

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE

NUMBER: M5-6SS-8008-X

SUBSYSTEM NAME: E - DOCKING SYSTEM

REVISION: 0 DEC. 1996

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: ENERGIA POWER PANEL RSC-E	MC621-0087-0009 SLYTJL468312.001
SRU	: PUSH BUTTON SWITCH	PKZ-8 (AGO.360.212.TU)

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
PUSH-BUTTON SWITCHES (TWO DOUBLE POLE SWITCHES UNDER A SINGLE COVER
CAP.) TWO POLE, MOMENTARY - APDS "CLOSE LATCHES" COMMAND.

REFERENCE DESIGNATORS: 36V73A8A3SB2-B5
36V73A8A3SB2-B6

QUANTITY OF LIKE ITEMS: 2
(TWO)

FUNCTION:
PROVIDE THE "CLOSE LATCHES" COMMAND STIMULI TO CLOSE THE APPROPRIATE
CONTACTS IN THE DSCU TO IMPLEMENT THE "CLOSE LATCHES" FUNCTION.
NOMINALLY, THE LATCHES ARE OPENED AND CLOSED AS PART OF THE AUTOMATIC
DOCKING SEQUENCE. THE "CLOSE LATCHES" SIGNAL IS ROUTED BY THE DSCU TO THE
LATCH ACTUATOR CONTROL UNIT (LACU) TO ENABLE THE CIRCUITS WHICH INITIATE
THE CLOSE LATCH MOTIONS. ONE MOTOR FOR EACH LATCH (M1, M2, AND M3.)

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL FAILURE MODE
NUMBER: MS-SSS-8008-01

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) FAILS

PASS/FAIL RATIONALE:

A)

B)

CLOSE LATCHES CIRCUIT ARE STAND-BY FOR NOMINAL USE.

C)

REDUNDANT FUNCTIONS ROUTED THROUGH THE SAME CONNECTOR.

METHOD OF FAULT DETECTION:

NONE.

MASTER MEAS. LIST NUMBERS: NONE

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NUMBER: M5-6SS-8006-01

- FAILURE EFFECTS -

(A) SUBSYSTEM:
PARTIAL LOSS OF SWITCH CONTROL CAPABILITY FOR THE APDS "CLOSE LATCHES"
COMMAND.

(B) INTERFACING SUBSYSTEM(S):
LOSS OF COMMAND REDUNDANCY.

(C) MISSION:
NO EFFECT FOR FIRST DOCKING ATTEMPT. ONLY SUBSEQUENT ATTEMPTS TO DOCK
DURING THE SAME MISSION WOULD BE AFFECTED. THE LATCHES ARE LAUNCHED IN
THE CLOSED CONFIGURATION.

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

(E) FUNCTIONAL CRITICALITY EFFECTS:
SHUTTLE OR PMA1 MECHANISM CONTROL: LOSS OF MISSION OBJECTIVES AFTER TWO
FAILURES.

FIRST FAILURE (ONE OF TWO ASSOCIATED SWITCHES FAILS OPEN) - NO EFFECT.
SECOND FAILURE (SECOND ASSOCIATED SWITCH FAILS OPEN) - LOSS OF CAPABILITY
TO RE-CLOSE THE LATCHES RESULTING IN LOSS OF CAPABILITY TO ATTEMPT SECOND
DOCKING.

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 S050107W), THEY ARE PROVIDING ADDITIONAL
FAULT TOLERANCE TO THE SYSTEM.

AFTER SECOND FAILURE, CREW COULD PERFORM AN IN-FLIGHT MAINTENANCE TO
DRIVE THE CAPTURE LATCH MOTORS (TO THE CLOSED POSITION) 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 SECOND
DOCKING CAPABILITY RESULTING IN LOSS OF MISSION OBJECTIVE.

-DISPOSITION RATIONALE-

(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 DMRSD.

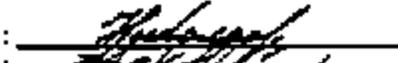
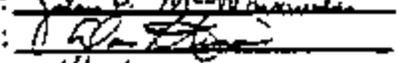
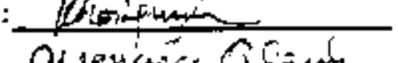
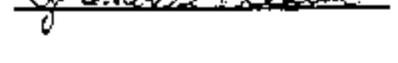
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(C) INSPECTION:
 REFER TO APPENDIX X1, ENERGIA HARDWARE.

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

(E) OPERATIONAL USE:
 AFTER SECOND FAILURE, CREW COULD PERFORM AN IN-FLIGHT MAINTENANCE TO
 DRIVE THE CAPTURE LATCH MOTORS (TO THE CLOSED POSITION) 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 SS/MA	:		:	
NASA SUBSYSTEM MANAGER	:		:	
JSC MOD	:		:	
NASA EPDC SS/MA	:		:	
NASA EPDC SUBSYSTEM MANAGER:				

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