GRAVITY PROBE B

PROCEDURE FOR

PAYLOAD VERIFICATION

P0910 REV A
(PTP) END-TO-END CHARGE CONTROL TEST

9 May 2002

Prepared by: *B. Clarke*

Approvals:

Program Responsibility	Signature	Date
B. Clarke Charge Control REE		
R. Brumley Payload Technical Manager		
B. Bencze Payload Electronics Manager		
D. Ross GP-B Quality Assurance		

NOTES:

Level of QA required during performance of this procedure:

____Stanford QA Representative

____Government QA Representative

All redlines must be approved by QA

Revision Record:

Rev	Rev Date	ECO #	Summary Description
-	2 April 2002	N/A	Original revision.
A	9 May 2002	1368	1. Modify operations to include contingency for supplying UV bias voltage using GSE instead of the flight GSS.

Acronyms and Abbreviations:

Acronym / Abbreviation	Meaning

Table of Contents

A Scope

This procedure is nominally an end-to-end health check of the UV charge control system done at the integrated spacecraft level. This document provides the procedure for measuring electric current due to UV photoemission from each of the gyroscope rotor/UV counter-electrode pairs using the flight UV cage and ECU. The flight GSS or GSE may be used to supply the bias voltage to the UV counter-electrode.

With the rotor in contact with the ground plane, the rotor and UV counter-electrode are illuminated with UV light from the ECU through the flight fiber optic cables. The counter-electrode is biased relative to the GSS single point ground using the GSS or relative to spacecraft ground using GSE to +3, 0 or –3 volts. In each case, the resulting current between the ground plane and the GSS single point is measured using GSE. The null case (current reading w/o light input to the rotor) is also measured to provide a baseline.

B Requirements Verification

This is and engineering test only. No requirements are verified using this procedure. The requirements listed below in section B.1 are for reference only.

B.1 Requirements cross reference

Science Mission Gyroscope Commissioning has required that normalized currents shall be > +10 fA/uW under a +3V bias condition and < -30 fA/uW under a -3V bias condition. See GP-B P0435AB.

T003 3.7.1.5.2.2.4.1, Photo Emissivity from UV Electrode requires that photoemission from the UV electrode shall be greater than or equal to 1.0e-7 electron/photon (20.5 fA/uW).

T003 3.7.1.5.2.2.1.2.6, UV 254 nanometer Photoemissivity of Rotor requires that the photo emission coefficient shall be greater than or equal to 1.0e-7 electrons/photon (20.5 fA/uW) for 254 nm photons.

The conversion from fA/uW to electrons/photon for light at 254 nm is 1 fA/uW= 4.87e-9 electron/photon.

B.2 Expected data for verification per requirement

The magnitudes of the normalized currents are expected to meet or exceed the measured magnitudes reported in GP-B P0435AB.

C Configuration Requirements

C.1 During the measurement, the probe pressure should be less than 5.0 e-6 torr. It is not clear exactly where the pressure threshold for this measurement lies. It is possible a reliable measurement may be made at pressures up to 5.0 e-5 torr.

C.2 The gyroscope rotor must be in contact with the ground plane and uncaged.

C.3 There must be no cables connected to the gyroscope ground plane connections at the top hat namely CG18, CG28, CG38 and CG48.

C.4 If the GSS is to be used to control the UV bias voltage, the GSS UV bias cables must be in their final flight configuration, connected to the UV bias connectors at the top hat namely BG-12, BG-34 and BG-PM. Otherwise connectors BG-12, BG-34 and BG-PM must be open.

C.5 The UV fiber optic cables must be connected and in the final flight configuration.

C.6 P0888 (PTP) UV Cable Continuity Check must have been successfully completed.

C.7 The flight electronics must be configured and initialized such that the UV Lamps and Optical Switches (ECU) can be commanded through POD_C. If the GSS is to be used to source the UV Bias voltage then the GSS must be configured and initialized such that it may be commanded through POD_C.

C.8 If possible, the space vehicle should be running on battery power during the test. Obvious sources of EMI near the vehicle should be eliminated.

C.9 During the measurement, access to the immediate area around the probe shall be restricted to the Test Lead and his designates.

D **Hardware Required**

D.1 Flight hardware required

Description	No. Req'd
See section C, Configuration Requirements.	

D.2 Commercial test equipment

Manufacturer	Model	Serial Number	Calibr. Exp. Date
Keithley Programmable Electrometer			
Keithley Programmable Electrometer			
Keithley Programmable Electrometer			
Keithley Programmable Electrometer			
PC W/IEEE INTERFACE			

D.3 Mechanical/Electrical Special test equipment

Number Needed	Description	Part No.	Rev. no.	Serial No.	Certification Date
4	Reynolds to MHV coffin box	N/A	N/A	N/A	N/A
4	Coaxial cable, BNC to BNC (12' min)	N/A	N/A	N/A	N/A
4	Coaxial cable, MHV to MHV (6')	N/A	N/A	N/A	N/A
4	GSS Ground Plane connection interface box	N/A	N/A	N/A	N/A
4	Coaxial cable, MHV to BNC (20')	N/A	N/A	N/A	N/A
1	GSE ground plane/UV bias interface box w/battery bias supply	N/A	N/A	N/A	N/A
3	Top Hat UV bias breakout box	N/A	N/A	N/A	N/A
4	Triax to BNC adapter	N/A	N/A	N/A	N/A
1	6' IEEE cable	N/A	N/A	N/A	N/A
3	2' IEEE cable	N/A	N/A	N/A	N/A

D.4 Tools

Description	No. Req'd

D.5 Expendables

Description	Quantity
Filtered nitrogen gas to be used for purging the UV section of the ECU during lamp operation.	N/A, on hand

E Software Required

E.1 Flight Software

Flight Software Name	Version No.
N/A	

E.2 CSTOL Scripts

CSTOL Script Name	Version No.
N/A	

E.3 SPC Scripts

SPC Script Name	Version No.
N/A	

E.4 Test Support Software

Test Software Name	Version No.
Strawberry Tree Data Acquisition for the PC	N/A

F Procedures Required

Procedure Name	Procedure No.
Pre-Integration UV Fiber Optics checkout	P0429AB
Hook-up and Check-out of All Gyro Cables with Probe Connectors	P0431AB
UV Current Measurements in Probe C (RT)	P0435AB
(PTP) ECU Temporary Installation Including Cables GP-B Payload Verification Test II Operations Order	P0835 Rev NC
PROBE C CABLE CONNECTOR INTERFACE	LMMS drawing 1C34103, Rev D

G Equipment Pretest Requirements

Equipment	Serial No.	Test Required	Proc. No.	Test Performed	
				Date	By
N/A					

H Personnel Requirements

Test Leader

The Test Leader shall be Bruce Clarke. He has overall responsibility for the implementation of this procedure.

Other Personnel

All personnel participating in this procedure shall work under the direction of the Test Leader who shall determine whether the person is qualified. For this procedure, participating engineers are expected to be (at various times) Bill Bencze and Robert Brumley.

