225-101 REV _____

SN: _____

Date Performed:_____

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

Approved by: William Bencze Date
Payload Electronics Manager.

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	1-Nov-2000	WJ Bencze

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

3.0 Formal Requirements Verification

This procedure does not formally verify any requirements for this unit; it is an engineering test procedure.

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.	P0758	GSS GSE Electrical Test Procedure
4.4.	26225	Assembly Drawing for the Aft Computer Unit (ACU)
4.5.	MIL-STD-1686	Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment

5.0 Test Facilities

5.1. Primary facility: HEPL Room 127, Stanford University

5.2. Alternate facility (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 government 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.

QA notification time/date:

Date/time:_____ Date/time:_____

GP-B QA (D. Ross) Govt Rep (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. Rick Bevan

7.5. Lorin Belanger (NASA/Ames)

7.6. Other: _____

7.7. Other: _____

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 via a Discrepancy Log (D-LOG). 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.

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 External Test Equipment

The following support hardware 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.

Item	Equipment Description	Qty	Make	PN	SN	Cal Due
1.	GSS Spacecraft emulator	1	SU	NA	01	
2.	GSS ACU gold system	1	SU	NA	01	
3.	2-stub 1553 coupler	2	MilesTek	90-50202		NA
4.	GSS testset workstation	1	SU	NA	NA	NA
5.	GSE power cable	1	LMCO	8A02084GSE-101	NA	NA
6.	GSE timing cable	1	LMCO	8A02085GSE-101	NA	NA
7.	GSE GFAB A cable	1	LMCO	8A01473-101	NA	NA
8.	GSE GFAB B cable	1	LMCO	8A01474-101	NA	NA
9.	GSE 1553 cable	2	LMCO	8A00673GSE-501	NA	NA
10.	1553 terminator	4	MilesTek	10-06403-025	NA	NA
11.	1553 patch cable	2	Trompeter	CA-2014-120	NA	NA
12.	LV triple out PS	1	HP/Agilent			
13.	MV single out PS (50 V)	1	HP/Agilent			
14.	MV single out PS (50 V)	1	HP/Agilent			
15.	HV single out PS	1	SRS			
16.	HV single out PS	1	SRS			
17.	HV patch cables	2	SU		NA	NA
18.	FRM to Banana cable	1	SU		NA	NA
19.	Multimeter	1	Fluke			
20.						
21.						
22.						
23.						
24.						
25.						

10.1. **Note**: Power supplies do not require calibration of their internal voltage and current meters; all power supplies shall be set using a calibrated external volt meter and any current measurements shall be set using a calibrated external ammeter.

11.0 Software

11.1. PitView software tools current on the Testset computer are as follows:

11.1.1. Shared Telemetry Server: Version:_____

11.1.2. Command Client: Version:_____

11.1.3. PitView window interface: Version:_____

11.1.4. GSW (RAD6000 SW) Version:_____

12.0 Equipment Pretest Requirements:

12.1. 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:
12.2. 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:

13.0 Device Under Test (DUT):

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

26225-101 GSS Aft Suspension Unit (ASU)	SN:	

Test Operator:	Name:	

