

PFR-113 Title: FM3 IDPU Reset during EFI AC Continuous Mode Assembly : IDPU SubAssembly : DCB **Component : FSW Units Affected:** Units fixed: **Originator:** Ellen Taylor - - X - - -_ – X – _ Organization: UCB Date: 10/19, 10/20/05 **Phone:** (510) 643-4054 Email : ertaylor@ssl.berkeley.edu **Failure Occurred During (Check one** $\sqrt{}$) $\sqrt{\text{Functional test}}$ \Box Qualification test \Box S/C Integration \Box Launch operations \Box Other (Flight Assy) **Environment when failure occurred**: □ Ambient □ Vibration □ Shock □ Thermal □ Vacuum √ Thermal-Vacuum □ EMI/EMC **Problem Description**

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

On 10/19, during overnight testing of the FM3 EFI V1 sphere in Thermal Vacuum, the FM3 IDPU reset 6 times. The APID 404 engineering packet showed anomalous data was being repeat-ably sent from the IDPU. On 10/20, during overnight testing again, the APID 404 engineering packet again showed anomalous data after about 4 hours of testing.

Analyses Performed to Determine Cause

(How do we know how the failure happened? Was it a bad part, bad handling, what?)

On 10/19, after approximately 4 hours of successful operation, 6 resets occurred in a relatively short amount of time. After the 6th reset, the command counter logged approximately 50 commands/sec and then the IDPU seemed to lock-up completely. The exact same anomalous APID 404 packet was being repeatably sent. Commands were sent to try and change the power state of the IDPU, but apparently not executed. See the attached IDL graphs of data. Finally, a /IDPURESET command was sent and successfully executed. After which, the 404 packet apparently recovered.

On 10/20, no resets occurred. However, after approximately 4 hours of successful operation, only half of the APID 404 data was being built correctly. For example, the clock was seen not only after the header, but midway through the packet as well. See attached screen shot of 404 packet. Finally, the incorrect data address was identified and the correct data was loaded. After which, the 404 packet apparently recovered.

<u>Tests Performed</u>. As soon as PFRs 109, 110 and 113 were logged, the instrument configuration (Version 2.09 and instrument in Continous Mode) was duplicated on the ETU IDPU. After several hours the IDPU reset similar to PFR110.

Numerous attempts to localize the failure to a single instrument failed, the theory developed that it was a resource overload due to running all of the instruments at the same time.

A small diagnostic was introduced to determine the interrupt routine last executed before the crash. This routine saves the data in an area of RAM not cleared upon reset. In this configuration, two resets were found and both were interrupt 0x13 (19) of the ISR7.5 interrupt which occurs at 256 Hz.

Interrupt 13H services the ETC (ESA and SST) packets as well as ESA High Voltage management. Additional sentry diagnostics were added to determine where the interrupt gets to when the crash occurs, but this yielded no definitive result.



Based upon evidence that the flight code was being modified (109, 113) an additional diagnostic was developed to determine which memory locations are being modified. This would give a "heads up" when the system did something to the main program. However, this process never found a source for the change.

At this point, the interrupt time for ISR7.5 was measured and found 13H as the longest interrupt. By viewing the logic analyser log against the source code, it was clear that the interrupt was trying to do too much on a single 3.9 msec interrupt. The design allocation was 2 msec for telemetry handlers. Thus, an SCR-29 was issued to move the ETC TM handler to its own interrupt. The configuration should yield 1.2 msec on 13H and on the 4 BKG interrupts (08H, 18H, 28H, 38H). SCR-29 was built into Version 2.13 (2D)

Tested Version 2.13 for 10 days from Oct 28 to Nov 7th and had no crashes or other obvious anomalies. The diagnostics were checked to determine if the flight program had changed and there were no occurrences.

Corrective Action/ Resolution

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

Upgrade to Version 2.13 or later and rerun the procedure.

Acceptance:	
MAM: Ron Jackson	; MSE: Ellen Taylor
PM: Peter Harvey	; Cognizant Engineer

Date of Closure_____

A. Test Script

REM REM TEST_PFR109_diags.CMD REM START c:\IDPU Testing\Scripts\IDPU\RUNV21.cmd

START c:\IDPU Testing\Scripts\Instrument_Functional_Procedures\INST_CONT_MODE_F2_hot.CMD

/idputable a 5 /idpuload 1 /idpuload 1 /idpuload 1 /idpuload 1 /idpuload 1

START c:\IDPU Testing\Scripts\IDPU\DIAGS.raw /IDPUCMDS 1 /IDPUEXEC

/IDPUDUMPADRH 7F /IDPUDUMPADRL 00