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

Gravity Probe B Relativity Mission

TEST PROCEDURE FOR THE DRAG-FREE GYROSCOPE SIMULATOR (DFGS) SOFTWARE

December 12, 2003

P0979 Rev B

Approvals

NAME	SIGNATURE	DATE
Calvin Tham *Software Engineer*		
David Hipkins *GSS RE*		
William Bencze *Payload Electronics Manager*		
Kelly Burlingham *Software Quality Engineer*		

Tom Langenstein ITAR Assessment Performed, ITAR Control Req'd? _____ ____ Yes ____ No

Revision History

REV	DATE	AUTHOR	COMMENTS

REV	DATE	AUTHOR	COMMENTS
	20 Feb 03	SKS	Initial version v1.0
A	06 Mar 03	CBBT	• Added test case objective and pass/fail criteria to each individual test cases. • Removed test case: "ATC Data Panel SV Angular Velocity Reset – Gyro A". Not a valid test for the simulator. Valid for flight software only. • Removed test case: "Position Data Panel Gyro A Data Velocity and Acceleration". Not a valid test for the simulator. Valid for flight software only. • Removed test case: "ATC Data Panel SV Angular Velocity Reset – Gyro B". Not a valid test for the simulator. Valid for flight software only. • Removed test case: "Position Data Panel Gyro B Data Velocity and Acceleration". Not a valid test for the simulator. Valid for flight software only. • Removed test case: "Hardware Data Panel Capture Dialog". Not applicable. This is a test for control desk, not a simulator test. • Removed test case: "Hardware Data Panel Thruster Mode Adjust". Not applicable. This is a test for control desk, not a simulator test. • Test case 11.1.3.4 changed to "Turn on all thrusters." • Test case 11.1.3.7 changed to "All at once, turn off the thrusters." • Test case 11.2.1.3 changed to "In the Gyro A Panel Gyro Position fields, confirm that the readouts show 5, 10 and 15 microns for X, Y and Z, respectively." • • Rev - test case 10.2.1.6 has been removed. A duplicate of 11.2.1.3. • Test case 11.2.10.4 changed to "Confirm that the Hardware Data Panel GSS A State COMP OK display is lit." • Test case 11.2.13.3 changed to "Turn on one of the High Voltage Power Supplies (750A) for the GSS attached to Gyro B. Note 1." • Test case 11.2.13.5 changed to "Turn on High Voltage Power Supplies (750B) for the GSS attached to Gyro A. Note 1." • Test case 11.2.13.6 changed to "Confirm that the Hardware Data Panel GSS A State Timing State display is approximately 5 volts." • Test case 11.2.15.2 changed to "Confirm that the Gyro A Panel X, Y & Z Position plot reflects the programmed accelerations." • Test case 11.2.16.1 changed to "Set the Position Data Panel Gyro A Constant Acceleration

REV	DATE	AUTHOR	COMMENTS
			Ax, Ay and Az controls to +0.000001, +0.000002, and –0.000001, respectively and press 'enter'." • Test case 11.2.16.3 changed to "Set the Position Data Panel Gyro A Constant Acceleration Ax, Ay and Az controls to +0.000000, +0.000000, and +0.000000, respectively and press 'enter'." • Test case 11.2.17.7 added: "Set Position Data Gyro A Initialization Vx, Vy and Vz all to +0.000000 and click Apply." • Test case 11.3.1.3 changed to "In the Gyro B Panel Gyro Position field, confirm that the readouts show 5, 10 and 15 microns for X, Y and Z, respectively." • Rev – test case 10.3.1.6 has been removed. A duplicate of 11.2.1.3. • Test case 11.3.13.3 changed to "Turn on one of the High Voltage Power Supplies (750A) for the GSS attached to Gyro B. Note 1." • Test case 11.3.13.5 changed to "Turn on High Voltage Power Supplies (750B) for the GSS attached to Gyro B. Note 1." • Test case 11.3.13.6 changed to "Confirm that the Hardware Data Panel GSS B State Timing State display is approximately 5 volts." • Test case 11.3.15.2 changed to "Confirm that the Gyro B Panel X, Y & Z Position plot reflects the programmed accelerations." • Test case 11.3.16.1 changed to "Set the Position Data Panel Gyro B Constant Acceleration Ax, Ay and Az controls to +0.000001, +0.000002, and –0.000001, respectively and press 'enter'." • Test case 11.3.16.3 changed to "Set the Position Data Panel Gyro B Constant Acceleration Ax, Ay and Az controls all to +0.000000 and press 'enter'." • Test case 11.3.17.7 added: "Set Position Data Gyro B Initialization Vx, Vy and Vz all to +0.000000." • Test case 11.5 added: SpinUp • Test case 11.6 added: Micrometeorite Impact • Test case 11.7 added: Timing Test Support • Test case 11.2.3.5 added: "Click the Gyro A Panel ATC Feed Disabled button." • Test case 11.2.4.5 added: "Click the Gyro A Panel UV Input Disabled button." • Test case 11.3.3.5 added: "Click the Gyro B Panel ATC Feed Disabled button." • Test case 11.3.4.5 added: "Click the Gyro B Panel UV Input Disabled button."

REV	DATE	AUTHOR	COMMENTS
			• Test case 11.4.2.10 added: "Set the Charge Data Panel Gyro A Charge Control Setup Initial Rotor Voltage to +0. Click Apply." • Test case 11.4.2.11 added: "Set the Charge Data Panel Gyro A Charge Control Setup Fixed Charge Rate (V/s) to +0.0 and press 'enter'." • Test case 11.4.3.10 added: "Set the Charge Data Panel Gyro B Charge Control Setup Initial Rotor Voltage to +0. Click Apply." • Test case 11.4.3.11 added: "Set the Charge Data Panel Gyro B Charge Control Setup Fixed Charge Rate (V/s) to +0.0 and press 'enter'." • The GSS attached to DFGS Gyro B shall be assigned the 1553 address for GSS number 2 instead of 4. • Added in Section 9.0 Test Environment, a complete list of software and their version numbers, used in this procedure. • Test case 11.2.2.5 added: "Click the Gyro A Panel No Electrode Voltages In button." • Test case 11.3.2.5 added: "Click the Gyro B Panel No Electrode Voltages In button." • Test case 11.4.1.13 changed to "Set the Charge Data Panel Gyro A and Gyro B Charge Control Setup Fixed Rotor Voltage (V) control to 0 and press 'enter'." • Test case 11.7.1.9 added: "Check the External Perturbations Data Panel Timing Test Gyro B "Timing Signal Out" button." • Test case 11.7.1.10 added: "Confirm the LED is lit." • Test case 11.7.1.11 added: "Check the External Perturbations Data Panel Timing Test Gyro B "No Timing Signal" button." • Test case 11.7.1.12 added: "Confirm the LED is dark." • Test case 11.7.1.13 added: "Check the External Perturbations Data Panel Timing Test Acceleration In B "Timing Signal In" button." • Test case 11.7.1.14 added: "Confirm the LED is lit." • Test case 11.7.1.15 added: "Check the External Perturbations Data Panel Timing Test Acceleration In B "No Timing Signal" button." • Test case 11.7.1.16 added: "Confirm the LED is dark." • Added Section 12.0 "Exiting Control Desk".
B	12 Dec 03	MDL	• Added a test case for step size (section 11.8) • Incorporated red-lines from As-Run dated

REV	DATE	AUTHOR	COMMENTS
			March 3, 2003

TABLE OF CONTENTS

1.0 Scope:

This procedure details the operations necessary to verify the proper operation of the Drag-Free Gyroscope Simulator (DFGS) software.