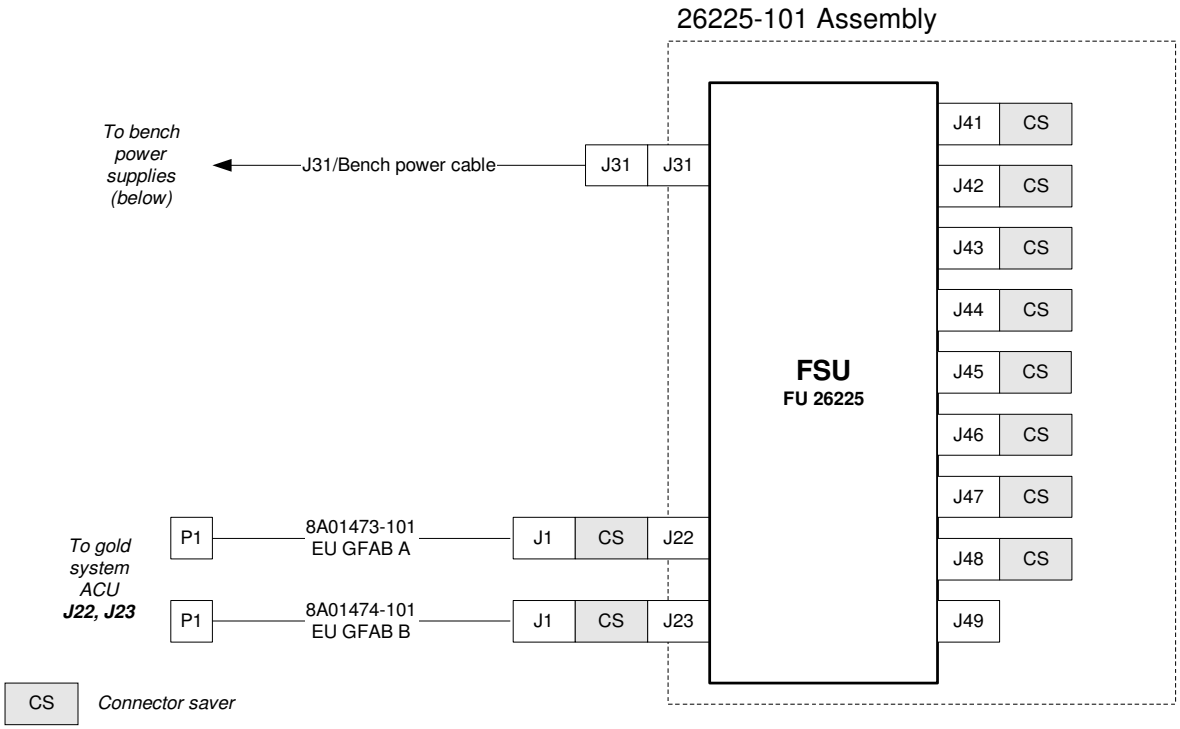
Start of test:	Date: Time:	

14.0 Test connection and Application of Power

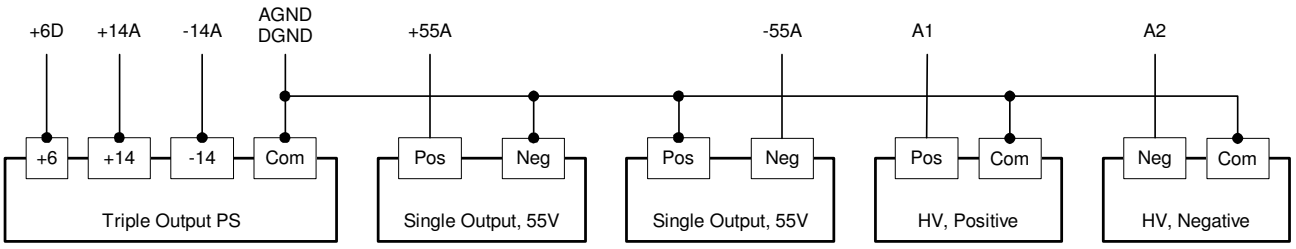
Note: All handling of this DUT shall be performed using ESD control methods, as outlined in MIL-STD-1686. Unit shall be inspected at an ESD certified station. Wrist straps and/or heel grounding straps shall be used.

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

		P/F	Notes
14.1.	Remove DUT from storage container. Verify that all connectors appear undamaged		
14.2.	Set and verify (using external meter) voltages on power supplies are as noted in Fig 1. Tolerances are as follows: < 15 V, ± 0.1 V tolerance ± 55 V, ± 0.5 V tolerance ± 750 V, ± 5 V tolerance		
14.3.	Verify power supplies are turned off.		
14.4.	Connect the power supplies as shown in Fig 1.		
14.5.	Connect data and timing cables as shown in Figs 2 and 3.		



Connection to J31 breakout cable



P707-1

Figure 1: Connection Diagram for FSU tests

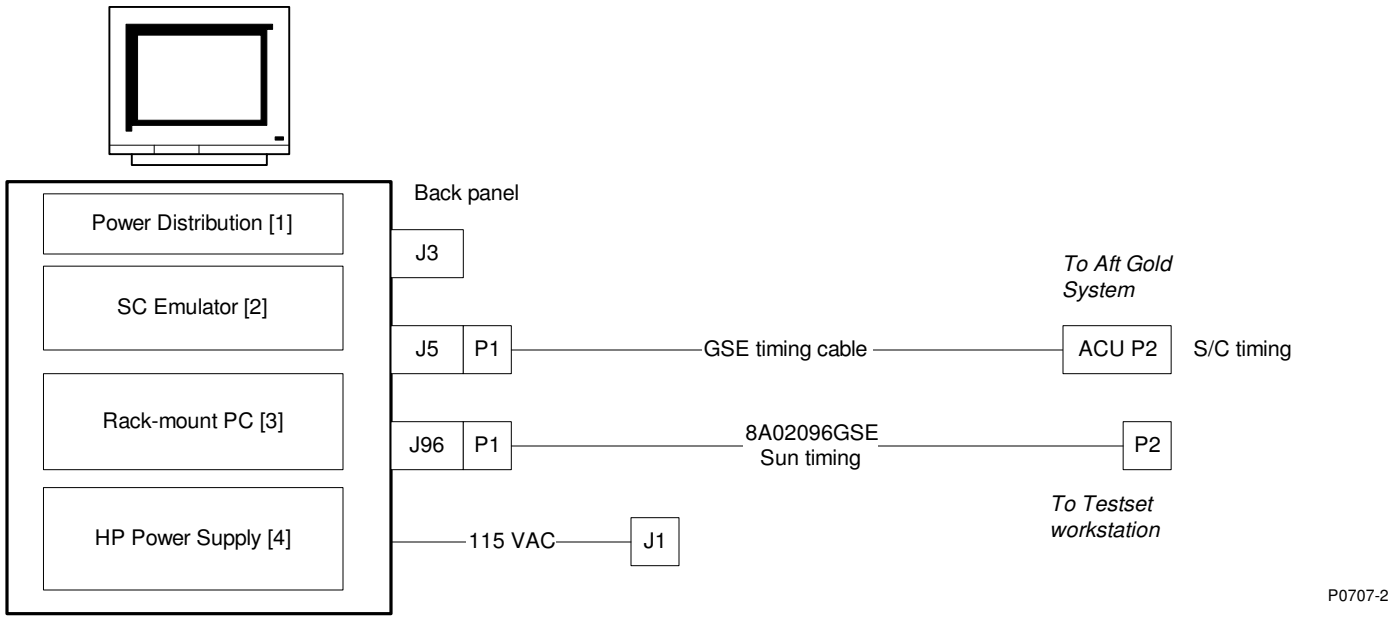


Figure 2: Spacecraft Emulator Wiring Diagram

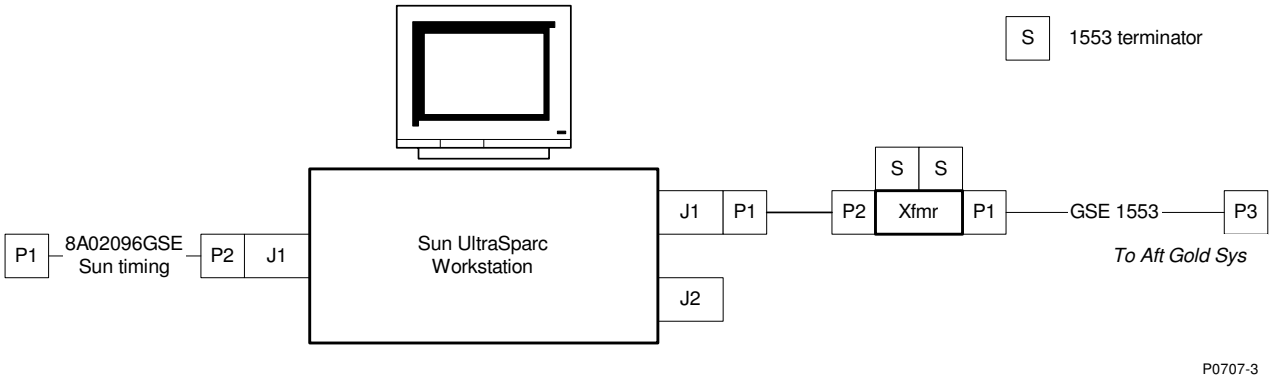


Figure 3: Testset workstation wiring diagram

End of Section

		P/F	Notes
14.6.	Set Spacecraft clock simulator to the following: **16fo: A+B** **10 Hz: A+B** **Sun 10 Hz: A+B**		
14.7.	Turn on low voltage power supply. Note the supply currents at right:		+6D current: _____ A +14A current: _____ A -14A current: _____ A
14.8.	Record power-on start time:		Start time:

