

PFR-062 Title: Inst Suite TV EFI V1 Failing Functional Tests

Assembly : EFI	SubAssembly : SPB-1 (S/N SPB-904)	
Component : n/a	Units Affected:	Units fixed:
Originator: John Bonnell	<input checked="" type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/>	<input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/>
Organization: UCBSSL	Date: 1 June 2005	
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Failure Occurred During (Check one ✓)

☒ Functional test ☐ Qualification test ☐ S/C Integration ☐ Launch operations ☐ Other (Flight Assy)

Environment when failure occurred:

☐ Ambient ☐ Vibration ☐ Shock ☐ Acoustic
☐ Thermal ☐ Vacuum ☒ Thermal-Vacuum ☐ EMI/EMC

Problem Description

(In this section it is important to document the specific symptoms of the problem. In the event we see it happen again, we would like to know as much as possible.)

During TVAC testing of the FM1 instrument suite, one of the channels (V1, and associated differential E channels) of the EFI began to fail its DC and AC Functional tests. These functional tests were routinely performed as part of the Suite-level LPT throughout the TVAC cycling of the FM1 Suite.

The failure became apparent during the first cold soak, where the V1 channel failed to respond to the normal AC excitation provided internally by the BEB ACTEST line, and where the amplitude of the response of the V1 channel to the normal DC excitation provided by the BEB BIAS line was reduced. The response of the V1 channel to DC and AC excitations was tracked through the 4th TVAC cycle, and it was found that the failure to respond to DC and AC excitation came and went intermittently with temperature, and did not follow any clear pattern.

The V1 channel's response to DC and AC excitation returned to normal at room temperatures, both in vacuum and at ambient pressure.

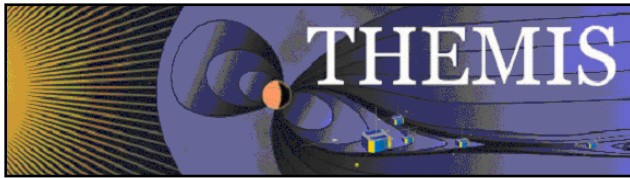
On the basis of the symptoms, it was felt that one of several causes could be at work: intermittent high- and low-impedance shorting of the V1 sensor to electrical ground via contacts in SPB-904 or temperature-dependent components on the BEB; failure of the ACTEST and/or BIAS lines for V1 on the BEB.

Analyses Performed to Determine Cause
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(How do we know how the failure happened? Was it a bad part, bad handling, what?)

The FM1 Instrument suite was brought out of TVAC (6 June 2005), and all Flight and test harnessing associated with each of the 6 EFI boom units were inspected. No obvious de-mating or connector problems were found upon inspection.

SPB-904 was de-mated from Flight harness and a boom-level CPT (electrical isolation and continuity; DC Functional; AC Functional) was performed with the sensor in stowed configuration. All results of the CPT were nominal, except for a relatively low resistance (300 ohms rather than few kohms) noted for the circuit through the Sphere Contact (a potential single-point of failure common to the electrical paths used in the DC and AC Functional tests). While out-of-family, such a low resistance in and of itself would not produce the effects noted during TVAC testing.



The exposed portions of the Sphere Contact were inspected by the CogME with the sensor in stowed configuration, and the Sphere Contact was found to be in its nominal position.

The doors of SPB-904 were opened manually (rather than electrically), and the following items and locations inspected: PEEK door insulators and metallization of same examined for obvious grounding paths – nominal, no obvious grounding paths found; Sensor surface (DAG-213), examined for scratches and other blemishes – nominal, no obvious signs of mistreatment, improper stowage or misalignment; Sphere Contact, inspected for proper position of conductive foam pad – nominal.

SPB-904 was returned to its fully-stowed configuration, and both it and the FM1 IDPU were placed in a TVAC chamber, with separate harnessing leading to each. The stowed boom-level LPT (electrical isolation and continuity; DC functional) was performed several times on SPB-904 over the temperature range from room temperature (approx. 25 C) down to –40 C (the Suite cold soak temperature); each time the results were nominal, and indicated no problems with the grounding and isolation of the V1 sensor.

Concurrent with the LPTs on SPB-904, tests of the functionality of the ACTEST and BIAS outputs of the BEB were made – the results of these tests were nominal, with the ACTEST line for each of the six EFI channels producing the nominal 5-Vpp 128-Hz square wave, and the BIAS lines responding with their full +/- 40-volt dynamic range upon command from the IDPU.

SPB-904 was then connected to BEB channels 1,2, and 4 in turn, and the usual suite-level DC and AC functional tests performed at the cold soak temperature of –40 C (channel 3 was not used due to a benign short in the test harness of that channel); in each case, the sensor's response to excitation was nominal, and the unit passed the functional test.

The FM1 EFI flight harness was checked for proper electrical isolation and continuity at room temperature; it passed.

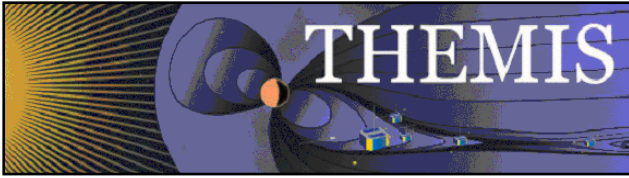
SPB-904 and the FM1 IDPU were returned to the FM1 Suite, and TVAC testing resumed (10 June 2005).

No obvious cause of this failure has been found as of this date (13 June 2005).

Corrective Action/ Resolution

(How do we fix the unit? And how do we make sure it doesn't happen again?)

Because no obvious cause of the failure has been found as of this date, there is no clear corrective action to be taken.



Problem/Failure Report
THM_PFR_0

Acceptance:

MAM: Ron Jackson _____; MSE: Ellen Taylor _____

PM: Peter Harvey _____; Cognizant Engineer _____

Date of Closure _____