FAILURE MODES EFFECTS ANALYSIS (FMEA) – CRITICAL HARDWARE
NUMBER: M5-6MR-B025-X

SUBSYSTEM NAME: ORBITER DOCKING SYSTEM

REVISION: 1   OCT, 1995

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	POWER SWITCHING UNIT (PSU) RSC-E	MC621-0087-1003 33Y.5114.007

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
LINE REPLACEABLE UNIT (LRU) PSU - APDS LOGIC AND POWER CONTROL,
DISTRIBUTION, AND PROTECTION.

REFERENCE DESIGNATORS: 40V53A1A1

QUANTITY OF LIKE ITEMS: 1
(ONE)

FUNCTION:
THE PSU CONTROLS AND DISTRIBUTES THE APDS LOGIC BUSES. IT PROTECTS AND
DISTRIBUTES THE APDS POWER BUSES. LOGIC AND MAIN POWER IS RECEIVED FROM
THE ORBITER THROUGH CONNECTOR X3 AND RETURNED THROUGH CONNECTOR X4.
THE LOGIC POWER BUSES ARE +IIIA, +IIIB, +IIIC AND THE POWER BUSES ARE +CIII1
AND CIII2. THE PSU PROVIDES THE FOLLOWING OUTPUTS:

OUTPUT FUNCTIONS:
1)   POWER BUS +CIII1: RING MOTOR M4, PACU MOTORS M6 & M8, FIXERS 1 & 2,
      AND HI-ENERGY DAMPERS 1 & 2.
2)   POWER BUS +CIII2: RING MOTOR M5, PACU MOTORS M7 & M9, FIXERS 3, 4, & 5,
      AND HI-ENERGY DAMPER 3.
3)   LOGIC POWER BUSES +IIIA, +IIIB, +IIIC ARE PROVIDED UNFUSED TO THE
      LACU, PACU-1, PACU-2, DSCU, AND THE DMCU.

1 26   **ORIGINAL**

| FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL FAILURE MODE
NUMBER: M5-6MR-B025-02

REVISION# 1   SEPT 1, 1995

SUBSYSTEM NAME: ORBITER DOCKING SYSTEM
LRU: MC621-0057-1003
| ITEM NAME: POWER SWITCHING UNIT

CRITICALITY OF THIS
FAILURE MODE: 1R3

FAILURE MODE:
LOSS OF ONE OF THREE LOGIC POWER BUSES: +IIIA, +IIIB, +IIIC.

MISSION PHASE:
OO   ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 104 ATLANTIS

CAUSE:
MULTIPLE 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) PASS
                           C) FAILS

PASS/FAIL RATIONALE:
A)

B)

C)
REDUNDANT FUNCTIONS ROUTED THROUGH THE SAME CONNECTOR.

METHOD OF FAULT DETECTION:
NONE.

MASTER MEAS. LIST NUMBERS: NONE

- FAILURE EFFECTS -

(A) SUBSYSTEM:
DEGRADATION OF CAPABILITY TO PROVIDE LOGIC BUS POWER TO AVIONICS LRUs.

(B) INTERFACING SUBSYSTEM(S):
LOSS OF CAPABILITY TO OPEN ONE OF THREE CAPTURE LATCHES. DEGRADED LOGIC
BUS REDUNDANCY.

(C) MISSION:

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
                    NUMBER: M5-6MR-B025- 02

NO EFFECT.

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

(E) FUNCTIONAL CRITICALITY EFFECTS:
FIRST FAILURE (LOSS OF ONE OF THREE LOGIC BUSES - NO EFFECT.
SECOND FAILURE (LOSS OF ONE OF TWO ASSOCIATED BUSES) - DISABLES CAPABILITY
TO RETRACT THE RING AND OPEN THE CAPTURE LATCHES.

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

(F) RATIONALE FOR CRITICALITY CATEGORY DOWNGRADE: *Unable to open latches while* ‡
THIRD FAILURE (INABILITY TO PERFORM IFM TO OPEN LATCHES) - ~~LOSS OF CAPABILITY~~
~~TO MANUALLY DRIVE CAPTURE LATCHES OPEN WHEN RING IS EXTENDED.~~ ~~INABILITY TO~~ ‡
~~SEPARATE ORBITER AND MIR RESULTING IN LOSS OF CREW AND VEHICLE.~~ ‡

-DISPOSITION RATIONALE-

Fourth failure (inability to perform IFM to
ring in) - Loss of capability to manually
open capture latches when ring is extended.
Inability to separate orbiter and MIR
resulting in loss of crew and vehicle.

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

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

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

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

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

(E) OPERATIONAL USE:
AFTER SECOND FAILURE, IN-FLIGHT MAINTENANCE PROCEDURES DEVELOPED TO DRIVE
THE CAPTURE LATCH 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 SS/MA	:		:	9/21/95
NASA SUBSYSTEM MANAGER	:		:	
NASA EPD&C SUBSYSTEM MANAGER	:			9/21/95

After third failure, IFM procedures developed to drive ring motors directly
from the feedthrough connectors in the external airlock, using the orbiter
breakout box.

RSC Energia   Proprietary Data