2.0 Formal Requirements Verification

This procedure verifies no formal requirements for GP-B; it is an engineering test procedure.

3.0 Reference Documents

Document	Document No.	ALIAS.
Integrated Test Facility Gyroscope Suspension System (GSS) Documentation	S0723	
ITF Drag-Free Gyroscope Simulator (DFGS) User Guide	S0720	
ITF Drag-Free Gyroscope Simulator Software Detailed Description	S0762	
Version Definition Document for the ITF Drag-Free Gyroscope Simulator	S0759	DFGS TP

4.0 Test Facilities

The DFGS Test Procedure shall be performed in the GP-B Integrated Test Facility (ITF) at LMMS Building 205.

5.0 QA Provisions:

5.1. This procedure shall be conducted on a formal basis to its latest approved and released version. Software QA (K. Burlingham) shall be notified 24 hours prior to the start of this procedure. QA may monitor the execution of all or part of this procedure should they elect to do so.

QA notification time/date:

Date/time:_____
GP-B QA (K. Burlingham)

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

5.3. QA may redline this procedure.

6.0 Personnel

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

6.1. William Bencze

6.2. Scott Smader

6.3. Matthew LeMieux

6.4. Ron Zilm

6.5. Yoshimi Ohshima

6.6. Calvin Tham

6.7. David Hipkins

7.0 General Instructions

7.1. Redlines can be initiated by the personnel listed in Section 5.2 and must be approved by QA.

7.2. Operators shall read this procedure in its entirety and resolve any apparent ambiguities before beginning this procedure.

7.3. Any nonconformance or anomaly is to be reported by an MCR. Refer to the Software Quality Assurance Plan, P0630, for guidance. Do not alter or break configuration if a failure occurs; notify Software Quality Assurance.

7.4. Only the following persons have the authority to exit/terminate this test or perform a retest:

Certified operators listed in Section 6.0 and GP-B QA.

8.0 Hardware Safety Requirements:

8.1. As required, special care shall be exercised per the “Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment”, MIL-STD-1686

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

8.3. Examine all mating connectors before attempting to mate them. Remove any foreign particles. Look for any damaged pins or sockets. Do not force the coupling action if excessive resistance is encountered. Ensure that keyways are aligned when mating connectors.

9.0 Test Environment

The LMMS ITF shall be configured and connected as described in S0720, Section 3. All supported spacecraft subsystems shall be loaded with latest stable flight software, including ATC, UV, CCCA, and GSS’s. The version numbers of relevant software modules shall be recorded in the following table:

Software version is documented by completing the following table.

Software	Version
Oasis CSTOL	
timing_test2.prc	

scfpodon.prc	
fqt_ephem.prc	
gss_sim_checkout.prc	
Command Load, modified for timing test	
pong11921736.load	
pong11921736.tline	
at_init.load	
Relevant software versions in ITF	
Onboard SPCs in EEPROM	
MSS	
GSW	
GndRT	
Gyro Simulator Software	

The GSS attached to DFGS Gyro A shall be assigned the 1553 address for GSS number 1, i.e., 12 (decimal). The GSS attached to DFGS Gyro B shall be assigned the 1553 address for GSS number 2, i.e., 13 (decimal).

Start the Drag-Free Gyroscope Simulator Software according to the procedure described in S0720, Section 4.

10.0 Device Under Test (DUT):

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

DFGS ; Drag Free Gyroscope Simulator	Ver:	

Test Operator:	Name:	

Start of test:	Date: Time:	

11.0 Test Cases

Notes:

1. Specific instructions for performing the indicated activity are dependent on the operator's control environment, e.g., PitView or Oasis. Consult knowledgeable ITF personnel.
2. ATC and Gyro Simulator clocks for Gravity Gradient models are not synchronized, and may give misleading results if not manually synchronized.
3. Thruster Modes are displayed in the Hardware Data Panel, and their values may change during these tests, but they are not relevant to the DFGS user.
4. Test cases need not be performed in the order provided below except where specified.
5. The initial setup condition for each test module in the procedure is the initial configuration of the simulator as it was brought up using the procedure described in Section 4 of S0720.

11.1. Connectivity

11.1.1. Gyro A Gyro Selection

Test case objective: To confirm the simulator's capability to select the requested gyro and that this selection is accurately reflected at all related displays as indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.1.1.1. Set the Gyro A Panel Gyro Selection control to the same GSS number as the GSS attached to the Gyro Simulator.	
11.1.1.2. Confirm that the selected number appears on the ATC Data Panel Gyro A Gyro Select readout.	
1.1.1.1 Confirm that the selected number appears on the Position Data Panel Gyro A Data Gyro Select readout.	
11.1.1.3. Confirm that the selected number appears on the Charge Data Panel Gyro A Charge Data Gyro Select readout.	
11.1.1.4. Confirm that the selected number appears on the Gravity Gradient Data Panel Gyro A Data Gyro Select readout.	

11.1.2. Gyro B Gyro Selection

Test case objective: To confirm the simulator's capability to select the requested gyro and that this selection is accurately reflected at all related displays as indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.1.2.1. Set the Gyro B Panel Gyro Selection control to the same GSS number as the GSS attached to the Gyro Simulator.	
11.1.2.2. Confirm that the selected number appears on the ATC Data Panel Gyro B Gyro Select readout.	
11.1.2.3. Confirm that the selected number appears on the Position Data Panel Gyro B Data Gyro Select readout.	
11.1.2.4. Confirm that the selected number appears on the Charge Data Panel Gyro B Charge Data Gyro Select readout.	
11.1.2.5. Confirm that the selected number appears on the Gravity Gradient Data Panel Gyro B Data Gyro Select readout.	

11.1.3. Connectivity 1553 and ATC

Test case objective: To confirm simulator connectivity to the ATC and verify signal communications on the 1553 bus such that the commands sent are accurately reflected by all related displays indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.1.3.1. Turn off all Thrusters via Oasis or PitView console. Note 1.	
11.1.3.2. On the ATC Data Panel, confirm that the 1553 Link Control is Active. If not, click the Active button.	
11.1.3.3. In the Hardware Data Panel Capture dialog box click Start.	
11.1.3.4. Turn on all Thrusters. Note 1.	
11.1.3.5. As each Thruster is turned on, confirm that the corresponding Hardware Data Panel Thruster Counts entry becomes non-zero.	
11.1.3.6. Confirm that the ATC Data Panel Thruster Forces, SV Frame Data, Torque and Force Plots, and both Gyro A and Gyro B ATC Acceleration Feed displays all vary as the thrusters are turned on.	
11.1.3.7. All at once, turn off the Thrusters. Note 1.	
11.1.3.8. As each Thruster is turned off, confirm that the corresponding Hardware Data Panel Thruster Counts entry becomes zero.	
11.1.3.9. Confirm that the ATC Data Panel Thruster Forces, SV Frame Data, Torque and Force Plots, and both Gyro A and Gyro B ATC Acceleration Feed displays all vary as the thrusters are turned off.	

