

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
 ASS'Y NOMENCLATURE: EECU

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 521407174-38-5

SHEET: 1

FMEA REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDMR / FUNC. 2/IR CRITICALITY	RATIONALE FOR ACCEPTANCE
3300	2	COMMAND LOGIC QTY-1 REFERENCE SCHEMATIC 2561765	MODE: LOSS OF RELEASE AND DERIGID CAPABILITY.  CAUSE(S): (1) U11A FAILS L.	WITH CAPTURE/RELEASE COMMAND, EE WILL ALWAYS CAPTURE, WITH RIG OR DERIG CMD, EE WILL ALWAYS RIG. DURING RELEASE OR DERIG SEQUENCE, MOTOR WILL REVERSE. IF CAPTURED OR RIGIDIZED, MOTOR WILL STALL OR SLIP CLUTCH IF REL. OR DERIG COMMANDED.  WORST CASE LOSS OF MISSION. LOSS OF EE PRIMARY MODES. UNANNUNCIATED. CREW ACTION REQ.  REDUNDANT PATHS REMAINING  BACKUP RELEASE		DESIGN FEATURES  THE DESIGN UTILIZES PROVEN CIRCUIT TECHNIQUES AND IS IMPLEMENTED USING CMOS LOGIC DEVICES.  CMOS DEVICES OPERATE AT LOW POWER AND HENCE DO NOT EXPERIENCE SIGNIFICANT OPERATING STRESSES. THE TECHNOLOGY IS MATURE, AND DEVICE RELIABILITY HISTORY IS WELL DOCUMENTED. ALL STRESSES ARE ADDITIONALLY REDUCED BY OPERATING THE APPROPRIATE PARAMETERS IN ACCORDANCE WITH SPAR-RMS-PA.003. SPECIAL HANDLING PRECAUTIONS ARE USED AT ALL STAGES OF MANUFACTURE TO PRECLUDE DAMAGE/STRESS DUE TO ELECTROSTATIC DISCHARGE.

RMS/ELEC - 969

PREPARED BY: HWG

SUPERCEDING DATE: 06 OCT 87

APPROVED BY:

ATE: \_\_\_\_\_

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
ASS'Y NOMENCLATURE: EEEU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASS'Y P/N: 517407177-315

SHEET: 2

THEA REF.	REV.	NAME QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/1A CRITICALITY	RATIONALE FOR ACCEPTANCE
3300	2	COMMAND LOGIC QTY-1 REFERENCE SCHEMATIC 2563765	MODE: LOSS OF RELEASE AND DERIGID CAPABILITY.  CAUSE(S): (1) UTTA FAILS E.	WITH CAPTURE/ RELEASE COMMAND, EE WILL ALWAYS CAPTURE. WITH RIC OR DERIG CMD, EE WILL ALWAYS RIC. DURING RELEASE OR DERIG SEQUENCE, MOTOR WILL REVERSE. IF CAPTURED OR RIGIDIZED, MOTOR WILL STALL OR SLIP CLUTCH IF REL. OR DERIG COMMANDED.  WORST CASE ----- LOSS OF MISSION. LOSS OF EE PRIMARY MODES. UNANNUNCIATED. CREW ACTION REQ.  REDUNDANT PATHS REMAINING ----- BACKUP RELEASE		ACCEPTANCE TESTS ----- THE EEEU IS SUBJECTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTAL TESTING AS AN SRU.  O VIBRATION: LEVEL AND DURATION REFERENCE TABLE 6  O THERMAL: +70 DEGREES C TO -25 DEGREES C (1 1/2 CYCLES)  THE EEEU IS INTEGRATED INTO THE END EFFECTOR AND IS FURTHER EXPOSED TO THE END EFFECTOR ACCEPTANCE TEST ENVIRONMENTS (VIBRATION AND THERMAL VACUUM).  THE END EFFECTOR ASSEMBLY IS PART OF THE INTEGRATED RMS SYSTEM TESTS (TP510 RMS STRONGBACK TEST AND TP552 FLAT FLOOR TEST) WHICH VERIFIES THE ABSENCE OF THE FAILURE MODE.  QUALIFICATION TESTS ----- THE EEEU IS SUBJECTED TO THE FOLLOWING SRU QUALIFICATION TEST ENVIRONMENTS.  O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 6  O SHOCK: 20G/11MS - 3 AXES (6 DIRECTIONS)  O THERMAL: +81 DEGREES C TO -36 DEGREES C (6 CYCLES) 1 X 10** 6 TORR  O HUMIDITY: TESTED IN THE END EFFECTOR HUMIDITY TEST.  O EMC: MIL-STD 461 AS MODIFIED BY SI-E-0002 (TESTS CE01, CE03, CS01, CS02, CS06, RE01, RE02 (M/B) RS01).  FLIGHT CHECKOUT ----- PDMS OPS CHECKLIST (ALL VEHICLES) JSC 16987

