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PRINT DATE: 04.12.96

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

**NUMBER: M5-6SS-B004-X**

**SUBSYSTEM NAME: E - DOCKING SYSTEM**

**REVISION: 0 DEC. 1996**

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	<b>PART NAME VENDOR NAME</b>	<b>PART NUMBER VENDOR NUMBER</b>
LRU	: ENERGIA POWER PANEL RSC-E	MC621-0067-0009 SLTYJ.468312.001
SRU	: PUSH BUTTON SWITCH	PKZ-8 (AGO.360.212.TU)

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**PART DATA**

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**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**

**PUSH-BUTTON SWITCHES(TWO DOUBLE POLE SWITCHES UNDER A SINGLE COVER CAP.) TWO POLE. MOMENTARY - APDS "RING-OUT" COMMAND.**

**REFERENCE DESIGNATORS: 36V73A8A3SB1-85  
36V73A8A3SB1-86**

**QUANTITY OF LIKE ITEMS: 2  
(TWO)**

**FUNCTION:**

**PROVIDE THE "RING OUT" COMMAND STIMULI TO CLOSE THE APPROPRIATE CONTACTS IN THE DSCU TO ENABLE THE TRANSMITTAL OF THE "RING OUT" COMMAND TO THE DMCU. THE DMCU ENABLES POWER TO THE RING MOTORS (M4 & M5) FOR RING EXTENSION AND RETRACTION FUNCTIONS.**

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL FAILURE MODE  
NUMBER: M5-6SS-8004- 01**

REVISION# 0 DEC, 1996

SUBSYSTEM NAME: E - DOCKING SYSTEM  
LRU: MC621-0087-0009  
ITEM NAME: PUSH BUTTON SWITCH

**CRITICALITY OF THIS  
FAILURE MODE: 2R3**

**FAILURE MODE:  
FAILS OPEN (MULTIPLE CONTACTS WITHIN ONE SWITCH)**

**MISSION PHASE:  
OO ON-ORBIT**

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

**CAUSE:  
A) PIECE PART FAILURE, B) CONTAMINATION, C) VIBRATION, D) MECHANICAL SHOCK, E)  
PROCESSING ANOMALY, F) THERMAL STRESS**

**CRITICALITY 1R1 DURING INTACT ABORT ONLY? NO**

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

**REDUNDANCY SCREEN A) PASS  
B) N/A  
C) FAIL**

**PASS/FAIL RATIONALE:  
A)**

**B)  
N/A - AT LEAST ONE REMAINING PATH IS DETECTABLE IN FLIGHT.**

**C)  
REDUNDANT FUNCTIONS ROUTED THROUGH THE SAME CONNECTOR.**

**METHOD OF FAULT DETECTION:  
NONE.**

**MASTER MEAS. LIST NUMBERS: NONE**

**- FAILURE EFFECTS -**

**(A) SUBSYSTEM:  
PARTIAL LOSS OF SWITCH CONTROL CAPABILITY FOR THE APDS "RING-OUT" COMMAND.**

**(B) INTERFACING SUBSYSTEM(S):  
FIRST FAILURE - NO EFFECT. LOSS OF COMMAND REDUNDANCY.**

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL FAILURE MODE  
NUMBER: MS-6SS-B004-01**

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

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

**(E) FUNCTIONAL CRITICALITY EFFECTS:**  
SHUTTLE OR PMA1 MECHANISM CONTROL: POSSIBLE LOSS OF MISSION AFTER TWO FAILURES.  
FIRST FAILURE (ONE OF TWO ASSOCIATED SWITCHES FAILS OPEN) - DISABLES ONE OF THREE PANEL COMMAND SIGNALS. NO EFFECT.  
SECOND FAILURE (FAILURE OF ASSOCIATED SWITCH DISABLES THE REMAINING TWO PANEL COMMAND CHANNEL INPUTS TO THE DSCU) - INABILITY TO EXTEND THE DOCKING RING TO ITS INITIAL DOCKING POSITION USING NOMINAL PROCEDURES.

**DESIGN CRITICALITY (PRIOR TO OPERATIONAL DOWNGRADE, DESCRIBED IN F):**

**(F) RATIONALE FOR CRITICALITY CATEGORY DOWNGRADE:**  
ALTHOUGH THE CRITICALITY REMAINS UNCHANGED AFTER WORKAROUNDS CONSIDERATION (ALLOWED PER CR 5050107W), THEY ARE PROVIDING ADDITIONAL FAULT TOLERANCE TO THE SYSTEM.

AFTER SECOND FAILURE, IN-FLIGHT MAINTENANCE PROCEDURES DEVELOPED TO DRIVE THE RING MOTORS DIRECTLY FROM THE FEED-THROUGH CONNECTORS IN THE EXTERNAL AIRLOCK USING THE ORBITER BREAKOUT BOX. IF UNABLE TO PERFORM THE IFM (THIRD FAILURE), LOSS OF DOCKING CAPABILITY RESULTING IN LOSS OF MISSION OBJECTIVE.

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**-DISPOSITION RATIONALE-**

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**(A) DESIGN:**  
REFER TO APPENDIX X1, ENERGIA HARDWARE.

**(B) TEST:**  
REFER TO APPENDIX X1, ENERGIA HARDWARE.

APDS PANEL OPERATION IS VERIFIED DURING GROUND CHECKOUT. ANY TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

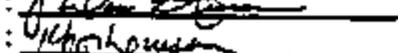
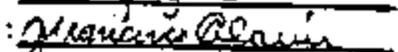
**(C) INSPECTION:**  
REFER TO APPENDIX X1, ENERGIA HARDWARE.

**(D) FAILURE HISTORY:**  
REFER TO APPENDIX X1, ENERGIA HARDWARE.

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(E) OPERATIONAL USE:  
AFTER SECOND FAILURE, IN-FLIGHT MAINTENANCE PROCEDURES DEVELOPED TO DRIVE THE RING MOTORS DIRECTLY FROM THE FEED-THROUGH CONNECTORS IN THE EXTERNAL AIRLOCK USING THE ORBITER BREAKOUT BOX.

- APPROVALS -

PRODUCT ASSURANCE ENGR	:	M. NIKOLAYEVA	:	
DESIGN ENGINEER	:	B. VAKULIN	:	
NASA SSMA	:		:	
NASA SUBSYSTEM MANAGER	:		:	
JSC MOD	:		:	
NASA EPDC SSMA	:		:	
NASA EPDC SUBSYSTEM MANAGER :			:	