

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE

NUMBER: M5-6MB-2204-G -X

SUBSYSTEM NAME: ELECTRICAL POWER GENERATION - CRYO, GENERIC

REVISION: 9 04/16/96

PART DATA

PART NAME	PART NUMBER
VENDOR NAME	VENDOR NUMBER
LRU : H2/O2 CONTROL BOXES	V070-764470
SRU : CONTROLLER, HYBRID DRIVER	MC477-0281-0002

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

CONTROLLER, HYBRID DRIVER (HDC), TYPE I - HEATER "A" AND "B" INHIBIT CONTROL.
LO2 TANKS 1 THRU 9

REFERENCE DESIGNATORS:

- 40V76A141AR13
- 40V76A141AR15
- 40V76A141AR20
- 40V76A141AR22
- 40V76A142AR13
- 40V76A142AR15
- 40V76A142AR20
- 40V76A142AR22
- 40V76A143AR13
- 40V76A143AR15
- 40V76A143AR20
- 40V76A143AR22
- 40V76A144AR13
- 40V76A144AR15
- 40V76A144AR20
- 40V76A144AR22
- 40V76A217AR13
- 40V76A217AR15
- 40V76A217AR20
- 40V76A217AR22
- 40V76A218A1AR13
- 40V76A218A1AR15
- 40V76A218A1AR20
- 40V76A218A1AR22
- 40V76A218A2AR13
- 40V76A218A2AR15
- 40V76A218A2AR20
- 40V76A218A2AR22
- 40V76A218A3AR13

FAILURE MODES EFFECTS ANALYSIS (FMEA) -CIL HARDWARE

NUMBER: M5-6MB-2204-G-X

40V76A218A3AR15
 40V76A218A3AR20
 40V76A218A3AR22
 40V76A218A4AR13
 40V76A218A4AR15
 40V76A218A4AR20
 40V76A218A4AR22

QUANTITY OF LIKE ITEMS:
 FOUR PER H2/O2 CONTROL BOX

FUNCTION:

DISABLES OPERATION OF LO2 TANK HEATER ELEMENTS IN RESPONSE TO A TRIP SIGNAL FROM AN LO2 TANK HEATER CURRENT LEVEL DETECTOR (CLD) RESULTING FROM DETECTION OF AN ABNORMAL CURRENT CONDITION.

- APPROVALS -

PRODUCT ASSURANCE ENGR : J. NGUYEN
 DESIGN ENGINEERING : T. D. NGUYEN
Editorially APPROVED JSC

J. Nguyen 7/2/97
T. D. Nguyen 7/1/97
at Albany 9-12-99

PRINT DATE: 09/09/92

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
 NUMBER: M5-6MB-2204-G-01

REVISION# 9 09/09/92

SUBSYSTEM: ELECTRICAL POWER GENERATION - CRYO, GENERIC
 LRU H2/O2 CONTROL BOXES
 ITEM NAME: CONTROLLER, HYBRID DRIVER
 CRITICALITY OF THIS FAILURE MODE: 1R3

FAILURE MODE:

LOSS OF OUTPUT, FAILS TO CONDUCT, FAILS TO TURN "ON"

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 BECAUSE THIS FAILURE CAN BE DETECTED ONLY IF THE TEST CIRCUIT IS USED OR IF A DIFFERENTIAL CURRENT CONDITION OCCURS.

C)

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
 NUMBER: M5-6MB-2204-G-01

 - FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF REDUNDANCY IN LO2 TANK HEATER ABNORMAL CURRENT PROTECTION.

(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 DUE TO THE FOLLOWING SCENARIO: 1) FIRST LATCHING HDC FAILS TO CONDUCT IN RESPONSE TO A TRIP SIGNAL FROM THE CURRENT LEVEL DETECTOR, 2) SECOND LATCHING HDC FAILS TO CONDUCT IN RESPONSE TO A TRIP SIGNAL FROM ITS ASSOCIATED CURRENT LEVEL DETECTOR, 3) AFFECTED LO2 TANK HEATER SHORTS THROUGH ONE OF ITS DOUBLE LAYERS OF INSULATION, AND 4) SAME LO2 TANK HEATER SHORTS TO STRUCTURE THROUGH ITS SECOND LAYER OF INSULATION CAUSING AFFECTED LO2 TANK HEATER TO CYCLE "ON" AND "OFF" UNCONTROLLABLY, POSSIBLY INDUCING AN ARC, RESULTING IN POSSIBLE LO2 TANK RUPTURE/EXPLOSION.

 - DISPOSITION RATIONALE -

(A) DESIGN:

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

(B) TEST:

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

HDC IS FUNCTIONALLY VERIFIED IN FLIGHT DURING LO2 TANK HEATER CURRENT LEVEL DETECTOR TESTS. PERFORM GROUND TURNAROUND TEST,

(TANKS 1-5) WHEN VALID VERIFICATION IS UNOBTAINABLE IN FLIGHT OR AFTER LRU REPLACEMENT.

(TANKS 6-9) PRIOR TO FIRST EDO FLIGHT, WHEN VALID VERIFICATION IS UNOBTAINABLE IN FLIGHT, OR AFTER LRU REPLACEMENT.

(C) INSPECTION:

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

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(D) FAILURE HISTORY:

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

(E) OPERATIONAL USE:

CREW WILL DISABLE HEATERS IN AFFECTED TANK.

 - APPROVALS -

PRODUCT ASSURANCE MGR	:	T. J. EAVENSON	:	<u>T. J. Eavenson 7/16/92</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>Walter J. Stapp 12/16/92</u>
NASA SUBSYSTEM MANAGER	:		:	<u>Howard J. Marshall 12/16/92</u>
NASA EPD&C RELIABILITY	:		:	<u>David Lopez For S. Woodard 12/14/92</u>
NASA QUALITY ASSURANCE	:		:	<u>W. R. O. Off. Williams 12/14/92</u>
NASA EPD&C SUBSYS MGR	:		:	<u>George R. Brown for F. Alcorn 14 Dec 92</u>