RMS/ELEC - 970

PREPARED BY: HWG

SUPERSEDING DATE: 06 OCT 87

APPROVED BY

ATE: \_\_\_\_\_

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
ASS'Y NOMENCLATURE: EEU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASS'Y P/N: 5140FT177-11-5 SHEET: 3

ITEM REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT OR END ITEM	HOUR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE
1100	2	COMMAND LOGIC QTY-1 REFERENCE SCHEMATIC 2563765	<p>MODE: LOSS OF RELEASE AND DERIG CAPABILITY.</p> <p>CAUSE(S): (1) UTA FAILS L.</p>	<p>WITH CAPTURE/ RELEASE COMMAND, EE WILL ALWAYS CAPTURE. WITH RIG OR DERIG CMD, EE WILL ALWAYS RIG. DURING RELEASE OR DERIG SEQUENCE, MOTOR WILL REVERSE. IF CAPTURED OR RIGIDIZED, MOTOR WILL STALL OR SLIP CLUTCH IF RCL OR DERIG COMMANDED.</p> <p>WORST CASE</p> <p>LOSS OF MISSION. LOSS OF EE PRIMARY MODES. UNANNUNCIATED. CREW ACTION REQ.</p> <p>REDUNDANT PATHS REMAINING</p> <p>BACKUP RELEASE</p>	QA/INSPECTIONS	<p>UNITS ARE MANUFACTURED UNDER DOCUMENTED QUALITY CONTROLS. THESE CONTROLS ARE EXERCISED THROUGHOUT DESIGN PROCUREMENT, PLANNING, RECEIVING, PROCESSING, FABRICATION, ASSEMBLY, TESTING AND SHIPPING OF THE UNITS. MANDATORY INSPECTION POINTS ARE EMPLOYED AT VARIOUS STAGES OF FABRICATION ASSEMBLY AND TEST. GOVERNMENT SOURCE INSPECTION IS INVOKED AT VARIOUS CONTROL LEVELS.</p> <p>EEE PARTS INSPECTION IS PERFORMED AS REQUIRED BY SPAR-RMS-PA.001. EACH EEE PART IS QUALIFIED AT THE PART LEVEL TO THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION. ALL EEE PARTS ARE 100% SCREENED AND BURNED IN, AS A MINIMUM, AS REQUIRED BY SPAR-RMS-PA.001, BY THE SUPPLIER. ADDITIONALLY, EEE PARTS ARE 100% RE SCREENED IN ACCORDANCE WITH REQUIREMENTS, BY AN INDEPENDENT SPAR APPROVED TESTING FACILITY. DPA IS PERFORMED AS REQUIRED BY PA.001 ON A RANDOMLY SELECTED 5% OF PARTS, MAXIMUM 5 PIECES, MINIMUM 3 PIECES FOR EACH LOT NUMBER/DATE CODE OF PARTS RECEIVED.</p> <p>WIRE IS PROCURED TO SPECIFICATION MIL-W-22759 OR MIL-W-81381 AND INSPECTED AND TESTED TO NASA JSCM8080 STANDARD NUMBER 95A.</p> <p>RECEIVING INSPECTION VERIFIES THAT ALL PARTS RECEIVED ARE AS IDENTIFIED IN THE PROCUREMENT DOCUMENTS, THAT NO PHYSICAL DAMAGE HAS OCCURRED TO PARTS DURING SHIPMENT, THAT THE RECEIVING DOCUMENTS PROVIDE ADEQUATE TRACEABILITY INFORMATION AND SCREENING DATA CLEARLY IDENTIFIES ACCEPTABLE PARTS.</p> <p>PARTS ARE INSPECTED THROUGHOUT MANUFACTURE AND ASSEMBLY AS APPROPRIATE TO THE MANUFACTURING STAGE COMPLETED. THESE INSPECTIONS INCLUDE:</p> <p>PRINTED CIRCUIT BOARD INSPECTION FOR TRACK SEPARATION, DAMAGE AND ADEQUACY OF PLATED THROUGH HOLES.</p> <p>COMPONENT MOUNTING INSPECTION FOR CORRECT SOLDERING, WIRE LOOPING, STRAPPING, ETC. OPERATORS AND INSPECTORS ARE TRAINED AND CERTIFIED TO NASA MHB 5300.4(3-1) STANDARD.</p> <p>CONFORMAL COATING INSPECTION FOR ADEQUATE PROCESSING IS PERFORMED USING ULTRAVIOLET LIGHT TECHNIQUES.</p> <p>POST P.C. BD. INSTALLATION INSPECTION, CLEANLINESS AND WORKMANSHIP (SPAR/GOVERNMENT REP. MANDATORY INSPECTION POINT)</p> <p>P.C. BD. INSTALLATION INSPECTION, CHECK FOR CORRECT BOARD INSTALLATION, ALIGNMENT OF BOARDS, PROPER CONNECTOR CONTACT MATING, WIRE ROUTING, STRAPPING OF WIRES ETC.,</p> <p>PRE-CLOSURE INSPECTION, WORKMANSHIP AND CLEANLINESS (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT)</p> <p>PRE-ACCEPTANCE TEST INSPECTION, WHICH INCLUDES AN AUDIT OF LOWER TIER INSPECTION COMPLETION, AS BUILT CONFIGURATION VERIFICATION TO AS DESIGN ETC., (MANDATORY INSPECTION POINT).</p>

