FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE
NUMBER: M8-1MR-BM022-X

SUBSYSTEM NAME: MECHANICAL - EDS

REVISION: 1 9/1/95

		PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:	GUIDE RING ASSEMBLY NPO-ENERGIA	33U.6271.011-05 33U.6271.011-05
SRU	:	SENSOR NPO-ENERGIA	33U.5319.027 33U.5319.027

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
CAPTURE SENSOR

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 3
THREE

FUNCTION:
THREE SENSORS, LOCATED ON THE GUIDE RING ASSEMBLY, ARE USED TO MONITOR THE RING MATCHING OF BOTH THE ORBITER AND MIR DOCKING RING ASSEMBLIES. EACH SENSOR CONTAINS TWO REDUNDANT SHORT CONTACTS AND TWO REDUNDANT LONG CONTACTS. THE SHORT CONTACTS OF THE THREE SENSORS ARE CONNECTED IN SERIES AND THE LONG CONTACTS OF THE THREE SENSORS ARE CONNECTED IN PARALLEL. TOGETHER THEY SENSE THE MATING OF THE TWO DOCKING RINGS AND SEND A SIGNAL TO THE DSCU TO ACTIVATE THE HIGH ENERGY DAMPERS AND TO ILLUMINATE THE "CAPTURE" INDICATOR LIGHT ON THE DOCKING CONTROL PANEL WHEN ALL THREE SENSORS ACTUATE SIMULTANEOUSLY. THE LONG CAPTURE SIGNAL IS DOWNLINKED TO GROUND PERSONNEL. THESE SENSORS SENSE THE SECOND POINT IN THE AUTOMATIC DOCKING SEQUENCE - MATING OF THE TWO DOCKING RINGS.

SERVICE IN BETWEEN FLIGHT AND MAINTENANCE CONTROL:
VISUAL INSPECTION, SERVICEABILITY CONTOL, DOCKING WITH CALIBRATING DOCKING MECHANISM.

MAINTAINABILITY
REPAIR METHOD - REPLACEMENT.

REFERENCE DOCUMENTS: 33U.5319.027
33U.6271.011-05

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL FAILURE MODE
NUMBER: M8-1MR-BM022-01

REVISION# 1 9/1/95

SUBSYSTEM NAME: MECHANICAL - EDS
LRU: GUIDE RING ASSEMBLY
ITEM NAME: SENSOR, CAPTURE

CRITICALITY OF THIS FAILURE MODE: 2R3

FAILURE MODE:
ONE CONTACT SET FAILS OPEN

MISSION PHASE:
OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 104 ATLANTIS

CAUSE:
PIECE PART FAILURE, VIBRATION, THERMAL/MECHANICAL SHOCK, MANUFACTURE/ MATERIAL DEFECT, CONTAMINATION

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

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

REDUNDANCY SCREEN

A) PASS
B) FAIL
C) FAIL

PASS/FAIL RATIONALE:
A)

B)
FAILS REDUNDANCY SCREEN "B" SINCE A FAILURE TO TRANSFER ON ONE CONTACT SET IS NOT DETECTABLE IN FLIGHT.

C)
FAILS REDUNDANCY SCREEN "C" SINCE NON-CONDUCTIVE CONTAMINATION CAN CAUSE A FAILS OPEN CONDITION ON BOTH CONTACT SETS AND AN OPEN/LOOSE CONNECTOR CAN RESULT IN LOSS OF SIGNAL FROM BOTH CONTACT SETS.

METHOD OF FAULT DETECTION:
UPON TERMINATING THE DOCKING PROCESS, GIVEN A LOSS OF CAPTURE INDICATION, CAPTURE OF BOTH MECHANISMS CAN BE DETERMINED DURING SEPARATION. IF BOTH MECHANISMS HAD PROPERLY LATCHED DURING CAPTURE IT WOULD BE DETECTED UPON SEPARATION, AT WHICH TIME A SECOND DOCKING ATTEMPT COULD BE MADE AT THE DISCRETION OF BOTH THE ORBITER AND MIR CREW. UNDER NORMAL DOCKING CONDITIONS THE "CAPTURE" INDICATION IS DISPLAYED WITHIN SECONDS FOLLOWING THE "INITIAL CONTACT" INDICATION.

MASTER MEAS. LIST NUMBERS: V53X0757E

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL FAILURE MODE
NUMBER: M8-1MR-SM022-01

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF "RING SHORT CAPTURE" OR "RING LONG CAPTURE" SIGNAL TO DSCU. NO EFFECT FIRST FAILURE. CAPTURE INDICATION IS ACHIEVED WHEN ONE SHORT CONTACT SET IN EACH OF THE THREE CAPTURE SENSORS AND ANY ONE LONG CONTACT SET ARE CLOSED. SHORT CONTACT SETS ON EACH CAPTURE SENSOR ARE CONNECTED IN SERIES, I.E. THE FIRST SHORT CONTACT SET IN EACH SENSOR ARE TIED TOGETHER AND THE SECOND SHORT CONTACT SET IN EACH SENSOR ARE TIED TOGETHER. A FAILED OPEN CONDITION ON ANY TWO CAPTURE SENSOR SHORT CONTACT SETS (ONE IN EACH SERIES CONTACT SET PATH) WILL PREVENT THE HIGH ENERGY DAMPERS FROM ACTIVATING. FAILURE TO TURN ON DAMPERS JUST AFTER CAPTURE COULD RESULT IN EXCESSIVE DOCKING LOADS. SIMILAR FAILURE OF ALL SIX LONG CONTACT SETS WILL PRODUCE THE SAME EFFECTS.

(B) INTERFACING SUBSYSTEM(S):
EXCESSIVE LOADS INCURRED DURING DOCKING, AS THE RESULT OF TWO SHORT CONTACT SETS FAILING OPEN AND CAUSING THE HIGH ENERGY DAMPERS NOT TO ACTIVATE, COULD PROPAGATE TO EXTERNAL AIRLOCK AND ORBITER STRUCTURE.

(C) MISSION:
NO EFFECT FIRST FAILURE. POSSIBLE LOSS OF MISSION FOLLOWING FAILURE OF SECOND CONTACT SET.

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT ON CREW OR VEHICLE. POTENTIAL DAMAGE TO ORBITER/MIR DOCKING MECHANISMS DUE TO HIGH LOADS INCURRED DURING CAPTURE.

(E) FUNCTIONAL CRITICALITY EFFECTS:
FIRST SHORT CONTACT SET FAILS OPEN - NO EFFECT. SECOND SHORT CONTACT SET FAILS OPEN - LOSS OF "CAPTURE" INDICATION. WITH LOSS OF THIS INDICATION CREW WOULD NOT BE 100% CERTAIN THAT CAPTURE HAS OCCURRED. CREW IS GIVEN TEN SECONDS TO DECIDE TO TERMINATE THE DOCKING PROCESS FOLLOWING INDICATION OF INITIAL CONTACT IF NO "CAPTURE" INDICATION IS PRESENT. WITHOUT CERTAINTY THAT CAPTURE HAS OCCURRED, CONTACT BETWEEN VEHICLES WOULD OCCUR WITHIN 10 SECONDS FOLLOWING INITIAL CONTACT INDICATION. WORST CASE SCENARIO IS THAT DOCKING AT THIS POINT WOULD BE TERMINATED. SECOND CONTACT SET FAILURE WILL ALSO PREVENT ENERGIZING OF HIGH ENERGY DAMPERS RESULTING IN POTENTIAL DAMAGE TO ORBITER/MIR DOCKING MECHANISMS DURING CAPTURE. DAMAGE COULD PRECLUDE DOCKING CAPABILITIES. ORBITER/MIR MISSION OBJECTIVES WOULD BE LOST WITH A FAILURE 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:
DESIGN OF THE SENSOR, SELECTION OF MATERIALS, AND SMALL ELECTRICAL LOADS REDUCE THE FAILURE PROBABILITY OF BOTH CONTACTS. DESIGN OF THE CONTACT PAIR (DUAL CHANNEL) HAS PASSED MAGNITUDES OF GROUND FUNCTIONAL TESTING

AND MULTIPLE USES DURING PILOTED VEHICLE OPERATIONS IN SPACE. WIRE REDUNDANCY FOR EACH CONTACT, CHOICE OF MATERIALS AND COATINGS FOR THE CONTACT PAIR, AND MAXIMUM SPACING BETWEEN LEADS OF EACH CONTACT PAIR ASSURES A HIGH LEVEL OF RELIABILITY. SPRING WHICH RETURNS THE INTERNAL ROD TO THE INITIAL POSITION IS DESIGNED TO OPERATE BEYOND LIMITS OF FATIGUE AND THUS, POSSIBILITY OF SPRING FAILURE IS VERY LOW. MISALIGNMENT OF THE ROD IS NOT POSSIBLE BY DESIGN.