POD_C shall be operated by a qualified test set operator to be assigned by the Payload Electronics manager, Bill Bencze. Presently the approved POD operator is Thomas Wai.

The QA program office shall be notified prior to the start of this procedure. A Quality Assurance Representative designated by Dorrene Ross shall review any discrepancy noted during this procedure, and approve its disposition. The presently designated QA Representative is Russ Leese.

ONR shall be notified at least 24 hours prior to the start of this procedure.

I Safety Requirements

Extreme care must be taken to avoid accidentally bumping the Probe or damaging the connectors. Connector savers or equivalent adapters shall be used to protect the connector pins from damage during the measurements. A properly grounded ESD wrist strap must be worn while mating to or de-mating from Probe connectors.

The fiber optic cables are very fragile. Use care when mating and demating fiber optic connectors as not to break the optical fiber or scratch the polished optical surface at the end of the connectors. All fiber optic connectors must be rinsed with ethanol, dried with filtered air and inspected using a 5X optical visor prior to mating to ensure there is no contamination on the optical surfaces.

All mate/demates involving flight connectors shall be logged.

Ozone is produced when running the UV lamps in an oxygen environment. Ozone in the amounts produced while running the flight lamps in air is a very mild hazard to both hardware and personnel. In order to mitigate ozone production, the UV section of the ECU should be purged with dry filtered nitrogen gas while the UV lamps are powered on.

J General Instructions

J.1 Authority to redline this procedure is given solely to the Test Lead with mandatory concurrence form the QA representative. Approval by the Payload Technical Manager shall be required if experiment functionality may be affected. QA Program Engineering concurrence is required before final review/buyoff (on last page) of the completion of the activity described in this procedure.

J.2 Any nonconformance or test anomaly will be recorded in a D-log or as a Discrepancy Report per Quality Plan P0108. Do not alter or break test configuration if a test failure occurs; notify quality assurance.

Upon completion of this procedure, the QA Program Engineer will certify their concurrence that the effort was performed and accomplished in accordance with the prescribed instructions by signing and dating in the designated place(s) in this document.

J.3 Only the following persons have the authority to exit/terminate this test or perform a retest:

Test Lead	Bruce Clarke or his designated representative
QA	Russ Leese, Dorrene Ross or other designated representative of Stanford Quality Assurance.

K References and Applicable Documents

Test started. Date:

Time:

L **OPERATIONS**

L.1 **ELECTRONICS SET-UP**

SECTION STARTED _____ AT _____
DATE TIME

SIGNED: _____ PRINT NAME: _____
TEST LEAD

SIGNED:_____ PRINT NAME: _____
QA REPRESENTATIVE

L.1.1 Record the UV bias voltage source to be used by circling the appropriate choice below:

Flight GSS GSE

L.1.2 Begin a light flow of dry nitrogen gas (10-20 sccm) through the ECU purge line and push the end of the line over the appropriate screw on the ECU-UV section vent cap. The purge should be running for at least 10 minutes before powering up the UV lamp. Record the time the purge was started below:

Started purge @ _____

L.1.3 Connect the Keithly electrometers to the Strawberry Tree data acquisition system using IEEE cables and position the electrometers near the top hat. There must be one electrometer used per gyro under test. This procedure nominally tests all four gyros at once.

Refer to Figure 1and Figure 2 when connecting the interface boxes and electrometers in steps L.1.4 through L.1.7.

L.1.4 Connect the four Reynolds/MHV coffin boxes to the four top hat gyro ground plane connectors CG18, CG28, CG38 and CG48.

L.1.5 If the GSS is to be used to source UV bias voltage, perform steps L.1.5.1 through L.1.5.2.

L.1.5.1 For each gyro under test, connect the GSS Ground Plane Connection Interface Box between the top hat gyro ground plane connector and the corresponding Forward GSS single point ground connector (J47) using an MHV-MHV coaxial cable.

L.1.5.2 For each gyro under test, connect the BNC output of the GSS Ground Plane Connection Interface Box to the corresponding electrometer input using a

BNC/BNC coaxial cable. Record the electrometer serial number associated with each gyro under test in Table 1 below.

L.1.6 If GSE is to be used to source UV bias voltage, perform steps L.1.6.1 through L.1.6.5.

L.1.6.1 Connect a top hat UV bias breakout box to each of the top hat bias connectors needed per Table 1. To perform the procedure on all four gyros, all top hat bias connections will be used, namely BG12, BG34 and BGPM.

L.1.6.2 For each gyro under test, connect the GSE ground plane/UV bias interface box w/battery bias supply to the top hat gyro ground plane using an MHV-BNC coaxial cable.

L.1.6.3 For each gyro under test, connect the GSE ground plane/UV bias interface box w/battery bias supply to the appropriate UV bias pins through the UV bias breakout boxes using BNC cables and banana plugs. Consult Table 1 for correct pin outs. Note that both UV fixtures on each gyro should be made common e.g. they are both connected to the same battery.

L.1.6.4 For each gyro under test, connect the BNC output of the GSE ground plane/UV bias interface box w/battery bias supply to the corresponding electrometer input using a BNC/BNC coaxial cable. Record the electrometer serial number associated with each gyro under test in Table 1 below.

L.1.6.5 Connect the ground connection of the GSE ground plane/UV bias interface box w/battery bias supply to local ground. This may be vehicle ground.

L.1.7 Power on all four electrometers. Select current measurement ('Amps') and 'Autoscale'. The peak-to-peak current noise may be estimated from the values on the LED display and should be < 40 fA. Making common the electrometer ground and the shield of the BNC/BNC cable which runs to the GSS Ground Plane Interface Box may lower the current noise level. Select the configuration that appears to give the lowest peak-to-peak noise performance.