RMS/ELEC - 971

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
 ASS'Y NOMENCLATURE: EEED

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 5E40T1174-10-5 | SHEET: 4

P/N REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HW/ / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE
3300	2	COMMAND LOGIC QTY-1 REFERENCE SCHEMATIC 2563765	MODE: LOSS OF RELEASE AND DERIGID CAPABILITY.  CAUSE(S): (1) UIIA FAILS L.	WITH CAPTURE/ RELEASE COMMAND, EE WILL ALWAYS CAPTURE, WITH RIG OR DERIG CMD, EE WILL ALWAYS RIG. DURING RELEASE OR DERIG SEQUENCE, MOTOR WILL REVERSE, IF CAPTURED OR RIGIDIZED, MOTOR WILL STALL OR SLIP CLUTCH IF REL. OR DERIG COMMANDED.  WORST CASE ----- LOSS OF MISSION. LOSS OF EE PRIMARY MODES. UNANNUNCIATED. CREW ACTION REQ.  REDUNDANT PATHS REMAINING ----- BACKUP RELEASE		A TEST READINESS REVIEW (TRR) WHICH INCLUDES VERIFICATION OF TEST PERSONNEL, TEST DOCUMENTS, TEST EQUIPMENT CALIBRATION/ VALIDATION STATUS AND HARDWARE CONFIGURATION IS CONVENED BY QUALITY ASSURANCE IN CONJUNCTION WITH ENGINEERING, RELIABILITY CONFIGURATION CONTROL, SUPPLIER AS APPLICABLE, AND THE GOVERNMENT REPRESENTATIVE, PRIOR TO THE START OF ANY FORMAL TESTING (ACCEPTANCE OR QUALIFICATION).  ACCEPTANCE TESTING (ATP) INCLUDES AMBIENT PERFORMANCE, THERMAL AND VIBRATION TESTING, (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT).  INTEGRATION OF UNIT TO END EFFECTOR ASSY - INSPECTIONS INCLUDE GROUNDING CHECKS, CONNECTORS FOR BENT OR PUSHBACK CONTACTS, VISUAL, CLEANLINESS, INTERCONNECT WIRING ETC. AND POWER-UP TEST TO SPAN INSPECTION TEST PROCEDURE IIP-2510.  PRE-ACCEPTANCE TEST INSPECTION, WHICH INCLUDES AN AUDIT OF LOWER TIER INSPECTION COMPLETION, AS BUILT CONFIGURATION VERIFICATION TO AS DESIGN ETC., (MANDATORY INSPECTION POINT).  ACCEPTANCE TESTING (ATP) INCLUDES, AMBIENT, VIBRATION AND THERMAL-VAC TESTING, (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT)  SRMS SYSTEMS INTEGRATION, THE INTEGRATION OF MECHANICAL ARM SUBASSEMBLIES AND THE FLIGHT CABIN EQUIPMENT TO FORM THE SRMS. INSPECTIONS ARE PERFORMED AT EACH PHASE OF INTEGRATION WHICH INCLUDES GROUNDING CHECKS, THRU WIRING CHECKS, WIRING ROUTING, INTERFACE CONNECTORS FOR BENT OR PUSH BACK CONTACTS ETC.  SRMS SYSTEMS TESTING - STRONGBACK AND FLAT FLOOR AMBIENT PERFORMANCE TEST, (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT)