End of Section

15.0 Software Tests:

Note: Commands issued here are raw GSW command router commands entered through the GSS "PitView" interface and its underlying shared telemetery server. They can be cross referenced via SCSE16 Section 9.2.5 (GSS software interface)

			P/F	Notes
15.1.	Boot Testset workstation; load GSW software on aft FEU, start PitView software.			
15.2.	Turn on low voltage power supply to DUT. Note the supply currents below: +6D @: _____ mA +14A @: _____ mA -14A @: _____ mA			
15.3.	Record power-on start time:			Start time:
15.4.	Turn on diagnostic software components in GSW	14, 1 16, 100		
15.5.	Execute mini-BERT (FCL test)	14, 38		
15.6.	Execute FMR test	14, 29		
15.7.	Execute ADDA board test	14, 28		
15.8.	Power cycle FSU (Power on reset test)			
15.9.	Clear Mode Register	16, 6		
15.10.	Clear PON reset	16, 13		
15.11.	Set oscillator to HIGH	16, 14		
15.12.	Measure oscillator level at J41 output (center to outer shield)			Level:
15.13.	Set oscillator to LO	16, 15		
15.14.	Measure oscillator level at J41 output (center to outer shield)			Level:
15.15.	Switch output relays to HV	16, 9		
15.16.	Switch output relays to LV	16, 10		

15.17. Turn on ± 50 supplies. Note currents below: +50V @ _____ mA -50V @ _____ mA		
15.18. Run mux reader and record values in table below:	14, 23, 5	

Channel	Signal	Value
1	P13V8_VMON	
2	M13V8_VMON	
3	P14A_VMON	
4	M14A_VMON	
5	P50_VMON	
6	M50_VMON	

15.19. Run mux reader and record values in table below:	14, 23, 6	

Channel	Signal	Value
1	P12A_VMON	
2	M12A_VMON	
3	P5A_VMON	
4	PHV_VMON	
5	NHV_VMON	
6	FRM_TEMP_MON	

15.20. Run mux reader and record values in table below:	14, 23, 7	

Channel	Signal	Value
1	SIG AGND	
2	P5A_REF	
3	P5D_VMON	
4	CHRG_ELX_MON	
5	OSC_VCO_MON	
6	TBD_11	

15.21. Run mux reader and record values in table below:	14, 23, 8	

Channel	Signal	Value
1	X_TEMP_MON	
2	Y_TEMP_MON	
3	Z_TEMP_MON	
4	FRM_TEMP_MON	
5	MUX_TEMP_MON	
6	TBD_12	

15.22. Put arbiter into Ground Test mode (COMP_OK = 1, Mode = 11)	16, 7 16, 5, 3	
15.23. Switch output relays to LV	16, 10	
15.24. Set the DA outputs to known values: 0.0 V	16, 20, 0, 0.0 16, 20, 1, 0.0 16, 20, 2, 0.0 16, 20, 3, 0.0 16, 20, 4, 0.0 16, 20, 5, 0.0	
15.25. Read DA0 mux channel: Value: _____	16, 18, 3 16, 19, 3	
15.26. Read DA1 mux channel: Value: _____	16, 18, 34 16, 19, 3	
15.27. Read DA2 mux channel: Value: _____	16, 18, 19 16, 19, 3	
15.28. Read DA3 mux channel: Value: _____	16, 18, 2 16, 19, 3	
15.29. Read DA4 mux channel: Value: _____	16, 18, 33 16, 19, 3	
15.30. Read DA5 mux channel: Value: _____	16, 18, 18 16, 19, 3	

15.31.	Set LVA_PRIME_BU_SEL = 0 (MR BIT 8)	16, 4, 7	
15.32.	Read X1_LV_VMON mux channel: Value: _____	16, 18, 10 16, 19, 3	J41 output (V)
15.33.	Read X2_LV_VMON mux channel: Value: _____	16, 18, 43 16, 19, 3	J42 output (V)
15.34.	Read Y1_LV_VMON mux channel: Value: _____	16, 18, 28 16, 19, 3	J43 output (V)
15.35.	Read Y2_LV_VMON mux channel: Value: _____	16, 18, 11 16, 19, 3	J44 output (V)
15.36.	Read Z1_LV_VMON mux channel: Value: _____	16, 18, 44 16, 19, 3	J45 output (V)
15.37.	Read Z2_LV_VMON mux channel: Value: _____	16, 18, 29 16, 19, 3	J46 output (V)
15.38.	Set LVA_PRIME_BU_SEL = 1 (MR BIT 8)	16, 3, 7	
15.39.	Read X1_LV_VMON mux channel: Value: _____	16, 18, 10 16, 19, 3	J41 output (V)
15.40.	Read X2_LV_VMON mux channel: Value: _____	16, 18, 43 16, 19, 3	J42 output (V)
15.41.	Read Y1_LV_VMON mux channel: Value: _____	16, 18, 28 16, 19, 3	J43 output (V)
15.42.	Read Y2_LV_VMON mux channel: Value: _____	16, 18, 11 16, 19, 3	J44 output (V)
15.43.	Read Z1_LV_VMON mux channel: Value: _____	16, 18, 44 16, 19, 3	J45 output (V)
15.44.	Read Z2_LV_VMON mux channel: Value: _____	16, 18, 29 16, 19, 3	J46 output (V)

J4x outputs measured WRT center pin on J47

15.45. Set the DA outputs to known values: (0.5 to 3.0 V)	16, 20, 0, 0.5 16, 20, 1, 1.0 16, 20, 2, 1.5 16, 20, 3, 2.0 16, 20, 4, 2.5 16, 20, 5, 3.0	
15.46. Read DA0 mux channel: Value: _____	16, 18, 3 16, 19, 3	
15.47. Read DA1 mux channel: Value: _____	16, 18, 34 16, 19, 3	
15.48. Read DA2 mux channel: Value: _____	16, 18, 19 16, 19, 3	
15.49. Read DA3 mux channel: Value: _____	16, 18, 2 16, 19, 3	
15.50. Read DA4 mux channel: Value: _____	16, 18, 33 16, 19, 3	
15.51. Read DA5 mux channel: Value: _____	16, 18, 18 16, 19, 3	

15.52.	Set LVA_PRIME_BU_SEL = 0 (MR BIT 8)	16, 4, 7	
15.53.	Read X1_LV_VMON mux channel: Value: _____	16, 18, 10 16, 19, 3	J41 output (V)
15.54.	Read X2_LV_VMON mux channel: Value: _____	16, 18, 43 16, 19, 3	J42 output (V)
15.55.	Read Y1_LV_VMON mux channel: Value: _____	16, 18, 28 16, 19, 3	J43 output (V)
15.56.	Read Y2_LV_VMON mux channel: Value: _____	16, 18, 11 16, 19, 3	J44 output (V)
15.57.	Read Z1_LV_VMON mux channel: Value: _____	16, 18, 44 16, 19, 3	J45 output (V)
15.58.	Read Z2_LV_VMON mux channel: Value: _____	16, 18, 29 16, 19, 3	J46 output (V)
15.59.	Set LVA_PRIME_BU_SEL = 1 (MR BIT 8)	16, 3, 7	
15.60.	Read X1_LV_VMON mux channel: Value: _____	16, 18, 10 16, 19, 3	J41 output (V)
15.61.	Read X2_LV_VMON mux channel: Value: _____	16, 18, 43 16, 19, 3	J42 output (V)
15.62.	Read Y1_LV_VMON mux channel: Value: _____	16, 18, 28 16, 19, 3	J43 output (V)
15.63.	Read Y2_LV_VMON mux channel: Value: _____	16, 18, 11 16, 19, 3	J44 output (V)
15.64.	Read Z1_LV_VMON mux channel: Value: _____	16, 18, 44 16, 19, 3	J45 output (V)
15.65.	Read Z2_LV_VMON mux channel: Value: _____	16, 18, 29 16, 19, 3	J46 output (V)

J4x outputs measured WRT center pin on J47

End of Section

16.0 Extension tests:

Additional software based tests may be run on the DUT at the discretion of the test director. Extension sheets (attached) will be duplicated and attached as appropriate

Extension sheets used on this procedure? YES NO.

17.0 Completion of procedure:

		P/F	Notes
17.1.	Turn off power to DUT.		
17.2.	Record power off time		End Time:
17.3.	Record total power on time on cover sheet of procedure.		
17.4.	Remove all external cables from DUT		
17.5.	Return DUT to storage container.		

18.0 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	

Extension Sheet

PN 26225-101 SN:_____, Date:_____Test Director:_____

Sheet _____of_____

Step	Operation	GSW Command	P/F