11.1.4. Connectivity UV Electrodes

Test case objective: To confirm simulator connectivity to the UV Lamps and verify that the commands sent are accurately reflected by all related displays indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.1.4.1. Turn off all UV Discrete HLDs via Oasis or PitView console. Note 1.	
11.1.4.2. Confirm that the Hardware Data Panel UV Discretes LEDs are all off.	
11.1.4.3. Turn on the UV Discrete HLDs.	
11.1.4.4. As each UV Discrete HLD is turned on, confirm that the corresponding Hardware Data Panel UV Discretes LED lights.	
11.1.4.5. Confirm that the Charge Data Panel Gyro A Charge Data UV A Active and UV B Active LEDs light as the UV A and B HLDs for the GSS number assigned to Gyro A are turned on.	
11.1.4.6. Confirm that the Charge Data Panel Gyro B Charge Data UV A Active and UV B Active LEDs light as the UV A and B HLDs for the GSS number assigned to Gyro B are turned on.	
11.1.4.7. Turn off the UV Discrete HLDs.	
11.1.4.8. As each UV Discrete HLD is turned off, confirm that the corresponding Hardware Data Panel UV Discretes LED is extinguished.	
11.1.4.9. Confirm that the Charge Data Panel Gyro A Charge Data UV A Active and UV B Active LEDs extinguish as the UV A and B HLDs for the GSS number assigned to Gyro A are turned off.	
11.1.4.10. Confirm that the Charge Data Panel Gyro B Charge Data UV A Active and UV B Active LEDs extinguish as the UV A and B HLDs for the GSS number assigned to Gyro B are turned off.	

11.2. Gyro A

11.2.1. Gyro A Gyroscope Position and Position Feedback

Test case objective: To confirm the input gyro positions are accurately reported at all related displays indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.1.1. In the Hardware Data Panel Capture Dialog box, press the Start button.	
11.2.1.2. In the Position Data Panel, set the Gyro A Initialization X, Y and Z inputs to 0.000005, 0.000010 and 0.000015, respectively, then click Apply.	
11.2.1.3. In the Gyro A Panel Gyro Position fields, confirm that the readouts show 5, 10 and 15 microns for X, Y and Z, respectively.	
11.2.1.4. In the Gyro A Panel, confirm that the Plots show the step response to the application of the Initialization positions.	
11.2.1.5. In the Position Data Panel Gyro A Data Position, confirm that the readouts show 5, 10 and 15 microns for X, Y and Z, respectively.	
11.2.1.6. In the Position Data Panel, set the Gyro A Initialization X, Y and Z inputs all to 0.000000, then click Apply.	

11.2.2. Gyro A Panel Electrode Voltages In

Test case objective: To confirm that Position Data Panel Gyro A Data Electrode Voltages On LED provides the correct indication when Gyro A Panel No Electrode Voltages In button is enabled/disabled.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.2.1. Click the Gyro A Panel No Electrode Voltages In button.	
11.2.2.2. Confirm that the Position Data Panel Gyro A Data Electrode Voltages On LED is extinguished.	
11.2.2.3. Click the Gyro A Panel Electrode Voltages In button.	
11.2.2.4. Confirm that the Position Data Panel Gyro A Data Electrode Voltages On LED is lit.	
11.2.2.5. Click the Gyro A Panel No Electrode Voltages In button.	

11.2.3. Gyro A Panel ATC Feed Switch

Test case objective: To confirm that ATC Data Panel Gyro A Data ATC Feed Active LED provides the correct indication when Gyro A Panel ATC Feed button is enabled/disabled.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.3.1. Click the Gyro A Panel ATC Feed Disabled button.	
11.2.3.2. Confirm that the ATC Data Panel Gyro A Data ATC Feed Active LED is extinguished.	
11.2.3.3. Click the Gyro A Panel ATC Feed Enabled button.	
11.2.3.4. Confirm that the ATC Data Panel Gyro A Data ATC Feed Active LED is lit.	
11.2.3.5. Click the Gyro A Panel ATC Feed Disabled button.	

11.2.4. Gyro A Panel ECU UV Input

Test case objective: To confirm that Charge Data Panel Gyro A Data UV Input Enabled LED provides the correct indication when Gyro A Panel UV Input button is enabled/disabled.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.4.1. Click the Gyro A Panel UV Input Disabled button.	
11.2.4.2. Confirm that the Charge Data Panel Gyro A Data UV Input Enabled LED is extinguished.	
11.2.4.3. Click the Gyro A Panel UV Input Enabled button.	
11.2.4.4. Confirm that the Charge Data Panel Gyro A Data UV Input Enabled LED is lit.	
11.2.4.5. Click the Gyro A Panel UV Input Disabled button.	

11.2.5. Gyro A Electrode voltages

Test case objective: To confirm that the simulator accurately reads the voltages from the control MUX output of the FSU MUX board.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.5.1. In the Gyro A Panel, confirm that X1, X2, Y1, Y2, Z1 and Z2 Electrode voltages are not frozen, that is, that small changes to the voltages occur.	
11.2.5.2. If Capture is not already active, in the Hardware Data Panel Capture Dialog press the Start button. Confirm that the Gyro A Panel Electrode Voltages plot tracks the same changes.	

11.2.6. Gyro A Arbiter State

Test case objective: To confirm the Gyro A Panel Arbiter State display correctly reports the commanded arbiter state change.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.6.1. Interrogate Arbiter State via Oasis or PitView console. Note 1.	
11.2.6.2. Confirm that the reported state matches the Gyro A Panel Arbiter State display.	
11.2.6.3. Confirm that the reported state matches the Hardware Data Panel GSS A State Arbiter State display	

11.2.7. Gyro A SU_R_CMD (SU_POS_CMD)

Test case objective: To confirm that the commanded SU_R_CMD bit changes are correctly reported by all related displays indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.7.1. Clear the SU_R_CMD bits in the GSS #1 FSU Forward Mode Register (FMR) via Oasis or PitView console. Note 1.	
11.2.7.2. Confirm that the Gyro A Panel Spin Up Position display is 0.	
11.2.7.3. Confirm that the Hardware Data Panel GSS A State SU_POS_CMD display is 0.	
11.2.7.4. Set the SU_R_CMD bits to 7 in the GSS #1 FSU Forward Mode Register (FMR) via Oasis or PitView console. Note 1.	
11.2.7.5. Confirm that the Gyro A Panel Spin Up Position display is 7.	
11.2.7.6. Confirm that the Hardware Data Panel GSS A State SU_POS_CMD display is 7.	