RMS/ELEC - 972

PREPARED BY: HWG

SUPERSEDING DATE: 06 OCT 97

APPROVED BY: \_\_\_\_\_

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**CRITICAL ITEMS LIST**

PROJECT: SRMS  
ASS'Y NOMENCLATURE: EECU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASS'Y P/N: 5114071174-38-5

SHEET: 5

Y/EA REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE
3300	2	COMMAND LOGIC QTY-1 REFERENCE SCHEMATIC 2563765	<p>MODE: LOSS OF RELEASE AND DERIGID CAPABILITY.</p> <p>CAUSE(S): (1) VITA FAILS L.</p>	<p>WITH CAPTURE/RELEASE COMMAND, EE WILL ALWAYS CAPTURE, WITH RIG OR DERIG CMD, EE WILL ALWAYS RIG. DURING RELEASE OR DERIG SEQUENCE, MOTOR WILL REVERSE. IF CAPTURED OR RIGIDIZED, MOTOR WILL STALL OR SLIP CLUTCH IF REL. OR DERIG COMMANDED.</p> <p>WORST CASE</p> <p>LOSS OF MISSION. LOSS OF EE PRIMARY MODES. UNANNUNCIATED. CREW ACTION REQ.</p> <p>REDUNDANT PATHS REMAINING</p> <p>BACKUP RELEASE</p>	<p>FAILURE HISTORY</p> <p>THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.</p>	

RMS/ELEC - 973

PREPARED BY: RMG

SUPERSEDING DATE: 06 OCT 87

APPROVED BY: \_\_\_\_\_

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
 ASS'Y NOMENCLATURE: EEU

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: SET80F174-10 5 | SHEET: 6

P/N & REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOUR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE
3300	2	COMMAND LOGIC QTY-1 REFERENCE SCHEMATIC 2563765	MODE: LOSS OF RELEASE AND DERIGID CAPABILITY.  CAUSE(S): (1) UTA FAILS L.	WITH CAPTURE/RELEASE COMMAND, EE WILL ALWAYS CAPTURE, WITH RIG OR DERIG CMD, EE WILL ALWAYS RIG, DURING RELEASE OR DERIG SEQUENCE, MOTOR WILL REVERSE, IF CAPTURED OR RIGIDIZED, MOTOR WILL STALL OR SLIP CLUTCH IF REL, OR DERIG COMMANDED.  WORST CASE LOSS OF MISSION, LOSS OF EE PRIMARY NODES, UNANNUNCIATED, CREW ACTION REQ.  REDUNDANT PATHS REMAINING BACKUP RELEASE		OPERATIONAL EFFECTS ----- THE PAYLOAD CANNOT BE RELEASED IN A PRIMARY EE MODE, WITH A SUBSEQUENT FAILURE, THE BACKUP STANDBY SYSTEM WILL NOT PROVIDE THE CAPABILITY TO RELEASE THE PAYLOAD, PAYLOAD MAY BE RELEASED WITH EVA OR ARM AND PAYLOAD MUST BE JETTISONED.  CREW ACTION ----- USE BACKUP TO RELEASE THE PAYLOAD, IF BACKUP IS FAILED, PERFORM AN EVA TO RELEASE THE PAYLOAD OR JETTISON.  CREW TRAINING ----- CREW WILL BE TRAINED TO DETECT ANY OFF NOMINAL EE OPERATIONS  MISSION CONSTRAINTS ----- NONE.  SCREEN FAILURES ----- N/A  OMRSD OFFLINE ----- PERFORM MANUAL EE DERIGIDIZE AND RELEASE, VERIFY CORRECT TIME FOR DERIGID FLAG AND OPEN FLAG TO CHANGE STATE.  OMRSD ONLINE INSTALLATION ----- NONE  OMRSD ONLINE TURNAROUND ----- PERFORM MANUAL EE DERIGIDIZE AND RELEASE, VERIFY CORRECT TIME FOR DERIGID FLAG AND OPEN FLAG TO CHANGE TO CREW.

RMS/ELEC - 974