

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE**  
**NUMBER:05-3A-ADC1 -X**

**SUBSYSTEM NAME:** MULTIFUNCTION ELECTRONIC DISPLAY SUBSYSTEM  
**REVISION:** 1 12/05/97

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**PART DATA**

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<b>PART NAME</b>	<b>PART NUMBER</b>
<b>VENDOR NAME</b>	<b>VENDOR NUMBER</b>
LRU : CONVERTER, ANALOG-TO-DIGITAL	MC409-0185-003X

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**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**  
 CONVERTER, ANALOG-TO-DIGITAL, (ADC 1A, & ADC 1B), "MPS, OMS, SPI"

**REFERENCE DESIGNATORS:** 30V73A181A1  
 30V73A181A2

**QUANTITY OF LIKE ITEMS:** 2  
 TWO

**FUNCTION:**  
 ACCEPTS SUBSYSTEM PARAMETERS FROM THE SUBSYSTEM AND/OR MDM. PERFORMS ANALOG TO DIGITAL CONVERSION, STORES CONVERTED SIGNALS INTERNALLY, AND TRANSMITS TO ASSOCIATED INTEGRATED DISPLAY PROCESSORS (IDP) UPON REQUEST VIA THE MEDS 1553B DATABUSES. AFTER PROCESSING THE DATA RECEIVED FROM THE ADC'S, THE ASSOCIATED IDP'S OUTPUT FORMATTED DISPLAY DATA TO THE APPROPRIATE MULTIFUNCTION DISPLAY UNITS (MDU'S).

THE FOLLOWING IS THE INFORMATION THAT IS PROCESSED BY THE ADC'S AND IDP'S PRIOR TO DISPLAY ON THE MDU'S:

MAIN PROPULSION SYSTEM (MPS) - LEFT/CENTER/RIGHT SSME CHAMBER PRESSURE, LO2/LH2 MPS MANIFOLD PRESSURE, AND MPS HELIUM PRESSURE (TANK SUPPLY OR REGULATOR OUTLET PRESSURE FOR PNEUMATIC/LEFT/CENTER/ RIGHT HELIUM SYSTEMS)

ORBITAL MANEUVERING SYSTEM (OMS) - LEFT/RIGHT OMS CHAMBER PRESSURE, LEFT/RIGHT NITROGEN (N2) TANK PRESSURE, AND LEFT/RIGHT HELIUM (HE) TANK PRESSURE.

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SURFACE POSITION INDICATOR (SPI) - PROVIDES THE ACTUAL AND COMMANDED POSITIONS OF THE SPEED BRAKE, AND PROVIDES THE ACTUAL POSITIONS OF THE ELEVONS, BODY FLAPS, RUDDER, AILERON.

**FAILURE MODES EFFECTS ANALYSIS FMEA - NON-CIL FAILURE MODE**  
**NUMBER: 05-3A-ADC1-01**

**REVISION#: 1 04/26/98**

**SUBSYSTEM NAME: MULTIFUNCTION ELECTRONIC DISPLAY SUBSYSTEM**  
**LRU: CONVERTER, ANALOG-TO-DIGITAL**  
**ITEM NAME: CONVERTER, ANALOG-TO-DIGITAL**  
**CRITICALITY OF THIS FAILURE MODE: 1R3**

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**FUNCTIONAL CRITICALITY/**  
**REQUIRED FAULT TOLERANCE/ACHIEVED FAULT TOLERANCE:1R/2/4**

**FAILURE MODE:**  
**LOSS OF OUTPUT**

**MISSION PHASE:** PL PRE-LAUNCH  
LO LIFT-OFF  
OO ON-ORBIT  
DO DE-ORBIT  
LS LANDING/SAFING

**VEHICLE/PAYLOAD/KIT EFFECTIVITY:** 102 COLUMBIA  
103 DISCOVERY  
104 ATLANTIS  
105 ENDEAVOUR

**CAUSE:**  
PIECE-PART FAILURE (MECHANICAL STRESS, VIBRATION), CONTAMINATION, ELECTRICAL STRESS, THERMAL STRESS, PROCESSING ANOMALY, RADIATION

**CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO**

**CRITICALITY 1R2 DURING INTACT ABORT ONLY (AVIONICS ONLY)? NO**

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**REDUNDANCY SCREEN** A) PASS  
B) PASS  
C) PASS

**PASS/FAIL RATIONALE:**

- A)
  
  
- B)
  
  
- C)

**METHOD OF FAULT DETECTION:**

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VISUAL; LOSS OF THE ADC WILL BECOME APPARENT WHEN THE INFORMATION IS CALLED UPON FOR DISPLAY. ADC FAILURES MAY ALSO RESULT IN MEDS MESSAGE.