ANALYSIS HAS SHOWN THAT THE MAXIMUM MOMENT IN THE Y DIRECTION IS EXCEEDED GIVEN A FAILURE TO ENGAGE THE HIGH ENERGY DAMPERS FOLLOWING CAPTURE. HOWEVER THIS MOMENT WOULD NOT EXCEED THE LIMITS ON THE EXTERNAL AIRLOCK OR ORBITER STRUCTURE.

(B) TEST:

DOCKING MECHANISM ACCEPTANCE TESTS:

1. ELECTRICAL SCHEMATIC CHECKOUT - CONTACT RESISTANCE ON EACH PIN OF THE CONNECTOR WHICH IS ELECTRICALLY TIED TO THE CAPTURE SENSOR IS CHECKED. THIS TEST VERIFIES CONTINUITY THROUGH THE CAPTURE SENSOR WHEN CAPTURE LATCHES ARE IN THEIR CLOSED POSITION.

2. INSULATION ELECTRICAL RESISTANCE TEST - THE INSULATION RESISTANCE AND ELECTRICAL STRENGTH OF INSULATION CHECKOUT OF EACH PIN OF THE CAPTURE SENSOR CONNECTOR TO THE APDA HOUSING WILL VERIFY THAT SENSOR CONTACT SETS ARE NOT ELECTRICALLY SHORTED TO GROUND.

3. INSPECTION SERVICEABILITY TEST - DURING SENSOR FUNCTIONAL TEST CAPTURE SENSOR CHECKOUT IS PERFORMED WITH DOCKING RING AT IT'S INITIAL POSITION. THE PLUNGER OF EACH CAPTURE SENSOR IS MANUALLY DEPRESSED AND APPROPRIATE LIGHTS ON THE TEST PANEL ARE VERIFIED TO ILLUMINATE.

4. VIBRORESISTENT TEST - APDS SUBJECTED TO THE FOLLOWING VIBRATION LEVELS FOR 2 MINUTES PER AXIS:

FREQUENCY (HZ)	SPECTORAL DENSITY ACCELERATION
FROM 20 TO 80	INCREASING, 3DB OCTAVE TO $0.04G^2/HZ$
FROM 80 TO 350	PERMANENT $0.04G^2/HZ$
FROM 350 TO 2000	DECREASING 3DB OCTAVE WITH $0.04G^2/HZ$

SUBSEQUENT TO THIS TEST AN INSPECTION IS PERFORMED TO IDENTIFY BROKEN OR LOOSE HARDWARE; AND AN ELECTRICAL CIRCUIT TEST, INSULATION RESISTANCE TEST, AND SENSOR FUNCTIONAL TEST ARE PERFORMED AS DEFINED IN ATP TESTS #1, #2, AND #3 ABOVE TO VERIFY PROPER CAPTURE SENSOR PERFORMANCE.

5. DOCKING MECHANISM CHECKOUT (STATIC) TEST - OPENING OF CAPTURE LATCHES IS VERIFIED. CAPTURE LATCHES ARE OPENED PER STEP 11 OF INSTRUCTION 33U.6201.006-05 PM-3. DURING CAPTURE LATCH LATCHING FORCE TEST, THE FORCE TO TRIP ALL THREE CAPTURE LATCHES AND LONG AND SHORT CAPTURE SENSORS IS VERIFIED NOT TO EXCEED 16 KGF.