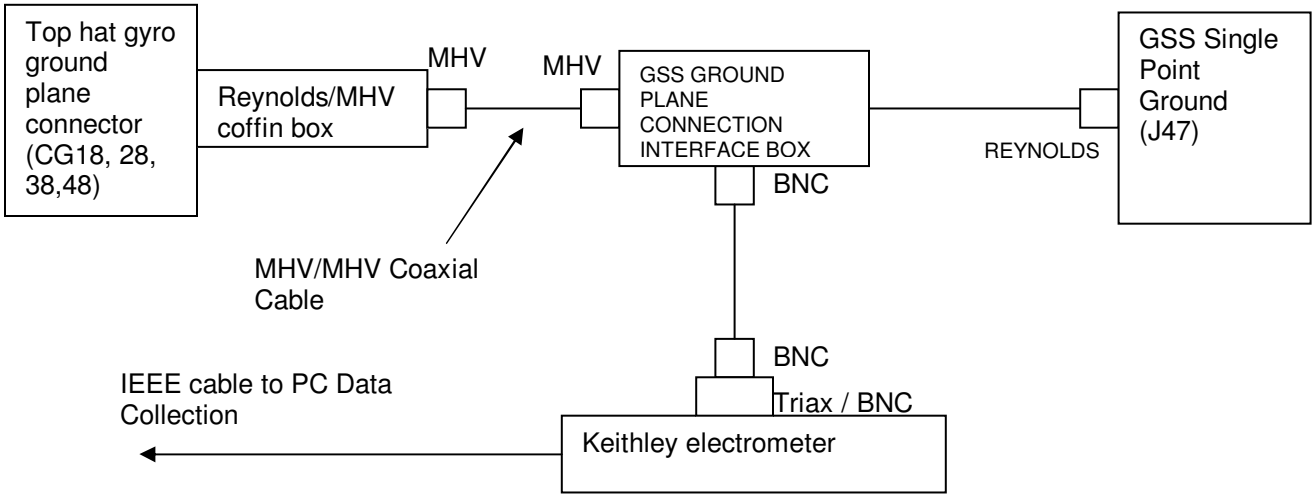

Figure 1 – Electrometer and GSS Ground Plane Interface Box Connections

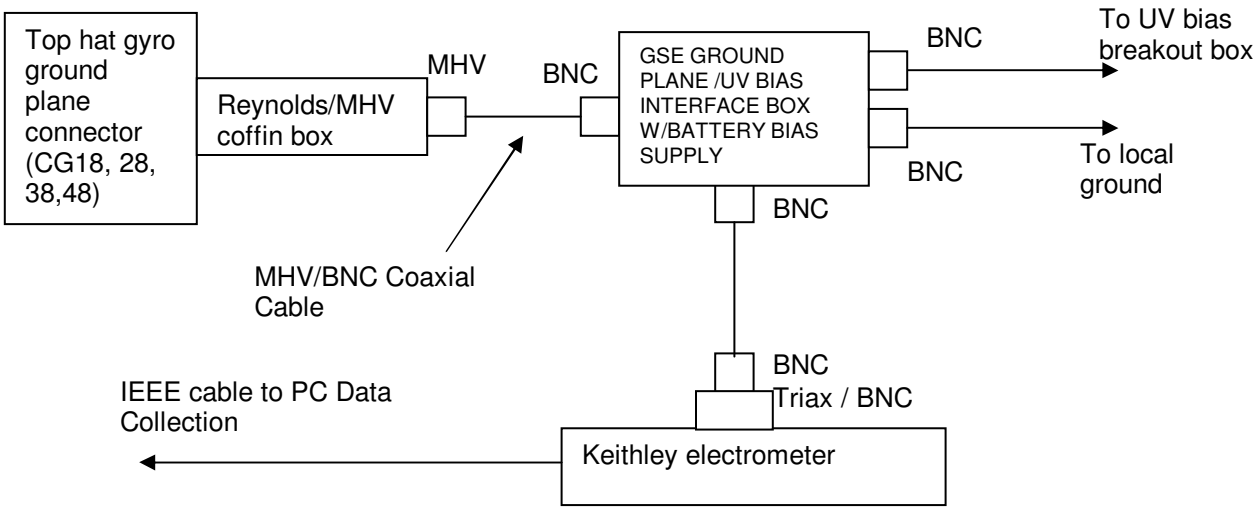

Figure 2 - Electrometer and GSE ground plane/UV bias interface box w/battery bias supply

Table 1 – Electronic set-up connection matrix

Gyro	Fixture	Ground Plane (top hat Reynolds connector)	UV Switch	UV Bias (top hat pin out)	GSS single point ground	Electrometer S/N	Data Log Column
1	A	CG-18	1a	BGPM-4	GSS1-J47		2
	B		1b	BG34-1			
2	A	CG-28	2a	BG34-3	GSS2-J47		3
	B		2b	BG34-4			
3	A	CG-38	3a	BG12-1	GSS3-J47		4
	B		3b	BG12-2			
4	A	CG-48	4a	BG12-3	GSS4-J47		5
	B		4b	BG12-4			

SECTION COMPLETED _____ AT _____
DATE TIME

SIGNED: _____ PRINT NAME: _____
TEST LEAD

SIGNED:_____ PRINT NAME: _____
QA REPRESENTATIVE

L.2 COMPUTER DATA ACQUISITION AND CONTROL SET-UP

SECTION STARTED _____ AT _____
DATE TIME

SIGNED: _____ PRINT NAME: _____
TEST LEAD

SIGNED:_____ PRINT NAME: _____
QA REPRESENTATIVE

L.2.1 Synchronize the clock on the PC running the Strawberry Tree Data Acquisition software with the clock on POD_C to +/- 10 seconds.

L.2.2 Start the Strawberry Tree Data Acquisition strip chart routine "UVSTRIP4.WBB" and begin logging data at 0.5 Hz. Record the filename and the time started below.

Log filename: _____

Time: _____

L.2.3 Start a bridge file to monitor the UV lamps during this section of the procedure. The logging rate should be at least 0.5 Hz. The set of monitors recorded should include as a minimum:

Item	Mnemonic
UV LAMP A UV output (intensity monitor)	DE_UVLampA_OUT
UV LAMP A current	CE_UVLampA_I
UV LAMP A Bulb temperature	TE_UVLampA_T2
UV A base temperature	TE_UV_BASE_SDTa
UV LAMP B UV output (intensity monitor)	DE_UVLampB_OUT
UV LAMP B current	CE_UVLampB_I
UV LAMP B Bulb temperature	TE_UVLampB_T2
UV B base temperature	TE_UV_BASE_SDTb

Record the filename and the time started below.

Bridge filename: _____

Time: _____

L.2.4 Start a bridge file to monitor the UV bias during this section of the procedure. The logging rate should be at least 0.5 Hz. The set of monitors recorded should include as a minimum:

Item	Mnemonic	Top Hat Pin
Bias voltage on GYRO 1, FIXTURE A	RY_pTlmFLT41	BGPM-4

Bias voltage on GYRO 1, FIXTURE B		BG34-1
Bias voltage on GYRO 2, FIXTURE A	RY_pTlmFLT42	BG34-3
Bias voltage on GYRO 2, FIXTURE B		BG34-4
Bias voltage on GYRO 3, FIXTURE A	RY_pTlmFLT43	BG12-1
Bias voltage on GYRO 3, FIXTURE B		BG12-2
Bias voltage on GYRO 4, FIXTURE A	RY_pTlmFLT44	BG12-3
Bias voltage on GYRO 4, FIXTURE B		BG12-4

Record the filename and the time started below.

Bridge filename: _____

Time: _____

If the flight GSS is being used to supply UV bias voltage:

Note both UV bias electrodes on a single gyro are sourced by a single GSS D/A so there is only one UV bias monitor per gyro. Step L.2.4 assumes each GSS is initialized so the UV bias electrode can be commanded and the telemetry specified is available. The steps to initialize the GSS are:

Turn On gss1_host
Display GSS_1_ProgTlm
Turn On GDP1 GDP
wait GSS PY_GDPNBL_1 = ENABLED
Turn On GHW1 GHW
wait GSS PY_GHWNBL_1 = ENABLED
Turn On GIO1 FwdMuxr
wait GSS PY_cmdCompStat1 = success
Use SHG1 Int10Hz
wait GSS PY_CNTRLRATE_1=HZ_10
Do GDP1 muxDiag with mux_diag_mode 7
wait GSS PY_cmdCompStat1 = success

This can be done to each box on power up.