**MASTER MEAS. LIST NUMBERS:** V72M5680P  
V72M5750P  
V72M5840P  
V72M5840P  
V98M3980P  
V98M4863P

**CORRECTING ACTION:** MANUAL

**CORRECTING ACTION DESCRIPTION:**  
CREW CAN UTILIZE THE REDUNDANT AD/C BY SELECTING A DIFFERENT IDP.

**REMARKS/RECOMMENDATIONS:**  
NONE

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**- FAILURE EFFECTS -**

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**(A) SUBSYSTEM:**  
LOSS OF ONE ADC

**(B) INTERFACING SUBSYSTEM(S):**  
NO EFFECT FIRST FAILURE

**(C) MISSION:**  
NO EFFECT FIRST FAILURE

**(D) CREW, VEHICLE, AND ELEMENT(S):**  
NO EFFECT FIRST FAILURE

**(E) FUNCTIONAL CRITICALITY EFFECTS:**  
POSSIBLE LOSS OF CREW/VEHICLE AS A RESULT OF THE INABILITY TO RESPOND TO SYSTEM FAILURES:

CASE 1:  
FIRST FAILURE - LOSS OF ASSOCIATED ADC  
SECOND FAILURE - LOSS OF REDUNDANT ADC

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THIRD FAILURE - LOSS OF CAUTION & WARNING ALARM  
FOURTH FAILURE - LH2 TOPPING VALVE (PV13) FAILS TO REMAIN OPEN  
FIFTH FAILURE - LH2 MANIFOLD RELIEF SYSTEM FAILS TO RELIEVE

CREW USES THE LH2/LO2 MANIFOLD PRESSURE PARAMETER TO DETERMINE WHICH PROPELLANT MANIFOLD REQUIRES IMMEDIATE VACUUM INERTING. PRESSURE BUILDUP DUE TO A RELIEF SYSTEM FAILURE WILL CAUSE A MANIFOLD RUPTURE, RESULTING IN LEAKAGE OF PROPELLANT INTO THE AFT COMPARTMENT RESULTING IN POSSIBLE AFT COMPARTMENT OVERPRESSURIZATION AND A FIRE/EXPLOSION HAZARD. POSSIBLE LOSS OF CRITICAL ADJACENT COMPONENTS DUE TO CRYOGENIC EXPOSURE.

**CASE 2:**

FIRST FAILURE - LOSS OF ASSOCIATED ADC  
SECOND FAILURE - LOSS OF REDUNDANT ADC  
THIRD FAILURE - LOSS OF CAUTION & WARNING ALARM  
FOURTH FAILURE - MPS HELIUM LEAK (CREW IS UNAWARE OF THE SITUATION AND ALLOWS PRESSURE IN THE SEAL TO DROP BELOW REDLINE RESULTING IN SSME SHUTDOWN.)  
FIFTH FAILURE - LOSS OF SECOND SSME

FAILURES WILL RESULT IN A CONTINGENCY (NON-INTACT) ABORT UNLESS SINGLE ENGINE PRESS-TO-MECO OR TAL CAPABILITY EXISTS.

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**- TIME FRAME -**

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**TIME FROM FAILURE TO CRITICAL EFFECT: MINUTES**

**TIME FROM FAILURE OCCURRENCE TO DETECTION: IMMEDIATE**

**TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: IMMEDIATE**

**IS TIME REQUIRED TO IMPLEMENT CORRECTING ACTION LESS THAN TIME TO EFFECT?  
YES**

**RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:  
N/A (CORRECTIVE ACTION CAN BE COMPLETED BEFORE CRITICAL EFFECT)**

**HAZARD REPORT NUMBER(S):**

**HAZARD(S) DESCRIPTION:**

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**- APPROVALS -**

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SS&PAE ENGR  
MEDS SYSTEM  
MEDS HARDWARE

: N. D. NGUYEN  
: M. B. WARNER  
: R. M. SITAPARA

: *N. D. Nguyen*  
: *M. B. Warner*  
: *Ramith Sitapara 4/28/98*