GRAVITY PROBE B

PROCEDURE FOR

PAYLOAD VERIFICATION II

(PTP) ECU TEST SUPPORT

Procedure No. P*544 Rev. –*

1/24/10

Prepared by: *D. Meriwether*

Approvals:

Program Responsibility	Signature	Date
D. Meriwether Test Author		
B. Farley TRE REE		
D. Murray Test Leader		
M. Taber Payload Test Director		
B. Muhlfelder Payload Integration Manager		
Bill Bencze Hardware Manager		
D. Ross GP-B Quality Assurance		
Rob Brumley Payload Technical Manager		

NOTES:

Level of QA required during performance of this procedure:
_X_ Stanford QA Representative
___ Government QA Representative

- Any red lines to the procedure shall require the approval and initial of the Test Author and Stanford QA prior to implementation.
- Stanford QA must be notified at least 24 hour before beginning this procedure.
- ONR must be emailed before beginning this procedure.
- A Quality Assurance representative or their designated representative shall be present during this procedure and shall review any discrepancy noted during assembly or test.
- Test Configuration is not to be changed or broken without approval of QA.
- Upon completion of this procedure, Quality Assurance will certify his/her concurrence that the effort was preformed and accomplished in accordance with the prescribed instructions by signing and dating.
- Discrepancies will be recorded in a D-log or as a DR per Quality Plan P0108

Revision Record:

Rev	Rev Date	ECO #	Summary Description

Acronyms and Abbreviations:

Acronym / Abbreviation	Meaning
ECU Monitor Mnemonics	
BE_XXXXX_XXXXXX	Binary Word Monitor
CE_XXXXX_XXXXXX	Current Monitor
DE_XXXXX_XXXXXX	Digital Word Monitor
TE_XXXXX_XXXXXX	Temperature Monitor
TE_XXXXX_X**GT**XXX	GRT TYPE Thermometer
TE_XXXXX_X**PT**XXX	PRT TYPE Thermometer
TE_XXXXX_X**ST**XXX	SDT TYPE Thermometer
TE_XXXXX_XXXXX**D**	Dewer located Thermometer
TE_XXXXX_XXXXX**P**	Probe located Thermometer
TE_XXXXX_XXXXX**Q**	Quartz Block located Thermometer
VE_XXXXX_XXXXXX	Voltage Monitor
AC	Alternate Current
Closed Loop	Hardware Controlled
Command	Software response indicating command sent
Current	Commanded Heater Amperage
DC	Direct Current
Open Loop	Software Controlled
Power	UV Lamp Power Supply readout
Pressure	GMA Pressure Sensor readout
Range	UV Lamp Power Hi Lo Range readout
Signal	UV Lamp Intensity readout
Temperature	Thermometer readout
Voltage	Commanded Heater Voltage

CCCA	Command & Control Computer Assembly
CSTOL	Colorado Spacecraft Test and Operations Language
ECU	Experimental Control Unit
EPS	Electrical Power Subsystem
FEU	Flight Equivalent Unit
FSW	Flight Software
FTP	file transfer protocol
GMA	Gas Management Assembly
GP-B	Gravity Probe B
ICD	Interface Control Document
MOC	Mission Operations Center

MSS	Mission Support Software
OASIS-CC	Operations and Science Instrument Support – Command and Control
ONR	Office of Naval Research
PDU	Power Distribution Unit
QA	Quality Assurance
RTC	Real-Time Commands
SPC	Stored Program Commands
TCP/IP	Transmission Control Protocol over Internet Protocol
Tlm	Telemetry
UPS	Uninteruptable Power System
VAC	Volts AC

Table of Contents

A Scope

This procedure sets the operational state of the ECU controlled components of the GP-B Payload[1] for Monitoring and Operation in support of other Payload Subsystems during Payload Verification II Testing. All ECU controlled Temperature Sensors, Payload Magnetometers, the Liquid Point Sensor and the PODS are monitored and recorded. If required, the Proton Monitor, the P9 Vacuum Gauge, the QBS AC Closed Loop Heater Control, the UV Lamps and the Mass Flow Meter Heater are Operated and Monitored.

B Requirements Verification

B.1 Requirements Cross Reference

B.2 Expected Data for verification per requirement

B.2.1 Excel spreadsheet analysis of the ECU operated telemetry monitors as displayed and recorded on the ECU Test Set

B.2.2 Printout of Ground Support Equipment Temperature Monitoring readout

B.2.3 Flow rate calculation from Flow Meter Heater test

C Configuration Requirements

C.1 The FIST Ops Test set shall be connected to the ECU via a 1553 bus for data transmission and a timing signal supplied across a S16D connection. Ref: Figure 1, ECU Test Set Interconnect diagram

C.2 The FIST Ops Test set and the ECU shall be provided power through an Uninterruptible Power Supply providing 110 VAC for more than one minute off the commercial power grid. Ref: Figure 1, ECU Test Set Interconnect diagram

C.3 The ECU shall be provided with a 1553 connection, a timing signal (10 Hz) and a 28.0 Volt power supply. Ref: Figure 1, ECU Test Set Interconnect diagram

C.4 The ECU Power Supply shall be the sole provider of Heater Power to ECU controlled Heaters. Ref: Figure 1, ECU Test Set Interconnect diagram

C.5 The Aft ECU shall be attached via cables to the Forward ECU, Top Hat, FEE Base Plate, Cross Flange & Dewar Support ring. Ref: Drawing 5856124, Payload Cable Interconnect Diagram

C.6 The Forward ECU shall be attached via cables to the Aft ECU, Probe Top Hat, Dewar Top Plate & FEE Base Plate. Ref: Drawing 5856124, Payload Cable Interconnect Diagram

[1] See ECU3.2.0Report_Excel.xls, Used Worksheet

C.7 Flight hardware required

Description	Part No.	Finite Lifetime Object	No. Req'd
Flight GP-B Dewar		N/A	1
Flight GP-B Probe		N/A	1
Flight ECU – Fwd	8A01313-101		1
Flight ECU – Aft	8A00922-101		1
Flight SRE – Aft	8A00920-101		1
Fwd ECU to Top Hat master Ground Cable Assembly	8A01467-101		1
Aft ECU to Top Hat master Ground Cable Assembly	8A01467-102		1
Fwd ECU J1 to Top Hat I1 Cable Assembly	8A00532-101		1
Fwd ECU J3 to Top Hat I3 Cable Assembly	8A01318-101		1
Aft ECU J30, J31 to FEE Base Plate Cable Harness	8A01959-101		1
FEE J12A to Top Hat I2 Cable Assembly	8A00533-101		1
Fwd ECU J5 to Top Hat I5 Cable Assembly	8A01289-101		1
Fwd ECU J6 to Top Hat I6 Cable Assembly	8A01290-101		1
Fwd ECU J7 to Top Hat I7 Cable Assembly	8A01291-101		1
Fwd ECU J10 to Dewar J805, FEE J805A Cable	8A01418-101		1
Cross Flange I10 to FEE J805A Cable Assembly	8A01551-101		1
Fwd ECU J8 to Dewar J801 Cable Assembly	8A01315-101		1
Fwd ECU J9 to Dewar J802, FEE J802A Cable Assembly	8A01268-101		1
Aft ECU J3 to Dewar Support Ring J814, FEE J9B, J9D Cable	8A01550-101		1
P9 Press Sense Cable J9B to Plumb Pallet P9A Cable Assembly	8A01962-101		1
P9 Press Sense Cable J9D to Plumb Pallet P9C Cable Assembly	8A01962-102		1
Magnetometer #1 & #2 Cable	8A01548-101		1
Magnetometer #3 & #4 Cable	8A01549-101		1

C.8 Commercial test equipment

Manufacturer	Model	Serial Number	Calibr. Exp. Date
SUN Workstation (Test Set)	Ultra 1 3D Creator	637F09FB	

C.9 Mechanical/Electrical Special test equipment

Description	Part No.	Certification Date
ECU Spacecraft Emulator	001	

C.10 Tools

Description	No. Req'd
8 mm tape drive	1

C.11 Expendables

Description	Quantity
8 mm tape	1

D Software Required

D.1 Flight Software

Flight Software Name	Version No.
MSS (Mission Support Software)	3.2.5S

D.2 CSTOL Scripts

CSTOL Script Name	Version No.
adc_vac_br.prc	V 1.1 : 01/15/99
cal1_br.prc	V 1.1 : 03/07/99
cal2_br.prc	V 1.2 : 02/10/99
dwrtemp_br.prc	V 1.1 : 03/07/99
ecu_p0544.prc	
ecu_seg.prc	V 1.1 : 01/31/01
ecu_unsg.prc	V 1.1 : 01/31/01
ecumisc_br.prc	V 1.1 : 01/15/99
ecupods_br.prc	V 1.1 : 02/11/99
fmt_ecu32a.prc	V 1.7 : 02/07/01
gmatemp_br.prc	V 1.1 : 02/10/99
htr2_br.prc	V 1.1 : 01/15/99
htr3_br.prc	V 1.1 : 01/15/99
htr4_br.prc	V 1.1 : 01/15/99
mag_uv_br.prc	V 1.1 : 02/10/99
mux1agn1.prc	V 1.1 : 01/31/01
mux1agn2.prc	V 1.1 : 01/31/01
mux1bgn1.prc	V 1.1 : 01/31/01
mux1bgn2.prc	V 1.1 : 01/31/01
mux2agn1.prc	V 1.1 : 01/31/01
mux2agn2.prc	V 1.1 : 01/31/01
mux2bgn1.prc	V 1.1 : 01/31/01
mux2bgn2.prc	V 1.1 : 01/31/01
mux3gn1.prc	V 1.1 : 01/31/01
mux3gn2.prc	V 1.1 : 01/31/01
mux4gn1.prc	V 1.1 : 01/31/01
mux4gn2.prc	V 1.1 : 01/31/01
muxgain_br.prc	V 1.1 : 02/11/99
muxio_br.prc	V 1.1 : 02/11/99
probetemp_br.prc	V 1.1 : 01/15/99
qbstemp_br.prc	V 1.1 : 02/12/99

D.3 SPC Scripts

SPC Script Name	Version No.
N/A	

D.4 Test Support Software

Test Software Name	Version No.
Oasis (Operating System Software)	V 2.4.5
Framex (front end software)	Framexs

E Procedures Required

Procedure Name	Procedure No.
(PTP) ECU Test Support	P0544

F Equipment Pretest Requirements

Equipment	Serial No.	Test Required	Proc. No.	Test Performed Date	By
FLIGHT Fwd ECU	8A01313-ECU GSE	FLIGHT Certification	ecu_box_tlm.prc	4/17/01	HDM
FLIGHT Aft ECU	8A00922-ECU GSE	FLIGHT Certification	ecu_box_htr.prc	4/17/01	HDM

G Personnel Requirements

G.1 As a general requirement, all operations involving flight equipment require at least two persons at all times.

G.2 The test leader for this procedure is Dr. Dave Murray <Beeper *650-317-7914, 1281893* >, or his appointed representative.

G.3 The Payload Test Director for all activities conducted in FIST Ops is Dr. Mike Taber <Beeper *650-599-8033, 1286139* >, or his appointed representative. The Payload Test Director is also responsible in general for the coordination of all payload tests, and will therefore schedule appropriate times for the performance of this procedure.

G.4 The Stanford Quality Assurance representative is Dorrene Ross <Beeper *650-317-7922, 1283969* > or her appointed representative.

G.5 The Office of Naval Research representative is Abe Sabbag < Sabbaga@onr.navy.mil> or his appointed representative.

G.6 The following personnel are qualified to perform this procedure using the FIST Ops test set:

G.6.1 Dave Meriwether <Beeper 650-317-7912 >

G.6.2 Thomas Wai <Phone 650-354-5644>

G.6.3 Denys Vanrenen <Phone 725-5769>

H Safety Requirements

H.1 Standard safety practices to ensure safety of personnel and prevent damage to equipment shall be observed during performance of this test.

H.2 Read the CARD's[2] appropriate to ECU Operations before running this test.

H.3 Prior to connecting the fiber optic bundles, clean with ethanol and then dry with compressed air

H.4 All connectors used will have connector savers attached. Protect all electrical connections and/or Connector Savers with ESD dust caps when the connectors are not mated.

H.5 Ensure that power is removed from cable assemblies before connecting and disconnecting cable connections.

H.6 Grounded wrist straps are to be worn prior to removal of connector caps or covers and during cable mating/demating operations.

H.7 Examine all mating connections before attempting to mate them. Remove any foreign particles. Look for any damaged pins or sockets. Do not force the coupling action if excessive resistance is encountered. Ensure that key ways are aligned.

I General Instructions

I.1 Test operators shall read this procedure in its entirety and resolve any apparent ambiguities prior to beginning this test.

I.2 This procedure operates systems throughout the GP-B satellite. Knowledge of the systems effected, caution in their operation and attention to information displayed must be applied at all times during these operations or Flight Hardware damaged may result.

I.3 This procedure shall be conducted on a formal basis to its latest approved and released version.

I.4 Tests will be conducted under the environmental conditions existing in the FIST Ops, HEPL Lab at Stanford University.

I.5 This procedure operates Flight Hardware. All use of software associated with this procedure must conform to the GP-B Configuration Control process.

I.6 In order to expedite test operations, unless specifically noted, the sequence in which major sections or subsections are preformed may be altered at the discretion of the Test Leader or his representative.

I.7 Upon completion of the test, all data on the FIST Ops test set under the /opt/usr6/lab and sub-directories shall be transferred to the data archive on the Payload Server. Upon confirmation that the FIST Ops test set data has been successfully archived, the data in the /opt/usr6/lab/bridge, /snaps, /messages and /oasis_raw_data directories may be deleted.

[2] Constraints and Restrictions Document

J References and Applicable Documents

J.1 SCIT-01 System Design, Verification, Integration & Test Plans

J.2 SCSE 06 Command and Telemetry Handbook, App B sw_cmd 3.2.5

J.3 SCSE 16 SECTION 9, Flight Software Design Specification, External Interface Detailed Design, Version Fg

J.4 PLSE-12, Science Payload Specification, Version 4.3

J.5 MSS3.2.0_Report_Excel.xls; Telemetry Monitor List for MSS 3.2.5

J.6 Probe C Drawings

- J.6.1 1C34883, (Probe schematics)
- J.6.2 1C34355, (Top Hat & Cross Flange Interfaces)
- J.6.3 1C34111, (Neck Tube Wiring)
- J.6.4 1C34141, (Heat Station Assembly)
- J.6.5 1C34299, (QBS Htr)

J.7 Dewar Drawings

- J.7.1 5833394, (Dewer Layout)
- J.7.2 5833506, (Probe B SMD Isometrics)
- J.7.3 5856124, (Payload Cable Interconnect)
- J.7.4 5833911, (Flow Control Htr)

J.8 ECU Drawings

- J.8.1 8A01940, ECU Aft Master Wire List
- J.8.2 8A01941, ECU Forward Master Wire List

Date Initiated _____

Time Initiated _____

K **Operations:**

K.1 ECU Test Set Initialization:

K.1.1 Connect the ECU Test Set to the Flight ECU. Ref: Operating Instructions for ECU Spacecraft Emulator.

K.1.2 Power on the Wavetek 10 Hz generator and ensure that the dials are set as marked.

K.1.3 Start the Temperature Sensor and Heater Verification CSTOL procedure:

K.1.3.1 CSTOL ACTIONS:

K.1.3.2 TYPE Go to start ecu_p0540.prc.

K.1.3.3 Oasis Binary and Message File recording started

K.1.3.4 MSS 3.2.5 ECU format loaded (nominal Format ID: F3250ECU32A).

CSTOL HOLD:

K.1.3.4.1 RECORD Message File name (*.event_messages):

_____

K.1.3.4.2 ECU state Monitors displayed

K.1.3.4.3 ECU state change recording started.

K.2 Flight ECU Initialization:

CSTOL ACTIONS:

K.2.1.1 Type Go to Command on the ECU Processing.

CSTOL HOLD:

K.2.1.2 Power On the ECU HLD Panel

K.2.1.2.1 Turn on the FLIGHT ECU Power Distribution unit Circuit Breaker.

K.2.1.2.2 Turn on power to the HP DC Power Supply.

K.2.1.2.3 Boot the PC and standby until the LabView ECU Test program comes up.

K.2.1.2.4 Turn on Power to SC Emulator (SN 001).

K.2.1.2.5 In LabView, click “Power Settings” button to “ON”

K.2.1.2.51.Confirm 28V on HP Power Supply

K.2.1.2.52.Check that Undervoltage Light is On.

K.2.1.2.6 HLD Initialization

K.2.1.2.61.Toggle A-side 1553 switch to B-side then A-side

K.2.1.2.62.Toggle A-side Power Converter On then Off

K.2.1.2.63.Toggle B-side Power Converter On then Off

K.2.1.2.64.Click on All ECU to A Power

K.2.1.2.65.Toggle A-side Heat Pulse Enable On then Off

K.2.1.2.66.Toggle B-side Heat Pulse Enable On then Off

K.2.1.2.67.Click on all 8 Disable HLD's (Dewer htr's, SIA htr's, GMA htr's, UV htr's)

K.2.1.2.7 Reset Undervoltage trip. (powers on ECU Unswitched Power)

K.2.1.2.8 Click ECU A-side 28V On

K.2.1.2.9 Click A-side All Enable

K.2.1.2.10 Click B-side All Enable

K.2.1.2.11 Click B-side Power Converters On

K.2.1.2.12 Click A-side Power Converters On

K.2.1.2.13 Confirm 28V on HP Power Supply

RECORD: HP DC Power Supply Voltage _____(Nominal 28 Volts)

RECORD: HP DC Power Supply Current _____(Nominal 0.88 Amps)

K.2.1.2.14 In the LabView "Power Settings" window, confirm DC Voltage is 28V and Current Limit is 4A.

CSTOL ACTIONS:

K.2.1.3 Type Go to Switch to 1553 bus Port 1 or Port 2

K.2.1.4 Limit check ECU Electronics Port 1 or 2 monitor (`BC_Ecu_1_2_Sel`) as displayed in VES_IoDirective1 (nominal = Port_1).

K.2.1.5 Check for and record SRE timing signal presence.

K.2.1.6 Limit check ECU state and locked ADC monitor (`DE_Ecu_Status`) as displayed in ECU_Critical_1 (nominal = 10000000).

K.2.1.7 Limit check Rollover Counter status (`BE_Failure_A, BE_Failure_B`) as displayed in FSW_SM_DI_10hz_1 (nominal = false).

K.2.1.8 Limit check Active ECU Side (`BC_1553_A_B_Sel`) in VES_IoDirective1 (nominal = Side_A).

CSTOL HOLD:

K.2.1.9 Review the ECU_Critical_1 display and confirm that both ECU Rollover Counters (`DE_Roll_Cntr__A, DE_Roll_Cntr__B`) are in synch and incrementing

K.2.1.10 Review the Startlab xterm window and check for any new errors.

K.2.1.11 CONFIRM: Startlab window errors (BC_SEND BC RECEIVE) have stopped updating: _____

CSTOL ACTIONS:

K.2.1.12 Type Go to Limit check ECU Initialization monitors[3]

K.3 Flight ECU Cable Connection:

K.3.1 OPERATOR: Turn Off the FLIGHT ECU Power Supply per Operating Instructions for ECU Spacecraft Emulator, Power Off the ECU Emulator Section.

K.3.1.1 **CAUTION**: Grounded wrist straps are to be worn during cable mating/demating operations.

K.3.1.2 **CAUTION**: The ECU is to be powered Off during cable mating/demating operations.

K.3.2 Fwd ECU J1 to Top Hat & Fwd ECU J3 to Top Hat I1I3 Cable Assembly Installation

K.3.2.1 OPERATOR: Connect the Fwd ECU J1 to Top Hat & Fwd ECU J3 to Top Hat I1I3 Cable Assembly. (Ref: Drawing 5856124, Payload Cable Interconnect Diagram)

K.3.3 Aft ECU to Final Filter Cable Harness & FEE J12A to Top Hat I2 Cable Installation

K.3.3.1 OPERATOR: Connect Aft ECU J30, J31 to Final Filter Cable Harness & FEE J12A to Top Hat I2 Cable Assembly (Ref: Drawing 5856124, Payload Cable Interconnect Diagram)

K.3.4 Fwd ECU J5 to Top Hat I5 Cable Installation

K.3.4.1 OPERATOR: Connect Fwd ECU J5 to Top Hat I5 Cable (Ref: Drawing 5856124, Payload Cable Interconnect Diagram).

K.3.5 Fwd ECU J6 to Top Hat I6 Cable Installation

K.3.5.1 OPERATOR: Connect Fwd ECU J6 to Top Hat I6 Cable (Ref: Drawing 5856124, Payload Cable Interconnect Diagram).

K.3.6 Fwd ECU J7 to Top Hat I7 Cable Installation

K.3.6.1 OPERATOR: Connect Fwd ECU J7 to Top Hat I7 Cable (Ref: Drawing 5856124, Payload Cable Interconnect Diagram).

[3] Ref: ECU3.2.5Report_Excel.xls, ECU Initialization Monitor's & Limits

K.3.7 Fwd ECU J10 to Dewar J805 Temp Sensor (ST17D) & FEE J805A to Cross Flange I10 Cable Assembly Installation

K.3.7.1 OPERATOR: Connect the Fwd ECU J10 to Dewar J805 Temp Sensor (ST17D) & FEE J805A to Cross Flange I10 Cable Assembly. (Ref: Drawing 5856124, Payload Cable Interconnect Diagram)

K.3.8 Fwd ECU J8 to Dewar J801 Cable Installation

K.3.8.1 OPERATOR: Connect Fwd ECU J8 to Dewar J801 cable (Ref: Drawing 5856124, Payload Cable Interconnect Diagram).

K.3.9 Aft ECU J10 to Magnetometer #1 & #3 Cable Assembly Installation

K.3.9.1 OPERATOR: Connect Aft ECU J10 to Magnetometer #1 & #3 Cable Assembly (Ref: Drawing 5856124, Payload Cable Interconnect Diagram).

K.3.10 Aft ECU J11 to Magnetometer #2 & #4 Cable Assembly Installation

K.3.10.1 OPERATOR: Connect Aft ECU J10 to Magnetometer #2 & #4 Cable Assembly (Ref: Drawing 5856124, Payload Cable Interconnect Diagram).

K.3.11 Fwd ECU J9 to Dewar J802, FEE J802A Cable Assembly Installation

K.3.11.1 OPERATOR: Connect Fwd ECU J9 to Dewar J802, FEE J802A Cable Assembly (Ref: Drawing 5856124, Payload Cable Interconnect Diagram).

K.3.12 Aft ECU J3 to Dewar Support Ring J814 & FEE Cable J9B to Plumbing Pallet Cable Assembly Installation

K.3.12.1 Connect the Aft ECU J3 to Dewar Support Ring J814 & FEE Cable J9B, J9D to Plumbing Pallet Cable Assembly. & Vac Gauge Cable (Ref: Drawing 5856124, Payload Cable Interconnect Diagram)

K.3.13 Fiber Optic Cable Bundle Installation

K.3.13.1 Connect the three 450 μm Fiber Optic Cable Bundles Cable (Ref: Drawing 5856124, Payload Cable Interconnect Diagram)

K.3.14 OPERATOR: Turn on the FLIGHT ECU Power Supply, ensure that it is set to 28 Volts.

K.3.14.1.1RECORD: HP DC Power Supply Voltage: _____ (Nominal: 28.0 Volts)

K.3.14.2 RECORD: HP DC Power Supply Current _____(Nominal 0.88 Amps)

K.3.14.3 CSTOL PAUSE, Wait for Operator input to end Cable Attachment and initiate the P9 Vacuum Gauge operation.

K.4 P9 Vacuum Gauge Operation (if required)

CSTOL ACTIONS:

K.4.1 TYPE GO to Start P9 Vacuum Gauge bridge file recording.

CSTOL HOLD:

K.4.2 RECORD the following Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_VAC_GAGE_PWR	P9 Vacuum gauge power			<100, >65535	
DE_VAC_GAGE_RNG	P9 Vacuum gauge range			<100, >65535	
DE_VAC_GAGE_SIG	P9 Vacuum gauge signal			<100, >65535	
TE_PrSLn_aST19P	Press sense line STA156 SDT/a: T-19P				
TE_PrSLn_bST20P	Press sense line SDT/b: T-20P				

CSTOL ACTIONS:

K.4.3 TYPE GO to Command P9 Vacuum Gauge On.

CSTOL HOLD:

K.4.4 RECORD the following P9 Vacuum Gauge Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
DE_VAC_GAGE_PWR	P9 Vacuum gauge power			14395 - 15911	
DE_VAC_GAGE_RNG	P9 Vacuum gauge range			2791 - 3085	
DE_VAC_GAGE_SIG	P9 Vacuum gauge signal			171 - 189	
TE_PrSLn_aST19P	Press sense line STA156 SDT/a: T-19P				
TE_PrSLn_bST20P	Press sense line SDT/b: T-20P				

K.5 Quartz Block Support Heater Operation (if required)

K.5.1.1 Side A QBS AC Closed Loop Temperature Control Checkout. (QBSACCLA)

Determine the Side A QBS Temperature Control Setpoint.

CSTOL ACTIONS:

K.5.1.1.1 TYPE GO to Command Side A QBS Heater to Off (Mode 82).

K.5.1.1.2 Command Side A QBS Temperature Setpoint to Zero (0)

CSTOL HOLD:

K.5.1.1.3 RECORD the following QBS Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_HSP_QBS____A	HSP QBS /A: H-05P			0	
DE_HSP_QBS____B	HSP QBS /B: H-06P			0	
DE_QBSHOpClLp_A	QBS htr Open/Closed Loop AC/DC			82	
DE_QBSHOpClLp_B	QBS htr Open/Closed Loop AC/DC			82	
VE_QBS_H_a_H05P	QBS htr V: H-05P			<100	
VE_QBS_H_b_H06P	QBS htr V: H-06P			<100	

CSTOL ACTIONS:

K.5.1.1.4 Bring up Plot: **ECU_V_QBS_LiqPS** and Monitor the Side A QBS Heater Voltage (**VE_QBS_H_a_H05P**)

K.5.1.1.5 TYPE GO to Incrementally increase the Side A QBS Temperature Setpoint until the Side A QBS Heater Voltage (**VE_QBS_H_a_H05P**) rises.

CSTOL HOLD:

K.5.1.1.6 Once the Voltage rises, RECORD the following QBS Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_HSP_QBS____A	HSP QBS /A: H-05P				
DE_HSP_QBS____B	HSP QBS /B: H-06P			0	
TE_QBS_b__GT11P	Quartz block support GRT/b: T-11P				
TE_QBS_a__GT10P	Quartz block support GRT/a: T-10P				
VE_QBS_H_a_H05P	QBS htr V: H-05P			25294 - 29185	
VE_QBS_H_b_H06P	QBS htr V: H-06P			<100	

CSTOL ACTIONS:

K.5.1.1.7 TYPE GO to Command the Side A QBS Temperature Setpoint to Zero (0)

CSTOL HOLD:

K.5.1.1.8 RECORD the following QBS Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_HSP_QBS____A	HSP QBS /A: H-05P			0	
DE_HSP_QBS____B	HSP QBS /B: H-06P			0	
VE_QBS_H_a_H05P	QBS htr V: H-05P			<100	
VE_QBS_H_b_H06P	QBS htr V: H-06P			<100	

CSTOL ACTIONS:

K.5.1.1.9 TYPE GO to Command Side A QBS Heater to AC Closed Loop Control mode. (Mode 80)

CSTOL HOLD:

K.5.1.1.10 RECORD the following QBS Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_HSP_QBS____A	HSP QBS /A: H-05P			0	
DE_HSP_QBS____B	HSP QBS /B: H-06P			0	
DE_QBSHOpClLp_A	QBS htr Open/Closed Loop AC/DC			80	
DE_QBSHOpClLp_B	QBS htr Open/Closed Loop AC/DC			82	
VE_QBS_H_a_H05P	QBS htr V: H-05P			<100	
VE_QBS_H_b_H06P	QBS htr V: H-06P			<100	

CSTOL ACTIONS:

K.5.1.1.11 TYPE GO to Command the Side A QBS Temperature Setpoint to the Temperature Control Setpoint as Recorded in step K.6.1.1.5

CSTOL HOLD:

K.5.1.1.12 RECORD the following QBS Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_HSP_QBS____A	HSP QBS /A: H-05P				
DE_HSP_QBS____B	HSP QBS /B: H-06P			0	
TE_QBS_a__GT10P	Quartz block support GRT/a: T-10P				
TE_QBS_b__GT11P	Quartz block support GRT/b: T-11P				
VE_QBS_H_a_H05P	QBS htr V: H-05P			<100, 25294 - 29185	
VE_QBS_H_b_H06P	QBS htr V: H-06P			<100	

CSTOL ACTIONS:

K.5.1.1.13 Manually increase the Side A QBS Temperature Setpoint to achieve the required QBS operating temperature.

CSTOL HOLD:

K.5.1.1.14 Once the Side A QBS Heater Voltage (**VE_QBS_H_a_H05P**) first significantly decreases (> 2 Volt drop), RECORD the following QBS Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_HSP_QBS____A	HSP QBS /A: H-05P				
DE_HSP_QBS_____B	HSP QBS /B: H-06P			0	
TE_Q_ForESST18Q	Quartz block forward end SDT: T-18Q				
TE_Q_ForEGGT17Q	Quartz block forward end GRT: T-17Q				
TE_QBS_SDTST12P	Quartz block support SDT: T-12P				
TE_QBS_a__GT10P	Quartz block support GRT/a: T-10P				
TE_QBS_b__GT11P	Quartz block support GRT/b: T-11P				
TE_Q_Flng_GT06Q	Quartz block flange GRT: T-06Q				
TE_Gyro_1_GT01Q	Gyroscope #1 GRT: T-01Q				
TE_Gyro_2_GT02Q	Gyroscope #2 GRT: T-02Q				
TE_Gyro_3_GT03Q	Gyroscope #3 GRT: T-03Q				
TE_Gyro_4_GT04Q	Gyroscope #4 GRT: T-04Q				
TE_Q_Aft__GT05Q	Quartz block aft end GRT: T-05Q				
TE_Q_G3_G4ST07Q	Quartz block G3/G4 SDT: T-07Q				
VE_QBS_H_b_H06P	QBS htr V: H-05P			<100	
VE_QBS_H_a_H05P	QBS htr V: H-06P			<100, 25294 - 29185	

K.5.1.2 Side B QBS AC Closed Loop Temperature Control Checkout. (QBSACCLB)

Determine the Side B QBS Temperature Control Setpoint.

CSTOL ACTIONS:

K.5.1.2.1 TYPE GO to Command Side B QBS Heater to Off (Mode 82).

K.5.1.2.2 Command Side B QBS Temperature Setpoint to Zero (0)

CSTOL HOLD:

K.5.1.2.3 RECORD the following QBS Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_HSP_QBS____A	HSP QBS /A: H-05P			0	
DE_HSP_QBS____B	HSP QBS /B: H-06P			0	
DE_QBSHOpClLp_A	QBS htr Open/Closed Loop AC/DC			82	
DE_QBSHOpClLp_B	QBS htr Open/Closed Loop AC/DC			82	
VE_QBS_H_a_H05P	QBS htr V: H-05P			<100	
VE_QBS_H_b_H06P	QBS htr V: H-06P			<100	

CSTOL ACTIONS:

K.5.1.2.4 Bring up Plot: **ECU_V_QBS_LiqPS** and MONITOR the Side B QBS Heater Voltage (**VE_QBS_H_b_H06P**).

K.5.1.2.5 TYPE GO to Incrementally increase the Side B QBS Temperature Setpoint until the Side B QBS Heater Voltage (**VE_QBS_H_b_H06P**) rises.

CSTOL HOLD:

K.5.1.2.6 Once the Voltage rises, RECORD the following QBS Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_HSP_QBS____A	HSP QBS /A: H-05P			0	
DE_HSP_QBS____B	HSP QBS /B: H-06P				
TE_QBS_b__GT11P	Quartz block support GRT/b: T-11P				
TE_QBS_a__GT10P	Quartz block support GRT/a: T-10P				
VE_QBS_H_a_H05P	QBS htr V: H-05P			<100	
VE_QBS_H_b_H06P	QBS htr V: H-06P			25294 - 29185	

CSTOL ACTIONS:

K.5.1.2.7 TYPE GO to Command the Side B QBS Temperature Setpoint to Zero (0)

CSTOL HOLD:

K.5.1.2.8 RECORD the following QBS Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_HSP_QBS____A	HSP QBS /A: H-05P			0	
DE_HSP_QBS____B	HSP QBS /B: H-06P			0	
VE_QBS_H_a_H05P	QBS htr V: H-05P			<100	
VE_QBS_H_b_H06P	QBS htr V: H-06P			<100	

CSTOL ACTIONS:

K.5.1.2.9 TYPE GO to Command Side B QBS Heater to AC Closed Loop Control mode. (Mode 80)

CSTOL HOLD:

K.5.1.2.10 RECORD the following QBS Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_HSP_QBS____A	HSP QBS /A: H-05P			0	
DE_HSP_QBS____B	HSP QBS /B: H-06P			0	
DE_QBSHOpClLp_A	QBS htr Open/Closed Loop AC/DC			82	
DE_QBSHOpClLp_B	QBS htr Open/Closed Loop AC/DC			80	
VE_QBS_H_a_H05P	QBS htr V: H-05P			<100	
VE_QBS_H_b_H06P	QBS htr V: H-06P			<100	

CSTOL ACTIONS:

K.5.1.2.11 TYPE GO to Command the Side B QBS Temperature Setpoint to the Temperature Control Setpoint as Recorded in step K.6.1.2.6

CSTOL HOLD:

K.5.1.2.12 RECORD the following QBS Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_HSP_QBS____A	HSP QBS /A: H-05P				
DE_HSP_QBS____B	HSP QBS /B: H-06P				
TE_QBS_b__GT11P	Quartz block support GRT/b: T-11P				
TE_QBS_a__GT10P	Quartz block support GRT/a: T-10P				
VE_QBS_H_a_H05P	QBS htr V: H-05P			<100	
VE_QBS_H_b_H06P	QBS htr V: H-06P			<100, 25294 - 29185	

CSTOL ACTIONS:

K.5.1.2.13 Manually increase the Side A QBS Temperature Setpoint to achieve the required QBS operating temperature.

CSTOL HOLD:

K.5.1.2.14 When the Side B QBS Heater Voltage (VE_QBS_H_b_H06P) first significantly decreases (> 2 Volt drop), RECORD the following QBS Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_HSP_QBS____A	HSP QBS /A: H-05P			0	
DE_HSP_QBS____B	HSP QBS /B: H-06P				
TE_Q_ForESST18Q	Quartz block forward end SDT: T-18Q				
TE_Q_ForEGGT17Q	Quartz block forward end GRT: T-17Q				
TE_QBS_SDTST12P	Quartz block support SDT: T-12P				
TE_QBS_a__GT10P	Quartz block support GRT/a: T-10P				
TE_QBS_b__GT11P	Quartz block support GRT/b: T-11P				
TE_Q_Flng_GT06Q	Quartz block flange GRT: T-06Q				
TE_Gyro_1_GT01Q	Gyroscope #1 GRT: T-01Q				
TE_Gyro_2_GT02Q	Gyroscope #2 GRT: T-02Q				
TE_Gyro_3_GT03Q	Gyroscope #3 GRT: T-03Q				
TE_Gyro_4_GT04Q	Gyroscope #4 GRT: T-04Q				
TE_Q_Aft__GT05Q	Quartz block aft end GRT: T-05Q				
TE_Q_G3_G4ST07Q	Quartz block G3/G4 SDT: T-07Q				
VE_QBS_H_a_H05P	QBS htr V: H-05P			<100	
VE_QBS_H_b_H06P	QBS htr V: H-06P			<100, 25294 - 29185	

K.6 Mass Flow Meter Heater (H-5AD, -5BD) Checkout. (FMETER) (if required)

K.6.1.1 Start Mass Flow Meter bridge file recording.

K.6.1.2 Side A Mass Flow Meter Heater (H-05AD) Checkout. (FMETERA)

CSTOL ACTIONS:

K.6.1.2.1 TYPE GO to Command H-05AD to 1.0 Volts (Setpoint = 27).[9]

CSTOL HOLD:

K.6.1.2.2 RECORD the following Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
CE_FlMHI_ah05ad	Flow meter htr current/a: (H-05AD)			1497 - 1830	
CE_FlMHI_bh05bd	Flow meter htr current/b: (H-05BD)			1497 - 1830	
DE_HSP_FlM____A	HSP Flow Meter /A: H-05AD			0	
DE_HSP_FlM____B	HSP Flow Meter /B: H-05BD			0	
TE_FlM_a__GT18D	Flow meter vent line GRT/a: T-18D				
TE_FlMtr_bGT19D	Flow meter vent line GRT/b: T-19D				
TE_St2Pr_aGT05P	Station 200 probe GRT: T-05P				
TE_St2Pr_bGT28P	STA 200 probe GRT/b: T-28P				
TE_St2Dw_aGT01D	Station 200 Dewar GRT/a: T-01D				
TE_St2Dw_bGT02D	Station 200 Dewar GRT/b: T-02D				
TE_GrdTk__ST16D	Guard tank bottom SDT: T-16D				
TE_HEX1Dw_ST03D	HEX-1 Dewar SDT: T-03D				
TE_HEX1Pr_ST01P	HEX-1 probe SDT: T-01P				
TE_Win_1_aST21P	Window #1 frame SDT/a: T-21P				
TE_Win_1_bST22P	Window #1 SDT/b: T-22P				
VE_FlMH_a_H05AD	Flow meter htr voltage/a: H-05AD			1305 - 1442	
VE_FlMH_b_H05BD	Flow meter htr voltage/b: H-05BD			<100	
VE_LiqPnt_LP01D	Liquid point sensor voltage: LP-01				

CSTOL ACTIONS:

K.6.1.2.3 TYPE GO to Command H-05AD to 0 Volts (Setpoint = 0).

CSTOL HOLD:

K.6.1.2.4 RECORD the following Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
CE_FlMHI_ah05ad	Flow meter htr current/a: (H-05AD)			<100	
DE_HSP_FlM____A	HSP Flow Meter /A: H-05AD			0	
TE_FlM_a__GT18D	Flow meter vent line GRT/a: T-18D				
VE_FlMH_a_H05AD	Flow meter htr voltage/a: H-05AD			<100	

CSTOL ACTIONS:

K.6.1.3 When prompted to, TYPE in the Heater SetPoint (Count) to Command H-05AD to a Heater Setpoint as prescribed by the Test Leader. (FMETERATEST)

CSTOL HOLD:

K.6.1.3.1 RECORD the following Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
CE_FlMHI_ah05ad	Flow meter htr current/a: (H-05AD)				
DE_HSP_FlM____A	HSP Flow Meter /A: H-05AD				
TE_FlM_a__GT18D	Flow meter vent line GRT/a: T-18D				
VE_FlMH_a_H05AD	Flow meter htr voltage/a: H-05AD				

CSTOL ACTIONS:

K.6.1.4 Repeat as necessary

K.6.1.5 When prompted to, TYPE in the Heater Set Point (Count) to Command H-05AD to a Heater Setpoint as prescribed by the Test Leader.

CSTOL HOLD:

K.6.1.5.1 RECORD the following Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
CE_FlMHI_ah05ad	Flow meter htr current/a: (H-05AD)				
DE_HSP_FlM____A	HSP Flow Meter /A: H-05AD				
TE_FlM_a__GT18D	Flow meter vent line GRT/a: T-18D				
VE_FlMH_a_H05AD	Flow meter htr voltage/a: H-05AD				

CSTOL ACTIONS:

K.6.1.6 When prompted to, TYPE 0 to command H-05AD off and start the Side B Mass Flow Meter Heater (H-05BD) Checkout.

CSTOL HOLD:

K.6.1.6.1 RECORD the following Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
CE_FlMHI_ah05ad	Flow meter htr current/a: (H-05AD)				
DE_HSP_FlM____A	HSP Flow Meter /A: H-05AD				
TE_FlM_a__GT18D	Flow meter vent line GRT/a: T-18D				
VE_FlMH_a_H05AD	Flow meter htr voltage/a: H-05AD				

K.6.1.7 RECORD the Calculated Flow Rate_____

K.6.1.8 Side B Mass Flow Meter Heater (H-05BD) Checkout. (FMETERB)

CSTOL ACTIONS:

K.6.1.8.1 TYPE GO to Command H-05BD to 1.0 Volts (Setpoint = 27).[9]

CSTOL HOLD:

K.6.1.8.2 RECORD the following Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
CE_FlMHI_bh05bd	Flow meter htr current/b: (H-05BD)			1497 - 1830	
DE_HSP_FlM____B	HSP Flow Meter /B: H-05BD			27	
TE_FlMtr_bGT19D	Flow meter vent line GRT/b: T-19D				
VE_FlMH_b_H05BD	Flow meter htr voltage/b: H-05BD			1305 - 1442	

CSTOL ACTIONS:

K.6.1.8.3 TYPE GO to Command H-05BD to 0 Volts (Setpoint = 0).

CSTOL HOLD:

K.6.1.8.4 RECORD the following Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
CE_FlMHI_bh05bd	Flow meter htr current/b: (H-05BD)			< 100	
DE_HSP_FlM____B	HSP Flow Meter /B: H-05BD			0	
TE_FlMtr_bGT19D	Flow meter vent line GRT/b: T-19D				
VE_FlMH_b_H05BD	Flow meter htr voltage/b: H-05BD			1305 - 1442	

CSTOL ACTIONS:

K.6.1.9 When prompted to, TYPE in the Heater Set Point (Count) to Command H-05BD to a Heater Setpoint as prescribed by the Test Leader. (FMETERBTEST)

CSTOL HOLD:

RECORD the following Heater Monitors: CSTOL HOLD:

K.6.1.9.1 RECORD the following Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
CE_FlMHI_bh05bd	Flow meter htr current/b: (H-05BD)				
DE_HSP_FlM____B	HSP Flow Meter /B: H-05BD				
TE_FlMtr_bGT19D	Flow meter vent line GRT/b: T-19D				
VE_FlMH_b_H05BD	Flow meter htr voltage/b: H-05BD				

[9] Ref: ECU Htr Setpoint.xls, Flight Worksheet

CSTOL ACTIONS:

K.6.1.10 Repeat as necessary

K.6.1.11 When prompted to, TYPE in the Heater Set Point (Count) to Command H-05BD to a Heater Setpoint as prescribed by the Test Leader.

CSTOL HOLD:

RECORD the following Heater Monitors: CSTOL HOLD:

K.6.1.11.1 RECORD the following Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
CE_FlMHI_bh05bd	Flow meter htr current/b: (H-05BD)				
DE_HSP_FlM____B	HSP Flow Meter /B: H-05BD				
TE_FlMtr_bGT19D	Flow meter vent line GRT/b: T-19D				
VE_FlMH_b_H05BD	Flow meter htr voltage/b: H-05BD				

CSTOL ACTIONS:

K.6.1.12 When prompted to, TYPE in the Heater Set Point (Count) to Command H-05BD to a Heater Setpoint as prescribed by the Test Leader.

CSTOL HOLD:

RECORD the following Heater Monitors: CSTOL HOLD:

K.6.1.12.1 RECORD the following Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
CE_FlMHI_bh05bd	Flow meter htr current/b: (H-05BD)				
DE_HSP_FlM____B	HSP Flow Meter /B: H-05BD				
TE_FlMtr_bGT19D	Flow meter vent line GRT/b: T-19D				
VE_FlMH_b_H05BD	Flow meter htr voltage/b: H-05BD				

CSTOL ACTIONS:

K.6.1.13 When prompted to, TYPE 0 to command H-05AD off and start the Side A Flow Control Heater (H-10D) Checkout.

K.7 Proton Monitor Checkout. (if required)

K.7.1.1 Start Proton Monitor bridge file recording.

CSTOL HOLD:

K.7.1.1.1 RECORD the following Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_PrtnData_013	Command Detection			F0	

CSTOL ACTIONS:

K.7.1.1.2 TYPE GO to send the Proton Detector Housekeeping Request

CSTOL HOLD:

K.7.1.1.3 When Prompted to, RECORD the following Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_PrtnData_013	Command Detection			D0	

K.7.1.1.4 When Prompted to, RECORD the following Heater Monitors:

Monitor Name	Description	Eng. Values	Count	Limit	Pass/Fail
DE_PrtnData_013	Command Detection			F0	

K.8 UV Lamp / Optical Switches Checkout[4] (UV) (if required)

CSTOL HOLD:

K.8.1 OPERATOR: Turn Off the FLIGHT ECU Power Supply per Operating Instructions for ECU Spacecraft Emulator, Power Off the ECU Emulator Section.

K.8.1.1 **CAUTION**: Grounded wrist straps are to be worn during cable mating/demating operations.

K.8.1.2 **CAUTION**: The ECU is to be powered down during cable mating/demating operations.

K.8.1.3 **CAUTION**: The UV Lamp should only be operated within the temperature range of 0^{o} C (273 K) – 50^{o} C (323 K).

K.8.1.4 **WARNING**: Wipe the Fiber Optic Cable Bundle ends with ethanol and then dry with compressed air before cable mating operations.

K.8.2 OPERATOR: Connect the following cables (Ref: Drawing 5856124, Payload Cable Interconnect Diagram)

Cable	Initial
Fiber Optic Cable Bundle W300P16	
Fiber Optic Cable Bundle W301P17	
Fiber Optic Cable Bundle W302P18	

K.8.3 OPERATOR: Turn on the FLIGHT ECU Power Supply, ensure that it is set to 28 Volts.

K.8.3.1 RECORD: HP DC Power Supply Voltage: _____ (Nominal: 28.0 Volts).

K.8.3.2 RECORD: HP DC Power Supply Current _____(Nominal 0.88 Amps)

K.8.4 Record the following monitors

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp				
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp				
CE_UVLampA_I	UV Lamp-A current				<100
CE_UVLampB_I	UV Lamp-B current				<100
DE_UVLampA_OUT	UV Lamp-A output				<100
DE_UVLampB_OUT	UV Lamp-B output				<100
TE_UV_BASE_SDTa	UV-A base SDT/a				
TE_UV_BASE_SDTb	UV-B base SDT/b				
TE_UVLampA_T2	UV Lamp-A bulb temp				
TE_UVLampB_T2	UV Lamp-B bulb temp				

[4] Ref. Section H.3, Safety Requirements – Fiber Optic Bundle Connection

CSTOL ACTIONS:

K.8.5 TYPE GO to Set Optical Switches 1A to the B Side UV Lamp (OS1A)

K.8.5.1 Pulse Optical Switches

CSTOL HOLD:

K.8.5.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			10	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			0	

CSTOL ACTIONS:

K.8.6 TYPE GO to Set Optical Switches 1B to the B Side UV Lamp (OS1B)

K.8.6.1 Pulse Optical Switches

CSTOL HOLD:

K.8.6.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			10	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			10	

CSTOL ACTIONS:

K.8.7 TYPE GO to Set Optical Switches 2A to the B Side UV Lamp (OS2A)

K.8.7.1 Pulse Optical Switches

CSTOL HOLD:

K.8.7.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			30	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			10	

CSTOL ACTIONS:

K.8.8 TYPE GO to Set Optical Switches 2B to the B Side UV Lamp (OS2B)

K.8.8.1 Pulse Optical Switches

CSTOL HOLD:

K.8.8.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			30	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			30	

CSTOL ACTIONS:

K.8.9 TYPE GO to Set Optical Switches 3A to the B Side UV Lamp (OS3A)

K.8.9.1 Pulse Optical Switches

CSTOL HOLD:

K.8.9.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			70	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			30	

CSTOL ACTIONS:

K.8.10 TYPE GO to Set Optical Switches 3B to the B Side UV Lamp (OS3B)

K.8.10.1 Pulse Optical Switches

CSTOL HOLD:

K.8.10.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			70	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			70	

CSTOL ACTIONS:

K.8.11 TYPE GO to Set Optical Switches 4A to the B Side UV Lamp (OS4A)

K.8.11.1 Pulse Optical Switches

CSTOL HOLD:

K.8.11.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			F0	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			70	

CSTOL ACTIONS:

K.8.12 TYPE GO to Set Optical Switches 4B to the B Side UV Lamp (OS4B)

K.8.12.1 Pulse Optical Switches

CSTOL HOLD:

K.8.12.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			F0	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			F0	

CSTOL ACTIONS:

K.8.13 TYPE GO to Command on the B Side 15 Volt UV Lamp (UV15VB)

CSTOL HOLD:

K.8.13.1 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			F8	
CE_UVLampB_I	UV Lamp-B current			<100	
DE_UVLampB_OUT	UV Lamp-B output			<100	
TE_UV_BASE_SDTb	UV-B base SDT/b				
TE_UVLampB_T2	UV Lamp-B bulb temp				

CSTOL ACTIONS:

K.8.14 TYPE GO to Command on the B Side 5 Volt UV Lamp (UV5VB)

CSTOL HOLD:

K.8.15 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			FC	
CE_UVLampB_I	UV Lamp-B current			<100	
DE_UVLampB_OUT	UV Lamp-B output			<100	
TE_UV_BASE_SDTb	UV-B base SDT/b				
TE_UVLampB_T2	UV Lamp-B bulb temp				

CSTOL ACTIONS:

K.8.15.1 **CAUTION**: The UV Lamp is a limited life object. Log all On and Off times of the UV Lamp 30 Volt Power Supply.

K.8.16 TYPE GO to Command on the B Side 30 Volt UV Lamp. (UV30VB)

K.8.16.1 Log the 30 Volt UV Lamp ON Time_____

K.8.16.2 TIMED CSTOL HOLD (2 minutes)

K.8.16.3 When PROMPTED to, RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			FE	
CE_UVLampB_I	UV Lamp-B current				
DE_UVLampB_OUT	UV Lamp-B output				
TE_UV_BASE_SDTb	UV-B base SDT/b				
TE_UVLampB_T2	UV Lamp-B bulb temp				

CSTOL ACTIONS:

K.8.17 TYPE GO to Command off the B Side 30 Volt UV Lamp. (UVBOFF)

CSTOL HOLD:

K.8.17.1 Log the 30 Volt UV Lamp OFF Time_____

K.8.17.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			FC	
CE_UVLampB_I	UV Lamp-B current			<100	
DE_UVLampB_OUT	UV Lamp-B output			<100	
TE_UV_BASE_SDTb	UV-B base SDT/b				
TE_UVLampB_T2	UV Lamp-B bulb temp				

K.8.17.3 Command off the B Side 5 Volt UV Lamp.

K.8.17.4 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			F8	
CE_UVLampB_I	UV Lamp-B current			<100	
DE_UVLampB_OUT	UV Lamp-B output			<100	
TE_UV_BASE_SDTb	UV-B base SDT/b				
TE_UVLampB_T2	UV Lamp-B bulb temp				

K.8.17.5 Command off the B Side 15 Volt UV Lamp.

K.8.17.6 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			F0	
CE_UVLampB_I	UV Lamp-B current			<100	
DE_UVLampB_OUT	UV Lamp-B output			<100	
TE_UV_BASE_SDTb	UV-B base SDT/b				
TE_UVLampB_T2	UV Lamp-B bulb temp				

CSTOL ACTIONS:

K.8.18 TYPE GO to Set Optical Switches 1A to the A Side UV Lamp (OS1A1)

K.8.18.1 Pulse Optical Switches

CSTOL HOLD:

K.8.18.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			E0	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			F0	

CSTOL ACTIONS:

K.8.19 TYPE GO to Set Optical Switches 1B to the A Side UV Lamp (OS1B1)

K.8.19.1 Pulse Optical Switches

CSTOL HOLD:

K.8.19.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			E0	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			E0	

CSTOL ACTIONS:

K.8.20 TYPE GO to Set Optical Switches 2A to the A Side UV Lamp (OS2B1)

K.8.20.1 Pulse Optical Switches

CSTOL HOLD:

K.8.20.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			C0	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			E0	

CSTOL ACTIONS:

K.8.21 TYPE GO to Set Optical Switches 2B to the A Side UV Lamp (OS2B1)

K.8.21.1 Pulse Optical Switches

CSTOL HOLD:

K.8.21.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			C0	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			C0	

CSTOL ACTIONS:

K.8.22 TYPE GO to Set Optical Switches 3A to the A Side UV Lamp (OS3A1)

K.8.22.1 Pulse Optical Switches

CSTOL HOLD:

K.8.22.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			80	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			C0	

CSTOL ACTIONS:

K.8.23 TYPE GO to Set Optical Switches 3B to the A Side UV Lamp (OS3B1)

K.8.23.1 Pulse Optical Switches

CSTOL HOLD:

K.8.23.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			80	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			80	

CSTOL ACTIONS:

K.8.24 TYPE GO to Set Optical Switches 4A to the A Side UV Lamp (OS4A1)

K.8.24.1 Pulse Optical Switches

CSTOL HOLD:

K.8.24.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			0	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			80	

CSTOL ACTIONS:

K.8.25 TYPE GO to Set Optical Switches 4B to the A Side UV Lamp (OS4B1)

K.8.25.1 Pulse Optical Switches

CSTOL HOLD:

K.8.25.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			0	
BE_OpSwUVLpVacB	Optical switches to lamps, UV lamp			0	

CSTOL ACTIONS:

K.8.26 TYPE GO to Command on the A Side 15 Volt UV Lamp (UV15VA)

CSTOL HOLD:

K.8.26.1 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail

BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			8	
CE_UVLampA_I	UV Lamp-A current				
DE_UVLampA_OUT	UV Lamp-A output				
TE_UV_BASE_SDTa	UV-A base SDT/a				
TE_UVLampA_T2	UV Lamp-A bulb temp				

CSTOL ACTIONS:

K.8.27 TYPE GO to Command on the A Side 5 Volt UV Lamp (UV5VA)

CSTOL HOLD:

K.8.27.1 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			C	
CE_UVLampA_I	UV Lamp-A current			<100	
DE_UVLampA_OUT	UV Lamp-A output			<100	
TE_UV_BASE_SDTa	UV-A base SDT/a				
TE_UVLampA_T2	UV Lamp-A bulb temp				

CSTOL ACTIONS:

K.8.27.2 **CAUTION**: The UV Lamp is a limited life object. Log all On and Off times of the UV Lamp 30 Volt Power Supply.

