

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE  
 NUMBER: M5-6MB-2201-G-X

SUBSYSTEM NAME: ELECTRICAL POWER GENERATION - CRYO, GENERIC  
 REVISION : 9 09/09/92

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: MID PCA 1	V070-764400
LRU	: MID PCA 2	V070-764430
LRU	: MID PCA 3	V070-764450
SRU	: CONTROLLER, HYBRID DRIVER	MC477-0263-0002

- PART DATA -

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:  
 CONTROLLER, HYBRID DRIVER (HDC), TYPE III - FUEL CELLS 1, 2, AND 3 REACTANT  
 SUPPLY VALVE "OPEN" CONTROL

REFERENCE DESIGNATORS: 40V76A25AR23  
 : 40V76A25AR24  
 : 40V76A25AR25  
 : 40V76A25AR26  
 : 40V76A26AR23  
 : 40V76A26AR24  
 : 40V76A26AR25  
 : 40V76A26AR26  
 : 40V76A27AR15  
 : 40V76A27AR16  
 : 40V76A27AR17  
 : 40V76A27AR18

QUANTITY OF LIKE ITEMS: 12  
 TWELVE

FUNCTION:  
 CONTROLS POWER TO OPEN H2 AND O2 REACTANT SUPPLY VALVES FOR FUEL CELLS 1, 2  
 AND 3. CONTROL CIRCUITRY IS INDEPENDENT FOR EACH FUEL CELL 1, 2, AND 3.

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FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE  
 NUMBER: M5-6MB-2201-G-02

SUBSYSTEM: ELECTRICAL POWER GENERATION - CRYO, GENERIC  
 LRU MID PCA 1  
 ITEM NAME: CONTROLLER, HYBRID DRIVER

REVISION# 9 09/09/92  
 CRITICALITY OF THIS  
 FAILURE MODE: 1R3

FAILURE MODE:  
 INADVERTENT OUTPUT, FAILS "ON", FAILS TO TURN "OFF"

MISSION PHASE:  
 PL PRELAUNCH  
 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, CONTAMINATION, VIBRATION, MECHANICAL SHOCK, PROCESSING  
 ANOMALY, THERMAL STRESS

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN A) PASS  
 B) FAIL  
 C) PASS

PASS/FAIL RATIONALE:

A)

B)

REDUNDANCY SCREEN "B" FAILS SINCE CANNOT DETECT FAILED HDC IN SERIES - VALVES  
 ARE NORMALLY OPEN.

C)

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 - FAILURE EFFECTS -  
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(A) SUBSYSTEM:

LOSS OF REDUNDANCY - ONE OF TWO HDC'S IN SERIES IS ENABLED.

(B) INTERFACING SUBSYSTEM(S):

NO EFFECT - FIRST FAILURE. FAILURE OF SECOND SERIES HDC WOULD CONTINUOUSLY POWER THE AFFECTED "OPEN" SOLENOID OF THE ASSOCIATED VALVE. FUEL CELL SUPPLY VALVES ARE NORMALLY OPEN. HOWEVER, CONTINUOUS POWER ON THE "OPEN" SOLENOID WOULD PREVENT THE CLOSURE OF THE RELATED VALVE WHEN REQUIRED.

(C) MISSION:

NO EFFECT DURING NORMAL FLIGHT. FCP SUPPLY VALVE IS NORMALLY OPEN.

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

NO EFFECT DURING NORMAL FLIGHT. FCP SUPPLY VALVE IS NORMALLY OPEN.

(E) FUNCTIONAL CRITICALITY EFFECTS:

POSSIBLE LOSS OF CREW/VEHICLE DUE TO THE FOLLOWING SCENARIO: 1) ONE HDC FAIL "ON", 2) SECOND HDC IN SERIES FAILS "ON" (CONTINUOUS POWER TO THE "OPEN SOLENOID), AND 3) ASSOCIATED FCP FAILS (POSSIBLE CROSSOVER AND FIRE DUE TO INABILITY TO CLOSE VALVE).

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 - DISPOSITION RATIONALE -  
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(A) DESIGN:

REFER TO APPENDIX B, ITEM NO. 1 - HYBRID DRIVER

(B) TEST:

REFER TO APPENDIX B, ITEM NO. 1 - HYBRID DRIVER

GROUND TURNAROUND TEST

CIRCUIT IS FUNCTIONALLY VERIFIED DURING DRIVER SERIES REDUNDANCY TEST (FUEL CELL REACTANT VALVE TEST) DURING EVERY TURNAROUND.

(C) INSPECTION:

REFER TO APPENDIX B, ITEM NO. 1 - HYBRID DRIVER

(D) FAILURE HISTORY:

REFER TO APPENDIX B, ITEM NO. 1 - HYBRID DRIVER

(E) OPERATIONAL USE:

NO CREW ACTION AFTER FIRST FAILURE.

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- APPROVALS -

PRODUCT ASSURANCE MGR	: T. J. EAVENSON	: <u>T. J. Eavenson 9/18/92</u>
PRODUCT ASSURANCE ENG	: T. K. KIMURA	: <u>T. K. Kimura 9/14/92</u>
DESIGN ENG TEAM LEADER	: G. M. ANDERSON	: <u>G. M. Anderson 9.15.92</u>
DESIGN ENGINEERING	: T. D. NGUYEN	: <u>T. D. Nguyen 9/15/92</u>
NASA RELIABILITY	:	: <u>M. J. ... 12/16/92</u>
NASA SUBSYSTEM MANAGER	:	: <u>Richard L. ... 12/16/92</u>
NASA EPD&C RELIABILITY	:	: <u>David ... 12/14/92</u>
NASA QUALITY ASSURANCE	:	: <u>HP KO ... 10/19/92</u>
NASA EPD&C SUBSYS MGR	:	: <u>Randy ... 10/29/92</u>