



STANFORD UNIVERSITY  
W.W. HANSEN EXPERIMENTAL PHYSICS LABORATORY  
GRAVITY PROBE B, RELATIVITY GYROSCOPE EXPERIMENT  
STANFORD, CALIFORNIA 94305-4085

## ECU AND CABLE INSTALLATION

### GP-B SCIENCE MISSION DEWAR OPERATIONS ORDER

9 August, 1999

PREPARED	_____	_____
	H. Yengoyan	Date
APPROVED	_____	_____
	M. R. Anderson, Systems Test Engr.	Date
APPROVED	_____	_____
	M. Taber, Test Director	Date
APPROVED	_____	_____
	J. Janicki, Safety Engineer	Date
APPROVED	_____	_____
	D. Ross, Quality Assurance	Date
APPROVED	_____	_____
	S. Buchman, Hardware Manager	Date

## **1. SCOPE**

This procedure provides authority to install the ECU bracket, Non-Flight ECU Unit, and ECU Cables onto the neck of the Science Mission Dewar to be used during payload integration testing.

### **NOTE**

**Flight hardware, protect parts and assemblies to prevent magnetic contamination and physical damage.**

## **2. REFERENCE DOCUMENTS**

### **2.1. Procedures**

Not applicable

### **2.2. Drawings**

8A01961GSE - FWD Electronics Mounting GSE Bracket, Rev. NC

5856126 – Bracket, Front, FWD Elec Mounting (GP-B), Rev. A

5856127 – Bracket, Rear, FWD Elec Mounting (GP-B), Rev. A

### **2.3. FIGURES**

Not applicable

### **2.4. SUPPORTING DOCUMENTATION**

GP-B Bolt Torque Specification, LMMS-5834972

GP-B Magnetic Control Plan, LMMS-5835031

GP-B (FIST) Preliminary Hazards Analysis, LMMS-F314446

GP-B (FIST) Safety Plan, LMMS- F314447

FIST Emergency Procedures SU/GP-B P0141

### 3. GENERAL REQUIREMENTS

#### 3.1 Quality Assurance

Integration shall be conducted on a formal basis to approved and released procedures. The QA program office shall be notified of the start of this procedure. A Quality Assurance Representative, designated by D. Ross shall be present during the procedure and shall review any discrepancies noted and approve their disposition. Upon completion of this procedure, the QA Program Engineer, D. Ross or her designate, nominally R. Leese, will certify her 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. Discrepancies will be recorded in a D-log or as a DR per Quality Plan P0108.

#### 3.2 Red-line Authority

Authority to red-line (make minor changes during execution ) this procedure is given solely to the PTD or his designate and shall be approved by the QA Representative. Additionally, approval by the Hardware Manager shall be required, if in the judgment of the PTD or QA Representative, experiment functionality may be affected.

#### 3.3 Personnel

The following personnel are qualified to perform this procedure:

- Bob Ajitomi
- Haig Yengoyan
- Paul Ayres
- Tom Welsh
- Mike Taber
- Dave Murray
- Byron Oh

See section 3.1 for details on which Quality Assurance personnel are required to be notified and/or witness this procedure.

#### 3.4 Safety

**In case of any injuries obtain medical treatment: at:**

LMMS Call 117      Stanford University Call 9-911

3.4.1 The GP-B (FIST) Safety Plan, LMSC-F314447, discusses safety design, operating and maintenance requirements which the R&DD program office has adhered to. These requirements

should be reviewed for applicability at any facility outside of R&DD (e.g. Stanford University) where FIST hardware is operated.

### 3.5 Hazards Analysis

The GP-B (FIST) Preliminary Hazards Analysis, LMSC-F314446, discusses hazards inherent in R&DD-developed FIST hardware in greater detail.

## 4. CONFIGURATION REQUIREMENTS:

4.1 SMD mounted in SMD test stand with work platforms and scaffolding attached.

## 5. HARDWARE REQUIREMENTS

The Dewar and accompanying build hardware are very delicate. Be sure to handle them with care so that they do not become damaged.