6. THERMO VACUUM TEST - DOCKING OF THE MECHANISM IS THERMALLY CYCLED, UNDER LOAD CONDITIONS, FROM +20°C TO -50/-55°C TO +50/+55°C TO

+20°C IN A VACUUM AT 10^{-4} TO 10^{-5} TORR. DWELL AT EACH TEMPERATURE AND BETWEEN OPERATIONS AT EACH TEMPERATURE IS A MINIMUM OF 60 MINUTES AFTER STABILIZATION. OPERATIONS INCLUDES PERFORMING DOCKING/CAPTURE. DOCKING IS ACCOMPLISHED AT A SPEED OF 0.15M/SEC BETWEEN THE SIMULATOR AND MOVEABLE PLATFORM (CONTAINING THE DOCKING MECHANISM) AND CAPTURE INDICATION IS VERIFIED DURING CAPTURE. PROPER OPERATION OF CAPTURE SENSORS IS VERIFIED FOR A TEMPERATURE RANGE OF -50°C/-55°C TO 50°C/55°C.

7. CONTROLLED DOCKING TEST - CONTROLLED DOCKING IS PERFORMED UNDER LOAD CONDITIONS. VISUAL OBSERVATION OF CAPTURE INDICATION DURING CAPTURE WILL VERIFY PROPER SENSOR OPERATION.

DOCKING MECHANISM QUALIFICATION TESTS:

1. ELECTRICAL CIRCUIT CHECK - CONTACT RESISTANCE ON EACH PIN OF THE CONNECTOR WHICH IS ELECTRICALLY TIED TO THE CAPTURE SENSOR IS CHECKED. THIS TEST VERIFIES CONTINUITY THROUGH THE CAPTURE SENSOR WHEN CAPTURE LATCHES ARE IN THEIR CLOSED POSITION.

2. INSULATION RESISTANCE TEST - THE INSULATION RESISTANCE AND ELECTRICAL STRENGTH OF INSULATION CHECKOUT OF EACH PIN OF THE CAPTURE SENSOR CONNECTOR TO THE APDA HOUSING WILL VERIFY THAT THE SENSOR CONTACT SETS ARE NOT ELECTRICALLY SHORTED TO GROUND.

3. VIBRATION STRENGTH TEST - APDS SUBJECTED TO THE FOLLOWING VIBRATION LEVELS IN EACH AXIS FOR A 400 SECOND DURATION.

FREQUENCY (HZ)	SPECTORAL DENSITY ACCELERATION
FROM 20 TO 80	INCREASING, 3DB OCTAVE TO $0.067G^2/HZ$
FROM 80 TO 350	CONSTANT $0.067G^2/HZ$
FROM 350 TO 2000	DECREASING 3DB OCTAVE WITH $0.067G^2/HZ$

SUBSEQUENT TO THIS TEST AN INSPECTION IS PERFORMED TO IDENTIFY BROKEN OR LOOSE HARDWARE; AND AN ELECTRICAL CIRCUIT CHECK TEST AND INSULATION RESISTANCE TEST ARE PERFORMED, AS DEFINED IN QTP TESTS #1 AND #2 ABOVE, TO VERIFY PROPER FUNCTIONING OF THE CAPTURE SENSORS.

4. SHOCK AND SAWTOOTH LOADING STRENGTH TEST - DOCKING MECHANISM IS SUBJECTED TO 20G TERMINAL SAWTOOTH SHOCK PULSES IN EACH AXIS, 3 PULSES IN EACH DIRECTION FOR A TOTAL OF 6 PULSES/AXIS. AFTER COMPLETION AN INSPECTION IS PERFORMED TO IDENTIFY BROKEN OR LOOSE HARDWARE; AND AN ELECTRICAL CIRCUIT CHECK TEST AND INSULATION RESISTANCE TEST ARE PERFORMED, AS DEFINED IN QTP TESTS #1 AND #2 ABOVE, TO VERIFY PROPER FUNCTIONING OF THE CAPTURE SENSORS.

