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Gravity Probe B Relativity Mission

GSS ACU PAYLOAD PROCESSOR REMOVAL PROCEDURE

P/N 26226 Rev A S/N:

GP-B Procedure
P1080 Rev -

Prepared by: William Bencze Date
RE, Gyroscope Suspension System (GSS) Group

Approved by: William Bencze Date
Payload Electronics Manager

Approved by: Dorrene Ross Date
GP-B Quality Assurance

Table of Contents:

1.0 Revision History

Rev Level	Comments/notes	Date	Revised By
-	First release of this procedure	17-Mar-04	WJ Bencze

2.0 Scope:

This procedure describes the steps required to remove a Payload Processor (PN 199A-964-1) from a GSS Aft Suspension Unit (ACU, PN 26224-101).

This procedure also performs intermediate electrical testing steps needed to support investigations for DR 448. Following removal from the enclosure, the payload processor will be transported to Lockheed Sunnyvale for a detailed inspection and photo documentation of the condition of the unit.

All data recorded during this procedure is recorded in this document; each assembled unit will use its own copy of this procedure, and will be identified by serial number on the cover sheet.

This procedure records engineering data only; it does not perform any requirements verification activities.

3.0 Reference Documents

3.1. Assembly drawing, GSS Aft Control Unit, 26224.

3.2. Assembly drawing, GSS Aft Suspension Unit, 26226.

3.3. Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment, MIL-STD-1686

4.0 Facilities

4.1. Gravity Probe B flight electronics lab, LMCO B/255

4.2. LMCO inspection and photograph facilities (LMCO Sunnyvale, as-req'd)

4.3. Gravity Probe B flight electronics lab, HEPL End Station III Rm 175

5.0 QA Provisions:

5.1. This procedure shall be conducted on a formal basis to its latest approved and released version. The QA Program Engineer (D. Ross) and the government representative (E. Ingraham) shall be notified 24 hours prior to he start of this procedure. QA may monitor the execution of all or part of this procedure should they elect to do so.

QA notified at date/time:

Date/time:_____	Date/time:_____
GP-B QA (D. Ross)	Government Rep. (E. Ingraham)

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

6.0 Test Personnel

This procedure, in whole or part, is to be conducted only by the following personnel:

6.1. William Bencze (Stanford)

6.2. David Hipkins (Stanford)

7.0 General Instructions

7.1. Redlines can be initiated by the test personnel listed in Section 6.0 and must be approved by QA. Extension sheets are provided at the end of the document to record extensive redlines. Record the extension sheet number/steps as needed in the space provided at each step in this procedure

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

7.3. Any nonconformance or test anomaly should be reported by a Discrepancy Report. Refer to the Quality Plan, P0108, for guidance. Do not alter or break test configuration if a test failure occurs; notify quality assurance.

7.4. Only the following persons have the authority to exit/terminate procedure: Test operators listed in Section 6.0 and GP-B QA.

7.5. Epoxy mixing operations shall be witnessed by QA.

7.6. Only edges of screws shall be staked. Do not fill or contaminate the tool slots on screw heads when staking into position.

8.0 Hardware Safety Requirements:

8.1. This assembly is ESD sensitive; special care shall be exercised per the “Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment”, MIL-STD-1686

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

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

8.4. Connector savers shall be used on all flight interfaces unless otherwise specified.

9.0 Equipment list

The following support hardware, test equipment, or software will be used and the applicable information for the instruments shall be recorded below. Hand-written additions to this list may be made in the space provided.

Equipment Description		Make	Model	SN	Cal Due
9.1.	Multimeter (1)	Fluke			
9.2.	Multimeter (2)	Fluke			
9.3.	28VDC Power Supply				NA
9.4.	4-channel digital oscilloscope	LeCroy			
9.5.	Cable, APU J1 28V Pwr	LMCO	8A02774GSE-101	001	NA
9.6.	DB25 breakout Box	LMCO	8A01958GSE-101		NA
9.7.					
9.8.					

10.0 Acronyms

ACU	Aft Control Unit, PN 25224-101 Black anodized box.
APU	Aft Power Unit, PN BE02598032. Gold plated box.
ASU	Aft Suspension Unit, PN 26226101 (= APU + ACU)
PP	Payload Processor, PN 199A-964-1 (BAe, formerly LMFS)

11.0 Disassembly and electrical test operations:

#	Operation	Initials /Date	Inspect /Date	Extension
N	***Operations must occur in the order specified in this procedure. Please read through and understand this procedure completely before starting assembly.*** ***Cleanliness during the assembly process is essential to ultimate reliability and performance. Please follow cleaning and handling instructions carefully*** ***Facilities shall be ESD compliant per NHB530.4 (3L) or LMCO equivalent*** ***Modifications, additions or deletions to these instructions shall be recorded on the attached extension sheet and be given a unique extension number denoting the point of entry from this main procedure. The extension sheet may also be used to record hardware specific information. All information recorded on the extension sheet shall be maintained as a permanent part of this procedure*** ***Items designated as "N" are notes, and are listed in bold italic font.***	XXXXX	XXXXX	XXXXX

11.1. Initial Electrical Test

#	Operation	Initials /Date	QA Inspection	Extension
N	***Reference SU assy drawing 26226A during this operation.*** ***The initial electrical test verifies proper operation of the GSS power supply both in its unloaded and loaded condition.***	XXXX	XXXX	
A1.	Photograph all six sides of the ASU assembly prior to disassembly operation.		XXXX	
A2.	Verify ESD dust covers are installed on all connector bodies. Install as required.		XXXX	
A3.	Break staking and remove external APU/ACU interconnect cable, PN 8A01472-101		XXXX	
A4.	Inspect cable mating surfaces and pins for damage or contamination.		XXXX	
A5.	Place dust covers on mating ends of cable		XXXX	
A6.	Bag and tag cable; place in safe storage.		XXXX	
A7.	Inspect J12 connector on the Aft Control Unit (ACU). Install a connector saver. Finger tighten the jackposts to hold the saver in place.		XXXX	
A8.	Inspect J11 connector on the Aft Power Unit (APU). Install a connector saver. Finger tighten the jackposts to hold the saver in place.		XXXX	
A9.	Inspect J1 connector on the Aft Power Unit (APU). Install a connector saver. Finger tighten the jackposts to hold the saver in place.		XXXX	
A10.	Connect DB25 breakout box to APU J11; leave the APU J21 end unconnected (See Figure 1). Finger tighten jack screws on connector backshell.		XXXX	
A11.	Verify setting of power supply to be 28.0 ± 0.1 VDC Value:_____ VDC			
A12.	With power supply off, connect power supply to APU J1 with cable 8A02774GSE-101. Install DMM in line on positive side of power supply as a current monitor (See Figure 1)		XXXX	

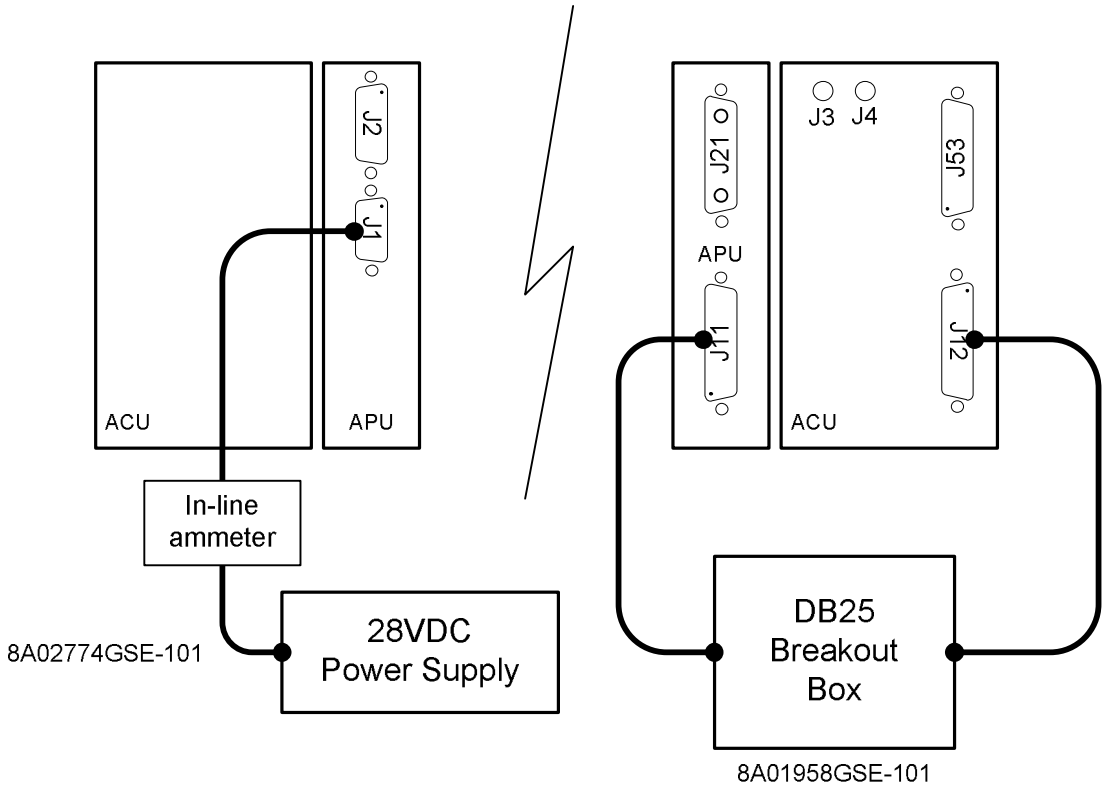

Figure 1 - Initial Electrical Test Setup

#	Operation	Initials /Date	QA Inspection	Extension
A13.	Connect digital scope to APU DB25 breakout box to the following signals: Ch 1: Pin 7 (5V pwr), Ch 2: Pin 6 (3.3V pwr), Ch 3: Pin 23 (Reset out). Ground reference is Pin 4 (digital return) Set scope at 50 ms/div, trigger on 2.5V, rising edge on reset signal (Ch 3)		XXXX	
A14.	Turn on 28 V power supply. Insure that the scope triggered properly on the rising edge of the reset signal and that the scope captured the power up profile of the 5 V and 3.3 V power supply.		XXXX	
A15.	Save an image of the scope screen. Attach to this procedure.		XXXX	

#	Operation	Initials /Date	QA Inspection	Extension
A16.	Using a handheld meter, measure and record the 5 V and 3.3 V signals with respect to digital power return (pin 4). Record in Table 1, col A			
A17.	Using a handheld meter, measure and record the reset signal output (pin 23) with respect to the digital power return (pin 4). Record in Table 1, col A			
A18.	Using a handheld meter, measure and record the ±15 V signals with respect to analog power return (pin 17). Record in Table 1, col A			
A19.	Power down 28 V supply		XXXX	
A20.	Save an image of the scope screen of the power supply shutdown profile. Attach to this procedure.		XXXX	
A21.	Connect the loose end of the breakout box to ASU J12.		XXXX	
A22.	Turn on 28 V power supply. Insure that the scope triggered properly on the rising edge of the reset signal and that the scope captured the power up profile of the 5 V and 3.3 V power supply.		XXXX	
A23.	Save an image of the scope screen. Attach to this procedure.		XXXX	
A24.	Using a handheld meter, measure and record the 5 V and 3.3 V signals with respect to Digital power return (pin 4). Record in Table 1, col B			
A25.	Using a handheld meter, measure and record the ±15 V signals with respect to analog power return (pin 4). Record in Table 1, col B			
A26.	Using a handheld meter, measure and record the reset signal output (pin 23) with respect to the digital power return (pin 4). Record in Table 1, col A			
A27.	Power down 28 V power supply.		XXXX	
A28.	Save an image of the scope screen of the power supply shutdown profile. Attach to this procedure.		XXXX	
A29.	Remove all cables from unit; place ESD dust caps on all unprotected connectors.		XXXX	
A30.	Operation sequence complete	XXXX		XXXX

Table 1 – Loaded and Unloaded APU Signal Measurements

Pin	Signal	A) Unloaded Measurement	B) Loaded Measurement
7	+ 5 Digital Power Out	V	V
6	+ 3.3 Digital Power Out	V	V
23	System Reset Out	-	-
4	Digital Power Return	-	-
18	+ 15 Analog Power Out	V	V
19	- 15 Analog Power Out	V	V
17	Analog Power Return	-	-
23	APU Reset out	V	V
N/A	28 V input current	mA	mA

11.2. APU Removal

#	Operation	Initials /Date	QA Inspection	Extension
N	***Reference SU assy drawing 26226A during this operation. Disassembly proceeds approximately in the opposite order of assembly of the unit.*** ***Use a vacuum cleaner or other dust collection device to collect staking fragments that will come off the unit when screws are removed.*** ***All operations are to be performed with ESD protection and with latex gloves to protect the flight hardware from contamination.***	XXXX	XXXX	XXXX
B1.	Orient the ASU so that the broad, gold plated surface of the APU is upward.		XXXX	
B2.	Remove the 14ea NAS1101-3-38 (size 10) bolts and washers that hold the APU to the APU.		XXXX	
B3.	Place ESD dust caps on all unprotected connectors on APU.		XXXX	
B4.	Lift off APU; store in a ESD-safe bag/enclosure.		XXXX	
B5.	Bag and tag bolts and washers. Store with APU unit.		XXXX	
B6.	Operation sequence complete	XXXX		XXXX

11.3. Box Disassembly

#	Operation	Initials /Date	QA Inspection	Extension
N	***Reference SU assy drawing 26224A during this operation. Disassembly proceeds approximately in the opposite order of assembly of the unit, to the point where the Payload Processor is removed.*** ***Use a vacuum cleaner or other dust collection device to collect staking fragments that will come off the unit when screws are removed.*** ***All operations are to be performed with ESD protection and with latex gloves to protect the flight hardware from contamination.***	XXXX	XXXX	XXXX
C1.	Remove jackposts and washers from ACU J51, J5, J6, J23, and J22 (10 places) [See 26224A P10]		XXXX	
C2.	Bag and tag jackposts and washers.		XXXX	
C3.	Remove NAS1101 (size 4) screws and washers (30 places) from cover. [See 26224A P9]		XXXX	
C4.	Bag and tag screws and washers.		XXXX	
C5.	Gently remove cover (8A02427-101) and set aside.		XXXX	
C6.	Remove EMI gasket braid; bag and tag. Set aside.		XXXX	
C7.	Photograph inside of ACU box. Make a closeup photo of processor card end flange and surrounding cabling.		XXXX	
C8.	With the unit oriented so that the opening is upward, loosen and remove the jam nuts on the 1553 connectors, J3 and J4. [See 26224A P8]		XXXX	
C9.	Clip and remove cable ties holding the 1553 extension cables to the tiedown blocks. (3 places). Discard.		XXXX	
C10.	Gently disconnect the 1553 cables from the connectors on the processor faceplate at P1 and P2 Bag and tag cables and jam nuts.		XXXX	

#	Operation	Initials /Date	QA Inspection	Extension
C11.	Remove vent plug assembly. Bag and tag 4 screws, 4 washers, 1 o-ring, 1 sintered disk, and 1 housing.		XXXX	
C12.	Bag and tag vent assy hardware.		XXXX	
C13.	Release the cam locks on the payload processor assembly via the access holes on the faceplate of the processor assembly.		XXXX	
C14.	Unscrew mounting screws on payload processor. This screws are captive on the payload processor face plate and will remain with the unit.		XXXX	
C15.	Prepare a clean ESD safe surface roughly 2 feet square to receive the processor once removed from the unit.		XXXX	
C16.	Insert two 10-32 x 2 inch cap screws about 3 turns into the threaded cam lock access holes on the faceplate of the payload processor.		XXXX	
C17.	Remove the payload processor from its slot by gently pulling on the 10-32 screws and rocking the processor board from side to side. The processor will slide out of the slot easily once the backplane connector disengages.		XXXX	
C18.	Place processor board onto prepared surface.		XXXX	
C19.	Photograph both sides of processor card.		XXXX	
C20.	Replace cover onto ASU. Hold in place with 6 to 8 screws, hand tightened.		XXXX	
C21.	Cover all unprotected connectors with ESD connector caps.		XXXX	
C22.	Operation sequence complete	XXXX		XXXX

11.4. Payload Processor Inspection

#	Operation	Initials /Date	QA Inspection	Extension
N	***Reference SU assy drawing 26224A during this operation. Disassembly proceeds approximately in the opposite order of assembly of the unit, to the point where the Payload Processor is removed.*** ***Use a vacuum cleaner or other dust collection device to collect staking fragments that will come off the unit when screws are removed.*** ***The APU may remain bolted to the ACU during this operation.*** ***All operations are to be performed with ESD protection and with latex gloves to protect the flight hardware from contamination.***	***XXXX***	***XXXX***	***XXXX***
D1.	Package Payload Processor in ESD bag and place is a padded transport container for shipment		XXXX	
D2.	Transport unit to LMCO inspection lab. Inspect and photograph as required per LMCO engineering and QA direction			
D3.	Package Payload Processor in ESD bag and place is a padded transport container for shipment		XXXX	
D4.	Transport unit LMCO GP-B B/255.		XXXX	

11.5. Procedure closure

#	Operation	Initials /Date	QA Inspection	Extension
E1.	Engineering signoff – procedure complete.		XXXX	XXXX
E2.	QA signoff – procedure complete.	XXXX		XXXX

Extension Sheet

E#	Extension Description	Initials /Date	Inspect /Date

Page ___ of ____

Duplicate as needed