

**CRITICAL ITEMS LIST**

PROJECT: SBMS  
ASS'Y NOMENCLATURE: EEEU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASS'Y P/R: S1140PT174-5

SHEET: 1

FMEA REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDMR / FUNC. 2/IRAB CRITICALITY	RATIONALE FOR ACCEPTANCE
3371	0	BITE CIRCUITRY SCHEMATIC 2563765	MODE: EEEU BITE CIRCUIT FAILS HIGH.  CAUSE(S): (1) U27A FAILS HIGH. (2) D11 FAILS O/C.	NONE.  WORST CASE  LOSS OF MISSION. SUBSEQUENT FAILURE MAY RESULT IN INCOMPLETE RIGIDIZATION FAILURE.  REDUNDANT PATHS REMAINING  INCOMPLETE RIGIDIZATION FAILURE.	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 DERATING 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 - 1023

PREPARED BY: RYNG SUPERSEDING DATE: 06 OCT 97 APPROVED BY: \_\_\_\_\_

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
ASS'Y NOMENCLATURE: EEEU

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

SHEET: 2

P/N & REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/IRAB CRITICALITY	RATIONALE FOR ACCEPTANCE
3371	0	BITE CIRCUITRY SCHEMATIC 2563765	MODE: EEEU BITE CIRCUIT FAILS HIGH.  CAUSE(S): (1) U27A FAILS HIGH. (2) D11 FAILS O/C.	NONE.  WORST CASE  LOSS OF MISSION. SUBSEQUENT FAILURE MAY RESULT IN INCOMPLETE RIGIDIZATION FAILURE.  REDUNDANT PATHS REMAINING  INCOMPLETE RIGIDIZATION FAILURE.		<p><b>ACCEPTANCE TESTS</b></p> <p>THE EEEU IS SUBJECTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTAL TESTING AS AN SRU.</p> <ul style="list-style-type: none"> <li>0 VIBRATION: LEVEL AND DURATION REFERENCE TABLE 6</li> <li>0 THERMAL: +70 DEGREES C TO -25 DEGREES C (1 1/2 CYCLES)</li> </ul> <p>THE EEEU IS INTEGRATED INTO THE END EFFECTOR AND IS FURTHER EXPOSED TO THE END EFFECTOR ACCEPTANCE TEST ENVIRONMENTS (VIBRATION AND THERMAL VACUUM).</p> <p>THE END EFFECTOR ASSEMBLY IS PART OF THE INTEGRATED RMS SYSTEM TESTS (TP518 RMS STRONGBACK TEST AND TP552 FLAT FLOOR TEST) WHICH VERIFIES THE ABSENCE OF THE FAILURE MODE.</p> <p><b>QUALIFICATION TESTS</b></p> <p>THE EEEU IS SUBJECTED TO THE FOLLOWING SRU QUALIFICATION TEST ENVIRONMENTS.</p> <ul style="list-style-type: none"> <li>0 VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 6</li> <li>0 SHOCK: 20G/11MS - 3 AXES (6 DIRECTIONS)</li> <li>0 THERMAL: +81 DEGREES C TO -36 DEGREES C (6 CYCLES) 1 X 10<sup>-4</sup> Torr</li> <li>0 HUMIDITY: TESTED IN THE END EFFECTOR HUMIDITY TEST.</li> <li>0 EMC: MIL-STD-461 AS MODIFIED BY SE-E-0002 (TESTS CE01, CE02, CS01, CS02, CS06, RE01, RE02 (M/B) RS01).</li> </ul> <p><b>FLIGHT CHECKOUT</b></p> <p>PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16907</p>

RMS/ELEC - 1024

PREPARED BY: HENG

SUPERSEDING DATE: 06 OCT 87

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

**CRITICAL ITEMS LIST**

PROJECT: RMS  
ASS'Y NOMENCLATURE: EEEU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASS'Y P/N: 5740PT174-5

SHEET: 3

P/N REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOUR / FUNC. 2/IRAB CRITICALITY	RATIONALE FOR ACCEPTANCE
3371	0	BITE CIRCUITRY SCHEMATIC 2563785	<p>MODE: EEEE BITE CIRCUIT FAILS HIGH.</p> <p>CAUSE(S): (1) U27A FAILS HIGH. (2) D11 FAILS O/C.</p>	<p>NONE.</p> <p>WORST CASE</p> <p>LOSS OF MISSION. SUBSEQUENT FAILURE MAY RESULT IN INCOMPLETE RIGIDIZATION FAILURE.</p> <p>REUNDANT PATHS REMAINING</p> <p>INCOMPLETE RIGIDIZATION FAILURE.</p>		<p>QA/INSPECTIONS</p> <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.003. 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.003, 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.003 ON A RANDOMLY SELECTED 5% OF PARTS, MAXIMUM 5 PIECES, MINIMUM 1 PIECES FOR EACH LOT NUMBER/DATE CODE OF PARTS RECEIVED.</p> <p>WIRE IS PROCURED TO SPECIFICATION MIL-W-22759 OR MIL-W 81301 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 NHB 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 - 1025

PREPARED BY: HMG

SUPERCEDING DATE: 06 OCT 87

APPROVED BY:

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
 ASS'Y NOMENCLATURE: EEEU

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

SHEET: 4

P/N REF.	REV.	NAME OF DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/IRAB CRITICALITY	RATIONALE FOR ACCEPTANCE
3371	0	BITE CIRCUITRY SCHEMATIC 2563765	MODE: EEEU BITE CIRCUIT FAILS HIGH.  CAUSE(S): (1) U27A FAILS HIGH. (2) O11 FAILS O/C.	NONE.  WORST CASE ----- LOSS OF MISSION. SUBSEQUENT FAILURE MAY RESULT IN INCOMPLETE RIGIDIZATION FAILURE.  REDUNDANT PATHS REMAINING ----- INCOMPLETE RIGIDIZATION FAILURE.		<p>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).</p> <p>ACCEPTANCE TESTING (ATP) INCLUDES AMBIENT PERFORMANCE, THERMAL AND VIBRATION TESTING. (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT).</p> <p>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 SPAR INSPECTION TEST PROCEDURE ITP-2510.</p> <p>ACCEPTANCE TESTING (ATP) INCLUDES, AMBIENT, VIBRATION AND THERMAL-VAC TESTING. (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT)</p> <p>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.</p> <p>SRMS SYSTEMS TESTING - STRONGBACK AND FLAT FLOOR AMBIENT PERFORMANCE TEST. (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT)</p>

RMS/ELEC - 1026

PREPARED BY: HFM

SUPERSEDING DATE: 06 OCT 87

APPROVED BY:

E: \_\_\_\_\_

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
ASS'Y NOMENCLATURE: EECU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASS'Y P/N: 514071174-5

SHEET: 5

P/N REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOW / FUNC. 2/IRAB CRITICALITY	RATIONALE FOR ACCEPTANCE
3371	0	BITE CIRCUITRY SCHEMATIC 2563765	MODE: EECU BITE CIRCUIT FAILS HIGH.  CAUSE(S): (1) U27A FAILS HIGH. (2) D11 FAILS O/C.	NONE.  WORST CASE ----- LOSS OF MISSION. SUBSEQUENT FAILURE MAY RESULT IN INCOMPLETE RIGIDIZATION FAILURE.  REDUNDANT PATHS REMAINING ----- INCOMPLETE RIGIDIZATION FAILURE.	FAILURE HISTORY	THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.

RMS/ELEC - 1027

PREPARED BY: HEMG

SUPERSEDING DATE: 06 OCT 87

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

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
ASS'Y NOMENCLATURE: EEEU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASS'Y P/N: 5TT40P1174-5

