

STEREO IMPACT

PROBLEM REPORT

PR-1033

FM1 SWEA I/F Errors

2005-01-18

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

Assembly : <u>SWEA/STE-D</u>	SubAssembly :
Component/Part Number:	Serial Number: <u>FM1</u>
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Failure Occurred During (Check one)

Functional test Qualification test S/C Integration Launch operations

Environment when failure occurred:

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

Problem Description

During SWEA/STE-D FM1 Thermal Balance test a low rate of interface errors (few/hour) occurred when the unit was cold and the operational heater was cycling. Most errors were caught and reported, but one managed to cause the instrument to disable the MCP HV. The MCP HV is hard to turn on accidentally (it takes 2 commands within 15 seconds), but relatively easy to turn off. The errors did not occur if the heater was off or on 100%, only when it cycled. It only occurred when the unit was below ~0C.

Analyses Performed to Determine Cause

The interface errors are caused by noise on the serial interface clock line. The noise seems to be the result of a number of things. First there is some ringing on the serial interface clock line. It is not enough to cause a problem by itself because of the hysteresis of the receiver (54AC14), but it is ~75% of the minimum data sheet hysteresis, so it increases the sensitivity to other noise on the line. Next there is some cross talk between the clock and other signals in the harness due to the extenders we used to get through the thermal vac wall, which were not shielded like the flight harnesses. Finally there is a small amount of cross-talk between the clock and power lines in the harness or harness extenders results in noise on the clock when switching on/off the SWEA operational heater. All these have to occur at the same time to cause the problem, which explains how infrequent it is.

It is hard to replicate exactly what we saw in thermal balance on the bench, but we do see the combination of these effects approaching being large enough to cause extra clock signals. We could probably solve the problem by using shielded harness extenders, but we would like to increase the noise immunity.

We find that if we add a small (47pF) capacitor between the 1Kohm series resistor at the input to the receiver and ground we can significantly reduce all noise sources while not significantly slowing down the clock (there seems to be adequate timing margins on the serial interface).

Corrective Action/ Resolution

Rework Repair Use As Is Scrap
Capacitors added and tested. Noise levels at the clock signal receiver are reduced. Thermal Vac test prove that the margins are adequate over temperature.

Date Action Taken: 2005-1-26 **Retest Results:** Success

Corrective Action Required/Performed on other Units Serial Number(s): FM2

Closure Approvals

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

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