SECTION COMPLETED _____ AT _____
DATE TIME

SIGNED: _____ PRINT NAME: _____
TEST LEAD

SIGNED:_____ PRINT NAME: _____
QA REPRESENTATIVE

L.3 CURRENT MEASUREMENT USING OPTICAL MODULATION

SECTION STARTED _____ AT _____
DATE TIME

SIGNED: _____ PRINT NAME: _____
TEST LEAD

SIGNED:_____ PRINT NAME: _____
QA REPRESENTATIVE

L.3.1 Circle which gyro(s) are under test (active) for this procedure:

GYRO #1 GYRO #2 GYRO #3 GYRO #4

(Any CSTOL scripts should contain a Boolean variable for each gyro denoting “active” or “inactive”.)

L.3.2 Command all optical switches to lamp B by sending the following commands:

Action	CSTOL Command
Switch 1a to lamp B (pulse switch)	Set ECU OptSw1Mode with Ecu_Side 1, Lamp_Side Lamp_b Set ECU PulsOptSw with Optical_Switch_P switch_1a_pulse
Switch 1b to lamp B (pulse switch)	Set ECU OptSw1Mode with Ecu_Side 2, Lamp_Side Lamp_b Set ECU PulsOptSw with Optical_Switch_P switch_1b_pulse
Switch 2a to lamp B (pulse switch)	Set ECU OptSw2Mode with Ecu_Side 1, Lamp_Side Lamp_b Set ECU PulsOptSw with Optical_Switch_P switch_2a_pulse
Switch 2b to lamp B (pulse switch)	Set ECU OptSw2Mode with Ecu_Side 2, Lamp_Side Lamp_b Set ECU PulsOptSw with Optical_Switch_P switch_2b_pulse
Switch 3a to lamp B (pulse switch)	Set ECU OptSw3Mode with Ecu_Side 1, Lamp_Side Lamp_b Set ECU PulsOptSw with Optical_Switch_P switch_3a_pulse
Switch 3b to lamp B (pulse switch)	Set ECU OptSw3Mode with Ecu_Side 2, Lamp_Side Lamp_b Set ECU PulsOptSw with Optical_Switch_P switch_3b_pulse
Switch 4a to lamp B (pulse switch)	Set ECU OptSw4Mode with Ecu_Side 1, Lamp_Side Lamp_b Set ECU PulsOptSw with Optical_Switch_P switch_4a_pulse
Switch 4b to lamp B (pulse switch)	Set ECU OptSw4Mode with Ecu_Side 2, Lamp_Side Lamp_b Set ECU PulsOptSw with Optical_Switch_P switch_4b_pulse

L.3.3 Power up the telemetry on both UV lamps by sending the following commands:

Action	CSTOL Command
UV Lamp-A +/- 15 V ON	Set ECU UvLamp15V with Ecu_Side 1,Switch_Mode on
UV Lamp-B +/- 15 V ON	Set ECU UvLamp15V with Ecu_Side 2,Switch_Mode on

time:_____

L.3.4 Once 10 minutes has passed since the start of the purge in step L.1.1, turn on the thermoelectric heater/cooler and the RF exciter on UV lamp A by commanding:

Action	CSTOL Command
UV Lamp-A +5V ON	Set ECU UvLamp5V with Ecu_Side 1,Switch_Mode on
UV Lamp-A +30V ON	Set ECU UvLamp30V with Ecu_Side 1,Switch_Mode on

time:_____

L.3.5 Record the lamp telemetry in Table 2 below as “initial value”.

L.3.6 Allow the lamp to warm for 20 minutes or until the Test Lead has determined the lamp output is stable enough to perform the current measurement. Record the lamp telemetry in Table 2 below as ”warm value”.

Table 2 – Lamp Telemetry w/Lamp A On, Lamp B Off

Item	Mnemonic	initial value (step L.3.5)	warm value (step L.3.6)	final value (step L.3.43)
UV LAMP A UV output (intensity monitor)	DE_UVLampA_OUT			
UV LAMP A current	CE_UVLampA_I			
UV LAMP A Bulb temperature	TE_UVLampA_T2			
UV A base temperature	TE_UV_BASE_SDTa			
UV LAMP B UV output (intensity monitor)	DE_UVLampB_OUT			
UV LAMP B current	CE_UVLampB_I			
UV LAMP B Bulb temperature	TE_UVLampB_T2			
UV B base temperature	TE_UV_BASE_SDTb			

time	N/A			

L.3.7 If the flight GSS is used to supply the UV bias voltage, for each active gyro, command UV bias electrodes to 0 V by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Gyro 1 UV bias to 0V	Select GHW1 cc_bias with chg_ctrl_bias 0
If gyro2=active	
Gyro 2 UV bias to 0V	Select GHW2 cc_bias with chg_ctrl_bias 0
If gyro3=active	
Gyro 3 UV bias to 0V	Select GHW3 cc_bias with chg_ctrl_bias 0
If gyro4=active	
Gyro 4 UV bias to 0V	Select GHW4 cc_bias with chg_ctrl_bias 0

If GSE is used to supply the UV bias voltage, for each active gyro, select UV bias 0V on the GSE ground plane/UV bias interface box w/battery bias supply.

L.3.8 For each active gyro, command the A-side optical switch to lamp A by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1a to lamp A	Set ECU OptSw1Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1a_pulse
If gyro2=active	
Switch 2a to lamp A	Set ECU OptSw2Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2a_pulse
If gyro3=active	
Switch 3a to lamp A	Set ECU OptSw3Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3a_pulse
If gyro4=active	
Switch 4a to lamp A	Set ECU OptSw4Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4a_pulse

L.3.9 Wait 30 seconds.

L.3.10 For each active gyro, command the A-side optical switch to lamp B by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1a to lamp B	Set ECU OptSw1Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1a_pulse

If gyro2=active	
Switch 2a to lamp B	Set ECU OptSw2Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2a_pulse
If gyro3=active	
Switch 3a to lamp B	Set ECU OptSw3Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3a_pulse
If gyro4=active	
Switch 4a to lamp B	Set ECU OptSw4Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4a_pulse

L.3.11 Wait 30 seconds.

L.3.12 Repeat L.3.8 – L.3.11 30X.

L.3.13 If the flight GSS is used to supply the UV bias voltage, for each active gyro, command UV bias electrodes to -3 V by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Gyro 1 UV bias to -3V	Select GHW1 cc_bias with chg_ctrl_bias 1
If gyro2=active	
Gyro 2 UV bias to -3V	Select GHW2 cc_bias with chg_ctrl_bias 1
If gyro3=active	
Gyro 3 UV bias to -3V	Select GHW3 cc_bias with chg_ctrl_bias 1
If gyro4=active	
Gyro 4 UV bias to -3V	Select GHW4 cc_bias with chg_ctrl_bias 1

If GSE is used to supply the UV bias voltage, for each active gyro, select UV bias -3V on the GSE ground plane/UV bias interface box w/battery bias supply.

L.3.14 For each active gyro, command the A-side optical switch to lamp A by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1a to lamp A	Set ECU OptSw1Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1a_pulse
If gyro2=active	
Switch 2a to lamp A	Set ECU OptSw2Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2a_pulse
If gyro3=active	
Switch 3a to lamp A	Set ECU OptSw3Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3a_pulse
If gyro4=active	
Switch 4a to lamp A	Set ECU OptSw4Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4a_pulse

L.3.15 Wait 30 seconds.

L.3.16 For each active gyro, command the A-side optical switch to lamp B by sending the following

commands:

Action	CSTOL Command
If gyro1=active	
Switch 1a to lamp B	Set ECU OptSw1Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1a_pulse
If gyro2=active	
Switch 2a to lamp B	Set ECU OptSw2Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2a_pulse
If gyro3=active	
Switch 3a to lamp B	Set ECU OptSw3Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3a_pulse
If gyro4=active	
Switch 4a to lamp B	Set ECU OptSw4Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4a_pulse

L.3.17 Wait 30 seconds.

L.3.18 Repeat L.3.14 - L.3.17 30X.

L.3.19 If the flight GSS is used to supply the UV bias voltage, for each active gyro, command UV bias electrodes to +3 V by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Gyro 1 UV bias to +3V	Select GHW1 cc_bias with chg_ctrl_bias 2
If gyro2=active	
Gyro 2 UV bias to +3V	Select GHW2 cc_bias with chg_ctrl_bias 2
If gyro3=active	
Gyro 3 UV bias to +3V	Select GHW3 cc_bias with chg_ctrl_bias 2
If gyro4=active	
Gyro 4 UV bias to +3V	Select GHW4 cc_bias with chg_ctrl_bias 2

If GSE is used to supply the UV bias voltage, for each active gyro, select UV bias +3V on the GSE ground plane/UV bias interface box w/battery bias supply.

L.3.20 For each active gyro, command the A-side optical switch to lamp A by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1a to lamp A	Set ECU OptSw1Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1a_pulse
If gyro2=active	
Switch 2a to lamp A	Set ECU OptSw2Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2a_pulse
If gyro3=active	
Switch 3a to lamp A	Set ECU OptSw3Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3a_pulse
If gyro4=active	
Switch 4a to lamp A	Set ECU OptSw4Mode with Ecu_Side 1, Lamp_Side Lamp_a

(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4a_pulse

L.3.21 Wait 30 seconds.

L.3.22 For each active gyro, command the A-side optical switch to lamp B by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1a to lamp B	Set ECU OptSw1Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1a_pulse
If gyro2=active	
Switch 2a to lamp B	Set ECU OptSw2Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2a_pulse
If gyro3=active	
Switch 3a to lamp B	Set ECU OptSw3Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3a_pulse
If gyro4=active	
Switch 4a to lamp B	Set ECU OptSw4Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4a_pulse

L.3.23 Wait 30 seconds.

L.3.24 Repeat L.3.20 - L.3.23 30X.

L.3.25 If the flight GSS is used to supply the UV bias voltage, for each active gyro, command UV bias electrodes to 0 V by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Gyro 1 UV bias to 0V	Select GHW1 cc_bias with chg_ctrl_bias 0
If gyro2=active	
Gyro 2 UV bias to 0V	Select GHW2 cc_bias with chg_ctrl_bias 0
If gyro3=active	
Gyro 3 UV bias to 0V	Select GHW3 cc_bias with chg_ctrl_bias 0
If gyro4=active	
Gyro 4 UV bias to 0V	Select GHW4 cc_bias with chg_ctrl_bias 0

If GSE is used to supply the UV bias voltage, for each active gyro, select UV bias 0V on the GSE ground plane/UV bias interface box w/battery bias supply.

L.3.26 For each active gyro, command the B-side optical switch to lamp A by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1b to lamp A	Set ECU OptSw1Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1b_pulse
If gyro2=active	

Switch 2b to lamp A	Set ECU OptSw2Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2b_pulse
If gyro3=active	
Switch 3b to lamp A	Set ECU OptSw3Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3b_pulse
If gyro4=active	
Switch 4b to lamp A	Set ECU OptSw4Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4b_pulse

L.3.27 Wait 30 seconds.

L.3.28 For each active gyro, command the B-side optical switch to lamp B by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1b to lamp B	Set ECU OptSw1Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1b_pulse
If gyro2=active	
Switch 2b to lamp B	Set ECU OptSw2Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2b_pulse
If gyro3=active	
Switch 3b to lamp B	Set ECU OptSw3Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3b_pulse
If gyro4=active	
Switch 4b to lamp B	Set ECU OptSw4Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4b_pulse

L.3.29 Wait 30 seconds.

L.3.30 Repeat L.3.26 – L.3.29 30X.

L.3.31 If the flight GSS is used to supply the UV bias voltage, for each active gyro, command UV bias electrodes to -3 V by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Gyro 1 UV bias to -3V	Select GHW1 cc_bias with chg_ctrl_bias 1
If gyro2=active	
Gyro 2 UV bias to -3V	Select GHW2 cc_bias with chg_ctrl_bias 1
If gyro3=active	
Gyro 3 UV bias to -3V	Select GHW3 cc_bias with chg_ctrl_bias 1
If gyro4=active	
Gyro 4 UV bias to -3V	Select GHW4 cc_bias with chg_ctrl_bias 1

If GSE is used to supply the UV bias voltage, for each active gyro, select UV bias -3V on the GSE ground plane/UV bias interface box w/battery bias supply.

L.3.32 For each active gyro, command the B-side optical switch to lamp A by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1b to lamp A	Set ECU OptSw1Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1b_pulse
If gyro2=active	
Switch 2b to lamp A	Set ECU OptSw2Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2b_pulse
If gyro3=active	
Switch 3b to lamp A	Set ECU OptSw3Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3b_pulse
If gyro4=active	
Switch 4b to lamp A	Set ECU OptSw4Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4b_pulse

L.3.33 Wait 30 seconds.

L.3.34 For each active gyro, command the B-side optical switch to lamp B by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1b to lamp B	Set ECU OptSw1Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1b_pulse
If gyro2=active	
Switch 2b to lamp B	Set ECU OptSw2Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2b_pulse
If gyro3=active	
Switch 3b to lamp B	Set ECU OptSw3Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3b_pulse
If gyro4=active	
Switch 4b to lamp B	Set ECU OptSw4Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4b_pulse

L.3.35 Wait 30 seconds.

L.3.36 Repeat L.3.32 – L.3.35 30X.

L.3.37 If the flight GSS is used to supply the UV bias voltage, for each active gyro, command UV bias electrodes to +3 V by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Gyro 1 UV bias to +3V	Select GHW1 cc_bias with chg_ctrl_bias 2
If gyro2=active	
Gyro 2 UV bias to +3V	Select GHW2 cc_bias with chg_ctrl_bias 2
If gyro3=active	
Gyro 3 UV bias to +3V	Select GHW3 cc_bias with chg_ctrl_bias 2
If gyro4=active	
Gyro 4 UV bias to +3V	Select GHW4 cc_bias with chg_ctrl_bias 2

If GSE is used to supply the UV bias voltage, for each active gyro, select UV bias +3V on the GSE ground plane/UV bias interface box w/battery bias supply.

