

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE**  
**NUMBER: M5-6SS-0925 -X**

**SUBSYSTEM NAME: ISS DOCKING SYSTEM**

**REVISION: 0 02/27/98**

**PART DATA**

	<b>PART NAME</b>	<b>PART NUMBER</b>
	<b>VENDOR NAME</b>	<b>VENDOR NUMBER</b>
LRU	:MID POWER CONTROL ASSEMBLY 1	VO70-764400
LRU	:MID POWER CONTROL ASSEMBLY 2	VO70-764430
SRU	:GENERAL PURPOSE RELAY	MC455-0129-0004

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**

GENERAL PURPOSE RELAY, 25-AMP - EXTERNAL AIRLOCK STRUCTURE HEATER  
 POWER, ZONES 1, 2, AND 3

**REFERENCE DESIGNATORS:** 40V76A25A3K5  
 40V76A26A3K5

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

**FUNCTION:**

CONNECTS MAIN A(B) POWER TO THE EXTERNAL AIRLOCK STRUCTURE HEATER  
 CIRCUITS.

**REFERENCE DOCUMENTS:** 1) VS70-640109, SCHEMATIC DIAGRAM - AIRLOCK  
 ENVIRONMENTAL CONTROL SUBSYSTEM

**FAILURE MODES EFFECTS ANALYSIS FMEA - NON-CIL FAILURE MODE**

NUMBER: M5-6SS-0925-01

REVISION#: 0 02/27/98

SUBSYSTEM NAME: ISS DOCKING SYSTEM

LRU: MID PCA 1(2)

ITEM NAME: GENERAL PURPOSE RELAY

CRITICALITY OF THIS

FAILURE MODE: 1R3

**FAILURE MODE:**

FAILS OPEN, FAILS TO CONDUCT, INADVERTENTLY OPENS, FAILS TO TRANSFER

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 1/1 DURING INTACT ABORT ONLY? NO

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

REDUNDANCY SCREEN	A) PASS
	B) PASS
	C) PASS

**PASS/FAIL RATIONALE:**

A)

B)

C)

**METHOD OF FAULT DETECTION:**

AN FDA ALARM ACTIVATES IF A HEATER CIRCUIT FAILS OFF AND A ZONE TEMPERATURE SENSOR DROPS BELOW THE FDA LOWER TEMPERATURE LIMIT.

MASTER MEAS. LIST NUMBERS:	V64T0135A
	V64T0136A
	V64T0137A

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL FAILURE MODE  
NUMBER: M5-6SS-0926-01**

**CORRECTING ACTION: MANUAL**

**CORRECTING ACTION DESCRIPTION:  
CREW WILL ACTIVATE REDUNDANT HEATER CIRCUIT.**

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**- FAILURE EFFECTS -**

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**(A) SUBSYSTEM:  
LOSS OF POWER TO ONE HEATER CIRCUIT IN EACH ZONE.**

**(B) INTERFACING SUBSYSTEM(S):  
FIRST FAILURE - NO EFFECT. REDUNDANT POWER PATH PROVIDED TO REDUNDANT  
HEATERS.**

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

**(D) CREW, VEHICLE, AND ELEMENT(S):  
FIRST FAILURE - NO EFFECT**

**(E) FUNCTIONAL CRITICALITY EFFECTS:  
POSSIBLE LOSS OF CREW/VEHICLE AFTER TWO FAILURES:**

- 1) RELAY FAILS OPEN - LOSS OF POWER TO ONE HEATER CIRCUIT IN EACH ZONE.  
REDUNDANT HEATERS CIRCUITS CONTROL TEMPERATURE WITHIN LIMITS.
- 2) RELAY IN REDUNDANT HEATER CIRCUIT FAILS OPEN - LOSS OF POWER TO ALL  
HEATER CIRCUITS. POTENTIAL CONDENSATION ON EXTERNAL AIRLOCK WALLS,  
AND/OR RUPTURE OF FROZEN WATER LINE (FREEZING OF WATER LINE CAN OCCUR  
DURING EVA ONLY WHILE UNDOCKED) RESULTS IN EXCESSIVE WATER IN EXTERNAL  
AIRLOCK. WATER MIGRATION TO KEEL AREA COULD RENDER RUSSIAN AVIONICS  
INOPERATIVE AFTER DOCKING, RESULTING IN LOSS OF NOMINAL AND PYROTECHNIC  
UNDOCKING CAPABILITY.

**DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (F)): 1R2**

**(F) RATIONALE FOR CRITICALITY DOWNGRADE:  
WORKAROUNDS ARE AVAILABLE TO MITIGATE THE RISK. THEREFORE, CRITICALITY IS  
DOWNGRADED FROM 1R2 TO 1R3.**

**AFTER THE SECOND FAILURE, THE CREW WOULD PERFORM EVA TO REMOVE 96 BOLTS  
FROM THE DOCKING BASE TO CIRCUMVENT THE WORST CASE "DESIGN CRITICALITY"**

**FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE  
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EFFECT: IF UNABLE TO PERFORM EVA (THIRD FAILURE), POSSIBLE LOSS OF CREW/VEHICLE DUE TO LOSS OF ALL UNDOCKING CAPABILITY.

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**- TIME FRAME -**

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**TIME FROM FAILURE TO CRITICAL EFFECT: DAYS**

**TIME FROM FAILURE OCCURRENCE TO DETECTION: HOURS**

**TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: HOURS**

**IS TIME REQUIRED TO IMPLEMENT CORRECTING ACTION LESS THAN TIME TO EFFECT?  
YES**

**RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:  
AFTER THE FIRST FAILURE, THE REDUNDANT HEATER CIRCUIT REMAINS OPERATIONAL TO CONTROL THE EXTERNAL AIRLOCK STRUCTURE WITHIN TEMPERATURE LIMITS.  
AFTER THE SECOND FAILURE, THE CREW CAN PERFORM EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE TO UNDOCK.**

**HAZARD REPORT NUMBER(S): ORBI 401**

**HAZARD(S) DESCRIPTION:  
INABILITY TO SAFELY SEPARATE ORBITER FROM A MATED ELEMENT**

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**- APPROVALS -**

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SS&PAE  
DESIGN ENGINEERING

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: C. J. ARROYO

: J. Kimura 4-13-98  
: [Signature]