11.2.8. Gyro A Operating Mode

Test case objective: To confirm that the commanded Operation Mode change is correctly reported by all related displays indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.8.1. Interrogate Operating Mode via Oasis or PitView console. Note 1.	
11.2.8.2. Confirm that the reported state matches the Gyro A Operating Mode display.	
11.2.8.3. Confirm that the reported state matches the Hardware Data Panel GSS A State Mode display.	

11.2.9. Gyro A Charge Control

Test case objective: To confirm that the commanded Charge Control bit changes are correctly reported by all related displays indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.9.1. Clear the Charge Control bits in the GSS FSU FMR. Note 1.	
11.2.9.2. Confirm that the Gyro A Panel Charge Control display is 0.	
11.2.9.3. Confirm that the Hardware Data Panel GSS A State Charge Bias display is 0.	
11.2.9.4. Confirm that the Charge Data Panel Gyro A Charge Bias display is 0.	
11.2.9.5. Set the Charge Control bits in the GSS FSU FMR to 01. Note 1.	
11.2.9.6. Confirm that the Gyro A Panel Charge Control display is 1.	
11.2.9.7. Confirm that the Hardware Data Panel GSS A State Charge Bias display is 1.	
11.2.9.8. Confirm that the Charge Data Panel Gyro A Charge Bias display is 1.	
11.2.9.9. Set the Charge Control bits in the GSS FSU FMR to 10. Note 1.	
11.2.9.10. Confirm that the Gyro A Panel Charge Control display is 2.	
11.2.9.11. Confirm that the Hardware Data Panel GSS A State Charge Bias display is 2.	
11.2.9.12. Confirm that the Charge Data Panel Gyro A Charge Bias display is 2.	
11.2.9.13. Clear the Charge Control bits in the GSS FSU FMR. Note 1.	

11.2.10. Gyro A COMP OK

Test case objective: To confirm Hardware Data Panel GSS A State COMP_OK LED provides the correct indication as the COMP_OK bit is being set or cleared.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.10.1. Clear the COMP_OK bit in the GSS FSU FMR. Note 1.	
11.2.10.2. Confirm that the Hardware Data Panel GSS A State COMP_OK LED is dark.	
11.2.10.3. Set the COMP_OK bit in the GSS FSU FMR. Note 1.	
11.2.10.4. Confirm that the Hardware Data Panel GSS A State COMP OK display is lit.	

11.2.11. Gyro A Low Threshold

Test case objective: To confirm the commanded Low Threshold bit changes are correctly reported by all related displays indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.11.1. Clear the Low Threshold bit in GSS FSU Forward Mode Register (FMR) via Oasis or PitView console. Note 1.	
11.2.11.2. Confirm that the Gyro A Panel Low Threshold display is 0.	
11.2.11.3. Confirm that the Hardware Data Panel GSS A State LO_THRESH_EN LED is dark.	
11.2.11.4. Set the Low Threshold bit in GSS FSU Forward Mode Register (FMR) via Oasis or PitView console. Note 1.	
11.2.11.5. Confirm that the Gyro A Panel Low Threshold display is 1.	
11.2.11.6. Confirm that the Hardware Data Panel GSS A State LO_THRESH_EN LED is lit.	

11.2.12. Gyro A High Threshold

Test case objective: To confirm the commanded High Threshold bit changes are correctly reported by all related displays indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.12.1. Clear the High Threshold bit in GSS FSU Forward Mode Register (FMR) via Oasis or PitView console. Note 1.	
11.2.12.2. Confirm that the Gyro A Panel High Threshold display is 0.	
11.2.12.3. Confirm that the Hardware Data Panel GSS A State HI_THRESH_EN LED is dark.	
11.2.12.4. Set the High Threshold bit in GSS FSU Forward Mode Register (FMR) via Oasis or PitView console. Note 1.	
11.2.12.5. Confirm that the Gyro A Panel High Threshold display is 1.	
11.2.12.6. Confirm that the Hardware Data Panel GSS A State HI_THRESH_EN LED is lit.	

11.2.13. Gyro A HVA Power Status

Test case objective: To confirm Hardware Data Panel GSS A State Timing State display correctly reports the voltage supplied by the high voltage power supplies 750A and 750B.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.13.1. Turn off both High Voltage Power Supplies for the GSS attached to Gyro A. Note 1.	
11.2.13.2. Confirm that the Hardware Data Panel GSS A State Timing State display is approximately 0 volts.	
11.2.13.3. Turn on one of the High Voltage Power Supplies (750A) for the GSS attached to Gyro A. Note 1.	
11.2.13.4. Confirm that the Hardware Data Panel GSS A State Timing State display is approximately 5 volts.	
11.2.13.5. Turn on High Voltage Power Supplies (750B) for the GSS attached to Gyro A. Note 1.	
11.2.13.6. Confirm that the Hardware Data Panel GSS A State Timing State display is approximately 5 volts.	
11.2.13.7. Turn off both High Voltage Power Supplies for the GSS attached to Gyro A. Note 1.	

11.2.14. Gyro A LVA/HVA Relay Emulation

Test case objective: To confirm the Hardware Data Panel GSS A State LVA/HVA LED provides the correct indication as the LVA/HVA relay emulator is being set or cleared.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.14.1. Clear the LVA/HVA relay emulator. Note 1.	
11.2.14.2. Confirm that reported the Hardware Data Panel GSS A State LVA/HVA LED is dark.	
11.2.14.3. Set the LVA/HVA relay emulator. Note 1.	
11.2.14.4. Confirm that reported the Hardware Data Panel GSS A State LVA/HVA LED is lit.	

11.2.15. Position Data Panel Gyro A Initialization Vx, Vy and Vz

Test case objective: To confirm the Gyro A Panel X, Y & Z Position plot reflects the input gyro initialization velocities.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.15.1. Set the Position Data Panel Gyro A Initialization Vx, Vy and Yz controls to +0.000001, +0.000002, and –0.000001, respectively, then click Apply.	
11.2.15.2. Confirm that the Gyro A Panel X, Y & Z Position plot reflects the programmed accelerations.	
11.2.15.3. Set the Position Data Panel Gyro A Initialization Vx, Vy and Yz controls all to +0.000000, then click Apply.	

11.2.16. Position Data Panel Gyro A Constant Acceleration

Test case objective: To confirm the Gyro A Panel X, Y & Z Position and Gyro A Panel ATC Acceleration plots reflect the input gyro initialization velocities.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**

11.2.16.1. Set the Position Data Panel Gyro A Constant Acceleration Ax, Ay and Az controls to +0.000001, +0.000002, and –0.000001, respectively and press 'enter'.	
11.2.16.2. Confirm that the Gyro A Panel X, Y & Z Position and Gyro A Panel ATC Acceleration plots reflect the programmed accelerations.	
11.2.16.3. Set the Position Data Panel Gyro A Constant Acceleration Ax, Ay and Az controls all to +0.000000 and press 'enter'.	