L.3.38 For each active gyro, command the B-side optical switch to lamp A by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1b to lamp A	Set ECU OptSw1Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1b_pulse
If gyro2=active	
Switch 2b to lamp A	Set ECU OptSw2Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2b_pulse
If gyro3=active	
Switch 3b to lamp A	Set ECU OptSw3Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3b_pulse
If gyro4=active	
Switch 4b to lamp A	Set ECU OptSw4Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4b_pulse

L.3.39 Wait 30 seconds.

L.3.40 For each active gyro, command the B-side optical switch to lamp B by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1b to lamp B	Set ECU OptSw1Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1b_pulse
If gyro2=active	
Switch 2b to lamp B	Set ECU OptSw2Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2b_pulse
If gyro3=active	
Switch 3b to lamp B	Set ECU OptSw3Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3b_pulse
If gyro4=active	
Switch 4b to lamp B	Set ECU OptSw4Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4b_pulse

L.3.41 Wait 30 seconds.

L.3.42 Repeat L.3.38 – L.3.41 30X.

L.3.43 Record the lamp telemetry in Table 2 above as “final value”.

L.3.44 Power down the RF exciter and the thermoelectric heater/cooler on lamp A by sending the following commands:

Action	CSTOL Command
UV Lamp-A +30V OFF	Set ECU UvLamp30V with Ecu_Side 1,Switch_Mode off
UV Lamp-A +5V OFF	Set ECU UvLamp5V with Ecu_Side 1,Switch_Mode off

time:_____

L.3.45 Command all optical switches to lamp A by sending the following commands:

Action	CSTOL Command
Switch 1a to lamp A (pulse switch)	Set ECU OptSw1Mode with Ecu_Side 1, Lamp_Side Lamp_a Set ECU PulsOptSw with Optical_Switch_P switch_1a_pulse
Switch 1b to lamp A (pulse switch)	Set ECU OptSw1Mode with Ecu_Side 2, Lamp_Side Lamp_a Set ECU PulsOptSw with Optical_Switch_P switch_1b_pulse
Switch 2a to lamp A (pulse switch)	Set ECU OptSw2Mode with Ecu_Side 1, Lamp_Side Lamp_a Set ECU PulsOptSw with Optical_Switch_P switch_2a_pulse
Switch 2b to lamp A (pulse switch)	Set ECU OptSw2Mode with Ecu_Side 2, Lamp_Side Lamp_a Set ECU PulsOptSw with Optical_Switch_P switch_2b_pulse
Switch 3a to lamp A (pulse switch)	Set ECU OptSw3Mode with Ecu_Side 1, Lamp_Side Lamp_a Set ECU PulsOptSw with Optical_Switch_P switch_3a_pulse
Switch 3b to lamp A (pulse switch)	Set ECU OptSw3Mode with Ecu_Side 2, Lamp_Side Lamp_a Set ECU PulsOptSw with Optical_Switch_P switch_3b_pulse
Switch 4a to lamp A (pulse switch)	Set ECU OptSw4Mode with Ecu_Side 1, Lamp_Side Lamp_a Set ECU PulsOptSw with Optical_Switch_P switch_4a_pulse
Switch 4b to lamp A (pulse switch)	Set ECU OptSw4Mode with Ecu_Side 2, Lamp_Side Lamp_a Set ECU PulsOptSw with Optical_Switch_P switch_4b_pulse

L.3.46 Power on the thermoelectric heater/cooler and the RF exciter on UV lamp B by commanding:

Action	CSTOL Command
UV Lamp-B +5V ON	Set ECU UvLamp5V with Ecu_Side 2,Switch_Mode on
UV Lamp-B +30V ON	Set ECU UvLamp30V with Ecu_Side 2,Switch_Mode on

time:_____

L.3.47 Record the lamp telemetry in Table 3 below as “initial value”.

L.3.48 Allow the lamp to warm for 20 minutes or until the Test Lead has determined the lamp output is stable enough to perform the current measurement. Record the lamp telemetry in Table 3 below as ”warm value”.

Table 3 – Lamp Telemetry w/Lamp A Off, Lamp B On

Item	Mnemonic	initial value (step L.3.47)	warm value (step L.3.48)	final value (step L.3.85)
UV LAMP A UV output (intensity monitor)	DE_UVLampA_OUT			
UV LAMP A current	CE_UVLampA_I			
UV LAMP A Bulb temperature	TE_UVLampA_T2			
UV A base temperature	TE_UV_BASE_SDTa			
UV LAMP B UV output (intensity monitor)	DE_UVLampB_OUT			
UV LAMP B current	CE_UVLampB_I			
UV LAMP B Bulb temperature	TE_UVLampB_T2			
UV B base temperature	TE_UV_BASE_SDTb			
time	N/A			

L.3.49 If the flight GSS is used to supply the UV bias voltage, for each active gyro, command UV bias electrodes to 0 V by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Gyro 1 UV bias to 0V	Select GHW1 cc_bias with chg_ctrl_bias 0
If gyro2=active	
Gyro 2 UV bias to 0V	Select GHW2 cc_bias with chg_ctrl_bias 0
If gyro3=active	
Gyro 3 UV bias to 0V	Select GHW3 cc_bias with chg_ctrl_bias 0
If gyro4=active	
Gyro 4 UV bias to 0V	Select GHW4 cc_bias with chg_ctrl_bias 0

If GSE is used to supply the UV bias voltage, for each active gyro, select UV bias 0V on the GSE ground plane/UV bias interface box w/battery bias supply.

L.3.50 For each active gyro, command the A-side optical switch to lamp B by sending the following commands:

Action	CSTOL Command
If gyro1=active	

Switch 1a to lamp B	Set ECU OptSw1Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1a_pulse
If gyro2=active	
Switch 2a to lamp B	Set ECU OptSw2Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2a_pulse
If gyro3=active	
Switch 3a to lamp B	Set ECU OptSw3Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3a_pulse
If gyro4=active	
Switch 4a to lamp B	Set ECU OptSw4Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4a_pulse

L.3.51 Wait 30 seconds.

L.3.52 For each active gyro, command the A-side optical switch to lamp A by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1a to lamp A	Set ECU OptSw1Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1a_pulse
If gyro2=active	
Switch 2a to lamp A	Set ECU OptSw2Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2a_pulse
If gyro3=active	
Switch 3a to lamp A	Set ECU OptSw3Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3a_pulse
If gyro4=active	
Switch 4a to lamp A	Set ECU OptSw4Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4a_pulse

L.3.53 Wait 30 seconds.

L.3.54 Repeat L.3.50 – L.3.53 30X.

L.3.55 If the flight GSS is used to supply the UV bias voltage, for each active gyro, command UV bias electrodes to -3 V by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Gyro 1 UV bias to -3V	Select GHW1 cc_bias with chg_ctrl_bias 1
If gyro2=active	
Gyro 2 UV bias to -3V	Select GHW2 cc_bias with chg_ctrl_bias 1
If gyro3=active	
Gyro 3 UV bias to -3V	Select GHW3 cc_bias with chg_ctrl_bias 1
If gyro4=active	
Gyro 4 UV bias to -3V	Select GHW4 cc_bias with chg_ctrl_bias 1

If GSE is used to supply the UV bias voltage, for each active gyro, select UV bias -3V on the GSE ground plane/UV bias interface box w/battery bias supply.

L.3.56 For each active gyro, command the A-side optical switch to lamp B by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1a to lamp B	Set ECU OptSw1Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1a_pulse
If gyro2=active	
Switch 2a to lamp B	Set ECU OptSw2Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2a_pulse
If gyro3=active	
Switch 3a to lamp B	Set ECU OptSw3Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3a_pulse
If gyro4=active	
Switch 4a to lamp B	Set ECU OptSw4Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4a_pulse

L.3.57 Wait 30 seconds.

L.3.58 For each active gyro, command the A-side optical switch to lamp A by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1a to lamp A	Set ECU OptSw1Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1a_pulse
If gyro2=active	
Switch 2a to lamp A	Set ECU OptSw2Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2a_pulse
If gyro3=active	
Switch 3a to lamp A	Set ECU OptSw3Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3a_pulse
If gyro4=active	
Switch 4a to lamp A	Set ECU OptSw4Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4a_pulse

L.3.59 Wait 30 seconds.

L.3.60 Repeat L.3.56 – L.3.59 30X.

L.3.61 If the flight GSS is used to supply the UV bias voltage, for each active gyro, command UV bias electrodes to +3 V by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Gyro 1 UV bias to +3V	Select GHW1 cc_bias with chg_ctrl_bias 2
If gyro2=active	
Gyro 2 UV bias to +3V	Select GHW2 cc_bias with chg_ctrl_bias 2
If gyro3=active	
Gyro 3 UV bias to +3V	Select GHW3 cc_bias with chg_ctrl_bias 2
If gyro4=active	

Gyro 4 UV bias to +3V	Select GHW4 cc_bias with chg_ctrl_bias 2

If GSE is used to supply the UV bias voltage, for each active gyro, select UV bias +3V on the GSE ground plane/UV bias interface box w/battery bias supply.

L.3.62 For each active gyro, command the A-side optical switch to lamp B by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1a to lamp B	Set ECU OptSw1Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1a_pulse
If gyro2=active	
Switch 2a to lamp B	Set ECU OptSw2Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2a_pulse
If gyro3=active	
Switch 3a to lamp B	Set ECU OptSw3Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3a_pulse
If gyro4=active	
Switch 4a to lamp B	Set ECU OptSw4Mode with Ecu_Side 1, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4a_pulse

L.3.63 Wait 30 seconds.

L.3.64 For each active gyro, command the A-side optical switch to lamp A by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1a to lamp A	Set ECU OptSw1Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1a_pulse
If gyro2=active	
Switch 2a to lamp A	Set ECU OptSw2Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2a_pulse
If gyro3=active	
Switch 3a to lamp A	Set ECU OptSw3Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3a_pulse
If gyro4=active	
Switch 4a to lamp A	Set ECU OptSw4Mode with Ecu_Side 1, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4a_pulse

L.3.65 Wait 30 seconds.

L.3.66 Repeat L.3.62 – L.3.65 30X.

L.3.67 If the flight GSS is used to supply the UV bias voltage, for each active gyro, command UV bias electrodes to 0 V by sending the following commands:

Action	CSTOL Command
If gyro1=active	

Gyro 1 UV bias to 0V	Select GHW1 cc_bias with chg_ctrl_bias 0
If gyro2=active	
Gyro 2 UV bias to 0V	Select GHW2 cc_bias with chg_ctrl_bias 0
If gyro3=active	
Gyro 3 UV bias to 0V	Select GHW3 cc_bias with chg_ctrl_bias 0
If gyro4=active	
Gyro 4 UV bias to 0V	Select GHW4 cc_bias with chg_ctrl_bias 0

If GSE is used to supply the UV bias voltage, for each active gyro, select UV bias 0V on the GSE ground plane/UV bias interface box w/battery bias supply.

L.3.68 For each active gyro, command the B-side optical switch to lamp B by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1b to lamp B	Set ECU OptSw1Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1b_pulse
If gyro2=active	
Switch 2b to lamp B	Set ECU OptSw2Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2b_pulse
If gyro3=active	
Switch 3b to lamp B	Set ECU OptSw3Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3b_pulse
If gyro4=active	
Switch 4b to lamp B	Set ECU OptSw4Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4b_pulse

L.3.69 Wait 30 seconds.

L.3.70 For each active gyro, command the B-side optical switch to lamp A by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1b to lamp A	Set ECU OptSw1Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1b_pulse
If gyro2=active	
Switch 2b to lamp A	Set ECU OptSw2Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2b_pulse
If gyro3=active	
Switch 3b to lamp A	Set ECU OptSw3Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3b_pulse
If gyro4=active	
Switch 4b to lamp A	Set ECU OptSw4Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4b_pulse

L.3.71 Wait 30 seconds.

L.3.72 Repeat L.3.68 – L.3.71 30X.

L.3.73 If the flight GSS is used to supply the UV bias voltage, for each active gyro, command UV bias electrodes to -3 V by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Gyro 1 UV bias to -3V	Select GHW1 cc_bias with chg_ctrl_bias 1
If gyro2=active	
Gyro 2 UV bias to -3V	Select GHW2 cc_bias with chg_ctrl_bias 1
If gyro3=active	
Gyro 3 UV bias to -3V	Select GHW3 cc_bias with chg_ctrl_bias 1
If gyro4=active	
Gyro 4 UV bias to -3V	Select GHW4 cc_bias with chg_ctrl_bias 1

If GSE is used to supply the UV bias voltage, for each active gyro, select UV bias -3V on the GSE ground plane/UV bias interface box w/battery bias supply.

L.3.74 For each active gyro, command the B-side optical switch to lamp B by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1b to lamp B	Set ECU OptSw1Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1b_pulse
If gyro2=active	
Switch 2b to lamp B	Set ECU OptSw2Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2b_pulse
If gyro3=active	
Switch 3b to lamp B	Set ECU OptSw3Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3b_pulse
If gyro4=active	
Switch 4b to lamp B	Set ECU OptSw4Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4b_pulse

L.3.75 Wait 30 seconds.

L.3.76 For each active gyro, command the B-side optical switch to lamp A by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1b to lamp A	Set ECU OptSw1Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1b_pulse
If gyro2=active	
Switch 2b to lamp A	Set ECU OptSw2Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2b_pulse
If gyro3=active	
Switch 3b to lamp A	Set ECU OptSw3Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3b_pulse
If gyro4=active	
Switch 4b to lamp A	Set ECU OptSw4Mode with Ecu_Side 2, Lamp_Side Lamp_a

(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4b_pulse

L.3.77 Wait 30 seconds.

L.3.78 Repeat L.3.74 – L.3.77 30X.

