FAILURE MODES EFFECTS ANALYSIS (FMEA) – CRITICAL HARDWARE
NUMBER: M5-6MR-B024-X

SUBSYSTEM NAME: ORBITER DOCKING SYSTEM

REVISION: 1   SEPT 1, 1995

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	DMCU RSC-E	MC621-0087-0005 33Y.5212.011

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
LINE REPLACEABLE UNIT (LRU) DOCKING MECHANISM CONTROL UNIT (DMCU) –
DOCKING RING MOTORS (M4/M5) LOGIC AND POWER CONTROL.

REFERENCE DESIGNATORS: 40V53A1A3

QUANTITY OF LIKE ITEMS: 1
(ONE)

FUNCTION:
THE DMCU IS DESIGNED TO RECEIVE COMMANDS FROM THE DOCKING SYSTEM
CONTROL UNIT (DSCU.) IT IMPLEMENTS DOCKING RING CONTROL DURING THE
AUTOMATIC AND THE PANEL CONTROLLED OPERATIONAL MODES. THE UNIT
CONTROLS THE TWO DOCKING MECHANISM (RING) ELECTROMOTORS. THE UNIT
RECEIVES THE FOLLOWING COMMANDS FROM THE CONTROL PANEL THROUGH THE
DSCU: 1) RING RETRACT, 2) STOP RING RETRACTION, 3) RING EXTEND, AND 4) STOP
RING EXTENSION. THE UNIT PROVIDES ONE TELEMETRY SIGNAL TO THE DATA
COLLECTION UNITS (DCUs) FOR MONITORING THE RING MOTOR ACTUATION.

OUTPUT FUNCTIONS:
1)   MOTOR CONTROL ± 27 V RING DEPLOY/RETRACT POWER FOR M4/M5 MOTORS
        (TWO POSITIVE AND TWO NEGATIVE POWER OUTPUTS PER MOTOR.)
2)   TELEMETRY INFORMATION (ONE DISCRETE) TO THE DCU-1.

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL FAILURE MODE
NUMBER: M5-6MR-B024- 01

SUBSYSTEM NAME: ORBITER DOCKING SYSTEM   REVISION#   1   SEPT 1, 1995
LRU: MC621-0067-0005   CRITICALITY OF THIS
ITEM NAME: DMCU   FAILURE MODE: 2R3

FAILURE MODE:
LOSS OF M4/M5 MOTOR CONTROL SIGNAL (ONE OF THREE) FOR RING EXTENSION OR
RETRACT.

MISSION PHASE:
OO   ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 104   ATLANTIS

CAUSE:
INTERNAL COMPONENT FAILURE(S)

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

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

REDUNDANCY SCREEN   A) PASS
                           B) FAILS
                           C) FAILS

PASS/FAIL RATIONALE:
A]

B)
SINGLE RELAY FAILURE NOT DETECTABLE.
C)
REDUNDANT FUNCTIONS ROUTED THROUGH THE SAME CONNECTOR.

METHOD OF FAULT DETECTION:
RING WOULD STOP AFTER SECOND FAILURE.

MASTER MEAS. LIST NUMBERS: NONE

- FAILURE EFFECTS -

(A) SUBSYSTEM:
DEGRADATION OF REDUNDANCY FOR CONTROLLING RING DRIVE MOTORS.

(B) INTERFACING SUBSYSTEM(S):
NO EFFECT.

(C) MISSION:
FIRST FAILURE - NO EFFECT.

RSC
Energia   *Proprietary Data*

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL FAILURE MODE
NUMBER: M5-6MR-B024-01

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

(E) FUNCTIONAL CRITICALITY EFFECTS:
FIRST FAILURE (LOSS OF ONE OF THREE INTERNAL CONTROL SIGNALS OF RING DRIVE
LOGIC CIRCUIT) - DEGRADED RING DRIVE CONTROL REDUNDANCY.
SECOND FAILURE (LOSS OF SECOND ASSOCIATED INTERNAL CONTROL SIGNAL) - LOSS
OF ALL RING CONTROL RESULTING IN LOSS OF CAPABILITY TO PERFORM DOCKING.
LOSS OF MISSION OBJECTIVES WITH INABILITY TO PERFORM DOCKING.

DESIGN CRITICALITY (PRIOR TO OPERATIONAL DOWNGRADE, DESCRIBED IN F): 2R3

(F) RATIONALE FOR CRITICALITY CATEGORY DOWNGRADE:
N/A (THERE ARE NO WORKAROUNDS TO CIRCUMVENT THIS FAILURE.)

-DISPOSITION RATIONALE-

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

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

RING DEPLOYMENT CONTROL OPERATION IS VERIFIED DURING GROUND CHECKOUT.
ANY TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

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

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

(E) OPERATIONAL USE:
AFTER THIRD FAILURE, CREW COULD PERFORM AN IN-FLIGHT MAINTENANCE TO DRIVE
THE RING MOTORS DIRECTLY FROM THE FEED-THROUGH CONNECTORS IN THE
EXTERNAL AIRLOCK, USING THE ORBITER BREAKOUT BOX. HOWEVER, WORST CASE,
CREW WOULD ABORT DOCKING SINCE THIS WORKAROUND REQUIRES A GREAT DEAL OF
TIME TO PERFORM.

- APPROVALS -

PRODUCT ASSURANCE ENGR	:	M. NIKOLAYEVA
DESIGN ENGINEER	:	B. VAKULIN
NASA SS/MA	:	
NASA SUBSYSTEM MANAGER	:	

NASA EPD&C SUBSYSTEM MANAGER: