W. W. Hansen Experimental Physics Laboratory
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Gravity Probe B Relativity Mission

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

GP-B Procedure
P0769 Rev A

DUT PN: 26225-101 REV _____ SN: _______

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Prepared by: David Hipkins Date
FSU Test RE, Gyroscope Suspension System (GSS) Group

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Approved by: William Bencze Date
Payload Electronics Manager.

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Approved by: Dorrene Ross Date
GP-B Quality Assurance

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Approved by: Richard Whelan Date
GP-B System Engineering

Table of Contents:

1.0 Revision History

Rev Level	Comments/notes	Date	Revised By
-	First release of this test procedure	02-April-2002	D Hipkins
A	Incorporation of redlines from first run of this procedure on FSU SN001	19-April-2002	D Hipkins

2.0 Scope:

This procedure is designed to test of the performance of the FSU against the GSS flow down requirements. The test consists of both static and dynamic tests. Noise level requirements as well as amplifier ranges are verified as well as verification the of position dependent logic of the Arbiter state machine. Each of the bridge sensitivities are calibrated against a standard capacitive load using the gyroscope simulator for (4) capacitance values. These values are the undriven capacitances for the (4) suspension line sets in the payload measured during the final integrated test at Stanford. The simulator also allows us observe the dynamic response of the device under test to various events and conditions. We obtain dynamic response data for the High, Low and Spinup analog backup circuits as well as captures for the High Backup caused by an Arbiter position error transition from Prime to the HBU state.

3.0 Device Under Test (DUT):

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

26225-101 GSS Fwd Suspension Unit (FSU)	SN:	

Test Operator:	Name:	

Start of test:	Date: Time:	

4.0 Formal Requirements Verification

The Extended Functional test sequence of this procedure verifies by test the following requirements GSS Requirements:

GSS Specification	Title	Requirement	P0769 ref.	Flowdown
3.3.2	Conducted Emissions into the Probe	No spurious signal in the frequency range of 1MHz to 1 GHz on any conductor connected to the probe shall be larger than 50 uV rms measured prior to top hat filtering.	17.8 Part C 17.7 Part C 17.6	GSS Flowdown
3.4.8.1.1	Spinup backup	A spinup backup controller shall be provided which is capable of suspending the gyroscope while spinup gas is flowing but may not necessarily meet the suspension performance requirements outlined in this document.	17.14 Part C	GSS Flowdown
3.4.8.1.2	Science mode backup	A science mode backup controller shall be provided which is capable of suspending the gyroscope in science mode and capable of rejecting disturbances specified in P0149, but may not necessarily meet the suspension performance requirements outlined in this document.	17.14 Part B	GSS Flowdown
3.4.8.1.3.1	Position error	The GSS shall autonomously (without command from the CCCA or ground) engage the backup system when the position of the gyro exceeds an 8 um radius from the center of the housing as indicated on the position bridge.	17.14 Part A	GSS Flowdown
3.4.8.1.3.2	Computer fault	The GSS shall autonomously (without command from the CCCA or ground) engage the backup system when the computer reads/writes to the FSU late by a factor of 1.5 of the nominal update rate.	17.15	GSS Flowdown
3.4.8.2.1.1	Range	The suspension voltage amplifier spinup drive output range shall be +/- 700 V.	17.9	GSS Flowdown
3.4.8.2.1.2	Noise	The suspension voltage amplifier spinup drive output noise shall be less than 1 V rms.	17.8 Parts A&B	GSS Flowdown
3.4.8.2.2.1	Range	The suspension voltage amplifier science drive output range shall be +/- 45 V.	17.11	GSS Flowdown
3.4.8.2.2.2	Noise	The suspension voltage amplifier science drive output noise spectral density shall be < 100 uV/rt(Hz) at 5.5 mHz; < 3 uV/rt(Hz) at 1 Hz; < 1 uV/rt(Hz) at > 100 Hz.	17.7 Parts A&B	GSS Flowdown
3.4.8.2.3.1	Range	The suspension voltage amplifier ground test drive output range shall be +/- 1400 V.	17.10	GSS Flowdown
3.4.8.3	Persistent state storage	The GSS shall store 16 bits of mode register information in non-volatile storage so that a power off/on cycle does not erase this information. Mode register information is defined in SCSE-16, section 9.	17.12.1 to 17.12.11	GSS Flowdown

Formal Requirements Verification (continued)

GSS Specification	Title	Requirement	P0769 ref.	Flowdown
3.4.11.1	Electrode Bias	The electrode bias signal shall be commandable to the following values: +3 V, -3 V, 0 V with respect to the FSU ground reference.	17.4	Derived based on T003 2.5
3.4.11.2	Accuracy at +/- 3 V	The accuracy of the electrode bias signal shall be +/- 0.2 V at the +/- 3 V settings with respect to the FSU ground reference.	17.4	Derived based on T003 2.5
3.4.11.3	Accuracy at 0 V	The accuracy of the electrode bias signal shall be +/-5 mV at the 0 V setting with respect to the FSU ground reference.	17.4	Derived based on T003 2.5
3.4.11.5	Noise on charge control bias	The noise on the electrode bias signal shall be less than 500 uV/rt(Hz) for frequences below 100 Hz	17.5	Derived based on T003 2.5
3.4.14.1	Suspension line signals at or above 100 kHz	Bright line peak-to-peak voltage for frequencies at or above 100 kHz shall be less than or equal to the following equation at each frequency: 500e-3 V / frequency (kHz)	17.7 Part D	Derived based on T003 2.7
3.4.14.2	Suspension line signals below 100 kHz	Bright line peak-to-peak voltage for frequencies below 100 kHz shall be less than or equal to the following equation at each frequency: 1e5 V / frequency ^2 (frequency in kHz).	17.7 Part D	Derived based on T003 2.7
3.4.17.5	Bridge Excitation Voltage	The capacitive bridge excitation voltage shall be less than 50 mV peak-peak.	17.3	Derived based on T003 2.7

5.0 Reference Documents

5.1.	PLSE 13-1 Rev A	GSS Specification
5.2.	P0758	GSS GSE Electrical Test Procedure (ETP)
5.3.	26225	Assembly Drawing for the Fwd Suspension Unit (FSU)
5.4.	S0477 Rev A	GSS Interface Control Document (ICD)
5.5.	P0749	Gyroscope Simulator Commissioning Procedure.
5.6.	P0892	On-Board A/D AND D/A Converter Calibration Procedure for GSS Forward Suspension Units (FSU)
5.7.	MIL-STD-1686	Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment

6.0 Test Facilities

6.1. Primary facility: GSS Integrated Systems Lab, ES3, room 175, Stanford University

7.0 QA Provisions:

7.1. 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 R. Gurr) 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)	Gov't Rep (R. Gurr)

7.2. 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.

8.0 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)

8.1. William Bencze

8.2. David Hipkins

8.3. Yoshimi Ohshima

8.4. Rob Brumley

8.5. Rick Bevan

8.6. Paul Shestople

8.7. Scott Smader

8.8. Other:

9.0 General Instructions

9.1. Redlines can be initiated by the test personnel listed in Section 8.0 and must be approved by QA.

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

9.3. 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.

9.4. Only the following persons have the authority to exit/terminate this test or perform a retest: test operators listed in Section 8.0 and GP-B QA.

10.0 Hardware Safety Requirements:

10.1. 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

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

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

10.4. Connector mating:

10.4.1. Examine all mating connectors before attempting to mate them.

10.4.2. Remove any foreign particles. Look for any damaged pins or sockets.

10.4.3. Do not force the coupling action if excessive resistance is encountered.

10.4.4. Ensure that key-ways are aligned when mating connectors.

11.0 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	1 2 3 4 (circle one)	
2.	GSS testbed system	1	SU	NA	NA	
3.	2-stub 1553 coupler	2	MilesTek	90-50202	NA	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	1	LMCO	8A00673GSE-501	NA	NA
10.	1553 terminator	2	MilesTek	10-06403-025	NA	NA
11.	1553 patch cable	2	Trompeter	CA-2014-120	NA	NA

Item	Equipment Description	Qty	Make	PN	SN	Cal Due
12.	Handheld Multimeter 87	1	Fluke	NA	68530005	03 October 2002
13.	Handheld Multimeter 87	1	Fluke	NA	68530016	03 October 2002
14.	Spectrum Analyzer 8568B	1	HP	NA	2207A01888 / 2152A03255	12 June 2002
15.	Oscilloscope, digital	1	LeCroy	NA	9314 3677	29 May 2002
16.	SR560 Low Noise Preamplifier	6	Stanford Research Systems	NA	59422, 59424 59418, 59409 59423, 59425	27 March 2003
17.	7090A Measurement Plotting System	1	HP	NA	2742A 07632	NA
18.	7470A Plotter	1	HP	NA	2210A 08001	NA
19.	E3630A Triple Output DC Power Supply	1	HP	NA	KR85017381	NA
20.	Spectrum Analyzer 35660A	1	HP	NA	2816A00727	07 December 2002
21.	Multimeter	1	HP	NA	3478	19 March 2003
22.	High Voltage Breakout Box	1	SU	NA	NA	NA
23.	Charge Control Bias Breakout Cable	1	SU	NA	NA	NA

12.0 Required Software

12.1.1. PitView software tools on the Testset computer are under version control. They are located in directory …/projects/gpbvx/hwQual/EFT.

12.1.2. MATLAB Release 12

12.1.3. Control Desk version 3.2, dSPACE, Inc. with associated applications developed for the test.

13.0 GSE Certification Requirements:

	P/F	**Notes**:
13.1. Verify **P0758** has been run on the Spacecraft Emulator GSE **within the past 180 days or since the rack has been moved** to the current test location.		Date of last Certification:
13.2. Verify **P0749** has been run on the gyroscope simulator facility **within the last 90 days**.		Date of last Certification:

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.

14.1. Aft Flight GSS Power Connection:

Test Description:	P/F	Notes
14.1.1. Verify all Aft power supplies are turned off on the Spacecraft Emulator panel.		
14.1.2. Connect FSU (DUT) to ACU as shown in Fig. 1.		
14.1.3. Set current limit on HP power supply in S/C emulator rack to 5.0 A • Close any LabView program that may be running. • Key in the following sequence on the front panel of the HP supply: • "**LOCAL, Function: CURRENT, 5.0, ENTER**"		
14.1.4. Restart the LabView *GSE Test* virtual instrument.		
14.1.5. Set supply voltage to **28.0 V** on the *GSE test* panel.		
14.1.6. Set Spacecraft clock simulator to the following: **16fo: A + B** **10 Hz: A + B** **Sun 10 Hz: A + B**		
14.1.7. Apply power to the aft box by turning on "Aft Main" on LabView control panel; record power on time in Power Log for this unit.		
14.1.8. Verify that current is < 550 mA; if greater remove power and cancel test.		
14.1.9. Record indicated main bus current as indicated on HP power supply front panel.		Current:
14.1.10. Cycle the "Power Mod 750A" and "Power Mod 750B" buttons "on" then "off" using the mouse (insures the state of the HV enable relays)		

Test Description:	P/F	Notes
14.1.11. Apply power to the forward GSS by turning on the "FSU A" supply on LabView control panel; record power on time in Power Log for this unit.		
14.1.12. Record indicated main bus current as indicated on HP power supply front panel.		Current:

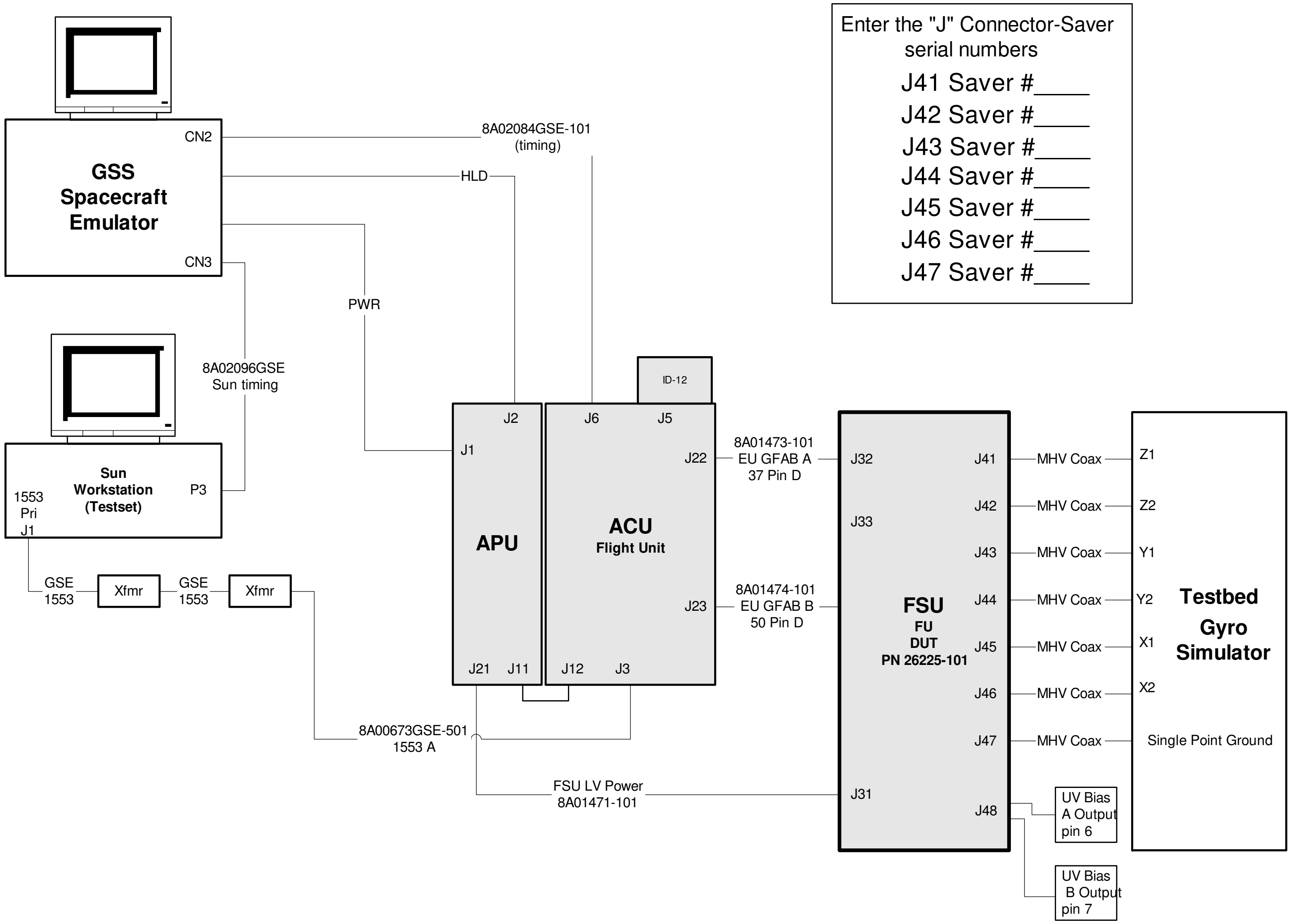

Figure 1 - Connections to DUT

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15.0 Recording of Extended Functional Test Data:

15.1. Data shall be entered in boxes delineated by a thick border, for example:

Data

16.0 FSU Calibration

Complete procedure **P0892**, On-Board A/D AND D/A Converter Calibration Procedure for GSS Forward Suspension Units (FSU).

Calibration complete: ____________
Initial / date

Calibrations file copied to release site, \\GSS-SERVER\Release\drop_box ____________
Initial / date

Attach hard copy of the calibration results to the P0769 results. ____________
Initial / date

Test Description:	P/F	Notes
16.1.1. Bring up the Sun workstation. For network computers type "whoami" in any window. The username and password is the same as your relgyro info.		
16.1.2. Open a Command Tool by "right clicking" the mouse in any open place on the screen and then left clicking "Command Tool" from the drop down menu.		
16.1.3. Type "cd /projects/gpbvx/gsw/ builds/build_2_0_8_1/bsp/pp" and then press Enter.		
16.1.4. Type "`ls`" and verify that the file named gsw_2_0_8_1.bin is present. If it is type "gssloader" and press Enter. The image will need a moment to load.		
16.1.5. Open another command tool window as before. This time type "~/hwQual/EFT"		
16.1.6. Type "startall" at the command prompt.		
16.1.7. Open the "ATC" PIT window		
16.1.8. Record GSW version from ATC PIT window at right:		GSW Ver:
16.1.9. Open the "Science Data" PITwindow		
16.1.10. Open the "Arbiter 7" PITwindow		

17.0 FSU Extended Functional Tests

17.1. Test Setup

Test Description:		P/F
17.1.1. Note how many times the box has been tested using P0769. (If it has not been tested before this is test cycle #1.)	Test Cycle #	

17.2. Initial board level tests

Test Description:	P/F
17.2.1. Run the FSU startup script; ***start.scp*** record pass/fail status of command at right Runs commands **16 13** (PON reset), **1 5** (use 10Hz clock) "**14 1**" and "**16 100**")	
17.2.2. Run the FCL diagnostic "**14 38**"; record pass/fail status of command at right.	
17.2.3. Run the FMR diagnostic "**14 29**"; record pass/fail status of command at right.	
17.2.4. Run the ADDA diagnostic script; ***adda.scp*** record pass/fail status of command at right.	
17.2.5. Run resultant script from P0892, ***FSU_'sn'_cal.scp.*** The **'sn'** is a 2 digit representation of the FSU serial number. ***;*** record pass/fail status of command at right.	
17.2.6. Set test set to use the low voltage calibrations. Run ***lv_cals.scp***; record pass/fail status of command at right.	
17.2.7. Run the script ***initialFSUconfig.scp ;*** record pass/fail status of command at right.	

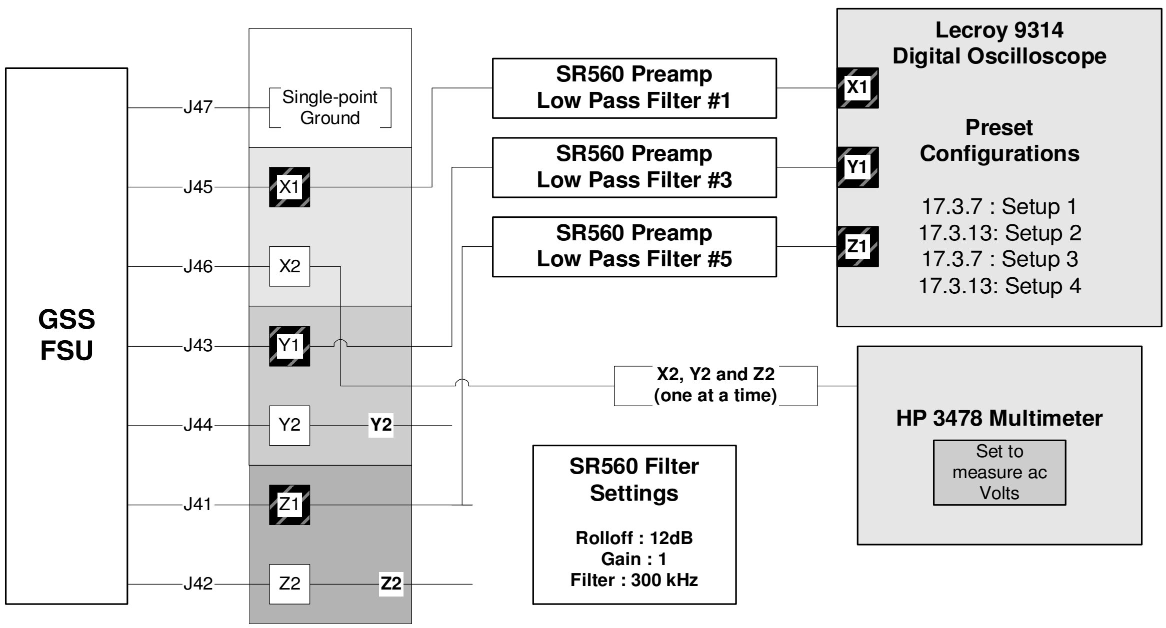

Figure 2. Oscillator Level Measurement Setup.

17.3. Oscillator level tests

(Satisfies GSS 3.4.17.5)

Test Description:			Done (〈)
17.3.1. Set the oscillator level to high. Run ***oschi.scp;***			
17.3.2. Configure the hardware according to Figure 2. On the previous page.			
17.3.3. Press “Panel Setup” on the LeCroy 9314 scope and choose ”Recall FROM SETUP 1”. Press Return. Press “Screen Dump” to make a hard copy. Press “Panel Setup on the Fluke 9314 and choose ”Recall FROM SETUP 3”. Press Return. Press “Screen Dump” to make a hard copy. Attach the plots to the following page. Make a photocopy of the completed page (2 plots) and place the photocopy in the acceptance procedure package.			
17.3.4. Record the values from the HP 3478 multimeter one at a time for 17.3.5, 17.3.6 and 17.3.7			**P/F**
17.3.5. Measure oscillator level at J45 output (J45 center to J47 center)	Acceptable Range 141 ± 20 mV_{rms}	Level:(mV_{rms})	
17.3.6. Measure oscillator level at J43 output (J43 center to J47 center)	Acceptable Range 141 ± 20 mV_{rms}	Level:(mV_{rms})	
17.3.7. Measure oscillator level at J41 output (J41 center to J47 center)	Acceptable Range 141 ± 20 mV_{rms}	Level:(mV_{rms})	
17.3.8. Set the oscillator level to low by running ***osclow.scp***;			
17.3.9. Press “Panel Setup on the LeCroy 9314 and choose ”Recall FROM SETUP 2”. Press Return. Press “Screen Dump” to make a hard copy. Press “Panel Setup on the Fluke 9314 and choose ”Recall FROM SETUP 4”. Press Return. Press “Screen Dump” to make a hard copy. Attach the plots to the following page. Make a photocopy of the completed page (2 plots) and place the photocopy in the acceptance procedure package.			
17.3.10. Record the values from the HP 3478 multimeter one at a time for 17.3.11, 17.3.12 and 17.3.13			
17.3.11. Measure oscillator level at J45 output (J45 center to J47 center)	Acceptable Range 14.1 ± 2 mV_{rms}	Level:(mV_{rms})	
17.3.12. Measure oscillator level at J43 output (J43 center to J47 center)	Acceptable Range 14.1 ± 2 mV_{rms}	Level:(mV_{rms})	
17.3.13. Measure oscillator level at J41 output (J41 center to J47 center)	Acceptable Range 14.1 ± 2 mV_{rms}	Level:(mV_{rms})	
17.3.14. Remove the Z1 and Z2 suspension lines from the Data Acquisition interface box.			

<u>Attach hard copy of the 3-phase oscilloscope bridge excitation traces from 17.3.9 " FROM SETUP 1"</u>

<u>Attach hard copy of the 3-phase oscilloscope bridge excitation traces from 17.3.9 " FROM SETUP 3"</u>

Attach hard copy of the 3-phase oscilloscope bridge excitation traces from 17.3.14 " FROM SETUP 2"

Attach hard copy of the 3-phase oscilloscope bridge excitation traces from 17.3.14 " FROM SETUP 4"

Oscillator level Low

17.4. Charge control bias tests

Charge Control Electrode, Zero Bias
(satisfies GSS 3.4.11.3 and partially satisfies GSS 3.4.11.1)

Test Description:	Done (〈)
17.4.1. Set up the measurement of the charge control bias according to Figure 3. ***Set the Gain to 1 and the cutoff frequency to 1MHz on the SR560 Low Noise Preamplifier***	
17.4.2. Start the Control Desk application on the NT computer.	
17.4.3. Load the ChargeBias.cdx experiment in the Control Desk application.	
17.4.4. Run ***chbias0.scp***; record the value in FLT:4 in the “ATC” PIT window below once the script completes and the display stabilizes:	
17.4.5. In the ChargeBias application select “stop” then “start” in the simstate window.	
17.4.6. Record the UV bias for both Bias A (pin 6) and Bias B (pin 7) from the Charge Bias Measurements window.	

Mux Channel	Monitor Signal	Acceptable Range	MUX Value (x.xx)	Measured Value (x.xx)	**P/F**
4	CHRG_ELX_MON	0.0 ± 5mV	mV	mV (J48; Pin 6)	
				mV (J48; Pin 7)	

Charge Control Electrode, Positive Bias
(partially satisfies GSS 3.4.11.2 and GSS 3.4.11.1)

17.4.7. Run ***chbiasp3.scp***; record the value in FLT:4 in the “ATC” PIT window below once the script completes and the display stabilizes:	
17.4.8. Set the toggles on the back of the Data Acquistion Interface Box to the ***up position.***	
17.4.9. Connect the top BNC output of IF5 Z1 to the HP 3478A voltmeter. Record the UV bias for Bias A (pin 6).	
17.4.10. Move the BNC cable to the top BNC output of IF6 Z2. Record the UV bias for Bias B (pin 7).	

Mux Channel	Monitor Signal	Acceptable Range	MUX Value (x.xx)	Measured Value (x.xx)	**P/F**
4	CHRG_ELX_MON	3.0 ± 0.2 V	V	V (J48; Pin 6)	
				V (J48; Pin 7)	

Charge Control Electrode, Negative Bias

(partially satisfies GSS 3.4.11.2 and GSS 3.4.11.1)

Test Description:	Done (〈)
17.4.11. Run ***chbiasm3.scp***; record the value in FLT:4 in the "ATC" PIT window below once the script completes and the display stabilizes:	
17.4.12. Connect the top BNC output of IF5 Z1 to the HP 3478A voltmeter. Record the UV bias for Bias A (pin 6).	
17.4.13. Move the BNC cable to the top BNC output of IF6 Z2. Record the UV bias for Bias B (pin 7).	

Mux Channel	Monitor Signal	Acceptable Range	MUX Value (xx.xx)	Measured Value (xx.xx)	**P/F**
4	CHRG_ELX_MON	-3.0 ± 0.2 V	V	V (J48; Pin 6)	
				V (J48; Pin 7)	

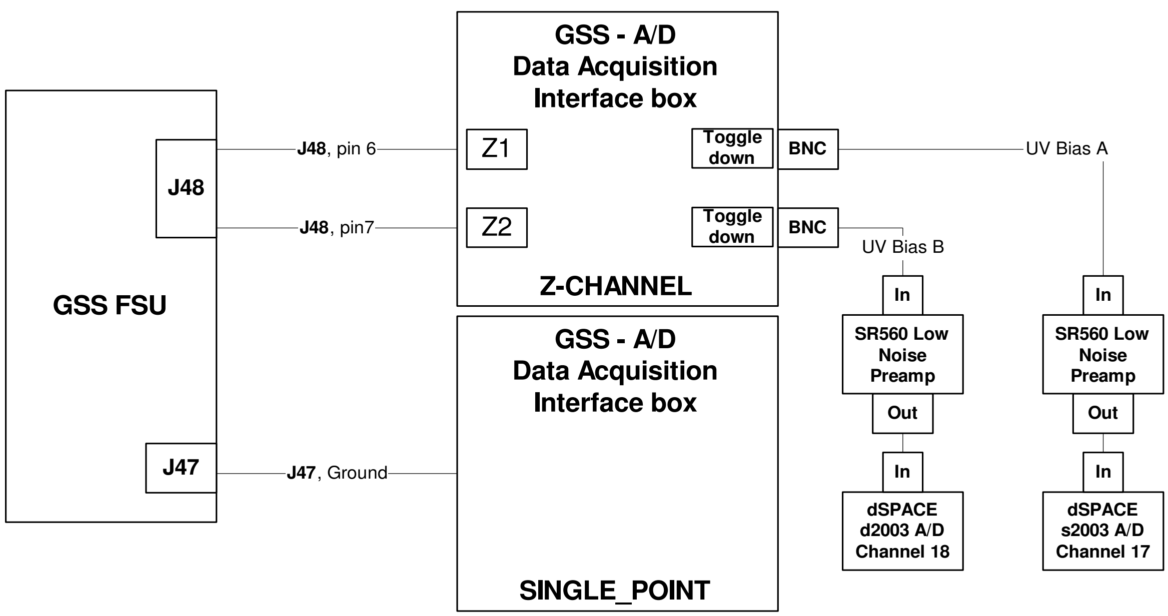

Figure 3. Measurement setup for Charge control bias noise measurements.

17.5. Noise on Charge Control Bias

(Satisfies GSS 3.4.11.5)

Test Description:	Done (〈)
17.5.1. Set the toggles on the back of the Data Acquistion Interface Box to the ***down position.***	
17.5.2. Confirm/set SRS 560 settings: (both channels) • Differential input • DC coupled • DC input • Low noise • Gain = 2 *(This compensates for the factor of 2 attenuation due to the 50Ω output impedance of the SR560 and the 50Ω input impedance of the HP 8568B)* • Connect cables leading from SRS boxes to dSPACE ds2003	
17.5.3. Run ***chbias0.scp***; From the Capture Settings Window of the ChargeBias.cdx experiment click the *Settings* button. Set the following capture variables : **Timestamping** : on, **Length** : 40.96 and the **Downsampling** 50. Press "START"	
17.5.4. Upon completion of the capture, select ***Save.*** Enter the destination filename using the following format: ***C:\FSU_Acceptance_Test\SN???\RawData\ChargeBias\chbiasnoise???*** where ***???*** corresponds to the serial number of the FSU in test. There will be an automatic .mat extension added to the file name.	
17.5.5. Start Matlab from the desktop. Set the working directory to **C:\FSU_Acceptance_Test\SN*???*\RawData\ChargeBias** .	
17.5.6. Compute the spectral density in $\mu V/(Hz)^{1/2}$ for both Bias A and B. Type ***ChargeBiasPSD*** at the command prompt. 17.5.7. Record the results below. (Don't forget the gain of 100)	
17.5.8. Make a plot of the two spectra using the following labels:	

Title("Charge Bias A Noise FSU S/N **???** *date*")	Title("Charge Bias B Noise FSU S/N **???** *date*")
Xlabel("Frequency (Hz)")	Xlabel("Frequency (Hz)")
Ylabel("Spectral Density (microvolts / rt(Hz))")	Ylabel("Spectral Density (microvolts / rt(Hz))")

17.5.9. Attach hard copies of the plots to the acceptance package.	

Ch. Bias Pin	FSU Output	Noise req. for f < 100Hz	Max. spectral density (xx.xx)	P / F
A	J48, pin 6	<500 $\mu V/(Hz)^{1/2}$	$\mu V/(Hz)^{1/2}$	
B	J48, pin 7	<500 $\mu V/(Hz)^{1/2}$	$\mu V/(Hz)^{1/2}$	

Close the Control Desk application and power off the dSPACE DSP.	

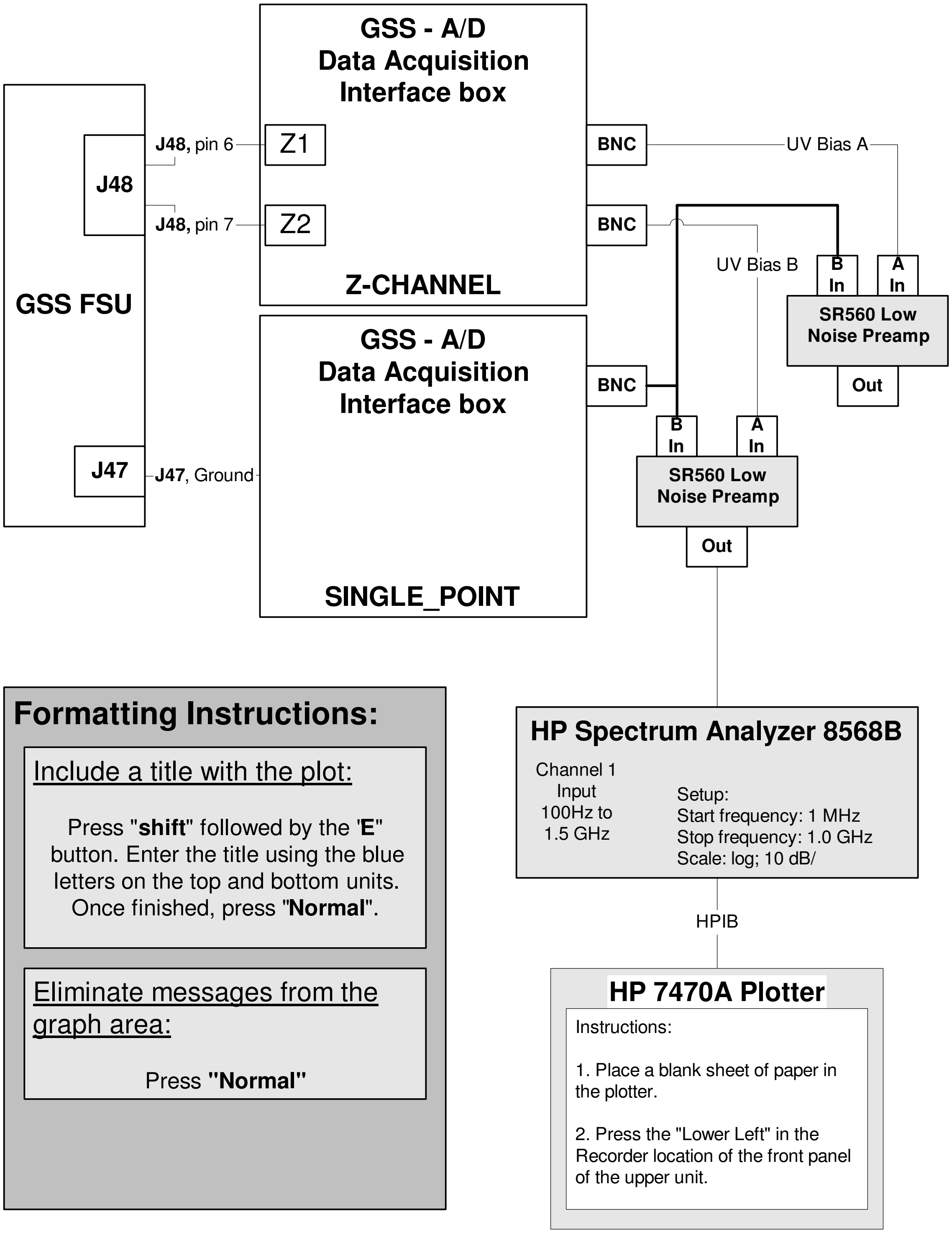

Figure 4. Experiment setup for Charge bias portion of Conducted Emissions into Probe noise measurement.

17.6. Charge Bias Conducted Emissions into the Probe
(partially satisfies GSS 3.3.2)

Test Description:	Done (〈)
17.6.1. Set up the measurement of the charge control bias according to Figure 4.	
17.6.2. Confirm/set HP 8568B settings: • Res BW: 10 kHz • Video BW: 1 kHz • Display line: set to 35 uV • Reference level: set to 20 mV • Start Frequency 1 MHz • Stop Frequency 1000 MHz	
17.6.3. Confirm/set SRS 560 settings: (both channels) • Differential input • DC coupled • DC input • Low noise • Gain = 1 • Disconnect cables leading from SRS boxes to dSpace DS 2003 (noise control)	
17.6.4. Disconnect the FSU bias connectors from the Data Acquisition Interface box and measure the noise floor of the experimental setup. Attach a hard copy of the plot to the procedure.	
17.6.5. Reconnect the FSU bias connectors.	
17.6.6. Measure the character of Bias A output. Determine the maximum value of any spurious signal in the range 1MHz to 1GHz and record it. Calculate $V_{rms}(max) = V_{(max)} * 1.4$ and record. (an additional factor of 2 is required in the RMS calculation to account for the dual 50 ohm terminations on the SR650 and the HP 8568B) *If measurement violates the noise requirement, compare with the noise floor measurement to insure that the measurement is in fact due to the FSU and not from the ambient environment.*	
17.6.7. Identify the maximum spectral feature for Bias A from the monitor using the marker function of the HP 8568B. Plot result. Print a hard copy of the spectrum for each Bias line and include them in the acceptance package.	
17.6.8. Repeat the measurement for bias B.	
17.6.9. Attach hard copies of the plots to the acceptance package.	

FSU Output	Signal path (Interface Box);	Noise Requirement; For 1 MHz < f_{max} <1 GHz	Maximum spectral component frequency	Spectral Density V_{rms} (f_{max})	P / F
J48, pin 6	Z1	< 50 μV_{rms}			
J48, pin 7	Z2	< 50 μV_{rms}			

17.7. LVA (Science drive) Noise Measurements

Part A : For noise at frequency @ 5.5 mHz and 1 Hz

(satisfies GSS 3.4.8.2.2.2)

Test Description:	Done (〈)
17.7.1. Turn on the dSPACE DSp. Start the Control Desk application on the NT computer.	
17.7.2. Run ***lva_zero_out.scp***; Configure the test setup according to Figure 5.	
17.7.3. Confirm/set SRS 560 settings: (both channels) • Differential input (A-B) • DC coupled • DC input • Low noise • Gain = 1000 • Cutoff = 1 kHz, low pass • Rolloff = 12 dB/octave	
17.7.4. Load LVANoise.cdx in Control Desk .From the Capture Settings Window click the *Settings* button. Set the following capture variables: • Timestamping : on • Length : 2048 • Downsampling 1000. • Press *Start*	
17.7.5. Upon completion of the capture, select ***Save.*** Enter the destination filename using the following format: **C:\FSU_Acceptance_Test\SN*???*\RawData\ LVANoise\ NoiseBelow2Hz???.mat** where as before ***???*** corresponds to the serial number of the FSU in test.	
17.7.7. Start Matlab from the desktop. Set the working directory to **C:\FSU_Acceptance_Test\SN*???*\RawData\LVA_Noise**	
17.7.8. Calculate the spectral density for each of the (6) channels using LVA_lowPSD.m	
17.7.9. Determine the values at 5.5 mHz and 1 Hz for each channel and record both in Part A.	
17.7.10. Make a plot of the spectra and use the following convention to label them. (J## represents the channel i.e.J41, J42 etc.) Attach hard copies of the plots to the acceptance package. Use the zoom feature if necessary to best show the levels at the frequencies of interest (5.5 mHz and 1 Hz).	
>Title(“LVA Low Frequency Noise FSU S/N ??? , J##, *date*”) >Xlabel(“Frequency (Hz)”) >Ylabel(“Spectral Density (microvolts / rt(Hz))”)	

Part A : (continued) **For noise at frequency @ 5.5 mHz and 1 Hz**
(satisfies GSS 3.4.8.2.2.2)

5.5 mHz results:				
FSU Output	Signal path (Interface Box); dSPACE A/D	Noise Requirement	Spectral Density @ 5.5mHz $\mu V(f_{max})/(Hz)^{1/2}$	**P/F**
J45	(GSS1,A/D1); 17	<100µV/(Hz)$^{1/2}$ @ 5.5mHz		
J46	(GSS2,A/D2); 18	<100µV/(Hz)$^{1/2}$ @ 5.5mHz		
J43	(GSS3,A/D3); 19	<100µV/(Hz)$^{1/2}$ @ 5.5mHz		
J44	(GSS4,A/D4); 20	<100µV/(Hz)$^{1/2}$ @ 5.5mHz		
J41	(GSS5,A/D5); 21	<100µV/(Hz)$^{1/2}$ @ 5.5mHz		
J42	(GSS6,A/D6); 22	<100µV/(Hz)$^{1/2}$ @ 5.5mHz		

(satisfies GSS 3.4.8.2.2.2)

1 Hz results:				
FSU Output	Signal path (Interface Box); dSPACE A/D	Noise Requirement	Spectral Density @ 1 Hz $\mu V(f_{max})/(Hz)^{1/2}$	**P/F**
J45	(GSS1,A/D1); 17	< 3µV/(Hz)$^{1/2}$ @ 1 Hz		
J46	(GSS2,A/D2); 18	< 3µV/(Hz)$^{1/2}$ @ 1 Hz		
J43	(GSS3,A/D3); 19	< 3µV/(Hz)$^{1/2}$ @ 1 Hz		
J44	(GSS4,A/D4); 20	< 3µV/(Hz)$^{1/2}$ @ 1 Hz		
J41	(GSS5,A/D5); 21	< 3µV/(Hz)$^{1/2}$ @ 1 Hz		
J42	(GSS6,A/D6); 22	< 3µV/(Hz)$^{1/2}$ @ 1 Hz		

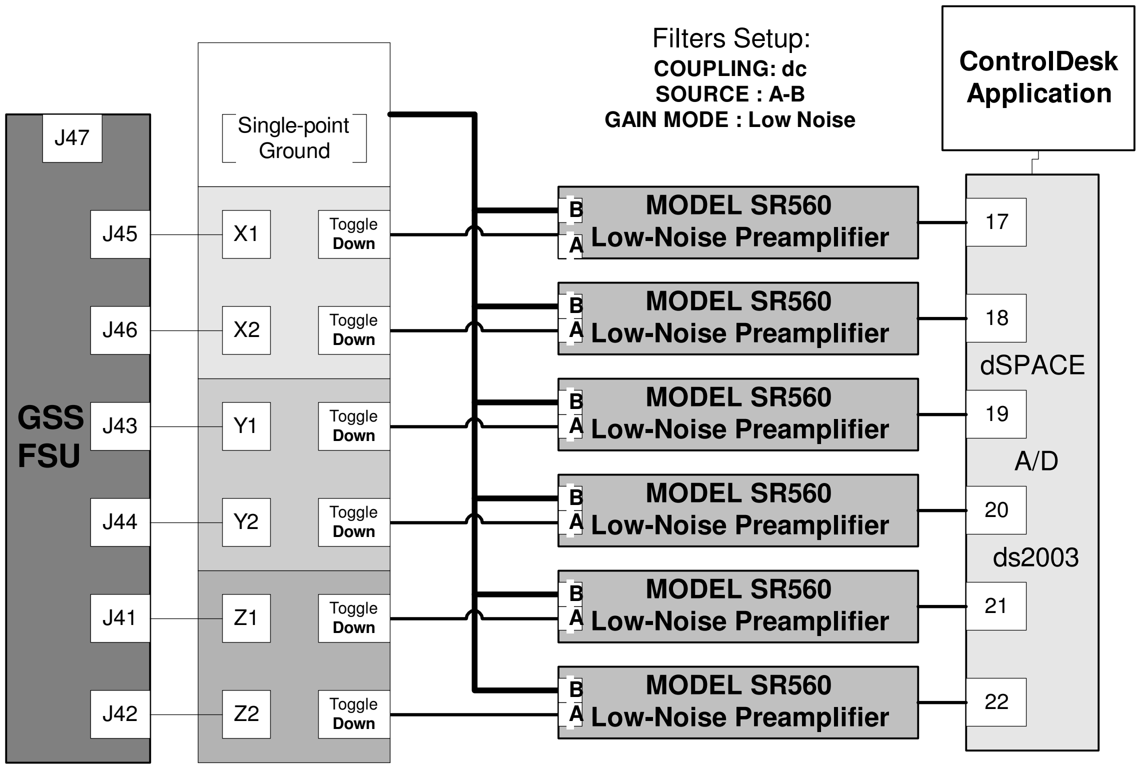

Figure 5. Science drive low frequency noise experimental setup.

Part B : For noise at frequencies greater than 100 Hz

(satisfies GSS 3.4.8.2.2.2)

Procedure is on the next page.

>100 Hz results:

FSU Output	Signal path (Interface Box); dSPACE A/D	Noise Requirement	Maximum spectral component frequency	Spectral Density $V(f_{max}) / (Hz)^{1/2}$	P/F
J45	(GSS1,A/D1); 17	< 1µV/(Hz)$^{1/2}$ @ >100 Hz			
J46	(GSS2,A/D2); 18	< 1µV/(Hz)$^{1/2}$ @ >100 Hz			
J43	(GSS3,A/D3); 19	< 1µV/(Hz)$^{1/2}$ @ >100 Hz			
J44	(GSS4,A/D4); 20	< 1µV/(Hz)$^{1/2}$ @ >100 Hz			
J41	(GSS5,A/D5); 21	< 1µV/(Hz)$^{1/2}$ @ >100 Hz			
J42	(GSS6,A/D6); 22	< 1µV/(Hz)$^{1/2}$ @ >100 Hz			

Part B (cont.): For noise at frequencies greater than 100 Hz

(satisfies GSS 3.4.8.2.2.2)

Test Description:	Done (〈)
17.7.11. Load LVA_HF_Noise.cdx in Control Desk	
17.7.12. Confirm/set SRS 560 settings: (both channels) • Differential input (A-B) • DC coupled • DC input • Low noise • Gain = 1000 • Cutoff = 1 kHz, low pass • Rolloff = 12 dB/octave	
17.7.13. From the Capture Settings window of LVA_HF_Noise.cdx click the *Settings* button. Set the following capture variables: • Timestamping : on • Length : 4.096 • Downsampling : 5 • Close the Capture Settings window and press ***Start***	
17.7.14. Upon completion of the capture, select ***Save***. Enter the destination filename using the following format: **C:\FSU_Acceptance_Test\SN*???*\RawData\ LVA_Noise \ LVA100Hz*???*.mat** where as before ***???*** corresponds to the serial number of the FSU in test.	
17.7.15. Start Matlab from the desktop. Set the working directory to **C:\FSU_Acceptance_Test\SN*???*\RawData\LVA_Noise**	
17.7.16. Calculate the spectral density for each of the (6) channels using LVA_highPSD.m	
17.7.17. Determine the value of the maximum spectral feature for each channel and record it in Part B.	
17.7.18. Make a plot of the spectra and use the following convention to label them. (J## represents the channel i.e.J41, J42 etc.) Attach hard copies of the plots to the acceptance package. Do not use the zoom feature. Plot the entire 0 to 1 kHz range.	
>Title("LVA Noise at Frequencies < 1 kHz, FSU S/N ???, J##, *date*") >Xlabel("Frequency (Hz)") >Ylabel("Spectral Density (microvolts / rt(Hz))")	
17.7.19. Configure the hardware according to Figure 6.	
17.7.20. Close Control Desk and power off the dSPACE DSP.	

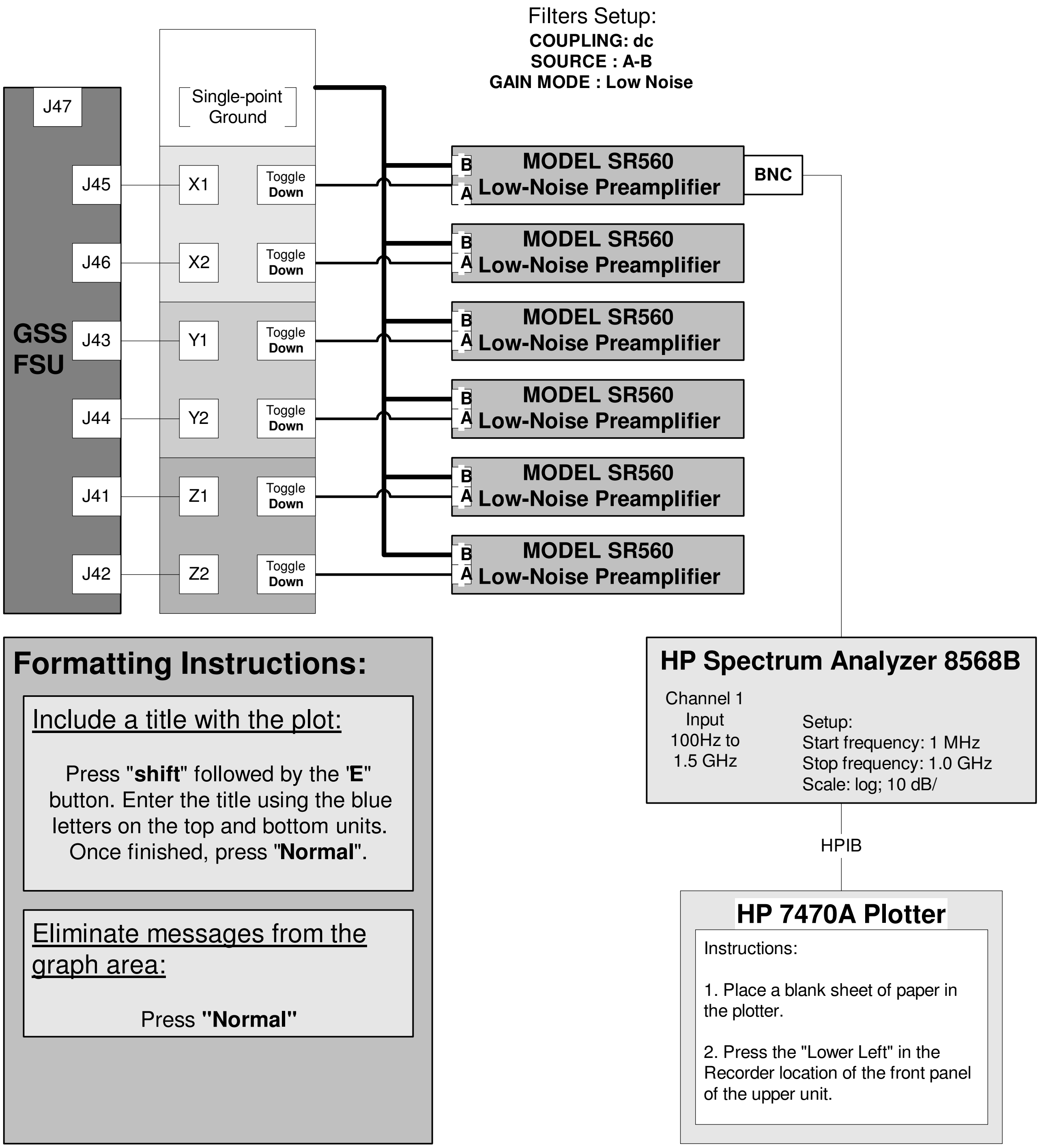

Figure 6. Experimental setup for measuring the conductance into the probe.

Part C: LVA High Frequency Noise Measurements

LVA Conducted Emissions into the probe

(partially satisfies GSS 3.3.2)

Test Description:	Done (〈)
17.7.21. Confirm/set HP 8568B settings: • Res BW: 10 kHz • Video BW: 1 kHz • Display line: set to 35 uV • Reference level: set to 20 mV • Start Frequency 1 MHz • Stop Frequency 1000 MHz	
17.7.22. Confirm/set SRS 560 settings: (all 6 units) • DC coupled • DC input Low noise • Gain = 1 • Disconnect cables leading from SRS boxes to dSpace DS 2003 (noise control)	
17.7.23. Run ***lva_noise.scp***; This sets the drive path to pass through the LVA. (via the Prime filter) Connect the X1 SRS amp output the HP 8568B as shown in Figure 6.	
17.7.24. Disconnect the FSU suspension lines at the Data Acquisition Interface box and run a noise floor measurement (characterize the ambient laboratory noise environment). Print a hard copy and attach to the procedure. Reconnect suspension lines once complete.	
17.7.25. Measure the character of SRS X1 output. Repeat for channels X2 through Z2 (6 total). Print a hard copy of the spectrum for each suspension line and include them in the acceptance package. Determine the maximum value of any spurious signal in the range 1MHz to 1GHz and record it. Calculate $V_{rms}(max) = V_{(max)} * 1.4$ and record. (an additional factor of 2 is required in the RMS calculation to account for the dual 50 ohm terminations on the SR650 and the HP 8568B) *If measurement violates the noise requirement, compare with the noise floor measurement to insure that the measurement is in fact due to the FSU and not from the ambient environment.*	

Channel	Suspension Line	Acceptable Range	Freq. (in MHz) ($V_{(max)}$)	Measured $V_{(max)}$ amplitude	Calculated $V_{rms}(max)$	**P/F**
(J45)	X1	<50μV rms		μV	μV rms	
(J46)	X2	<50μV rms		μV	μV rms	
(J43)	Y1	<50μV rms		μV	μV rms	
(J44)	Y2	<50μV rms		μV	μV rms	
(J41)	Z1	<50μV rms		μV	μV rms	
(J42)	Z2	<50μV rms		μV	μV rms	

Part D: Bright line peak-peak voltage noise

Suspension line signals at or above 100 kHz
(satisfies 3.4.14.1)

Test Description:	Done (〈)
17.7.26. Confirm/set HP 8568B settings: • Res BW: 10 kHz • Video BW: 100 Hz • Display line: set to 251 uV • Reference level: set to 10 mV • Start Frequency 100 kHz • Stop Frequency 1 MHz	
17.7.27. Confirm/set SRS 560 settings: (all 6 units) • LP cutoff 1 MHz • 12 dB/octave rolloff • Gain = 1 • (all other setting same as previous)	
17.7.28. Measure all six SRS outputs and make/attach plots (X1 – Z2) Compare the obtained plots with the graph below. All bright line spectral components must lay below the line plotted in Figure 7.	

Channel	Suspension Line	Acceptable Range	Freq. ($V_{(max)}$) (in kHz) {Enter only if range is exceeded otherwise None}	Measured amplitude $V_{(max)}$ {Enter only if range is exceeded}	**P/F**
(J45)	X1	Compare with Figure 7		μV	
(J46)	X2	Compare with Figure 7		μV	
(J43)	Y1	Compare with Figure 7		μV	
(J44)	Y2	Compare with Figure 7		μV	
(J41)	Z1	Compare with Figure 7		μV	
(J42)	Z2	Compare with Figure 7		μV	

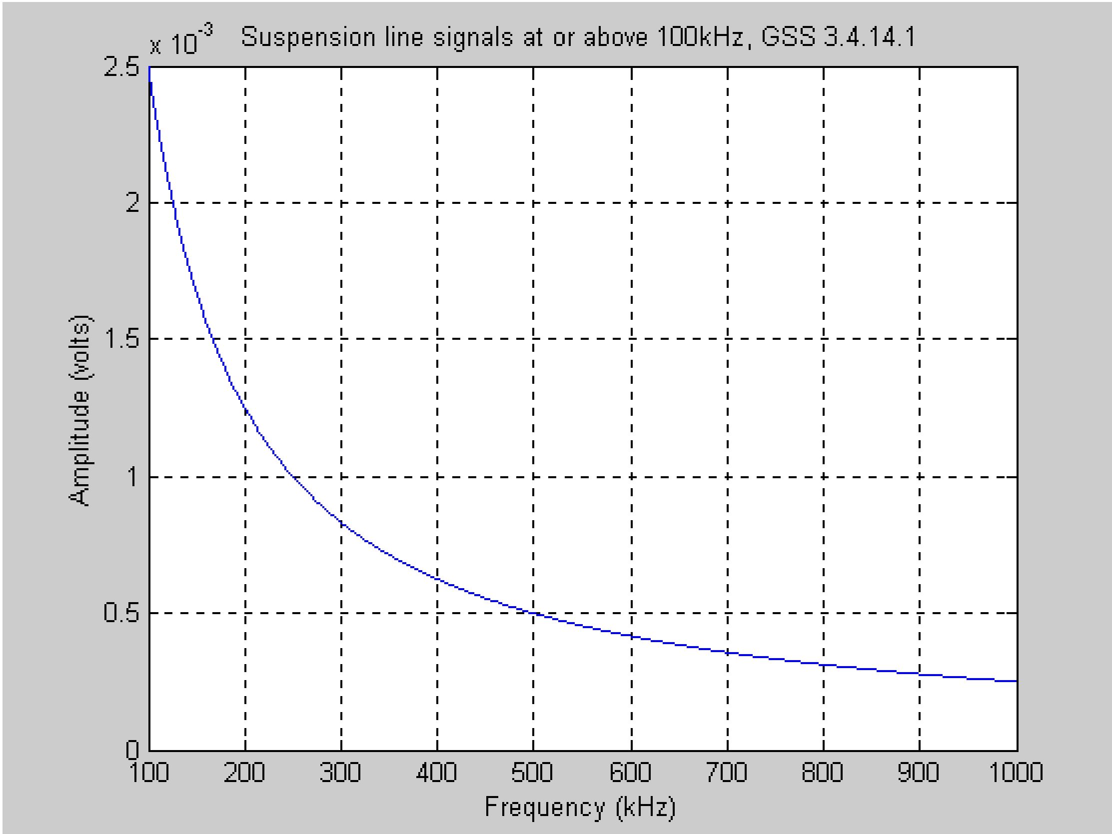

Figure 7. Bright line peak to peak requirement for suspension lines (Plot adjusted to amplitude for simpler comparison with output of HP 8568B spectrum analyzer.

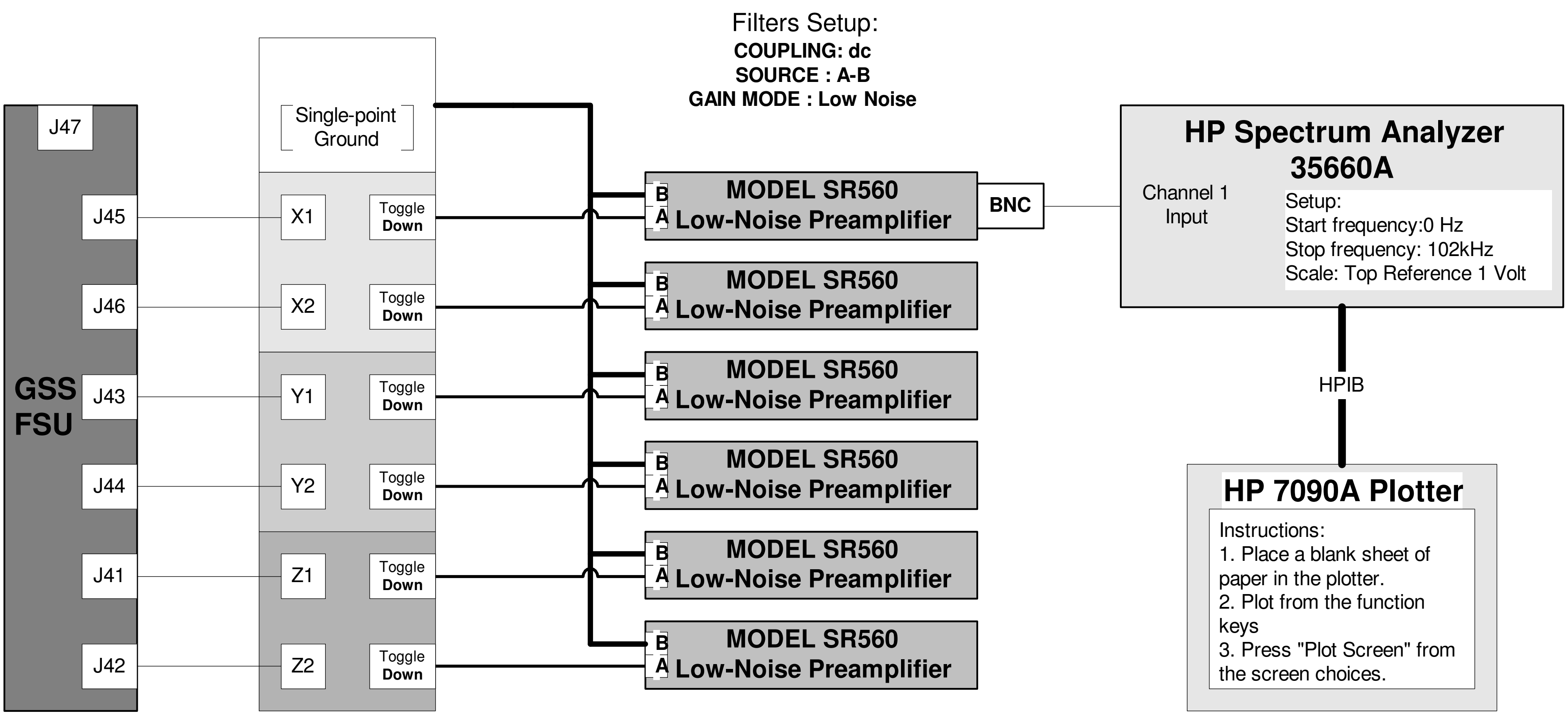

Figure 8. High frequency measurement experimental setup suspension line signals below 100 kHz using the HP35660A Spectrum Analyzer.

Suspension line signals below 100 kHz

(satisfies 3.4.14.2)

Test Description:	Done (〈)
17.7.29. Move the output to the HP 35660A as shown in Figure 8 above beginning with J45, X1.	
17.7.30. Confirm/set HP 35660A settings: • Top reference level: set to 1 V • Start Frequency 0 Hz • Stop Frequency 102 kHz	
17.7.31. Confirm/set SRS 560 settings: (all 6 units) • LP cutoff 100 kHz • 12 dB/octave roll-off • Gain = 1 • DC coupled • A-B differential • (all other setting same as previous)	
17.7.32. Measure the output from the center pin of connectors 41 through 46 with respect to pin 47 beginning with J45. Print a hard copy of the spectrum for each suspension line and include them in the acceptance package. Determine the maximum value of any spurious signal in the range 10Hz to 100 kHz and record it. (near dc measurements are not reliable with this spectrum analyzer.)	
17.7.33. All bright line spectral components must lay below the line plotted in Figure 9.	

Channel	Suspension Line	Acceptable Range	Freq. ($V_{(max)}$) (in kHz)	Measured $V_{(max)}$ amplitude (xx.x)	P/F
(J45)	X1	Compare with Figure 9		mV	
(J46)	X2	Compare with Figure 9		mV	
(J43)	Y1	Compare with Figure 9		mV	
(J44)	Y2	Compare with Figure 9		mV	
(J41)	Z1	Compare with Figure 9		mV	
(J42)	Z2	Compare with Figure 9		mV	

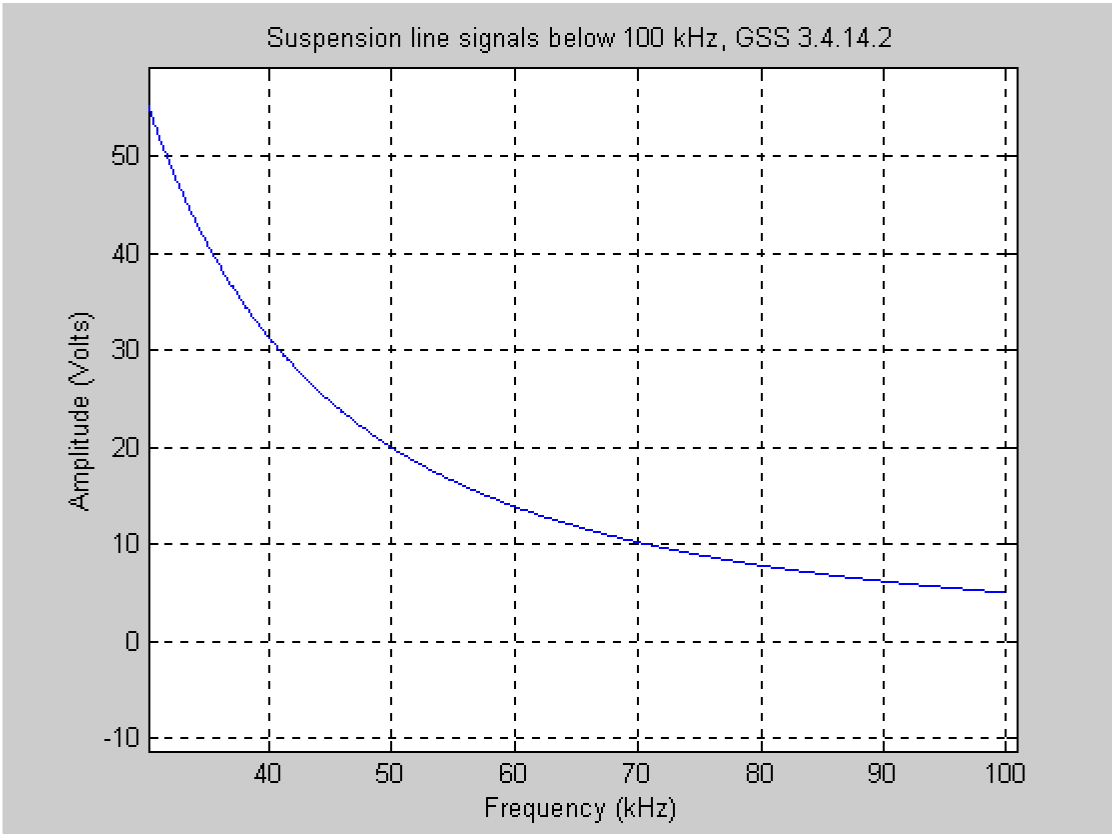

Figure 9. *Bright line peak to peak requirement for suspension lines (Plot adjusted to amplitude for simpler comparison with output of HP 35660A spectrum analyzer.*

Test Description:	Done (√)
17.7.34. Disconnect any cables connected to the top row of BNC output connectors on the Data Acquisition Interface boxes.	
17.7.35. Set test set to use the high voltage calibrations. Run ***hv_cals.scp.***	

Extended Functional Test note
For all high voltage range measurements use (2) handheld DMMs connected in series to measure the voltage. Use only the Fluke 87 True RMS multimeters for this measurement. The Fluke 77 III type are not rated for the high voltage. The experimental setup is illustrated in Figure 10.   ***The HP 3478 is rated for a maximum input of 300 volts in our test configuration.***

Test Description:	Done (〈)
17.7.36. Before turning on the high voltage be sure to set the configuration of the data acquisition interface boxes. On the back of the data acquisition boxes are toggle switches that allow one to switch between the bottom row of BNC outputs and the top row. Switch these all so that the output is on the top row. ***The toggle switches should all be pulled up.*** ***CHECK THIS BEFORE TURNING ON THE HIGH VOLTAGE!!!***	
17.7.37. There is a High Voltage / Low Voltage latching relay that needs to be set before applying high voltage to the gyroscope simulator GSE. You can actuate the latch by moving the toggle switch in the direction of the high voltage label and then pressing the button on the opposite side of the box. It is VERY important that you do both. Simply moving the toggle will not change the relay and can result in damage to the simulator. There is an LED that is lighted when the toggle switch is in the position that is active. If there is no light on then the position of the switch is actually the opposite of the toggle position indicated. *(Note that this is a precautionary measure at this point in the procedure. The measurement will not involve this circuit but it is safer to be in this configuration regardless.)* ***CHECK THIS BEFORE TURNING ON THE HIGH VOLTAGE!!!***	
17.7.38. Run ***pre_hv_on.scp***; This will configure the FSU to do the following; • Clear the mode register • Reset the PON bit • Set the HV/LV relay on the HVAs to the LV output state. • Change the MODE to ground test. • Command 0.0 volts from the D/As to all (6) channels. • Set the MUX monitor to write the D/A outputs to programmable telemetry	
17.7.39. Check the telemetry to confirm that there is in fact 0 volts being commanded by the D/As. Confirm that the sampling rate is 10 Hz. If not, issue the line command **1 5**. After checking the telemetry return the sampling rate to its original value if different than 10 Hz.	
17.7.40. Run ***hv_on.scp***; This will configure the FSU to do the following; • Switch the HV/LV relay to the HV state • Set the MUX monitor to write the HV_VMON outputs to programmable telemetry	
17.7.41. Turn on the +/- 725 High Voltage supply at the SCE.	

17.8. HVA (Spinup drive) Noise Measurements

Part A. For frequencies <1 kHz
(Partially satisfies GSS 3.4.8.2.1.2)

	Test Description:	Done (〈)
17.8.1.	Turn on the Dspace DSP. Start the Control Desk application on the NT computer.	
17.8.2.	Load HVA _Noise.cdx in Control Desk	
17.8.3.	Configure the measurement setup per Figure 5.	
17.8.4.	Confirm/set SRS 560 settings: (both channels) • Differential input (A-B) • DC coupled • DC input • Low noise • Gain = 50 • Cutoff = 1 kHz, low pass • Rolloff = 12 dB/octave	
17.8.5.	From the Capture Settings window of HVA_Noise.cdx click the *Settings* button. Set the following capture variables: • Timestamping : on • Length : 4.096 • Downsampling : 5 • Close the Capture Settings window and press ***Start***	
17.8.6.	Upon completion of the capture, select ***Save***. Enter the destination filename using the following format: **C:\FSU_Acceptance_Test\SN*???*\RawData\ HVA_Noise \ HVA_SU_1kHz*???*.mat** where as before ***???*** corresponds to the serial number of the FSU in test.	
17.8.7.	Start Matlab from the desktop. Set the working directory to **C:\FSU_Acceptance_Test\SN*???*\RawData\LVA_Noise**	
17.8.8.	Calculate the spectral density for each of the (6) channels using ***HVA_highFFT.m***. Remember to include the gain.	
17.8.9.	Record the maximum spectral density feature for each of the (6) channels in the table on the next page.	
17.8.10.	Make a plot of the spectra and use the following convention to label them. (J## represents the channel i.e.J41, J42 etc.) Attach hard copies of the plots to the acceptance package. Do not use the zoom feature. Plot the entire 0 to 1 kHz range.	

>Title("HVA Noise at Frequencies < 1 kHz, FSU S/N ??? *date*")

>Xlabel("Frequency (Hz)")

>Ylabel("Spectral Density (microvolts / rt(Hz))")

Test Description:	Done (〈)
17.8.11. Close Control Desk and power off the dSPACE DSP.	

<1 kHz results: HVA Spinup path

FSU Output	Signal path (Interface Box); dSPACE A/D	Noise Requirement	Maximum spectral component frequency	Peak Amplitude V_{rms}	**P/F**
J45	(GSS1,A/D1); 17	< 1 V_{rms}			
J46	(GSS2,A/D2); 18	< 1 V_{rms}			
J43	(GSS3,A/D3); 19	< 1 V_{rms}			
J44	(GSS4,A/D4); 20	< 1 V_{rms}			
J41	(GSS5,A/D5); 21	< 1 V_{rms}			
J42	(GSS6,A/D6); 22	< 1 V_{rms}			

Part B. For frequencies >100 Hz.
(Partially satisfies GSS 3.4.8.2.1.2)

Test Description:	Done (〈)
17.8.12. Measure the rms noise spectrum for each of the suspension lines using the experimental setup shown in Figure 8.	
17.8.13. Find the maximum spectral feature using the marker and record the frequency and rms voltage associated with it. Print a hard copy of each electrode's spectrum and include it in the acceptance package. *(Use the "Marker" feature to denote the frequency component having the highest noise level before plotting a hard copy.)*	

FSU Output	Monitor Signal	Acceptable Noise	Freq. (max. V_{rms})	Measured Value (x.xx)	**P/F**
(J45)	X1_HV_VMON	<1 V_{rms}		V_{rms}	
(J46)	X2_HV_VMON	<1 V_{rms}		V_{rms}	
(J43)	Y1_HV_VMON	<1 V_{rms}		V_{rms}	
(J44)	Y2_HV_VMON	<1 V_{rms}		V_{rms}	
(J41)	Z1_HV_VMON	<1 V_{rms}		V_{rms}	
(J42)	Z2_HV_VMON	<1 V_{rms}		V_{rms}	

Part C: HVA High Frequency Noise Measurements

HVA Conducted Emissions into the probe
(partially satisfies GSS 3.3.2)

Test Description:	Done (〈)
17.8.14. Connect the X1 SRS amp output the HP 8568B as shown in Figure 6.	
17.8.15. Confirm/set HP 8568B settings: • Res BW: 10 kHz • Video BW: 1 kHz • Display line: set to 35 uV • Reference level: set to 20 mV • Start Frequency 1 MHz • Stop Frequency 1000 MHz	
17.8.16. Confirm/set SRS 560 settings: (all 6 units) • DC coupled • DC input Low noise • Gain = 1 • Disconnect cables leading from SRS boxes to dSpace DS 2003 (noise control)	
17.8.17. Disconnect the FSU suspension lines at the Data Acquisition Interface box and characterize the ambient laboratory noise environment. Attach a hard copy to the procedure. Reconnect suspension lines once complete.	
17.8.18. Measure the character of SRS X1 output. Repeat for channels X2 through Z2 (6 total). Print a hard copy of the spectrum for each suspension line and include them in the acceptance package. Determine the maximum value of any spurious signal in the range 1MHz to 1GHz and record it. Calculate V_{rms}(max) = $V_{(max)}$ * 1.4 and record. (an additional factor of 2 is required in the RMS calculation to account for the dual 50 ohm terminations on the SR650 and the HP 8568B) *If measurement violates the noise requirement, compare with the noise floor measurement to insure that the measurement is in fact due to the FSU and not from the ambient environment.*	

Test Description:						Done (〈)
Channel	Suspension Line	Acceptable Range	Freq. ($V_{(max)}$) (in MHz)	Measured $V_{(max)}$ amplitude (xx. x)	Calculated V_{rms}(max) (xx. x)	**P/F**
(J45)	X1	<50µV rms		µV	µV rms	
(J46)	X2	<50µV rms		µV	µV rms	
(J43)	Y1	<50µV rms		µV	µV rms	
(J44)	Y2	<50µV rms		µV	µV rms	
(J41)	Z1	<50µV rms		µV	µV rms	
(J42)	Z2	<50µV rms		µV	µV rms	
17.8.19. Disconnect all (6) “A” inputs from the SR560 Preamplifiers.						

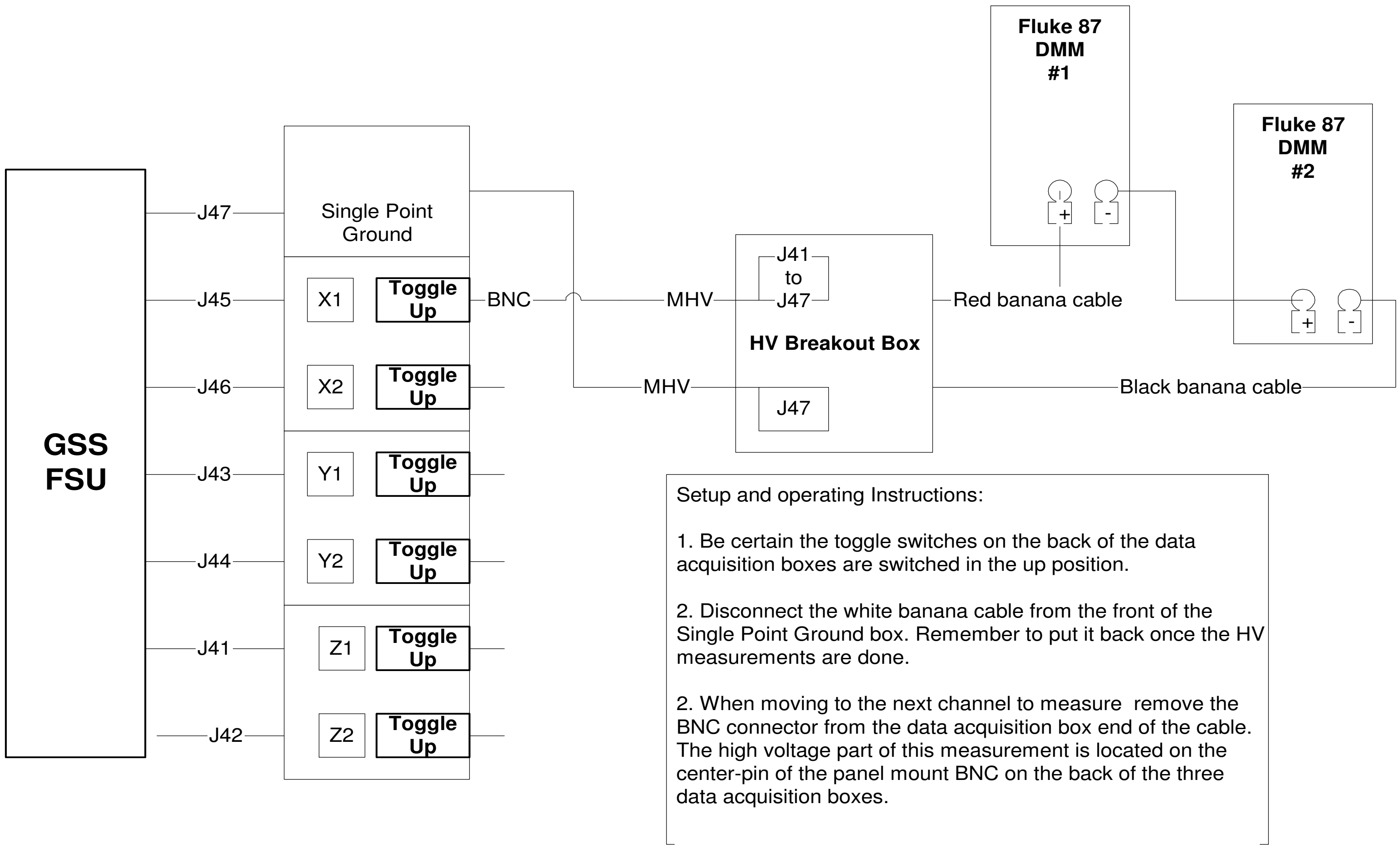

Figure 11. Experimental setup for high voltage range measurements

17.9. Spinup drive output range

HVA range, positive voltage

(partially satisfies GSS 3.4.8.2.1.1)

WARNING: HIGH VOLTAGE PRESENT ON OUTPUTS DURING THIS TEST SECTION	
Two persons must be present during test	
Test Description:	Done (〈)
17.9.1. Turn on ±725 V supply to GSS from the LabView application.	
17.9.2. Run ***HVA_max_pos.scp*****;** Confirm HV output value from the MUX values from FLT:1 through 6 in the "ATC" PIT.	
17.9.3. Read the voltage for each of the channels 1 through 6 by summing the voltages of the (2) Fluke 87 True RMS multimeters. Record the value in the measured value column.	

FSU Output	Suspension Line	Requirement	Meter #1 (xxx.x)	Meter #2 (xxx.x)	Meters #1+#2 (xxx.x)	**P/F**
J45	X1	+ 600 K 10 Volts	V	V	V	
J46	X2	+ 600 K 10 Volts	V	V	V	
J43	Y1	+ 600 K 10 Volts	V	V	V	
J44	Y2	+ 600 K 10 Volts	V	V	V	
J41	Z1	+ 600 K 10 Volts	V	V	V	
J42	Z2	+ 600 K 10 Volts	V	V	V	

HVA range, negative voltage

(partially satisfies GSS 3.4.8.2.1.1)

Test Description:	Done (〈)
17.9.4. Run ***HVA_max_neg.scp*** from the command client.	
17.9.5. Read the voltage for each of the channels 1 through 6 by summing the voltages of the (2) Fluke 87 True RMS multimeters. Record the value in the measured value column.	

FSU Output	Suspension Line	Requirement	Meter #1 (xxx.x)	Meter #2 (xxx.x)	Meters #1+#2 (xxx.x)	**P/F**
J45	X1	- 600 K 10 Volts	V	V	V	
J46	X2	- 600 K 10 Volts	V	V	V	
J43	Y1	- 600 K 10 Volts	V	V	V	
J44	Y2	- 600 K 10 Volts	V	V	V	
J41	Z1	- 600 K 10 Volts	V	V	V	
J42	Z2	- 600 K 10 Volts	V	V	V	

17.10. Ground test drive output range
(Satisfies GSS 3.4.8.2.3.1)

Test Description:	Done (〈)
17.10.1. Run ***hva_gt_max_pos.scp*;** Confirm HV output value from the MUX values from FLT:1 through 6 in the "ATC" PIT.	
17.10.2. Read the voltage for each of the channels 1 through 6 by summing the voltages of the (2) Fluke 87 True RMS multimeters. Record the value in the measured value column.	

FSU Output	Suspension Line	Acceptable Range	Meter #1 (xxx.x)	Meter #2 (xxx.x)	Meters #1+#2 (xxxx.x)	**P/F**
(J45)	X1	+ 1200 K 15 Volts	V	V	V	
(J46)	X2	+ 1200 K 15 Volts	V	V	V	
(J43)	Y1	+ 1200 K 15 Volts	V	V	V	
(J44)	Y2	+ 1200 K 15 Volts	V	V	V	
(J41)	Z1	+ 1200 K 15 Volts	V	V	V	
(J42)	Z2	+ 1200 K 15 Volts	V	V	V	

Test Description:	Done (〈)
17.10.3. Run ***hva_gt_max_neg.scp*;** Confirm HV output value from the MUX values from FLT:1 through 6 in the "ATC" PIT.	
17.10.4. Read the voltage for each of the channels 1 through 6 by summing the voltages of the (2) Fluke 87 True RMS multimeters. Record the value in the measured value column.	