### NOTE

**Take all necessary precautions not to let anything physically damage the Science Mission Dewar or particulate onto its surfaces.**

### 5.1 Hardware Required:

Qt. 1 ECU EU Unit  
Qt. 2 8A01961GSE-102 ECU Bracket Assembly  
Qt. 2 5856126-101 Front Bracket Assembly  
Qt. 2 5856127-101 Rear Bracket Assembly  
Qt. 1 Torque wrench 10-120 in-lbs.  
Qt. ARFasteners for attaching support rods and bracket  
Qt. ARHand tools (Alan wrenches, screw drivers, etc.)

## 6. OPERATIONS:

Operator \_\_\_\_\_.

Date Initiated \_\_\_\_\_.

Time Initiated \_\_\_\_\_.

## 6.1 Configuration Requirements:

SMD mounted in SMD test stand with work platforms and scaffolding attached.

## 7. NOTIFICATION

### 7.1 Safety Notification

Safety shall be notified 24 hours in advance prior to the start of any work performed. Record who was contacted, the date, and time below.

Contact: \_\_\_\_\_

Date and Time: \_\_\_\_\_

### 7.2 Quality Assurance Notification

PTD to notify the Quality Engineer 24 hours in advance prior to the start of any work performed. Record who was contacted, the date, and time below.

Contact: \_\_\_\_\_

Date and Time: \_\_\_\_\_

### 7.3 ONR Notification

Quality Engineer to notify ONR 24 hours in advance prior to the start of any work performed. Record who was contacted, the date, and time below.

Contact: \_\_\_\_\_

Date and Time: \_\_\_\_\_

## 8. INSTALLING THE ECU BRACKET AND ECU UNIT

### 8.1 Mounting ECU Brackets onto the Dewar

- 8.1.1 Begin by removing the two -110 L brackets from the fully assembled 8A01961GSE-102 ECU Bracket.

8.1.2 Mount the –109 ECU Base Plate on the forward electronic mounting brackets (5856126 & 5856127) using the 8 each 10-32 x 1/2” long 100° flat head screws hand tight.

8.1.3 Per Note 7 torque all 10-32 screws in the bracket to 25±2 in-lbs. per the 5834972 GP-B Bolt Torque Specification. Record information below.

Torque Wrench Asset Number \_\_\_\_\_

Calibration Due Date \_\_\_\_\_

Final Torque Value \_\_\_\_\_

8.1.4 Product Assurance to witness torque.

QA Witness \_\_\_\_\_

8.1.5 After mounting the base plate, get the ECU unit and open up the bottom sheet metal cover. Save the sheet metal screws for reattaching the cover.

8.1.6 Mount the two –110 L brackets to the ECU unit using the 10 each 10-32 x .625” long socket head cap screws, 10 each #10 flat washers, 10 each #10 lock washers, and 10 each 10-32 hex nuts.

8.1.7 Mount the brackets to the side of the ECU so that the bottom of the bracket lays flush to the ground. Slip one flat washer and one lock washer on each screw and nut and hand tighten.

8.1.8 Per Note 7 torque the 10-32 screws to 25±2 in-lbs. per the 5834972 GP-B Bolt Torque Specification.

Torque Wrench Asset Number \_\_\_\_\_

Calibration Due Date \_\_\_\_\_

Final Torque Value \_\_\_\_\_

8.1.9 Product Assurance to witness torque.

QA Witness \_\_\_\_\_

8.1.10 Reattach the bottom sheet metal cover to the ECU unit and screw the sheet metal screws into the box hand tight.

**Approval of Section 8.1**

Approved: \_\_\_\_\_ Date: \_\_\_\_\_  
Integration Engineer

Discrepancies if any:

Approved: \_\_\_\_\_ Date: \_\_\_\_\_  
PTD

Approved: \_\_\_\_\_ Date: \_\_\_\_\_  
QA Representative

Approved: \_\_\_\_\_ Date: \_\_\_\_\_  
Integration Manager

**8.2 Mounting the ECU Unit**

**CAUTION**

**The ECU Unit is ESD Sensitive. Use appropriate ESD protection when handling the unit or installing associated cables.**

8.2.1 After the two bracket are mounted to the ECU unit, bring the unit up to the dewar by the installed -109 ECU Base Plate.

