

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE**

NUMBER: 05-6-2213 -X

SUBSYSTEM NAME: ELECTRICAL POWER DISTRIBUTION &amp; CONTROL

REVISION: 0 05/03/88

**PART DATA**

PART NAME	PART NUMBER
VENDOR NAME	VENDOR NUMBER
LRU : PANEL R1A1	V070-730275
SRU : SWITCH, TOGGLE	ME452-0102-7301

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**

SWITCH, TOGGLE, 3PDT - FUEL CELL TO ESSENTIAL BUS CONTROL

**REFERENCE DESIGNATORS:** 32V73A1A1S7  
 32V73A1A1S8  
 32V73A1A1S9

**QUANTITY OF LIKE ITEMS:** 3  
 THREE-ONE PER ESSENTIAL BUS

**FUNCTION:**

PROVIDES CAPABILITY TO CONNECT THE FUEL CELL TO AND DISCONNECT THE FUEL CELL FROM THE ESSENTIAL BUS ON TWO CONTACT SETS. OTHER CONTACT SET PROVIDES SWITCH SCAN TO MDM'S AND ESS BUS FEED TO DISPLAYS AND CONTROL PANELS R12, O14, O15, O16, C3, F9, O6, O7, O8, A11, R1 AND R2.

**FAILURE MODES EFFECTS ANALYSIS FMEA – NON-CIL FAILURE MODE**

NUMBER: 05-6-2213- 01

REVISION#: 1 07/26/99

SUBSYSTEM NAME: ELECTRICAL POWER DISTRIBUTION &amp; CONTROL

LRU: PANEL R1A1

CRITICALITY OF THIS

ITEM NAME: SWITCH, TOGGLE

FAILURE MODE: 1R3

**FAILURE MODE:**

FAILS OPEN, PREMATURELY OPENS, SHORTS TO GROUND (FUEL CELL TO ESSENTIAL BUS CONTACTS)

**MISSION PHASE:**

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

<b>VEHICLE/PAYLOAD/KIT EFFECTIVITY:</b>	102	COLUMBIA
	103	DISCOVERY
	104	ATLANTIS
	105	ENDEAVOUR

**CAUSE:**

PIECE PART STRUCTURAL FAILURE, CONTAMINATION, VIBRATION, MECHANICAL SHOCK, PROCESSING ANOMALY

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

<b>REDUNDANCY SCREEN</b>	A) PASS
	B) N/A
	C) PASS

**PASS/FAIL RATIONALE:**

A)

B)

"B" SCREEN IS "N/A" BECAUSE FAILURE OF AT LEAST TWO REMAINING PATHS IS READILY DETECTABLE IN FLIGHT (LOSS OF LAST ESSENTIAL BUS SOURCE, POWER CONTACTOR, REDUNDANT VALVE CLOSURE).

C)

- FAILURE EFFECTS -

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL FAILURE MODE  
NUMBER: 05-6-2213- 01**

**(A) SUBSYSTEM:**

LOSS OF ONE OF THREE SOURCES TO AN ESSENTIAL BUS. ESSENTIAL BUS IS LEFT WITH TWO MAIN BUSES AS POWER SOURCES.

**(B) INTERFACING SUBSYSTEM(S):**

FIRST FAILURE - NO EFFECT. TWO OTHER FAILURES MUST OCCUR BEFORE THE AFFECTED ESSENTIAL BUS LOADS ARE LOST.

**(C) MISSION:**

SAME AS (B)

**(D) CREW, VEHICLE, AND ELEMENT(S):**

SAME AS (B)

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

POSSIBLE LOSS OF CREW/VEHICLE AFTER FIFTH FAILURE (FAILED CLOSED POWER CONTACTOR) DUE TO INABILITY TO SAFE FUEL CELL WHEN FUEL CELL COOLING IS LOST. LOSS OF REDUNDANT REACTANT VALVE CLOSURE CAPABILITY AND LOSS OF THE ASSOCIATED ESSENTIAL BUS (REQUIRES LOSS OF ALL THREE SOURCES) RESULTS IN LOSS OF THE ASSOCIATED FUEL CELL COOLANT PUMP AS WELL AS REDUNDANT CONTROL OF THAT FUEL CELL'S REACTANT VALVES. THIS NECESSITATES REMOVAL OF ALL LOAD FROM THE FUEL CELL IN ORDER TO RENDER IT SAFE. INABILITY TO REMOVE THE BUS LOAD FROM THE FUEL CELL UNDER THESE CIRCUMSTANCES WILL RESULT IN FUEL CELL OVERHEATING WITH SUBSEQUENT RUPTURE AND/OR EXPLOSION/FIRE.

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**- APPROVALS -**

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EDITORIALLY APPROVED  
TECHNICAL APPROVAL

: BNA  
: VIA APPROVAL FORM

: J. Kamura 7-26-99  
: 05-6-2213-01