K.8.28 TYPE GO to Command on the A Side 30 Volt UV Lamp. (UV30VA)

K.8.28.1 Log the 30 Volt UV Lamp ON Time_____

K.8.28.2 TIMED CSTOL HOLD (2 minutes)

K.8.28.3 When PROMPTED to, RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			E	
CE_UVLampA_I	UV Lamp-A current			<100	
DE_UVLampA_OUT	UV Lamp-A output			<100	
TE_UV_BASE_SDTa	UV-A base SDT/a				
TE_UVLampA_T2	UV Lamp-A bulb temp				

CSTOL ACTIONS:

K.8.29 TYPE GO to Command off the A Side 30 Volt UV Lamp (UVAOFF)

CSTOL HOLD:

K.8.29.1 Log the 30 Volt UV Lamp OFF Time_____

K.8.29.2 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			C	
CE_UVLampA_I	UV Lamp-A current			<100	
DE_UVLampA_OUT	UV Lamp-A output			<100	
TE_UV_BASE_SDTa	UV-A base SDT/a				
TE_UVLampA_T2	UV Lamp-A bulb temp				

K.8.29.3 Command off the A Side 5 Volt UV Lamp.

K.8.29.4 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			8	
CE_UVLampA_I	UV Lamp-A current			<100	
DE_UVLampA_OUT	UV Lamp-A output			<100	
TE_UV_BASE_SDTa	UV-A base SDT/a				
TE_UVLampA_T2	UV Lamp-A bulb temp				

K.8.29.5 Command off the A Side 15 Volt UV Lamp.

K.8.29.6 RECORD the following Optical Switch Monitors:

Monitor Name	Description	Eng. Values	Count	Expected Count	Pass/Fail
BE_OpSwUVLpVacA	Optical switches to lamps, UV lamp			0	
CE_UVLampA_I	UV Lamp-A current			<100	
DE_UVLampA_OUT	UV Lamp-A output			<100	
TE_UV_BASE_SDTa	UV-A base SDT/a				
TE_UVLampA_T2	UV Lamp-A bulb temp				

K.8.30 ECU Test Support completion

K.8.30.1 TYPE: GO to End ECU Test Support.

CSTOL ACTIONS:

K.8.30.2 Command Off all ECU Controlled Heaters

K.8.30.3 Snap & Clear Monitors.

K.8.30.4 Command Off ECU.

K.8.30.5 Snap & Clear ECU Monitors.

K.8.30.6 End ECU Message File Recording.

K.8.30.7 End Bridge File Recording.

K.8.30.8 End Oasis Binary File Recording.

K.8.30.9 OPERATOR: Power down ECU power supply.

K.8.30.10 RECORD: Voltage:_____ (Nominal: 0.0) Amperage:_____ (Nominal: 0.0).

K.8.30.11 Data Analysis

K.8.30.12 Load Data into Excel spreadsheet

K.8.30.13 Sort data into Monitors and graph Heater Set Point

K.8.30.14 Attach data charts and a sample of the data to this document

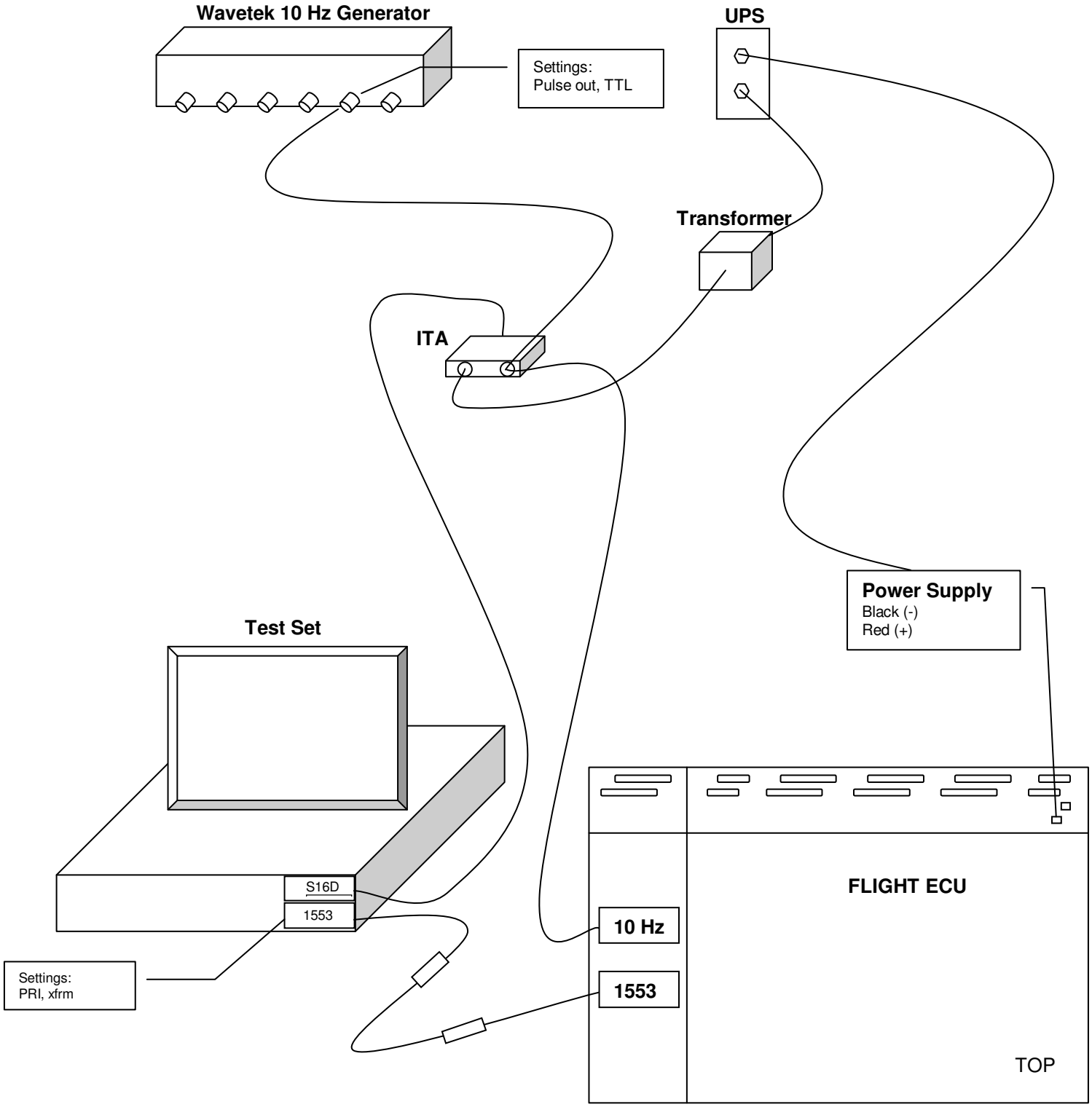
K.8.30.15 Test completed:

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

Test Leader: _____
Date: _____
Time: _____

Quality Engineer: _____
Date: _____
Time: _____

Figure 1


Wavetek 10 Hz Generator
Settings:
Pulse out, TTL
UPS
Transformer
ITA
Power Supply
Black (-)
Red (+)
Test Set
S16D
1553
Settings:
PRI, xfrm
FLIGHT ECU
10 Hz
1553
TOP