11.2.17. Position Data Panel Gyro A Wall Impact

Test case objective: To confirm the simulator's capability to simulate a completely inelastic collision at the housing wall (when the "Halt at Wall" button is selected) and also a completely elastic collision at the housing wall (when the "Elastic Bounce" button is selected). The Gyro A Panel Position X, Y and Z plot will confirm the successful execution of these 2 features.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.2.17.1. Click Position Data Panel Gyro A Wall Impact X-Axis, Y-Axis and Z-Axis Halt at Wall buttons.	
11.2.17.2. Set Position Data Gyro A Initialization X, Y and Z and Position Data Gyro A Constant Acceleration Ax, Ay and Az controls all to 0. Set Position Data Gyro A Initialization Vx, Vy and Vz to +0.000001, +0.000002, and –0.000001, respectively, then click Apply.	
11.2.17.3. Confirm that Gyro A Panel Position X, Y and Z plot shows rotor move to 15 microns, then "stick."	
11.2.17.4. Click Position Data Panel Gyro A Wall Impact X-Axis, Y-Axis and Z-Axis Elastic Bounce buttons.	
11.2.17.5. Without changing Gyro A Initialization or Gyro A Constant Acceleration controls, click Gyro A Initialization Apply button.	
11.2.17.6. Confirm that Gyro A Panel Position X, Y and Z plot shows rotor start in center, then move to 15 microns, then bounce elastically.	
11.2.17.7. Set Position Data Gyro A Initialization Vx, Vy and Vz all to +0.000000 and click Apply.	

11.3. Gyro B

11.3.1. Gyro B Gyroscope Position and Position Feedback

Test case objective: To confirm the input gyro positions are accurately reported at all related displays indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**

11.3.1.1. In the Hardware Data Panel Capture Dialog box, press the Start button.	
11.3.1.2. In the Position Data Panel, set the Gyro B Initialization X, Y and Z inputs to 0.000005, 0.000010 and 0.000015, respectively, then click Apply.	
11.3.1.3. In the Gyro B Panel Gyro Position field, confirm that the readouts show 5, 10 and 15 microns for X, Y and Z, respectively.	
11.3.1.4. In the Gyro B Panel, confirm that the Plots show the step response to the application of the Initialization positions.	
11.3.1.5. In the Position Data Panel Gyro B Data Position, confirm that the readouts show 5, 10 and 15 microns for X, Y and Z, respectively.	
11.3.1.6. In the Position Data Panel, set the Gyro B Initialization X, Y and Z inputs all to 0.000000, then click Apply.	

11.3.2. Gyro B Panel Electrode Voltages In

Test case objective: To confirm that Position Data Panel Gyro B Data Electrode Voltages On LED provides the correct indication when Gyro B Panel No Electrode Voltages In button is enabled/disabled.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.2.1. Click the Gyro B Panel No Electrode Voltages In button.	
11.3.2.2. Confirm that the Position Data Panel Gyro B Data Electrode Voltages On LED is extinguished.	
11.3.2.3. Click the Gyro B Panel Electrode Voltages In button.	
11.3.2.4. Confirm that the Position Data Panel Gyro B Data Electrode Voltages On LED is lit.	
11.3.2.5. Click the Gyro B Panel No Electrode Voltages In button.	

11.3.3. Gyro B Panel ATC Feed Switch

Test case objective: To confirm that ATC Data Panel Gyro B Data ATC Feed Active LED provides the correct indication when Gyro B Panel ATC Feed button is enabled/disabled.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.3.1. Click the Gyro B Panel ATC Feed Disabled button.	
11.3.3.2. Confirm that the ATC Data Panel Gyro B Data ATC Feed Active LED is extinguished.	
11.3.3.3. Click the Gyro B Panel ATC Feed Enabled button.	
11.3.3.4. Confirm that the ATC Data Panel Gyro B Data ATC Feed Active LED is lit.	
11.3.3.5. Click the Gyro B Panel ATC Feed Disabled button.	

11.3.4. Gyro B Panel ECU UV Input

Test case objective: To confirm that Charge Data Panel Gyro B Data UV Input Enabled LED provides the correct indication when Gyro B Panel UV Input button is enabled/disabled.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.4.1. Click the Gyro B Panel UV Input Disabled button.	
11.3.4.2. Confirm that the Charge Data Panel Gyro B Data UV Input Enabled LED is extinguished.	
11.3.4.3. Click the Gyro B Panel UV Input Enabled button.	
11.3.4.4. Confirm that the Charge Data Panel Gyro B Data UV Input Enabled LED is lit.	
11.3.4.5. Click the Gyro B Panel UV Input Disabled button.	

11.3.5. Gyro B Electrode voltages

Test case objective: To confirm that the simulator accurately reads the voltages from the control MUX output of the FSU MUX board.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.5.1. In the Gyro B Panel, confirm that X1, X2, Y1, Y2, Z1 and Z2 Electrode voltages are not frozen, that is, that small changes to the voltages occur.	
11.3.5.2. If Capture is not already active, in the Hardware Data Panel Capture Dialog press the Start button. Confirm that the Gyro B Panel Electrode Voltages plot tracks the same changes.	

11.3.6. Gyro B Arbiter State

Test case objective: To confirm the Gyro B Panel Arbiter State display correctly reports the commanded arbiter state change.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.6.1. Interrogate Arbiter State via Oasis or PitView console. Note 1.	
11.3.6.2. Confirm that the reported state matches the Gyro B Panel Arbiter State display.	
11.3.6.3. Confirm that the reported state matches the Hardware Data Panel GSS B State Arbiter State display	

11.3.7. Gyro B SU_R_CMD (SU_POS_CMD)

Test case objective: To confirm that the commanded SU_R_CMD bit changes are correctly reported by all related displays indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.7.1. Clear the SU_R_CMD bits in the GSS #4 FSU Forward Mode Register (FMR) via Oasis or PitView console. Note 1.	
11.3.7.2. Confirm that the Gyro B Panel Spin Up Position display is 0.	
11.3.7.3. Confirm that the Hardware Data Panel GSS B State SU_POS_CMD display is 0.	
11.3.7.4. Set the SU_R_CMD bits to 7 in the GSS #4 FSU Forward Mode Register (FMR) via Oasis or PitView console. Note 1.	
11.3.7.5. Confirm that the Gyro B Panel Spin Up Position display is 7.	
11.3.7.6. Confirm that the Hardware Data Panel GSS B State SU_POS_CMD display is 7.	

11.3.8. Gyro B Operating Mode

Test case objective: To confirm that the commanded Operation Mode change is correctly reported by all related displays indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.8.1. Interrogate Operating Mode via Oasis or PitView console. Note 1.	
11.3.8.2. Confirm that the reported state matches the Gyro B Operating Mode display.	
11.3.8.3. Confirm that the reported state matches the Hardware Data Panel GSS B State Mode display.	

11.3.9. Gyro B Charge Control

Test case objective: To confirm that the commanded Charge Control bit changes are correctly reported by all related displays indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.9.1. Clear the Charge Control bits in the GSS FSU FMR. Note 1.	
11.3.9.2. Confirm that the Gyro B Panel Charge Control display is 0.	
11.3.9.3. Confirm that the Hardware Data Panel GSS A State Charge Bias display is 0.	
11.3.9.4. Confirm that the Charge Data Panel Gyro B Charge Bias display is 0.	
11.3.9.5. Set the Charge Control bits in the GSS FSU FMR to 01. Note 1.	
11.3.9.6. Confirm that the Gyro B Panel Charge Control display is 1.	
11.3.9.7. Confirm that the Hardware Data Panel GSS A State Charge Bias display is 1.	
11.3.9.8. Confirm that the Charge Data Panel Gyro B Charge Bias display is 1.	
11.3.9.9. Set the Charge Control bits in the GSS FSU FMR to 10. Note 1.	
11.3.9.10. Confirm that the Gyro B Panel Charge Control display is 2.	
11.3.9.11. Confirm that the Hardware Data Panel GSS A State Charge Bias display is 2.	
11.3.9.12. Confirm that the Charge Data Panel Gyro B Charge Bias display is 2.	
11.3.9.13. Clear the Charge Control bits in the GSS FSU FMR. Note 1.	

11.3.10. Gyro B COMP OK

Test case objective: To confirm Hardware Data Panel GSS B State COMP_OK LED provides the correct indication as the COMP_OK bit is being set or cleared.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.10.1. Clear the COMP_OK bit in the GSS FSU FMR. Note 1.	
11.3.10.2. Confirm that the Hardware Data Panel GSS B State COMP_OK LED is dark.	
11.3.10.3. Set the COMP_OK bit in the GSS FSU FMR. Note 1.	
11.3.10.4. Confirm that the Hardware Data Panel GSS B State COMP OK display is 1.	

11.3.11. Gyro B Low Threshold

Test case objective: To confirm the commanded Low Threshold bit changes are correctly reported by all related displays indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.11.1. Clear the Low Threshold bit in GSS FSU Forward Mode Register (FMR) via Oasis or PitView console. Note 1.	
11.3.11.2. Confirm that the Gyro B Panel Low Threshold display is 0.	
11.3.11.3. Confirm that the Hardware Data Panel GSS B State LO_THRESH_EN LED is dark.	
11.3.11.4. Set the Low Threshold bit in GSS FSU Forward Mode Register (FMR) via Oasis or PitView console. Note 1.	
11.3.11.5. Confirm that the Gyro B Panel Low Threshold display is 1.	
11.3.11.6. Confirm that the Hardware Data Panel GSS B State LO_THRESH_EN LED is lit.	

11.3.12. Gyro B High Threshold

Test case objective: To confirm the commanded High Threshold bit changes are correctly reported by all related displays indicated in the activities below.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.12.1. Clear the High Threshold bit in GSS FSU Forward Mode Register (FMR) via Oasis or PitView console. Note 1.	
11.3.12.2. Confirm that the Gyro B Panel High Threshold display is 0.	
11.3.12.3. Confirm that the Hardware Data Panel GSS B State HI_THRESH_EN LED is dark.	
11.3.12.4. Set the High Threshold bit in GSS FSU Forward Mode Register (FMR) via Oasis or PitView console. Note 1.	
11.3.12.5. Confirm that the Gyro B Panel High Threshold display is 1.	
11.3.12.6. Confirm that the Hardware Data Panel GSS B State HI_THRESH_EN LED is lit.	

11.3.13. Gyro B HVA Power Status

Test case objective: To confirm Hardware Data Panel GSS B State Timing State display correctly reports the voltage supplied by the high voltage power supplies 750A and 750B.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.13.1. Turn off both High Voltage Power Supplies for the GSS attached to Gyro B. Note 1.	
11.3.13.2. Confirm that the Hardware Data Panel GSS B State Timing State display is approximately 0 volts.	
11.3.13.3. Turn on one of the High Voltage Power Supplies (750A) for the GSS attached to Gyro B. Note 1.	
11.3.13.4. Confirm that the Hardware Data Panel GSS B State Timing State display is approximately 5 volts.	
11.3.13.5. Turn on High Voltage Power Supplies (750B) for the GSS attached to Gyro B. Note 1.	
11.3.13.6. Confirm that the Hardware Data Panel GSS B State Timing State display is approximately 5 volts.	
11.3.13.7. Turn off both High Voltage Power Supplies for the GSS attached to Gyro B. Note 1.	

11.3.14. Gyro B LVA/HVA Relay Emulation

Test case objective: To confirm the Hardware Data Panel GSS B State LVA/HVA LED provides the correct indication as the LVA/HVA relay emulator is being set or cleared.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.14.1. Clear the LVA/HVA relay emulator. Note 1.	
11.3.14.2. Confirm that reported the Hardware Data Panel GSS B State LVA/HVA LED is dark.	
11.3.14.3. Set the LVA/HVA relay emulator. Note 1.	
11.3.14.4. Confirm that reported the Hardware Data Panel GSS B State LVA/HVA LED is lit.	

11.3.15. Position Data Panel Gyro B Initialization Vx, Vy and Vz

Test case objective: To confirm the Gyro B Panel X, Y & Z Position plot reflects the input gyro initialization velocities.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.15.1. Set the Position Data Panel Gyro B Initialization Vx, Vy and Yz controls to +0.000001, +0.000002, and –0.000001, respectively, then click Apply.	
11.3.15.2. Confirm that the Gyro B Panel X, Y & Z Position plot reflects the programmed accelerations.	
11.3.15.3. Set the Position Data Panel Gyro B Initialization Vx, Vy and Yz controls all to +0.000000, then click Apply.	

11.3.16. Position Data Panel Gyro B Constant Acceleration

Test case objective: To confirm the Gyro B Panel X, Y & Z Position and Gyro B Panel ATC Acceleration plots reflect the input gyro initialization velocities.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**

11.3.16.1. Set the Position Data Panel Gyro B Constant Acceleration Ax, Ay and Az controls to +0.000001, +0.000002, and –0.000001, respectively and press 'enter'.	
11.3.16.2. Confirm that the Gyro B Panel X, Y & Z Position and Gyro B Panel ATC Acceleration plots reflect the programmed accelerations.	
11.3.16.3. Set the Position Data Panel Gyro B Constant Acceleration Ax, Ay and Az controls all to +0.000000 and press 'enter'.	