5. APDS SERVICEABILITY TEST IN A SIX-DEGREE-OF-FREEDOM DYNAMIC TEST - THE SIX-DEGREE-OF-FREEDOM DYNAMIC TEST VERIFIES APDS DOCKING AND UNDOCKING OPERATIONS UNDER CLOSE-TO-FULL-SCALE CONDITIONS. STATIC MOTION OF ENTITIES IS SIMULATED UNDER SPECIFIC INERTIAL AND GEOMETRICAL PARAMETERS FOR VARIOUS INITIAL CONDITIONS FOR MIR/SHUTTLE DOCKING. A TOTAL OF 20 DOCKINGS IS PERFORMED WHICH INCLUDES CAPTURE. SUBSEQUENT TO THIS TEST AN ENGINEERING INSPECTION IS PERFORMED TO IDENTIFY BROKEN OR LOOSE HARDWARE; AND

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AN ELECTRICAL CIRCUIT CHECK TEST AND INSULATION RESISTANCE TEST ARE PERFORMED, AS DEFINED IN QTP TESTS #1 AND #2 ABOVE, TO VERIFY PROPER FUNCTIONING OF THE CAPTURE SENSORS.

6. COLD AND HEAT RESISTANCE TEST - DOCKING OF THE MECHANISM IS THERMALLY CYCLED FROM +20°C TO -50/-55°C TO +50/+55°C TO +20°C IN A VACUUM AT 10^{-4} TO 10^{-5} TORR. DWELL AT EACH TEMPERATURE AND BETWEEN OPERATIONS AT EACH TEMPERATURE IS A MINIMUM OF 60 MINUTES AFTER STABILIZATION. AFTER EACH DOCKING/CAPTURE, AS SHOWN IN THE FOLLOWING TABLE, CAPTURE INDICATIONS ARE VERIFIED.

SEQ NO.	DOCKING RATE, M/S	SIMULATOR ROTATIONAL ANGLE		TEMP °C	VOLTAGE VOLTS	PRESS INTEGRITY CHECKOUT
		PITCH	ROLL			
1	0.10	0°	0°	25 +/-10	23	YES
2	0.10	0°	4°	25 +/-10	34	NO
3	0.12	4°	4°	25 +/-10	27	NO
4*	—	—	—	+60+/-5	—	YES
4	0.10	4°	0°	+50+/-5	27	YES
5*	—	—	—	-(60+/-5)	—	YES
5	0.10	4°	0°	-(30+/-5)	27	YES
6*	—	—	—	+60+/-5	—	YES
6	0.12	0°	4°	+50+/-5	23	YES
7*	—	—	—	-(60+/-5)	—	YES
7	0.10	0°	4°	-(30 +/-5)	23	YES
8*	—	—	—	+60+/-5	—	YES
8	0.12	4°	4°	50 +/-5	34	YES
9*	—	—	—	-(60+/-5)	—	YES
9	0.12	4°	4°	-(30 +/-5)	34	YES
10*	—	—	—	+60+/-5	—	YES
10	0.10	4°	0°	+50+/-5	27	YES
11*	—	—	—	-(60+/-5)	—	YES
11	0.10	0°	4°	-(30 +/-5)	27	YES
12*	—	—	—	+60+/-5	—	YES
12*	0.10	0°	4°	+50+/-5	27	YES
13*	—	—	—	-(60+/-5)	—	YES
13*	0.12	4°	4°	-(30 +/-5)	27	YES
14*	—	—	—	+60+/-5	—	YES
14*	0.12	4°	4°	+50+/-5	27	YES
15*	0.12	4°	4°	+25+/-10	23	YES

*MC621-0067-2001, -4001, & -5001 ONLY

AFTER COMPLETION AN INSPECTION IS PERFORMED TO IDENTIFY BROKEN OR LOOSE HARDWARE; AND AN ELECTRICAL CIRCUIT CHECK TEST AND INSULATION RESISTANCE TEST ARE PERFORMED, AS DEFINED IN QTP TESTS #1 AND #2 ABOVE, TO VERIFY PROPER CAPTURE SENSOR FUNCTIONING.

7. TRANSPORTABILITY STRENGTH TEST - SHIPPING LOADS ARE SIMULATED ON A VIBRATING TABLE TO VERIFY THAT THE DOCKING MECHANISM WILL NOT BE

DAMAGED DURING SHIPMENT. THIS TEST IS CONDUCTED UNDER THE CONDITIONS CONTAINED IN THE FOLLOWING TABLE.