FSU Output	Suspension Line	Acceptable Range	Meter #1 (xxx.x)	Meter #2 (xxx.x)	Meters #1+#2 (xxxx.x)	**P/F**
(J45)	X1	- 1200 K 15 Volts	V	V	V	
(J46)	X2	- 1200 K 15 Volts	V	V	V	
(J43)	Y1	- 1200 K 15 Volts	V	V	V	
(J44)	Y2	- 1200 K 15 Volts	V	V	V	
(J41)	Z1	- 1200 K 15 Volts	V	V	V	
(J42)	Z2	- 1200 K 15 Volts	V	V	V	

Test Description:			P/F
17.10.5. Turn off the HV power supply			
17.10.6. Run the script ***initialFSUconfig.scp ;*** record pass/fail status of command at right.			
17.10.7. Set test set to use the low voltage calibrations. Run ***lv_cals.scp***; record pass/fail status of command at right.			
17.10.8. Disconnect any BNC cables from the top row, on the back of the data acquisition interface box. Flip each of the toggle switches to the down position.			
17.10.9. Disconnect the GSS suspension cables from the data acquisition interface boxes and connect them to the gyro simulator interface boxes.			
17.10.10. Turn on the Dspace DSP. Start the Control Desk application on the NT computer.			
17.10.11. Load ***FSU_Functional.cdx*** in the Control Desk application.			
17.10.12. Disable the electrode voltages and rotor positions for each axis by setting “Enable GSS”, EnX, EnY and EnZ to 0.			
17.10.13. Start the simulation.			
17.10.14. Run ***oschi.scp***; record indicated gyro position as reported in the “Science data” PIT window. Confirm the sampling rate to be 220 Hz.			
17.10.15. Required | position | $\leq$ 0.5 (μm)	Pos X (μm)	Pos Y (μm)	Pos Z (μm)
17.10.16. Run ***osclow.scp***; record indicated gyro position as reported in the “Science data” PIT window:			
17.10.17. Required | position | $\leq$ 0.5 (μm)	Pos X (μm)	Pos Y (μm)	Pos Z (μm)

17.11. LVA Range

LVA range, positive voltage

(partially satisfies GSS 3.4.8.2.2.1)

Test Description:	P/F
17.11.1. Run ***lva_max_pos.scp*** from the command client.	
17.11.2. Record the electrode voltages from the ***FSU_Functional.cdx*** screen. Record these values as well as the "Commanded Gyro Electrode Voltage as read from the Timing and Status Info PIT window, FLT:1 through FLT:6. Confirm that the sampling rate is 10 Hz. If not, issue the line command **1 5**.	

FSU Output	Suspension Line	Requirement	Commanded Gyro Electrode Voltage	Measured Value	P/F
J45	X1	> +45 Volts	V	V	
J46	X2	> +45 Volts	V	V	
J43	Y1	> +45 Volts	V	V	
J44	Y2	> +45 Volts	V	V	
J41	Z1	> +45 Volts	V	V	
J42	Z2	> +45 Volts	V	V	

LVA range, negative voltage

(partially satisfies GSS 3.4.8.2.2.1)

Test Description:	P/F
17.11.3. Run ***lva_max_neg.scp*** from the command client.	
17.11.4. Record the electrode voltages from the ***FSU_Functional.cdx*** screen and from the Science Data PIT window. , FLT:1 through FLT:6. Confirm that the sampling rate is 10 Hz. If not, issue the line command **1 5**. After checking the telemetry return the sampling rate to its original value if different than 10 Hz.	

FSU Output	Suspension Line	Requirement	Commanded Gyro Electrode Voltage	Measured Value	P/F
J45	X1	< -45 Volts	V	V	
J46	X2	< -45 Volts	V	V	
J43	Y1	< -45 Volts	V	V	
J44	Y2	< -45 Volts	V	V	
J41	Z1	< -45 Volts	V	V	
J42	Z2	< -45 Volts	V	V	

17.12. Arbiter Threshold Limit Transition Tests.
(*Successful completion of 17.10.1 through 17.10.11 satisfies GSS 3.4.8.3)*

Test Description:	Notes	P/F
17.12.1. Set the PON reset bit. Power cycle the FSU box (Turn off LV power from the LabView application on the SCE. Wait 10 seconds before turning on LV power)		
17.12.2. Clear the Mode Register Word. Verify that this is in fact the result by looking in the "Arbiter 7" PIT window.	GHW command 16 6 MRW: 0000 0000 **0**000 0000	
17.12.3. Clear the PON reset bit (inactive)	GHW command 16 13 MRW: 0000 0000 **1**000 0000	
17.12.4. Run script ***mrw10.scp*** .	MRW: 1010 1010 **1**010 1010	
17.12.5. Set the PON reset bit. Power cycle the FSU box (Turn off LV power wait 10 seconds turn on LV power). *Note that the only bit that should have changed is the PON reset bit shown in bold.*	MRW: 1010 1010 **0**010 1010	
17.12.6. Clear the Mode Register Word. Verify that this is in fact the result by looking in the "Arbiter 7" PIT window.	GHW command 16 6 MRW: 0000 0000 **0**000 0000	
17.12.7. Clear the PON reset bit (inactive)	GHW command 16 13 MRW: 0000 0000 **1**000 0000	
17.12.8. Run script ***mrw01.scp*** .	MRW: 0101 0101 **1**101 0101	
17.12.9. Set the PON reset bit. Power cycle the FSU box (Turn off LV power wait 10 seconds turn on LV power). *Note that the only bit that should have changed is the PON reset bit shown in bold.*	MRW: 0101 0101 **0**101 0101	
17.12.10. Clear the Mode Register Word. Verify that this is in fact the result by looking in the "Arbiter 7" PIT window.	GHW command 16 6 MRW: 0000 0000 **0**000 0000	
17.12.11. Clear the PON reset bit (inactive).	GHW command 16 13 MRW: 0000 0000 **1**000 0000	
17.12.12. Verify from the "Arbiter 7" window that the Mode reads **"00-PWR ON".**	Should read **MODE : "00-PWR ON".**	

<table>
<tr><th colspan="2">Test Description:</th><th colspan="2">Notes</th><th>P/F</th></tr>
<tr><td colspan="2">17.12.13. Turn on the 220 Hz interrupt. Verify in Timing and Staus Info PIT window.</td><td colspan="2">SHG command 1 7</td><td></td></tr>
<tr><td colspan="2">17.12.14. Run osclow.scp;</td><td colspan="2"></td><td></td></tr>
<tr><td colspan="2">17.12.15. Turn on the bridge position filters</td><td colspan="2">SCS command 6 11</td><td></td></tr>
<tr><td colspan="2">17.12.16. Compare the bridge positions measured by the Science Data PIT window and FSU_Functional.cdx)</td><td colspan="2">Each axis should be
|position|< 0.5 µm</td><td></td></tr>
<tr><td>Science Data Pit Window</td><td>x-position (µm)</td><td>y-position (µm)</td><td colspan="2">z-position (µm)</td></tr>
<tr><td colspan="2">17.12.17. Set the COMP_OK bit. Check Arbiter 7 PIT window .</td><td colspan="2">GHW command 16 7</td><td></td></tr>
<tr><td colspan="2">17.12.18. Enable the HIGH_THRESHOLD_EN and LOW_THRESHOLD_EN bits on the mode register</td><td colspan="2">GHW commands
16 11 & 16 21</td><td></td></tr>
<tr><td colspan="2">17.12.19. Change the MODE to Ground Test. This will bring the arbiter into the PRIME state</td><td colspan="2">GHW command 16 5 3</td><td></td></tr>
<tr><td colspan="2">17.12.20. Verify that the HIGH_THRESHOLD and LOW_THRESHOLD are not exceeded. (Arbiter 7 PIT window)</td><td colspan="2">Both should read;
“below threshold” or “within threshold”</td><td></td></tr>
<tr><td colspan="2">17.12.21. Change the MODE to science mode. Wait 45 seconds for arbiter timer to time out.</td><td colspan="2">GHW command 16 5 1
Arbiter state should be LB1</td><td></td></tr>
<tr><td colspan="2">17.12.22. Run script ARB_8to9.</td><td colspan="2">Arbiter state should be LB2</td><td></td></tr>
<tr><td colspan="2">17.12.23. Run script ARB_9to1</td><td colspan="2">Arbiter state should be PRIME</td><td></td></tr>
<tr><td colspan="2">17.12.24. In the Control Desk application open the Arbiter.cdx experiment.</td><td colspan="2"></td><td></td></tr>
</table>

For the next section you will be asked to record the displacement from center in boxes labeled by the axis. The convention used is shaded boxes represent negative displacements and those which are clear or having no shading are positive. For example:

X(µm) HT	**Y**(µm) HT	**Z**(µm) HT
1	**1**	**-1**

Represents a displacement of (1,1,-1). Although seemingly redundant it is shown this way to easily see that commanded directions are consistent with the resulting vector.

<table>
<tr><th>Test Description:</th><th colspan="3">Notes</th><th>P/F</th></tr>
<tr><td rowspan="2">17.12.25. Move the rotor position of the gyroscope simulator off-center in the direction of the 1st octant using the minimum increment until the arbiter's high threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After recording the positions wait a minimum of 45 seconds and check that the arbiter state is HB1.</td><td colspan="3">Arbiter State should be HB1</td><td></td></tr>
<tr><td>X(µm) HT</td><td>Y(µm) HT</td><td>Z(µm) HT</td><td>Net (µm)</td></tr>
<tr><td>17.12.26. Move the gyro to the center.</td><td colspan="3">Arbiter State should be LB1</td><td></td></tr>
<tr><td rowspan="2">17.12.27. Move the rotor position of the gyroscope simulator off-center in the direction of the 2nd octant using the minimum increment until the arbiter's high threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After recording the positions return the gyro to center position.</td><td colspan="3">Arbiter State should be LB1</td><td></td></tr>
<tr><td>X(µm) HT</td><td>Y(µm) HT</td><td>Z(µm) HT</td><td>Net (µm)</td></tr>
<tr><td rowspan="2">17.12.28. Move the rotor position of the gyroscope simulator off-center in the direction of the 3rd octant using the minimum increment until the arbiter's high threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After recording the positions return the gyro to center position.</td><td colspan="3">Arbiter State should be LB1</td><td></td></tr>
<tr><td>X(µm) HT</td><td>Y(µm) HT</td><td>Z(µm) HT</td><td>Net (µm)</td></tr>
<tr><td rowspan="2">17.12.29. Move the rotor position of the gyroscope simulator off-center in the direction of the 4th octant using the minimum increment until the arbiter's high threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After recording the positions return the gyro to center position.</td><td colspan="3">Arbiter State should be LB1</td><td></td></tr>
<tr><td>X(µm) HT</td><td>Y(µm) HT</td><td>Z(µm) HT</td><td>Net (µm)</td></tr>
<tr><td rowspan="2">17.12.30. Move the rotor position of the gyroscope simulator off-center in the direction of the 5th octant using the minimum increment until the arbiter's high threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After recording the positions return the gyro to center position.</td><td colspan="3">Arbiter State should be LB1</td><td></td></tr>
<tr><td>X(µm) HT</td><td>Y(µm) HT</td><td>Z(µm) HT</td><td>Net (µm)</td></tr>
</table>

Test Description:	Notes			P/F
17.12.31. Move the rotor position of the gyroscope simulator off-center in the direction of the **6th octant** using the minimum increment until the arbiter's high threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After recording the positions return the gyro to center position.	Arbiter State should be **LB1**			
	X(µm) HT	**Y**(µm) HT	**Z**(µm) HT	**Net** (µm)
17.12.32. Move the rotor position of the gyroscope simulator off-center in the direction of the **7th octant** using the minimum increment until the arbiter's high threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After recording the positions return the gyro to center position.	Arbiter State should be **LB1**			
	X(µm) HT	**Y**(µm) HT	**Z**(µm) HT	**Net** (µm)
17.12.33. Drop the **COMP_OK** bit	GSW command 16 8 Arbiter State should be **LB2**			
17.12.34. Move the rotor position of the gyroscope simulator off-center in the direction of the **8th octant** using the minimum increment until the arbiter's high threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After recording the positions return the gyro to center position.	Arbiter State should be **HB2**			
	X(µm) HT	**Y**(µm) HT	**Z**(µm) HT	**Net** (µm)
17.12.35. Set the **COMP_OK** bit	GSW command 16 7 Arbiter State should be **PRIME**			
17.12.36. Enable the **LOW_THESHOLD_EN** and Disable the **HIGH_THRESHOLD_EN.** It is important to send these commands in that order.	GSW command 16 21 GSW command 16 12			
17.12.37. Drop the heartbeat by changing to 10 Hz sampling. Wait a minimum of 45 seconds.	SHG command 1 5			
17.12.38. Move the rotor position of the gyroscope simulator off-center in the direction of the **1st octant** using the minimum increment until the arbiter's low threshold is exceeded. Stop moving the gyro and ***reset the heartbeat by issuing the SHG command 1 7***. Record the (3) bridge positions from the Science Data Pit window.	Arbiter State should be **HB1**			
	X(µm) LT	**Y**(µm) LT	**Z**(µm) LT	**Net** (µm)
17.12.39. Move the rotor position to the center. After *30 seconds* the arbiter state will end up in **LB1**.	Arbiter State should be **LB1**			

<table>
<tr><th>Test Description:</th><th colspan="3">Notes</th><th>P/F</th></tr>
<tr><td rowspan="2">17.12.40. Move the rotor position of the gyroscope simulator off-center in the direction of the 2nd octant using the minimum increment until the arbiter's low threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After 30 seconds the arbiter state will end up in HB2.</td><td colspan="3">Arbiter State should be
HB1</td><td></td></tr>
<tr><td>X(µm)
LT</td><td>Y(µm)
LT</td><td>Z(µm)
LT</td><td>Net (µm)</td></tr>
<tr><td>17.12.41. Reposition the gyro simulator at the center.</td><td colspan="3">Arbiter State should be
LB1</td><td></td></tr>
<tr><td>17.12.42. Drop the COMP_OK bit</td><td colspan="3">GSW command 16 8
Arbiter State should be
LB2</td><td></td></tr>
<tr><td rowspan="2">17.12.43. Move the rotor position of the gyroscope simulator off-center in the direction of the 3rd octant using the minimum increment until the arbiter's low threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After 30 seconds the arbiter state will end up in HB2.</td><td colspan="3">Arbiter State should be
HB2</td><td></td></tr>
<tr><td>X(µm)
LT</td><td>Y(µm)
LT</td><td>Z(µm)
LT</td><td>Net (µm)</td></tr>
<tr><td>17.12.44. Reposition the gyro simulator at the center. Set the COMP_OK bit</td><td colspan="3">GSW command 16 7
Arbiter State should be
PRIME</td><td></td></tr>
<tr><td>17.12.45. Drop the COMP_OK bit</td><td colspan="3">GSW command 16 8
Arbiter State should be
LB2</td><td></td></tr>
<tr><td rowspan="2">17.12.46. Move the rotor position of the gyroscope simulator off-center in the direction of the 4th octant using the minimum increment until the arbiter's low threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After 30 seconds the arbiter state will end up in HB2.</td><td colspan="3">Arbiter State should be
HB2</td><td></td></tr>
<tr><td>X(µm)
LT</td><td>Y(µm)
LT</td><td>Z(µm)
LT</td><td>Net (µm)</td></tr>
<tr><td>17.12.47. Reposition the gyro simulator at the center. Set the COMP_OK bit</td><td colspan="3">GSW command 16 7
Arbiter State should be
PRIME</td><td></td></tr>
<tr><td>17.12.48. Drop the COMP_OK bit</td><td colspan="3">GSW command 16 8
Arbiter State should be
LB2</td><td></td></tr>
</table>

