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FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE

NUMBER: M5-6SS-B026-X

SUBSYSTEM NAME: E - DOCKING SYSTEM

REVISION: 0 FEBDEC. 19976

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: DSCU RSC-E	MC621-0087-1002 33Y.5212.005

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

LINE REPLACEABLE UNIT (LRU) DSCU - DOCKING SYSTEM CONTROL UNIT.

REFERENCE DESIGNATORS: 45V53A2A2

QUANTITY OF LIKE ITEMS: 1

(ONE)

FUNCTION:

THE DSCU IS USED TO IMPLEMENT THE AUTOMATED DOCKING SEQUENCE AND TO RECEIVE AND PROCESS THE COMMANDS FROM THE APDS CONTROL PANEL. THE UNIT PROVIDES TELEMETRY TO THE DCU_s AND STATUS INDICATION TO THE APDS CONTROL PANEL.

OUTPUT FUNCTIONS:

1. PROVIDES HI-ENERGY DAMPERS POWER AND CONTROL FOR THE -HARD-DOCKING MECHANISM.
2. PROVIDES HI-ENERGY AND LOW-ENERGY DAMPERS POWER AND CONTROL (FOR THE "SOFT" DOCKING MECHANISM).
3. PROVIDES CONTROL FOR DOCKING RING EXTENSION AND RETRACTION.
4. PROVIDES FIXERS POWER AND CONTROL.
5. PROVIDES HOOKS OPENING AND CLOSING CONTROL.
6. PROVIDES CAPTURE LATCHES OPENING AND CLOSING CONTROL.
7. PROVIDES TELEMETRY TO THE DCU_s AND STATUS INDICATION TO THE APDS PANEL.
8. PROVIDES LOW LEVEL AXIAL SLIP CLUTCH LOCKING DEVICE POWER AND CONTROL (FOR THE "SOFT" DOCKING MECHANISM).

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL FAILURE MODE

NUMBER: M5-655-B028-23A

REVISION# 0 FEBDEC, 19976

SUBSYSTEM NAME: E - DOCKING SYSTEM

LRU: MC621-0087-1002

ITEM NAME: DSCU

CRITICALITY OF THIS

FAILURE MODE: 2R3

FAILURE MODE:

LOSS OF ONE OF THREE CONTROL SIGNALS FOR THE SLIP CLUTCH LOCKING DEVICE
TO THE -SOFT- POSITION.

MISSION PHASE:

OO ON-ORBIT

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

CAUSE:

INTERNAL COMPONENT FAILURES

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

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

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

PASS/FAIL RATIONALE:

A)

B)

N/A - AT LEAST ONE REMAINING PATH IS DETECTABLE IN FLIGHT
"MASKED" BY REDUNDANT CONTROL SIGNAL.

C)

REDUNDANT SIGNAL ROUTED THROUGH THE SAME CONNECTOR.

METHOD OF FAULT DETECTION:

NONE

MASTER MEAS. LIST NUMBERS: NONE

- FAILURE EFFECTS -

(A) SUBSYSTEM:

DEGRADATION OF REDUNDANCY WHICH ACTIVATES THE LOCKING DEVICE.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL FAILURE MODE
NUMBER: M5-855-B028-23A**

(B) INTERFACING SUBSYSTEM(S):
FIRST FAILURE - NO EFFECT.

(C) MISSION:
FIRST FAILURE - NO EFFECT.

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

(E) FUNCTIONAL CRITICALITY EFFECTS:
APPLIES TO SHUTTLE "SOFT" DOCKING MECHANISM: POSSIBLE LOSS OF MISSION AFTER TWO FAILURES.
FIRST FAILURE (LOSS OF ONE OF THREE CONTROL SIGNALS TO THE "SOFT" POSITION) - DEGRADED REDUNDANCY.
SECOND FAILURE (LOSS OF ONE OF TWO REMAINING ASSOCIATED CONTROL SIGNALS) - SLIP CLUTCH CANNOT BE ACTIVATED. POSSIBLE LOSS OF "SOFT" DOCKING CAPABILITY.

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

(F) RATIONALE FOR CRITICALITY CATEGORY DOWNGRADE:
N/A

ALTHOUGH THE CRITICALITY REMAINS UNCHANGED AFTER WORKAROUNDS CONSIDERATION (ALLOWED PER CR S05010740), THEY ARE PROVIDING ADDITIONAL FAULT TOLERANCE TO THE SYSTEM.

AFTER SECOND FAILURE, CREW COULD PERFORM AN IN-FLIGHT MAINTENANCE TO DRIVE THE SLIP CLUTCH MOTORS (TO THE "SOFT" 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 "SOFT" DOCKING CAPABILITY RESULTING IN LOSS OF MISSION OBJECTIVE.

-DISPOSITION RATIONALE-

(A) DESIGN:
REFER TO APPENDIX X7, ENERGIA HARDWARE.

(B) TEST:
REFER TO APPENDIX X7, ENERGIA HARDWARE.

DSCU CIRCUIT OPERATION IS VERIFIED DURING GROUND CHECKOUT. ANY TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:
REFER TO APPENDIX X7, ENERGIA HARDWARE.

(D) FAILURE HISTORY:
REFER TO APPENDIX X7, ENERGIA HARDWARE.

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL FAILURE MODE


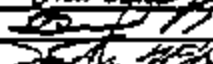
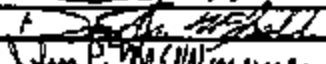

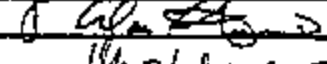
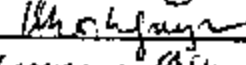
NUMBER: M5-6SS-8028-23A

(E) OPERATIONAL USE:

NONE

AFTER SECOND FAILURE, CREW COULD PERFORM AN IN-FLIGHT MAINTENANCE TO DRIVE THE SLIP CLUTCH MOTORS (TO THE -SOFT- 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	:	: 