11.3.17. Position Data Panel Gyro B Wall Impact

Test case objective: To confirm the simulator's capability to simulate a completely inelastic collision at the housing wall (when the "Halt at Wall" button is selected) and also a completely elastic collision at the housing wall (when the "Elastic Bounce" button is selected). The Gyro B Panel Position X, Y and Z plot will confirm the successful execution of these 2 features.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.3.17.1. Click Position Data Panel Gyro B Wall Impact X-Axis, Y-Axis and Z-Axis Halt at Wall buttons.	
11.3.17.2. Set Position Data Gyro B Initialization X, Y and Z and Position Data Gyro B Constant Acceleration Ax, Ay and Az controls all to 0. Set Position Data Gyro B Initialization Vx, Vy and Vz to +0.000001, +0.000002, and –0.000001, respectively, then click Apply.	
11.3.17.3. Confirm that Gyro B Panel Position X, Y and Z plot shows rotor move to 15 microns, then "stick."	
11.3.17.4. Click Position Data Panel Gyro B Wall Impact X-Axis, Y-Axis and Z-Axis Elastic Bounce buttons.	
11.3.17.5. Without changing Gyro B Initialization or Gyro B Constant Acceleration controls, click Gyro A Initialization Apply button.	
11.3.17.6. Confirm that Gyro B Panel Position X, Y and Z plot shows rotor start in center, then move to 15 microns, then bounce elastically.	
11.3.17.7. Set Position Data Gyro B Initialization Vx, Vy and Vz all to +0.000000.	

11.4. Charge Data

Note: It is impractical to test the Environmental Model of the Gyro Simulator Rotor Voltage Model because changes are too subtle to be observed by the Test Operator. However, if the following tests pass, it is reasonable to conclude that the Environmental Model will execute properly.

11.4.1. Fixed Rotor Voltage - Gyro A and Gyro B

Test case objective: To confirm the simulator's capability to accurately report the commanded changes in rotor voltages through the displays indicated in the activities below when the charge control setup is set to the Fixed Rotor Voltage model.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**

11.4.1.1. Set the Charge Data Panel Gyro A Charge Control Setup Fixed Rotor Voltage (V) control to 0 and press 'enter'.	
11.4.1.2. Check the Charge Data Panel Gyro A Charge Control Setup Rotor Voltage Model Fixed Rotor Voltage button.	
11.4.1.3. If Capture is not already active, in the Hardware Data Panel Capture Dialog press the Start button. Confirm that Charge Data Panel Gyro A Rotor Voltage plot is active.	
11.4.1.4. Set the Charge Data Panel Gyro A Charge Control Setup Fixed Rotor Voltage (V) control to +5 and press 'enter'.	
11.4.1.5. Confirm that the Charge Data Panel Gyro A Charge Data Rotor Voltage Display reads +5.	
11.4.1.6. Confirm that the Charge Data Panel Gyro A Rotor Voltage (V) plot tracks the change.	
11.4.1.7. Set the Charge Data Panel Gyro B Charge Control Setup Fixed Rotor Voltage (V) control to 0 and press 'enter'.	
11.4.1.8. If Capture is not already active, in the Hardware Data Panel Capture Dialog press the Start button. Confirm that Charge Data Panel Gyro B Rotor Voltage plot is active.	
11.4.1.9. Check the Charge Data Panel Gyro B Charge Control Setup Rotor Voltage Model Fixed Rotor Voltage button.	
11.4.1.10. Set the Charge Data Panel Gyro B Charge Control Setup Fixed Rotor Voltage (V) control to +5 and press 'enter'.	
11.4.1.11. Confirm that the Charge Data Panel Gyro B Charge Data Rotor Voltage Display reads +5.	
11.4.1.12. Confirm that the Charge Data Panel Gyro B Rotor Voltage (V) plot tracks the change.	
11.4.1.13. Set the Charge Data Panel Gyro A and Gyro B Charge Control Setup Fixed Rotor Voltage (V) control to 0 and press 'enter'.	

11.4.2. Rotor Charging - Gyro A

Test case objective: To confirm the simulator's capability to accurately report the commanded changes in rotor charge rate through the displays indicated in the activities below when the charge control setup is set to the Allowed Rotor Charging model.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.4.2.1. Check the Charge Data Panel Gyro A Charge Control Setup Rotor Voltage Model Allow Rotor Charging button.	
11.4.2.2. Set the Charge Data Panel Gyro A Charge Control Setup Fixed Charge Rate (V/s) to –0.5 and press 'enter'.	
11.4.2.3. Check the Charge Data Panel Gyro A Charge Control Setup Rotor Charge Model Fixed Charge Rate button.	
11.4.2.4. Confirm that Charge Data Panel Gyro A Charge Data Charge Rate display is –0.5.	
11.4.2.5. Confirm that Charge Data Panel Gyro A Rotor Voltage plot tracks the commanded charge rate.	
11.4.2.6. Confirm that the Charge Data Panel Gyro A Charge Data Rotor Voltage display tracks the changing charge.	
11.4.2.7. Set the Charge Data Panel Gyro A Charge Control Setup Initial Rotor Voltage to +15. Click Apply.	
11.4.2.8. Confirm that Charge Data Panel Gyro A Rotor Voltage plot initializes to +15.	
11.4.2.9. Confirm that the Charge Data Panel Gyro A Charge Data Rotor Voltage initializes to +15.	
11.4.2.10. Set the Charge Data Panel Gyro A Charge Control Setup Initial Rotor Voltage to +0. Click Apply.	
11.4.2.11. Set the Charge Data Panel Gyro A Charge Control Setup Fixed Charge Rate (V/s) to +0.0 and press 'enter'.	

11.4.3. Rotor Charging - Gyro B

Test case objective: To confirm the simulator's capability to accurately report the commanded changes in rotor charge rate through the displays indicated in the activities below when the charge control setup is set to the Allowed Rotor Charging model.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**
11.4.3.1. Check the Charge Data Panel Gyro B Charge Control Setup Rotor Voltage Model Allow Rotor Charging button.	
11.4.3.2. Set the Charge Data Panel Gyro B Charge Control Setup Fixed Charge Rate (V/s) to –0.5 and press 'enter'.	
11.4.3.3. Check the Charge Data Panel Gyro B Charge Control Setup Rotor Charge Model Fixed Charge Rate button.	
11.4.3.4. Confirm that Charge Data Panel Gyro B Charge Data Charge Rate display is –0.5.	
11.4.3.5. Confirm that Charge Data Panel Gyro B Rotor Voltage plot tracks the commanded charge rate.	
11.4.3.6. Confirm that the Charge Data Panel Gyro B Charge Data Rotor Voltage display tracks the changing charge.	
11.4.3.7. Set the Charge Data Panel Gyro B Charge Control Setup Initial Rotor Voltage to +15. Click Apply.	
11.4.3.8. Confirm that Charge Data Panel Gyro B Rotor Voltage plot initializes to +15.	
11.4.3.9. Confirm that the Charge Data Panel Gyro B Charge Data Rotor Voltage initializes to +15.	
11.4.3.10. Set the Charge Data Panel Gyro B Charge Control Setup Initial Rotor Voltage to +0. Click Apply.	
11.4.3.11. Set the Charge Data Panel Gyro B Charge Control Setup Fixed Charge Rate (V/s) to +0.0 and press 'enter'.	