L.3.79 If the flight GSS is used to supply the UV bias voltage, for each active gyro, command UV bias electrodes to +3 V by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Gyro 1 UV bias to +3V	Select GHW1 cc_bias with chg_ctrl_bias 2
If gyro2=active	
Gyro 2 UV bias to +3V	Select GHW2 cc_bias with chg_ctrl_bias 2
If gyro3=active	
Gyro 3 UV bias to +3V	Select GHW3 cc_bias with chg_ctrl_bias 2
If gyro4=active	
Gyro 4 UV bias to +3V	Select GHW4 cc_bias with chg_ctrl_bias 2

If GSE is used to supply the UV bias voltage, for each active gyro, select UV bias +3V on the GSE ground plane/UV bias interface box w/battery bias supply.

L.3.80 For each active gyro, command the B-side optical switch to lamp B by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1b to lamp B	Set ECU OptSw1Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1b_pulse
If gyro2=active	
Switch 2b to lamp B	Set ECU OptSw2Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2b_pulse
If gyro3=active	
Switch 3b to lamp B	Set ECU OptSw3Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3b_pulse
If gyro4=active	
Switch 4b to lamp B	Set ECU OptSw4Mode with Ecu_Side 2, Lamp_Side Lamp_b
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4b_pulse

L.3.81 Wait 30 seconds.

L.3.82 For each active gyro, command the B-side optical switch to lamp A by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Switch 1b to lamp A	Set ECU OptSw1Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_1b_pulse
If gyro2=active	
Switch 2b to lamp A	Set ECU OptSw2Mode with Ecu_Side 2, Lamp_Side Lamp_a

(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_2b_pulse
If gyro3=active	
Switch 3b to lamp A	Set ECU OptSw3Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_3b_pulse
If gyro4=active	
Switch 4b to lamp A	Set ECU OptSw4Mode with Ecu_Side 2, Lamp_Side Lamp_a
(pulse switch)	Set ECU PulsOptSw with Optical_Switch_P switch_4b_pulse

L.3.83 Wait 30 seconds.

L.3.84 Repeat L.3.80 – L.3.83 30X.

L.3.85 Record the lamp telemetry in Table 3 above as “final value”.

L.3.86 Power down the RF exciter and the thermoelectric heater/cooler on lamp B by sending the following commands:

Action	CSTOL Command
UV Lamp-B +30V OFF	Set ECU UvLamp30V with Ecu_Side 2,Switch_Mode off
UV Lamp-B +5V OFF	Set ECU UvLamp5V with Ecu_Side 2,Switch_Mode off

time:_____

L.3.87 If the flight GSS is used to supply the UV bias voltage, for each active gyro, command UV bias electrodes to 0 V by sending the following commands:

Action	CSTOL Command
If gyro1=active	
Gyro 1 UV bias to 0V	Select GHW1 cc_bias with chg_ctrl_bias 0
If gyro2=active	
Gyro 2 UV bias to 0V	Select GHW2 cc_bias with chg_ctrl_bias 0
If gyro3=active	
Gyro 3 UV bias to 0V	Select GHW3 cc_bias with chg_ctrl_bias 0
If gyro4=active	
Gyro 4 UV bias to 0V	Select GHW4 cc_bias with chg_ctrl_bias 0

If GSE is used to supply the UV bias voltage, for each active gyro, select UV bias 0V on the GSE ground plane/UV bias interface box w/battery bias supply.

L.3.88 ***Confirm that +5 V power to both lamps A and B is off.***

L.3.89 Power down the telemetry for both lamps A and B by sending the commands:

Action	CSTOL Command
UV Lamp-A +/- 15 V OFF	Set ECU UvLamp15V with Ecu_Side 1,Switch_Mode off
UV Lamp-B +/- 15 V OFF	Set ECU UvLamp15V with Ecu_Side 2,Switch_Mode off

time:_____

L.3.90 Stop the all bridge files.

L.3.91 Stop the Strawberry Tree log file.

L.3.92 Stop nitrogen purge and remove the purge line from the ECU.

L.3.93 Power down all electrometers. Disconnect and remove the GSE cabling connected to the top hat and the forward GSS units.

SECTION COMPLETED _____ AT _____
DATE TIME

SIGNED: _____ PRINT NAME: _____
TEST LEAD

SIGNED:_____ PRINT NAME: _____
QA REPRESENTATIVE

L.4 **DATA REDUCTION**

SECTION STARTED _____ AT _____
DATE TIME

SIGNED: _____ PRINT NAME: _____
TEST LEAD

SIGNED:_____ PRINT NAME: _____
QA REPRESENTATIVE

L.4.1 From section L.3 "as run", calculate the number of minutes each of the power lines were on for each lamp, the number of power line on/off cycles and the number of ½ cycles for each optical switch and update Table 4 below.

L.4.2 Use the embedded Excel spreadsheet at the end of this procedure along with the Strawberry Tree and bridge file data from section L.3 to complete Table 5 and attach hard copies to the 'as built' of this procedure.

Table 4 – Lamp and Switch Usage Log

	+/- 15V		**+ 5 V**		**+ 30 V**		
	time on (min)	**on/off cycles**	**time on (min)**	**on/off cycles**	**time on (min)**	**on/off cycles**	
Lamp A							
Lamp B							
Switch (1/2 cycles)							
1a	**1b**	**2a**	**2b**	**3a**	**3b**	**4a**	**4b**

SECTION COMPLETED _____ AT _____
DATE TIME

SIGNED: _____ PRINT NAME: _____
TEST LEAD

SIGNED:_____ PRINT NAME: _____
QA REPRESENTATIVE

Test completed.

Completed by: _____
Witnessed by: _____
Date: _____
Time: _____

The results obtained in the performance of this procedure are acceptable:

Engineer(s)

SIGNED: _____PRINT:_____ DATE:_____

SIGNED: _____PRINT:_____ DATE:_____

SIGNED: _____PRINT:_____ DATE:_____

Test Lead

SIGNED: _____PRINT:_____ DATE:_____

The information obtained under this assembly and test procedure is as represented and the documentation is complete and correct:

Payload Test Director

SIGNED: _____PRINT:_____ DATE:_____

QA Representative

SIGNED: _____PRINT:_____ DATE:_____

Program QA Engineer

SIGNED: _____PRINT:_____ DATE:_____

Table 5 – Normalized Current Measurements
LAMP A

GYRO #	UV fixture	Bias (V)	CURRENT (fA)			average intensity monitor (counts)	Normalized Current (fA/count)	Normalized discharge rate (mV/s/count)
			UV ON	UV OFF	net			
1	A	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!
	B	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!
2	A	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!
	B	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!
3	A	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!
	B	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!
4	A	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!
	B	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!

Rotor capacitance 1000 pF

Normalized Current Measurements (cont.)

LAMP B

GYRO #	UV fixture	Bias (V)	CURRENT (fA)			average intensity monitor (counts)	Normalized Current (fA/count)	Normalized discharge rate (mV/s/count)
			UV ON	UV OFF	net			
1	A	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!
	B	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!
2	A	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!
	B	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!
3	A	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!
	B	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!
4	A	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!
	B	3			0		#DIV/0!	#DIV/0!
		0			0		#DIV/0!	#DIV/0!
		-3			0		#DIV/0!	#DIV/0!

Rotor capacitance 1000 pF