VIBRATION ACCELER DIRECTION	VIBRATION ACCELER AMPLITUDE	FREQUENCY SUBBAND, HZ					TOTAL TEST DURATION	
		5-7	7-15	15-30	30-40	40-60		
		TEST DURATION, MIN					HR	MIN
ALONG X-AXIS	1.4	–	4	–	–	–	–	4
	1.2	76	93	32	61	39	5	7
ALONG Y-AXIS	1.1	–	4	–	–	–	–	4
	1.0	13	16	7	10	7	–	53
ALONG Z-AXIS	1.1	–	4	–	–	–	–	4
	1.0	32	40	16	26	16	2	10

SUBSEQUENT TO THIS TEST AN INSPECTION IS PERFORMED TO IDENTIFY BROKEN OR LOOSE HARDWARE; AND AN ELECTRICAL CIRCUIT CHECK TEST AND INSULATION RESISTANCE TEST ARE PERFORMED, AS DEFINED IN QTP TESTS #1 AND #2 ABOVE, TO VERIFY PROPER FUNCTIONING OF THE CAPTURE SENSORS.

8. TARGET SERVICE LIFE TEST - TESTS ARE PERFORMED TO VERIFY PROPER DOCKING AND UNDOCKING OPERATIONS OVER ITS LIFE OF 100 DOCKINGS. PROPER CAPTURE INDICATION (CAPTURE SENSOR OPERATION) IS VERIFIED DURING 100 DOCKING AND UNMATING CYCLES (FOR MC621-0067-1001/-3001 UNITS ONLY). FOR MC621-0067-2001, -4001, & -5001 UNITS PROPER OPERATION VERIFIED DURING 388 CYCLES (44 VACUUM/LOAD CYCLES, 16 LOAD CYCLES, & 324 NO-LOAD CYCLES). AFTER COMPLETION AN INSPECTION IS PERFORMED TO IDENTIFY BROKEN OR LOOSE HARDWARE; AND AN ELECTRICAL CIRCUIT CHECK TEST AND INSULATION RESISTANCE TEST ARE PERFORMED, AS DEFINED IN QTP TESTS #1 AND #2 ABOVE, TO VERIFY PROPER FUNCTIONING OF THE CAPTURE SENSORS.

9. CONTROL DISASSEMBLY - UPON COMPLETION OF ALL QUAL TESTING THE DOCKING MECHANISM IS DISMANTLED AND CAPTURE SENSORS ARE CHECKED FOR EVIDENCE OF WEAR OR FAILURE.

OMRSD - TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:
RECEIVING INSPECTION
ALL INCOMING PARTS ARE SUBJECTED TO EXTERIOR INSPECTION.

CONTAMINATION CONTROL
CORROSION PROTECTION PROVISIONS AND CONTAMINATION CONTROL VERIFIED BY INSPECTION. CHECK OF ROOM CLEANLINESS; PARTS WASHING AND OTHER OPERATIONS OF THE TECHNOLOGICAL PROCESS WHICH PROVIDES CLEANLINESS ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES
HEAT TREATING, SOLDERING, CHEMICAL PLATING, AND CURING VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
ASSEMBLY/INSTALLATION VERIFIED BY INSPECTION.

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TESTING
ATP/QTP/OMRSD TESTING VERIFIED BY INSPECTION.

HANDLING/PACKAGING
PROPER PACKAGING, STORAGE, AND TRANSPORTATION VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:
DATA ON TEST FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING OF ODS DOCKING MECHANISMS CAN BE FOUND IN PRACA DATA BASE.

(E) OPERATIONAL USE:
CREW COULD OPEN CAPTURE LATCHES AND FIRE APPROPRIATE ORBITER RCS JETS TO INITIATE SEPARATION. IF CONDITIONS ARE ACCEPTABLE, CREW COULD REMAINED CAPTURED AND ALLOW PASSIVE DAMPERS AND SPRING MECHANISMS TO DAMPEN RELATIVE MOTION SUFFICIENTLY TO CONTINUE DOCKING.

- APPROVALS -

DESIGN ENGINEER	:	M. NIKOLAYEVA	:
DESIGN MANAGER	:	A. SOUBCHEV	:
NASA SS/MA	:		:
NASA SUBSYSTEM MANAGER	:		: