STEREO IMPACT

PR Numbers: 1xxx=UCB, 2xxx=Caltech/JPL, 3xxx=UMd, 4xxx=GSFC/SEP, 5xxx=GSFC/Mag, 6xxx=CESR, 7xxx=Keil, 8xxx=ESTEC, 9xxx=MPAe

Assembly : PLASTIC FM2	**SubAssembly :** LVPS
Component/Part Number: 8W9444503-014	**Serial Number:** FM2
Originator: Selda Heavner	**Organization:** U.C. Berkeley
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Failure Occurred During (Check one √)

v Functional test | Qualification test | S/C Integration | Launch operations

Environment when failure occurred:

Ambient | Vibration | Shock | Acoustic
Thermal | Vacuum | v Thermal-Vacuum | EMI/EMC

Problem Description

UNH observed out of range output voltages when Plastic LVC was started at cold temperatures when integrated with the flight instrument. UNH reported that at cold temperatures between 1.7°C and 6.7°C (read on internal temperature sensors) the output voltages ±12V were at ±11.5 to 11.8 and LVC output voltage +5.5V was at 4.6V. UNH also detected the ±12 supply line increasing to ±13.6V after several minutes of operation as well as +5.5V supply line reaching +5.0V.

Analyses Performed to Determine Cause

Plastic LVC FM2 was placed in environmental chamber with nitrogen flowing into the antistatic bag. The converter was cooled down to –8.0°C. The converter was left in the chamber without turning it on for two hours. Plastic LVC was then turned on with a test load. The voltages were recorded every 30 minutes. The bench supply voltage was set at 28.02V.

10:30am		
Signal	**Output**	**Current**
+5.5V	5.39V	430mA
-5.5V	-5.73V	26mA
+12V	12.68V	222mA
-12V	-12.76V	63mA
2.5VA	2.460V	120mA
2.5VB	2.427V	420mA
11:00am		
Signal	**Output**	**Current**
+5.5V	5.00V	430mA
-5.5V	-5.35V	26mA
+12V	11.79V	222mA
-12V	-11.88V	63mA
2.5VA	2.459V	120mA
2.5VB	2.426V	420mA
11:35am		
Signal	**Output**	**Current**
+5.5V	4.93V	430mA
-5.5V	-5.29V	26mA
+12V	11.66V	222mA
-12V	-11.75V	63mA
2.5VA	2.459V	120mA
2.5VB	2.426V	420mA

After reproducing the problem the LVC was taken out of the environmental chamber. While troubleshooting the cause of voltage drop, UCB also found instability at +5.5V when the circuit was heated with a heat gun. The instability however diminished when pressure was applied on the Norwee holder that incapsulates the main transformer.

The voltage drop in +5.5V and +12V lines are due to temperature difference at two diodes D28 and D29. D29 was installed on the side facing the cover due to mechanical restrictions. D29 and D28 must remain on the same side and relatively close together for thermal compensation.

The instability is due to a crack in T1 transformer's core. The core was investigated under microscope and a very small crack was found. There is also some concern about how this transformer was mounted. The Norwee holder seems to relax with time, reducing the pressure that holds the core together; epoxy had been used between the bobbin and core to work around this problem, but there is concern about what happens over temperature. It is not clear if this holder and epoxy issue might be related to the crack.

May 17, 2005: FM2 was assembled in final configuration. FM2 passed the room temperature functional test. Then FM2 was placed in –20°C chamber and left to soak for an hour. When 28.0V supply was turned on 5.5V went to 6.1V and the bench supply was current limiting. The test was stopped immediately. The supply at room temperature was still consuming more current and +5.5V was 5.63V. The ripple at cathode of D28 was bigger than expected.

Corrective Action/ Resolution

Rework v Repair Use As Is Scrap

UNIT (FM1/FM2)_____

Solution of ±12 and ± 5.5V line drop:

1- Remove D28 and solder a new diode (JANTXV1N5711-1) on the same side as D29.

D/C: _____

Completed by: _____ Date: _____

Solution for Instability

2- New transformer will be wound and placed in the circuit (without using epoxy between the bobbin and core to hold the core together; just the usual epoxy to hold the bobbin in place)

T1 tested: _____

Completed by: _____ Date: _____

3- Confirm if the current transformer T2 has the right configuration. If not, replace the transformer.

T2 tested: _____

Completed by: _____ Date: _____

4- Instead of Norwee Holders the core will be held in place by a Bellville washer, a 18-8 Stainless Steel 4-40 Pan Head Machine Screw 0.780 inches long and a 4-40 Small Pattern Nut.

Completed by: _____ Date: _____

5- Replace R15 with a 3.01KΩ resistor (D55342H07B3E01R)

D/C:_____

Completed by: _____ Date: _____

6- Change R29 to a 10.0K Ω resistor (D55342H07B10E0R)

D/C:_____

Completed by: _____ Date: _____

7- Change T4 to TN16/9.6/6.3 –3F3 material (back to T4 rev 02).

T4 tested: _____

Completed by: _____ Date: _____

8- Replace C48 0.1µF (M123A02BXC104KC) capacitor. (During bench test this capacitor was also removed but Rev 08 value will be kept).

D/C:_____

Completed by: _____ Date: _____

9- Stake and Coat all the components that were changed or replaced. Attach a mixing record sheet. For T1 staking : Staking must be surrounding the nut per Mechanical Engineer's instructions.

Completed by: _____ Date: _____

May 17, 2005 problem fix:

10- Replace D28 with JANTXV1N5711-1 diode. Record the D/C below

D/C: _____

Completed by: _____ Date: _____

11- Replace C61 with a 1000pF capacitor (CCR06CG102FR)

D/C:_____

Completed by: _____ Date: _____

12- Stake and Coat all the components that were changed or replaced. Attach a mixing record sheet.

Completed by: _____ Date: _____

Inspected by:_____Date:_____

The LVPS tests (including thermal tests and stability tests) will then be repeated at UCB to verify the fix. Then the unit will be returned to UNH, re-integrated with the flight instrument, and tested under the same conditions that caused the original problem.

Date Action Taken:_____ **Retest Results**:_____

Corrective Action Required/Performed on other Units v Serial Number(s): ____FM1*___
*Note: The diodes will be collocated on Plastic LVC although FM1 did not demonstrate the same problem as FM2 (perhaps because it was never in exactly the same configuration). According to UNH, Plastic LVC FM1 ±12V lines increased to approximately ±14V but +5.5V line did not drop to 4.96V. Instability test will be applied to FM1 to see if there is a core problem. If there is no problem, existing core will be kept and mechanical mounting change will occur on FM1 even the core is not cracked.

Closure Approvals

Subsystem Lead:	_____	Date:_____
IMPACT Project Manager:	_____	Date _____
IMPACT QA:	_____	Date:_____
NASA IMPACT Instrument Manager:	_____	Date:_____