- 8.2.2 Verify the orientation of the ECU unit onto the ECU bracket. The ECU unit must have the J1, J3, J5, and J6 connectors pointing up toward the sunshade.
- 8.2.3 Lift the ECU unit onto the base plate oriented in the correct position and hold it against the base plate.
- 8.2.4 While one person is holding the ECU in place, the other person will attach the 8 each 10-32 x .75" long socket head cap screws, 8 each #10 flat washers, 8 each #10 lock washers, and 8 each 10-32 hex nuts. Tighten the screws hand tight.
- 8.2.5 Verify that there is one flat washer and one lock washer on each screw and nut.
- 8.2.6 After all the fasteners are installed on the bracket, torque the eight 10-32 screws per Note 7 to  $25 \pm 2$  in-lbs. per the 5834972 GP-B Bolt Torque Specification.

Torque Wrench Asset Number \_\_\_\_\_  
Calibration Due Date \_\_\_\_\_  
Final Torque Value \_\_\_\_\_

- 8.2.7 Product Assurance to witness torque.

QA Witness \_\_\_\_\_

- 8.2.8 Verify that all screws were torqued and the ECU unit is correctly oriented.

- 8.2.9 After the ECU unit is installed, measure the electrical resistance between the ECU unit and the 5856126 & 5856127 mounting brackets. The resistance is to be less than 0.0025 Ohms. Record data below.

ECU unit to mounting bracket \_\_\_\_\_  $\Omega$

- 8.2.10 Product Assurance to witness measurement.

QA Witness \_\_\_\_\_

**Approval of Section 8.2**



Approved: \_\_\_\_\_ Date: \_\_\_\_\_  
Integration Engineer

Discrepancies if any:

Approved: \_\_\_\_\_ Date: \_\_\_\_\_  
PTD

Approved: \_\_\_\_\_ Date: \_\_\_\_\_  
QA Representative

Approved: \_\_\_\_\_ Date: \_\_\_\_\_  
Integration Manager

### 8.3 Installing Cables to the ECU Unit

#### CAUTION

**The ECU Unit is ESD Sensitive. Use appropriate ESD protection when handling the unit or installing associated cables.**

8.3.1 Once the ECU is installed on the dewar bracket, install the following cables per Figure 1 from the Top Hat, Dewar Top Plate, Forward ECU and AFT ECU. Connect the cables to the connector savers on the flight Top Hat and Dewar connections. Prior to installing each cable, inspect the cable's connectors and mating connectors for bent or misaligned pins or sockets. If any contacts are discrepant, do not install the cable and notify Product Assurance in order to document the discrepancy.

- 8A00533-ECUGSE-101
- 8A01268-ECUGSE-101
- 8A01315-ECUGSE-101
- 8A01289-ECUGSE-101
- 8A01290-ECUGSE-101
- 8A01291-ECUGSE-101

8A00532-ECUGSE-101  
8A01970GSE-101  
Forward to AFT ECU GSE Cable #1  
Forward to AFT ECU GSE Cable #2

8.3.2 Verify that all the cables are installed in their proper locations and their fasteners are hand tight.

**Approval of Section 8.3**

Approved: \_\_\_\_\_ Date: \_\_\_\_\_  
Integration Engineer

Discrepancies if any:

Approved: \_\_\_\_\_ Date: \_\_\_\_\_  
PTD

Approved: \_\_\_\_\_ Date: \_\_\_\_\_  
QA Representative

Approved: \_\_\_\_\_  
Integration Manager

Date: \_\_\_\_\_

## 9. PROCEDURE COMPLETED

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

Test Engineer \_\_\_\_\_ Date \_\_\_\_\_

PTD \_\_\_\_\_ Date \_\_\_\_\_

Discrepancies if any:

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

Integration Manager \_\_\_\_\_ Date \_\_\_\_\_

QA Representative \_\_\_\_\_ Date \_\_\_\_\_

Quality Assurance \_\_\_\_\_ Date \_\_\_\_\_