SHEET: 6

P/N REV.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/IRAB CRITICALITY	RATIONALE FOR ACCEPTANCE
3371	0	BITE CIRCUITRY SCHEMATIC 2563765	MODE: * EEEU BITE CIRCUIT FAILS HIGH.  CAUSE(S): (1) U27A FAILS HIGH. (2) 011 FAILS O/C.	NONE.  WORST CASE  LOSS OF MISSION. SUBSEQUENT FAILURE MAY RESULT IN INCOMPLETE RIGIDIZATION FAILURE.  REDUNDANT PATHS REMAINING  INCOMPLETE RIGIDIZATION FAILURE.		<p><b>OPERATIONAL EFFECTS</b></p> <p>NONE: UNABLE TO RIGIDIZE/DERIGIDIZE WITH SUBSEQUENT FAILURE. IF FAILURE OCCURS DURING RIGIDIZE SEQUENCE THE CARRIAGE WILL NOT COMPLETELY RIGIDIZE AND ARM WILL REMAIN LIMP IF IN AUTO MODE. OPERATOR WILL DETECT OFF NOMINAL OPERATION OF THE EE.</p> <p><b>CREW ACTION</b></p> <p>NONE. WITH SUBSEQUENT FAILURE THE EE MODE SWITCH SHOULD BE TURNED OFF. CREW SHOULD OBSERVE THE CAPTURE SEQUENCE AND DETERMINE THAT THE CRAPPLE FIXTURE HAS BEEN DRAWN FAR ENOUGH INTO THE EE TO PROHIBIT PAYLOAD ROTATIONS. IF THE INTERFACE DOES NOT APPEAR RIGID, ATTEMPT TO RIGIDIZE IN THE ALTERNATE MODE. IF RIGIDIZE IS UNSUCCESSFUL, ATTEMPT RELEASE USING PRIMARY EE MODE. IF SHARES OPEN, MANEUVER THE ARM AWAY FROM THE PAYLOAD. IF SHARES DON'T OPEN, ATTEMPT TO RELEASE IN BACKUP MODE. IF SHARES OPEN, MANEUVER ARM AWAY FROM PAYLOAD. MANEUVER ORBITER AWAY FROM PAYLOAD. IF SHARES CANNOT BE OPENED IN ANY MODE, THEN THE ARM/PAYLOAD COMBIN ATION CAN BE JETTISONED.</p> <p><b>CREW TRAINING</b></p> <p>CREW TO BE TRAINED TO RECOGNIZE OFF NOMINAL OPERATION OF THE EE AND TURN MODE SWITCH TO OFF AFTER SPEC TIME AND MANEUVER THE ORBITER AWAY FROM A FREE FLYING PAYLOAD AT ANY TIME DURING ARM OPERATIONS.</p> <p><b>MISSION CONSTRAINT</b></p> <p>WHEN CAPTURING A FREE FLYING PAYLOAD THE EE MUST BE FAR ENOUGH AWAY FROM STRUCTURE TO PROHIBIT CONTACT REGARDLESS OF PAYLOAD ROTATIONS.</p> <p><b>SCREEN FAILURES</b></p> <p>A: EE OPERATES NORMALLY. INDEPENDENT PATH NOT INSTRUMENTED. B: EE OPERATES NORMALLY. INDEPENDENT PATH NOT INSTRUMENTED.</p> <p><b>OHRSD OFFLINE</b></p> <p>ON EEEU ACTIVATE EE BITE TEST POINT. VERIFY EEEU BITE INDICATION.</p> <p><b>OHRSD ONLINE INSTALLATION</b></p>

RMS/ELEC - 1028

PREPARED BY: HWG

SUPERCEDING DATE: 06 OCT 07

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

# CRITICAL ITEMS LIST

PROJECT: SRMS  
 ASS'Y NOMENCLATURE: EEEU

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 51740P1174-5

SHEET: 7

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/IRAB CRITICALITY	RATIONALE FOR ACCEPTANCE
3371	0	BITE CIRCUITRY SCHEMATIC 2561765	MODE: EEEU BITE CIRCUIT FAILS HIGH.  CAUSE(S): (1) U27A FAILS HIGH. (2) D11 FAILS O/C.	NONE.  WORST CASE LOSS OF MISSION. SUBSEQUENT FAILURE MAY RESULT IN INCOMPLETE RIGIDIZATION FAILURE.  REDUNDANT PATHS REMAINING  INCOMPLETE RIGIDIZATION FAILURE.	NONE / FUNC. 2/IRAB CRITICALITY	NONE  OMRSD ONLINE TURNAROUND  NONE

RMS/ELEC - 1029

PREPARED BY: MHC

SUPERCEDING DATE: 06 OCT 87

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