11.5. Spin Up

11.5.1. Spin up verification – Gyro A and Gyro B

Test case objective: To confirm the simulator's ability to measure the force (acceleration) generated on the rotor as a result of a simulated gas flow.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**

11.5.1.1. On the External Perturbations Data Panel SpinUp Gyro A, set X to +0.400000, Y to +0.350000 and Z to +0.200000.	
11.5.1.2. Check the External Perturbations Data Panel SpinUp Accelerations In A "Enable" button.	
11.5.1.3. Check the External Perturbations Data Panel SpinUp Gyro A "Flow Gas" button.	
11.5.1.4. Confirm that GyA SU Ax, Ay and Az increase to the values set in 11.5.1.1 quickly.	
11.5.1.5. Check the External Perturbations Data Panel SpinUp Panel SpinUp Accelerations In A "Disable" button.	
11.5.1.6. Confirm that GyA SU Ax, Ay and Az report +0.000000.	
11.5.1.7. Check the External Perturbations Data Panel SpinUp Accelerations In A "Enable" button.	
11.5.1.8. Confirm that GyA SU Ax, Ay and Az returns to the values set in 11.5.1.1 quickly.	
11.5.1.9. Check the External Perturbations Data Panel SpinUp Gyro A "Stop Gas" button.	
11.5.1.10. Confirm that GyA SU Ax, Ay and Az slowly return to +0.000000.	
11.5.1.11. Check the External Perturbations Data Panel SpinUp Panel SpinUp Accelerations In A "Disable" button.	
11.5.1.12. Set X, Y and Z values back to initial values (subject to change).	
11.5.1.13. On the External Perturbations Data Panel SpinUp Gyro B, set X to +0.400000, Y to +0.350000 and Z to +0.200000.	
11.5.1.14. Check the External Perturbations Data Panel SpinUp Accelerations In B "Enable" button.	
11.5.1.15. Check the External Perturbations Data Panel SpinUp Gyro B "Flow Gas" button.	
11.5.1.16. Confirm that GyB SU Ax, Ay and Az increase to the values set in 11.5.1.12 quickly.	
11.5.1.17. Check the External Perturbations Data Panel SpinUp Accelerations In B "Disable" button.	
11.5.1.18. Confirm that GyB SU Ax, Ay and Az report +0.000000.	

11.5.1.19. Check the External Perturbations Data Panel SpinUp Accelerations In B "Enable" button.	
11.5.1.20. Confirm that GyB SU Ax, Ay and Az returns to the values set in 11.5.1.1 quickly	
11.5.1.21. Check the External Perturbations Data Panel SpinUp Gyro B "Stop Gas" button.	
11.5.1.22. Confirm that GyA SU Ax, Ay and Az slowly return to +0.000000.	
11.5.1.23. Check the External Perturbations Data Panel SpinUp Panel SpinUp Accelerations In A "Disable" button.	
11.5.1.24. Set X, Y and Z values back to initial values (subject to change).	

11.6. Micrometeorite Impact

11.6.1. Micrometeorite Impact – Gyro A and Gyro B

Test case objective: To confirm the simulator's ability to measure a micrometeorite impact by applying a constant force to the rotor.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**

Activity	**Pass / Fail**
11.6.1.1 Check the External Perturbations Data Panel Micrometeorite “Ready” button.	
11.6.1.2 Set the magnitude to +1.000000 kg m/s.	
11.6.1.3 Set the X direction value to +1.000000, Y and Z direction values to +0.000000.	
11.6.1.4 Check the “Go” button.	
11.6.1.5 Confirm the MM Ax value fluctuates and damps down to +0.000000.	
11.6.1.6 Check the External Perturbations Data Panel Micrometeorite “Ready” button.	
11.6.1.7 Set the Y direction value to +1.000000, X and Z direction values to +0.000000.	
11.6.1.8 Check the “Go” button.	
11.6.1.9 Confirm the MM Ay value fluctuates and damps down to +0.000000.	
11.6.1.10 Check the External Perturbations Data Panel Micrometeorite “Ready” button.	
11.6.1.11 Set the Z direction value to +1.000000, X and Y direction values to +0.000000.	
11.6.1.12 Check the “Go” button.	
11.6.1.13 Confirm the MM Az value fluctuates and damps down to +0.000000.	
11.6.1.14 Check the External Perturbations Data Panel Micrometeorite “Ready” button.	
11.6.1.15 Set X, Y and Z direction values to +1.000000.	

11.7. Timing Test Support

11.7.1. Timing Test Support – Gyro A and Gyro B

Test case objective: To confirm the simulator’s ability to allow timing signal output for the timing test and timing signal input for the timing acceleration test.

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**

Activity	**Pass / Fail**
11.7.1.1. Check the External Perturbations Data Panel Timing Test Gyro A "Timing Signal Out" button.	
11.7.1.2. Confirm the LED is lit.	
11.7.1.3. Check the External Perturbations Data Panel Timing Test Gyro A "No Timing Signal" button.	
11.7.1.4. Confirm the LED is dark.	
11.7.1.5. Check the External Perturbations Data Panel Timing Test Acceleration In A "Timing Signal In" button.	
11.7.1.6. Confirm the LED is lit.	
11.7.1.7. Check the External Perturbations Data Panel Timing Test Acceleration In A "No Timing Signal" button.	
11.7.1.8. Confirm the LED is dark.	
11.7.1.9. Check the External Perturbations Data Panel Timing Test Gyro B "Timing Signal Out" button.	
11.7.1.10. Confirm the LED is lit.	
11.7.1.11. Check the External Perturbations Data Panel Timing Test Gyro B "No Timing Signal" button	
11.7.1.12. Confirm the LED is dark.	
11.7.1.13. Check the External Perturbations Data Panel Timing Test Acceleration In B "Timing Signal In" button	
11.7.1.14. Confirm the LED is lit.	
11.7.1.15. Check the External Perturbations Data Panel Timing Test Acceleration In B "No Timing Signal" button	
11.7.1.16. Confirm the LED is dark	

11.8. Step Size

11.8.1. Step Size Verification

Test case objective: To confirm the simulator's frequency of updating internal variables (step size).

Pass/Fail Criteria: All activities below executed successfully with no errors logged.

Activity	**Pass / Fail**

Activity	**Pass / Fail**
11.8.1.1. Click on “Timer Task 1” in the ControlDesk “Tool Window” • open the Tool Window by selecting the menu item: View -> Controlbars -> Tool Window • Click on the lower Tool Window tab corresponding to the “sdf” file • expand the top level • expand the “Task Info” level • click on “Timer Task 1”	
11.8.1.2. Select the External Perturbations Data Panel	
11.8.1.3. Drag & drop the icon labeled “sampleTime” (in the Tool Window) onto the “Test Indicator” on the External Perturbations Data Panel	
11.8.1.4. Confirm that it reads 250 microseconds. (i.e., 0.000250)	

12.0 Exiting Control Desk

12.1. Go to ‘Platform’, “Application” and select “Stop Real-time Processor”.

12.2. Go to ‘File’ and select “Exit”

12.3. When prompt to save changes, select “No”.

12.4. Go to C:\ITF_Applications\Workspace and delete “Basic_Simulator_2”.

13.0 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	