<table>
<tr><th>Test Description:</th><th colspan="3">Notes</th><th>P/F</th></tr>
<tr><td rowspan="2">17.12.49. Move the rotor position of the gyroscope simulator off-center in the direction of the 5th octant using the minimum increment until the arbiter's low threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After 30 seconds the arbiter state will end up in HB2.</td><td colspan="3">Arbiter State should be HB2</td><td></td></tr>
<tr><td>X(µm) LT</td><td>Y(µm) LT</td><td>Z(µm) LT</td><td>Net (µm)</td></tr>
<tr><td>17.12.50. Reposition the gyro simulator at the center. Set the COMP_OK bit</td><td colspan="3">GSW command 16 7
Arbiter State should be PRIME</td><td></td></tr>
<tr><td>17.12.51. Drop the COMP_OK bit</td><td colspan="3">GSW command 16 8
Arbiter State should be LB2</td><td></td></tr>
<tr><td rowspan="2">17.12.52. Move the rotor position of the gyroscope simulator off-center in the direction of the 6th octant using the minimum increment until the arbiter's low threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After 30 seconds the arbiter state will end up in HB2.</td><td colspan="3">Arbiter State should be HB2</td><td></td></tr>
<tr><td>X(µm) LT</td><td>Y(µm) LT</td><td>Z(µm) LT</td><td>Net (µm)</td></tr>
<tr><td>17.12.53. Reposition the gyro simulator at the center. Set the COMP_OK bit</td><td colspan="3">GSW command 16 7
Arbiter State should be PRIME</td><td></td></tr>
<tr><td>17.12.54. Drop the COMP_OK bit</td><td colspan="3">GSW command 16 8
Arbiter State should be LB2</td><td></td></tr>
<tr><td rowspan="2">17.12.55. Move the rotor position of the gyroscope simulator off-center in the direction of the 7th octant using the minimum increment until the arbiter's low threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After 30 seconds the arbiter state will end up in HB2.</td><td colspan="3">Arbiter State should be HB2</td><td></td></tr>
<tr><td>X(µm) LT</td><td>Y(µm) LT</td><td>Z(µm) LT</td><td>Net (µm)</td></tr>
<tr><td>17.12.56. Reposition the gyro simulator at the center. Set the COMP_OK bit</td><td colspan="3">GSW command 16 7
Arbiter State should be PRIME</td><td></td></tr>
<tr><td>17.12.57. Drop the COMP_OK bit</td><td colspan="3">GSW command 16 8
Arbiter State should be LB2</td><td></td></tr>
</table>

<table>
<tr><th>Test Description:</th><th colspan="3">Notes</th><th>P/F</th></tr>
<tr><td rowspan="2">17.12.58. Move the rotor position of the gyroscope simulator off-center in the direction of the 8th octant using the minimum increment until the arbiter's high threshold is exceeded. Stop moving the gyro and record the (3) bridge positions from the Science Data Pit window. After recording the positions return the gyro to center position</td><td colspan="3">Arbiter State should be
LB2</td><td></td></tr>
<tr><td>X(µm)
LT</td><td>Y(µm)
LT</td><td>Z(µm)
LT</td><td>Net (µm)</td></tr>
<tr><td>17.12.59. Enable the HIGH_THESHOLD_EN and set the COMP_OK bit.</td><td colspan="3">GSW command 16 11
GSW command 16 7
Arbiter State should be
PRIME</td><td></td></tr>
</table>

Arbiter test complete.

17.13. Bridge Calibration using Gyroscope Simulator:

<u>Using Gyroscope1 Probe C capacitances.</u>

17.13.1. Load ***TB_FSUBridge_Cal_Gyro1.cdx*** in Control Desk application.	
17.13.2. Run the script ***initialFSUconfig.scp ;*** record pass/fail status of command at right.	
17.13.3. Command the gyro simulator actuators to the following positions. The axes function independently of each other so you can set all three to a given offset position at the same time. For instance, the first measurement could be made by setting the positions to [15.0 15.0 15.0] and the voltages for x, y and z could be measured simultaneously. Record the bridge output voltages as read from the telemetry for each channel and position.	

Offset Position (μm)	Bridge Channel X (μm)	Bridge Channel Y (μm)	Bridge Channel Z (μm)
15.0			
11.0			
7.5			
5.0			
2.5			
0.0			
-2.5			
-5.0			
-7.5			
-11.0			
-15.0			

Using Gyroscope2 Probe C capacitances.

17.13.4.	Connect the FSU to the Gyroscope Simulator. Load ***TB_FSUBridge_Cal_Gyro2.cdx*** in Control Desk application.
17.13.5.	Run the script ***initialFSUconfig.scp ;*** record pass/fail status of command at right.
17.13.6.	Command the gyro simulator actuators to the following positions. The axes function independently of each other so you can set all three to a given offset position at the same time. For instance, the first measurement could be made by setting the positions to [15.0 15.0 15.0] and the voltages for x, y and z could be measured simultaneously. Record the bridge output voltages as read from the telemetry for each channel and position.

Offset Position (μm)	Bridge Channel X (μm)	Bridge Channel Y (μm)	Bridge Channel Z (μm)
15.0			
11.0			
7.5			
5.0			
2.5			
0.0			
-2.5			
-5.0			
-7.5			
-11.0			
-15.0			

<u>Using Gyroscope3 Probe C capacitances.</u>

17.13.7. Connect the FSU to the Gyroscope Simulator. Load ***TB_FSUBridge_Cal_Gyro3.cdx*** in Control Desk application.

17.13.8. Run the script ***initialFSUconfig.scp ;*** record pass/fail status of command at right. ☐

17.13.9. Command the gyro simulator actuators to the following positions. The axes function independently of each other so you can set all three to a given offset position at the same time. For instance, the first measurement could be made by setting the positions to [15.0 15.0 15.0] and the voltages for x, y and z could be measured simultaneously. Record the bridge output voltages as read from the telemetry for each channel and position.

Offset Position (µm)	Bridge Channel X (µm)	Bridge Channel Y (µm)	Bridge Channel Z (µm)
15.0			
11.0			
7.5			
5.0			
2.5			
0.0			
-2.5			
-5.0			
-7.5			
-11.0			
-15.0			

Using Gyroscope4 Probe C capacitances.

17.13.10. Connect the FSU to the Gyroscope Simulator. Load ***TB_FSUBridge_Cal_Gyro4.cdx*** in Control Desk application.			
17.13.11. Run the script ***initialFSUconfig.scp ;*** record pass/fail status of command at right.			
17.13.12. Command the gyro simulator actuators to the following positions. The axes function independently of each other so you can set all three to a given offset position at the same time. For instance, the first measurement could be made by setting the positions to [15.0 15.0 15.0] and the voltages for x, y and z could be measured simultaneously. Record the bridge output voltages as read from the telemetry for each channel and position.			
Offset Position (µm)	Bridge Channel X (µm)	Bridge Channel Y (µm)	Bridge Channel Z (µm)
15.0			
11.0			
7.5			
5.0			
2.5			
0.0			
-2.5			
-5.0			
-7.5			
-11.0			
-15.0			

17.14. ABU Tests

Part A: High Back-Up Tests

(partially satisfies GSS 3.4.8.1.3.1)

Test Description:				Done (√)
17.14.1. Load the ***ABU.cdx*** application from the Control Desk. Start the simulation.				
17.14.2. Run ***hbu_park.scp*; Record the LV_VMON values from FLT:1 through 6 in the "ATC" PIT once the script completes and the display stabilizes				
17.14.3. Run ***osclo.scp***; record indicated gyro position from the "Science data" PIT window: Confirm the sample rate is 220 Hz.				
Gyroscope Center ***Science Data Pit Window***	Pos X (μm)	Pos Y (μm)	Pos Z (μm)	
17.14.4. Run the line commands **1 5** *(set the sampling rate to 10 Hz)* and **14 23 3** (set the telemetry to read out the LVA monitor				
17.14.5. Record the LVA_MON values from FLT:1 through 6 in the "ATC" PIT.				
17.14.6. Run the line command **1 7** (set the sampling rate back to 220 Hz).				
17.14.7. Save a capture of the (3) positions and (6) electrode voltages to **C:\FSU_Acceptance_Test\SN*???*\RawData\ABU\ Hb\Hb_center**				
17.14.8. Using MATLAB, determine the mean values of each of the (9) variables captures and record them in the appropriate boxes.				
Gyroscope Center ***ABU.cdx***	Pos X (μm)	Pos Y (μm)	Pos Z (μm)	

FSU Output	Monitor Signal	Acceptable Range	MUX Value	Acceptable Range	Measured Value (xx.xx)	**P/F**
(J45)	X1_ LV_VMON	10.6 ± 1.90 V	V	10.6 ± 1.90 V	V	
(J46)	X2_ LV_VMON	10.6 ± 1.90 V	V	10.6 ± 1.90 V	V	
(J43)	Y1_ LV_VMON	10.6 ± 1.90 V	V	10.6 ± 1.90 V	V	
(J44)	Y2_ LV_VMON	10.6 ± 1.90 V	V	10.6 ± 1.90 V	V	
(J41)	Z1_ LV_VMON	-20.7 ±1.33 V	V	-20.7 ±1.33 V	V	
(J42)	Z2_ LV_VMON	-20.7 ±1.33 V	V	-20.7 ±1.33 V	V	

High Back-Up Tests (cont.)

Dynamic Test

(partially satisfies GSS 3.4.8.1.3.1)

Test Description:	Done (〈)
17.14.9. Perturb the gyroscope position using 0.1 kg-m/sec impulse increments beginning with 1.0 kg-m/sec directed toward the geometric center of the 1st octant in the housing. Capture the gyroscope trajectory for the maximum impulse that causes an excursion of 15 μm from center. Repeat this for each of the 8 octants.	
17.14.10. Save the file and path as ; ***C:\FSU_Acceptance_Test\SN???\RawData\ABU\Hb \Impulses*** *SN[??]hb_oct#_10* where ? identifies the serial number, # is the octant number and the last 2 numbers designate the impulse level. So 1.0 =10, 0.2 = 02, etc.	

Octant	Filename of the last Capture	Impulse required for a 15 μm excursion for center (kg-m/sec)	Maximum excursion from center (μm)	Net (μm)
1st	*SN[??]hb_oct1##*	Applied impulse	μm (X)	
		kg-m/sec	μm (Y)	
			μm (Z)	
2nd	*SN[??]hb_oct2##*	Applied impulse	μm (X)	
		kg-m/sec	μm (Y)	
			μm (Z)	
3rd	*SN[??]hb_oct3##*	Applied impulse	μm (X)	
		kg-m/sec	μm (Y)	
			μm (Z)	
4th	*SN[??]hb_oct4##*	Applied impulse	μm (X)	
		kg-m/sec	μm (Y)	
			μm (Z)	
5th	*SN[??]hb_oct5##*	Applied impulse	μm (X)	
		kg-m/sec	μm (Y)	
			μm (Z)	
6th	*SN[??]hb_oct6##*	Applied impulse	μm (X)	
		kg-m/sec	μm (Y)	
			μm (Z)	
7th	*SN[??]hb_oct7##*	Applied impulse	μm (X)	
		kg-m/sec	μm (Y)	
			μm (Z)	
8th	*SN[??]hb_oct8##*	Applied impulse	μm (X)	
		kg-m/sec	μm (Y)	
			μm (Z)	

High Back-Up Capture test:

(satisfies 3.4.8.1.1)

Test Description:	Done (〈)
17.14.11. Confirm that the gyroscope simulator is in the center.	
17.14.12. The arbiter state should still be in the **HB2 (7)** If not, run ***hbu_park.scp***	
17.14.13. Set the control rate to 220 Hz using the line command ***1 7***.	
17.14.14. Enable the High Threshold using the line command ***16 11***.	
17.14.15. Select BU filter by issuing the GHW command **16 3 7**	
17.14.16. The capture requires two operators. The operator at the Sun workstation enters a 16 7 command that transitions the arbiter state to PRIME. Since there is no digital controller the simulator gyroscope will drift slowly from center. The other operator needs to apply the impulse to the rotor from the ***ABU.cdx*** experiment as soon after the backup controller releases control as possible. Care is required in recognizing when the impulse is applied consistent with the octant being probed. If you are unclear how to recognize this see the R.E.	
C:\FSU_Acceptance_Test\SN*???*\RawData\ABU\ HB\CAPTURE\Octant#\hb_cap_sn??_13 where ***??*** corresponds to the serial number of the FSU, **#** corresponds to the octant direction of the impulse and the last 2 digits correspond to the impulse strength, in this case 1.3 kg-m/sec.	
17.14.17. Capture one trace for each octant using the maximum impulses found in octant #1. Determine experimentally the best capture settings to use for the data acquisition. Use the file format above when the impulse value necessary for a given octant differs dramatically from that of octant #1, otherwise use the file format shown in the table. Print a hard copy of the capture and attach to the acceptance package. Record the results in the table on the next page.	

High Back-Up Capture test (cont.):
(satisfies 3.4.8.1.1)

Octant	Filename of the last Capture	Measure Impulse for a 15 µm maximum excursion	Maximum excursion from center (µm)	Net (µm)
1st	*HB_OCT1_Capture*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
2nd	*HB_OCT2_Capture*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
3rd	*HB_OCT3_Capture*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
4th	*HB_OCT4_Capture*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
5th	*HB_OCT5_Capture*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
6th	*HB_OCT6_Capture*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
7th	*HB_OCT7_Capture*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
8th	*HB_OCT8_Capture*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	

Part B: Low Back-Up Tests:
(partially satisfies GSS 3.4.8.1.2)

Test Description:					Done (√)
17.14.18. Run ***lb1.scp***; places the arbiter in state 8 with the low threshold disabled.					
17.14.19. Record the positions from the ***Science Data PIT*** window. Confirm the sampling rate to be 220 Hz.					
Gyroscope Center ***Science Data Pit Window***	Pos X (μm)		Pos Y (μm)	Pos Z (μm)	
17.14.20. Record the positions from the ***ABU.cdx*** application.					
Gyroscope Center ***ABU.cdx***	Pos X (μm)		Pos Y (μm)	Pos Z (μm)	
17.14.21. Save a capture of the (3) positions and (6) electrode voltages to **C:\FSU_Acceptance_Test\SN*???*\RawData\ABU\ Lb\lb_center**					
17.14.22. From the captured data use MATLAB to determine the mean values of each of the (9) variables captures and record them in the appropriate box.					

FSU Output	Monitor Signal	Acceptable Range	Measured Value (xx.xx)	**P/F**
(J45)	X1_ LVA_MON	0.10 ± 0.05 V	V	
(J46)	X2_ LVA_MON	0.10 ± 0.05 V	V	
(J43)	Y1_ LVA_MON	0.10 ± 0.05 V	V	
(J44)	Y2_ LVA_MON	0.10 ± 0.05 V	V	
(J41)	Z1_ LVA_MON	-0.205 ± 0.05 V	V	
(J42)	Z2_ LVA_MON	-0.205 ± 0.05 V	V	

Low Back-Up Tests (cont.)

Dynamic test

(partially satisfies GSS 3.4.8.1.2)

Test Description:	Done (〈)
17.14.23. For octant # 1determine the maximum impulse the Low Backup controller can hold before the high threshold is exceeded and the high backup controller takes over. Capture the gyroscope trajectory and save the file and path as ; ***C:\FSU_Acceptance_Test\SN???\RawData\ABU\LB*** *SN**?**LB_OCT1_#* , where # designates the impulse level. So 0.034 =034, 0.010 = 010, etc.	
17.14.24. Repeat the impulse in each of the 7 remaining octants beginning with this amplitude. Record the amplitude of the impulse below.	

Octant	Filename of the last Capture	Min. impulse required = 0.001 kg-m/sec	Maximum excursion from center (µm)	Net (µm)
1st	*SN[_ _]LB_OCT1_[_ _ _]*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
2nd	*SN[_ _]LB_OCT2_[_ _ _]*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
3rd	*SN[_ _]LB_OCT3_[_ _ _]*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
4th	*SN[_ _]LB_OCT4_[_ _ _]*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
5th	*SN[_ _]LB_OCT5_[_ _ _]*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
6th	*SN[_ _]LB_OCT6_[_ _ _]*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
7th	*SN[_ _]LB_OCT7_[_ _ _]*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
8th	*SN[_ _]LB_OCT8_[_ _ _]*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	

<u>Before moving on to the Spinup Backup tests you need to configure both the GSE and GSS for high voltage operations. Complete the following instruction set before proceeding.</u>

Test Description:	Done (√)
17.14.25. There is a High Voltage / Low Voltage latching relay that needs to be set before applying high voltage to the gyroscope simulator GSE. You can actuate the latch by moving the toggle switch in the direction of the high voltage label and then pressing the button on the opposite side of the box. It is VERY important that you do both. Simply moving the toggle will not change the relay and can result in damage to the simulator. There is an LED that is lighted when the toggle switch is in the position that is active. If there is no light on then the position of the switch is actually the opposite of what you would think. ***CHECK THIS <u>BEFORE</u> TURNING ON THE HIGH VOLTAGE!!!***	
17.14.26. Run ***pre_hv_on.scp***; This will configure the FSU to do the following; • Clear the mode register • Reset the PON bit • Set the HV/LV relay on the HVAs to the LV output state. • Change the MODE to ground test. • Command 0.0 volts from the D/As to all (6) channels. • Set the MUX monitor to write the D/A outputs to programmable telemetry	
17.14.27. Check the telemetry to confirm that there is in fact 0 volts being commanded by the D/As.	
17.14.28. Run ***hv_on.scp***; This will configure the FSU to do the following; • Switch the HV/LV relay to the HV state • Set the MUX monitor to write the HV_VMON outputs to programmable telemetry	
17.14.29. Turn on the +/- 725 High Voltage supply at the SCE.	

Part C: Spinup Back-Up Tests:

Spinup Backup Center Position
(partially satisfies GSS 3.4.8.1.1)

Test Description:	Done (〈)
17.14.30. Run ***su_bu0.scp***; Places the arbiter in SB1, the ABU spinup position to center and the bridge excitation in high.	
17.14.31. Open the ***ABU_SU.cdx*** if it is not already running.	
17.14.32. Record the positions from the ***Science Data PIT*** window.	

Pos X (μm)	Pos Y (μm)	Pos Z (μm)	Net (μm)	Expected |position| ~ 0.0 (μm)

17.14.33. Record the positions from the ***ABU_SU.cdx*** application.

Pos X (μm)	Pos Y (μm)	Pos Z (μm)	Net (μm)	Expected |position| ~ 0.0 (μm)

17.14.34. Record the FSU commanded voltages from the ***Timing and Status Info PIT*** (FLT:1 through FLT:6) and the measured values from the ***ABU_SU.cdx*** application.

FSU Output	Mux Monitor Signal	MUX Value (xx.xx)	Measured Value (xx.xx)
(J45)	X1_BU	V	V
(J46)	X2_BU	V	V
(J43)	Y1_BU	V	V
(J44)	Y2_BU	V	V
(J41)	Z1_BU	V	V
(J42)	Z2_BU	V	V

17.14.35. Save a capture of the (3) positions and (6) electrode voltages to **C:\FSU_Acceptance_Test\SN*???*\RawData\ABU\Spinup\FSU?su_bu_pos0_nogas**	

Spinup Backup Center Position
(cont.)

Test Description:	Done (〈)
17.14.36. Simulate 0.050 g force normal to the spinup channel by choosing the button on the ***ABU_SU.cdx*** application, ***Force Configuration*: Gas Force ON** .	
17.14.37. Record the positions from the ***Science Data PIT*** window.	

Pos X (µm)	Pos Y (µm)	Pos Z (µm)	Net (µm)	Expected |position| > 0.0 (µm)

17.14.38. Record the positions from the ***ABU_SU.cdx*** application

Pos X (µm)	Pos Y (µm)	Pos Z (µm)	Net (µm)	Expected |position| > 0.0 (µm)

17.14.39. Read the FSU commanded voltages from the ***Timing and Status Info PIT*** and the ***ABU_SU.cdx*** application and record the measured values.

FSU Output	Mux Monitor Signal	MUX Value (xx.xx)	Measured Value (xx.xx)
(J45)	X1_BU	V	V
(J46)	X2_BU	V	V
(J43)	Y1_BU	V	V
(J44)	Y2_BU	V	V
(J41)	Z1_BU	V	V
(J42)	Z2_BU	V	V

17.14.40. Save a capture of the (3) positions and (6) electrode voltages to **C:\FSU_Acceptance_Test\SN*???*\RawData\ABU\Spinup\FSU???su_bu_pos0_with_gas**	
17.14.41. Disable the 0.050 g force normal to the spinup channel by choosing the button on the ***ABU_SU.cdx*** application, ***Force Configuration:* All Forces OFF**	

Part C: Spinup Back-Up Tests (cont.):

Spinup Backup Position 1

(partially satisfies GSS 3.4.8.1.1)

Test Description:	Done (〈)
17.14.42. Run ***su_bu1.scp***; Places the arbiter in SB1, the ABU spinup position to radial position 1 and the bridge excitation in high.	
17.14.43. Record the positions from the ***Science Data PIT*** window.	

Pos X (µm)	Pos Y (µm)	Pos Z (µm)	Net (µm)	Expected |position| ~ –7.0 (µm)

17.14.44. Record the positions from the ***ABU_SU.cdx*** application. Simulate 0.100 g force normal to the spinup channel.

Pos X (µm)	Pos Y (µm)	Pos Z (µm)	Net (µm)	Expected |position| ~ –7.0 (µm)

Test Description	Done
17.14.45. Save a capture of the (3) positions and (6) electrode voltages to **C:\FSU_Acceptance_Test\SN*???*\RawData\ABU\Spinup\FSU?su_bu_pos1**	

17.14.46. Record the FSU commanded voltages from the ***Timing and Status Info PIT*** (FLT:1 through FLT:6) and the measured values from the ***ABU_SU.cdx*** application.

FSU Output	Mux Monitor Signal	MUX Value (xx.xx)	Measured Value (xx.xx)
(J45)	X1_BU	V	V
(J46)	X2_BU	V	V
(J43)	Y1_BU	V	V
(J44)	Y2_BU	V	V
(J41)	Z1_BU	V	V
(J42)	Z2_BU	V	V

Test Description	Done
17.14.47. Save a capture of the (3) positions and (6) electrode voltages to **C:\FSU_Acceptance_Test\SN*???*\RawData\ABU\Spinup\FSU???su_bu_pos1_nogas**	

Spinup Backup Position 1
(cont.)

Test Description:	Done (√)
17.14.48. Simulate 0.050 g force normal to the spinup channel by choosing the button on the ***ABU_SU.cdx*** application, ***Force Configuration*:** **Gas Force ON** .	
17.14.49. Record the positions from the ***Science Data PIT*** window.	

Pos X (µm)	Pos Y (µm)	Pos Z (µm)	Net (µm)	Expected |position| > –7.0 (µm)

17.14.50. Record the positions from the ***ABU_SU.cdx*** application

Pos X (µm)	Pos Y (µm)	Pos Z (µm)	Net (µm)	Expected |position| > –7.0 (µm)

17.14.51. Read the FSU commanded voltages from the ***Timing and Status Info PIT*** and the ***ABU_SU.cdx*** application and record the measured values.

FSU Output	Mux Monitor Signal	MUX Value (xx.xx)	Measured Value (xx.xx)
(J45)	X1_BU	V	V
(J46)	X2_BU	V	V
(J43)	Y1_BU	V	V
(J44)	Y2_BU	V	V
(J41)	Z1_BU	V	V
(J42)	Z2_BU	V	V

17.14.52. Save a capture of the (3) positions and (6) electrode voltages to **C:\FSU_Acceptance_Test\SN*???*\RawData\ABU\ Spinup\FSU???su_bu_pos1_with_gas**	
17.14.53. Disable the 0.050 g force normal to the spinup channel by choosing the button on the ***ABU_SU.cdx*** application, ***Force Configuration:*** **All Forces OFF**	

Part C: Spinup Back-Up Tests (cont.):

Spinup Backup Position 2
(partially satisfies GSS 3.4.8.1.1)

Test Description:	Done (√)
17.14.54. Run ***su_bu2.scp***; Arbiter remains in SB1, the ABU spinup position to radial position 2 and the bridge excitation in high.	
17.14.55. Record the positions from the ***Science Data PIT*** window.	

Pos X (µm)	Pos Y (µm)	Pos Z (µm)	Net (µm)	Expected |position| ~ –9.0 (µm)

17.14.56. Record the positions from the ***ABU_SU.cdx*** application.

Pos X (µm)	Pos Y (µm)	Pos Z (µm)	Net (µm)	Expected |position| ~ –9.0 (µm)

17.14.57. Record the FSU commanded voltages from the ***Timing and Status Info PIT*** (FLT:1 through FLT:6) and the measured values from the ***ABU_SU.cdx*** application.

FSU Output	Mux Monitor Signal	MUX Value (xx.xx)	Measured Value (xx.xx)
(J45)	X1_BU	V	V
(J46)	X2_BU	V	V
(J43)	Y1_BU	V	V
(J44)	Y2_BU	V	V
(J41)	Z1_BU	V	V
(J42)	Z2_BU	V	V

17.14.58. Save a capture of the (3) positions and (6) electrode voltages to **C:\FSU_Acceptance_Test\SN*???*\RawData\ABU\Spinup\FSU???su_bu_pos2_nogas**	

Spinup Backup Position 2
(cont.)

Test Description:	Done (〈)
17.14.59. Simulate 0.050 g force normal to the spinup channel by choosing the button on the ***ABU_SU.cdx*** application, ***Force Configuration*: Gas Force ON** .	
17.14.60. Record the positions from the ***Science Data PIT*** window.	

Pos X (µm)	Pos Y (µm)	Pos Z (µm)	Net (µm)	Expected |position| > -9.0 (µm)

17.14.61. Record the positions from the ***ABU_SU.cdx*** application

Pos X (µm)	Pos Y (µm)	Pos Z (µm)	Net (µm)	Expected |position| > -9.0 (µm)

17.14.62. Read the FSU commanded voltages from the ***Timing and Status Info PIT*** and the ***ABU_SU.cdx*** application and record the measured values.

FSU Output	Mux Monitor Signal	MUX Value (xx.xx)	Measured Value (xx.xx)
(J45)	X1_BU	V	V
(J46)	X2_BU	V	V
(J43)	Y1_BU	V	V
(J44)	Y2_BU	V	V
(J41)	Z1_BU	V	V
(J42)	Z2_BU	V	V

17.14.63. Save a capture of the (3) positions and (6) electrode voltages to **C:\FSU_Acceptance_Test\SN*???*\RawData\ABU\ Spinup\FSU???su_bu_pos2_with_gas**	
17.14.64. Disable the 0.050 g force normal to the spinup channel by choosing the button on the ***ABU_SU.cdx*** application, ***Force Configuration:* All Forces OFF**	

Part C: Spinup Back-Up Tests (cont.):

Spinup Backup Position 3
(partially satisfies GSS 3.4.8.1.1)

Test Description:	Done (〈)
17.14.65. Run ***su_bu3.scp***; Arbiter remains in SB1, the ABU spinup position to radial position 3 and the bridge excitation in high.	
17.14.66. Record the positions from the ***Science Data PIT*** window.	

Pos X (μm)	Pos Y (μm)	Pos Z (μm)	Net (μm)	Expected |position| ~ −11.0 (μm)

17.14.67. Record the positions from the ***ABU_SU.cdx*** application

Pos X (μm)	Pos Y (μm)	Pos Z (μm)	Net (μm)	Expected |position| ~ −11.0 (μm)

17.14.68. Record the FSU commanded voltages from the ***Timing and Status Info PIT*** (FLT:1 through FLT:6) and the measured values from the ***ABU_SU.cdx*** application.

FSU Output	Mux Monitor Signal	MUX Value (xx.xx)	Measured Value (xx.xx)
(J45)	X1_BU	V	V
(J46)	X2_BU	V	V
(J43)	Y1_BU	V	V
(J44)	Y2_BU	V	V
(J41)	Z1_BU	V	V
(J42)	Z2_BU	V	V

17.14.69. Save a capture of the (3) positions and (6) electrode voltages to **C:\FSU_Acceptance_Test\SN*???*\RawData\ABU\ Spinup\FSU???su_bu_pos3_nogas**	

Spinup Backup Position 3
(cont.)

Test Description:	Done (〈)
17.14.70. Simulate 0.050 g force normal to the spinup channel by choosing the button on the ***ABU_SU.cdx*** application, ***Force Configuration*: Gas Force ON** .	
17.14.71. Record the positions from the ***Science Data PIT*** window.	

Pos X (μm)	Pos Y (μm)	Pos Z (μm)	Net (μm)	Expected |position| > -11.0 (μm)

17.14.72. Record the positions from the ***ABU_SU.cdx*** application

Pos X (μm)	Pos Y (μm)	Pos Z (μm)	Net (μm)	Expected |position| > -11.0 (μm)

17.14.73. Read the FSU commanded voltages from the ***Timing and Status Info PIT*** and the ***ABU_SU.cdx*** application and record the measured values.

FSU Output	Mux Monitor Signal	MUX Value (xx.xx)	Measured Value (xx.xx)
(J45)	X1_BU	V	V
(J46)	X2_BU	V	V
(J43)	Y1_BU	V	V
(J44)	Y2_BU	V	V
(J41)	Z1_BU	V	V
(J42)	Z2_BU	V	V

17.14.74. Save a capture of the (3) positions and (6) electrode voltages to **C:\FSU_Acceptance_Test\SN*???*\RawData\ABU\Spinup\FSU???su_bu_pos3_with_gas**	
17.14.75. Disable the 0.050 g force normal to the spinup channel by choosing the button on the ***ABU_SU.cdx*** application, ***Force Configuration:* All Forces OFF**	

Test Description:				Done (〈)
17.14.76. Apply a 1 kg-m/sec impulse to the gyroscope simulator for each of the 8 octants. Capture the gyroscope trajectory for each increment and save the file and path as ; ***C:\FSU_Acceptance_Test\SN???\RawData\ABU\SU_BU\POS3_BUMP*** *SN**?**SU_BU_OCT1_#* , where # designates the impulse level.				
17.14.77. Repeat the impulse in each of the 7 remaining octants beginning with this amplitude. Record the amplitude of the impulse below.				
Octant	Filename of the last Capture	Impulse applied 1 kg-m/sec	Max. excursion from radial position 3 (µm)	
1st	*SN[ ] SU_OCT1*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
2nd	*SN[ ] SU_OCT2*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
3rd	*SN[ ] SU_OCT3*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
4th	*SN[ ] SU_OCT4*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
5th	*SN[ ] SU_OCT5*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
6th	*SN[ ] SU_OCT6*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
7th	*SN[ ] SU_OCT7*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	
8th	*SN[ ] SU_OCT8*	Applied impulse	µm (X)	
		kg-m/sec	µm (Y)	
			µm (Z)	

Test Description:	Done (√)
17.14.78. Run ***su_bu0.scp***;	
17.14.79. Turn off High Voltage supply at the Space Craft Emulator	
17.14.80. Verify the voltage is off by checking the electrode voltages in ***ABU_SU.cdx***	
17.14.81. Switch the HV/LV relay to LV; ***GHW command 16 10***	
17.14.82. Switch the gyroscope simulator interface to the Low Voltage setting	

17.15. Computer Fault
(partially satisfies GSS 3.4.8.1.3.2)

Test Description:	Done (√)
17.15.1. Start ***CompFail.cdx*** in Control Desk. Start the simulation and click “Start” in the data capture window.	
17.15.2. Run ***hbu_park.scp***	
17.15.3. Set LVA filter to BU. Issue ***16 3 7*** line command.	
17.15.4. Issue ***16 7*** line command to move the Arbiter state to Prime.	
17.15.5. Turn off the power to the ACU leaving power to the FSU on.	
17.15.6. Check to see if the transition to High Backup was captured in ***CompFail.cdx.*** Repeat 17.15.2 through 17.15.5. after reloading the image and reconfiguring the FSU.	
17.15.7. Save capture to **C:\FSU_Acceptance_Test\SN*???*\RawData\ABU\Comp_Fail_Test.**	

17.16. Completion of procedure:

	P/F	Notes
17.16.1. Turn OFF power to the FSU		
17.16.2. Remove all external cables from DUT		
17.16.3. 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**	**Notes**