

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
ASS'Y NOMENCLATURE: EEEU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASS'Y P/N: 51101174 5

SHEET 1

P/N REF.	REV.	PART QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWA / FUNC. 2/IRB CRITICALITY	RATIONALE FOR ACCEPTANCE
1591	0	POWER CONDITIONER QTY-1 SCHEMATIC 25590B2	<p>MODE: LOSS OF A EEEU FUSE.</p> <p>CAUSE(S): (1) MECHANICAL DEFECT. (2) FUSES, 1 HAS SMALL RESISTOR IN SERIES).</p>	<p>NONE.</p> <p>WORST CASE</p> <p>LOSS OF MISSION. SUBSEQUENT FAILURE COULD CAUSE INCOMPLETE RIGIDIZE, UNANNUNCIATED.</p> <p>REDUNDANT PATHS REMAINING</p> <p>OTHER FUSE AND RESISTOR.</p>	<p>DESIGN FEATURES</p>	<p>REUNDANCY ACHIEVED USING TWO FUSES IN PARALLEL AND TESTABILITY ACHIEVED BY INCLUDING A "TEST" RESISTOR IN SERIES WITH ONE FUSE.</p> <p>FUSES ARE CONTROLLED AS DEFINED BY NSFC SPEC 40N10259 FOR THE RMS APPLICATION AND HAVE BEEN QUALIFIED TO THE REQUIREMENTS OF THIS SPECIFICATION.</p> <p>EEE PARTS HAVE BEEN SELECTED AND CONTROLLED IN ACCORDANCE WITH SPAR-RMS-PA.003. THIS DOCUMENT DEFINES THE PROGRAM REQUIREMENTS FOR MONITORING AND CONTROLLING EEE PARTS. THE REQUIREMENTS INCLUDE PART SELECTION TO AT LEAST "ESTABLISHED RELIABILITY" LEVELS, AND ADEQUATE DERATING OF PART STRESS LEVELS. PROCEDURES AND ACTIVITIES ARE SPECIFIED TO ENSURE AT LEAST EQUIVALENT QUALITY FOR NONSTANDARD AND IRREGULAR PARTS RELIABILITY ANALYSIS HAS CONFIRMED NO PARTS WITH GENERICALLY HIGH FAILURE RATES. AEROSPACE DESIGN STANDARDS FOR DETAILING ELECTRONIC PARTS PACKAGING, MOUNTING AND STRUCTURAL/MECHANICAL/INTEGRITY OF ASSEMBLIES ARE APPLIED. SUCH DESIGN HAS BEEN REVIEWED AND FOUND SATISFACTORY THROUGH THE DESIGN AUDIT PROCESS, INCLUDING THE USE OF RELIABILITY, MAINTAINABILITY AND SAFETY CHECKLISTS. MATERIAL SELECTION AND USAGE CONFORMS TO SPAR-SG.300 WHICH IS EQUIVALENT TO THE NASA MATERIALS USAGE REQUIREMENTS. WORST CASE ANALYSIS HAS BEEN CONDUCTED TO ENSURE THAT PERFORMANCE CAN BE MET UNDER WORST CASE TEMPERATURE AND AGING EFFECTS. EEE PARTS STRESS ANALYSIS HAS BEEN COMPLETED AND CONFIRMS THAT THE PARTS MEET THE DERATING REQUIREMENTS.</p> <p>PRINTED CIRCUIT BOARD DESIGNS HAVE BEEN REVIEWED TO ENSURE ADEQUATE CIRCUIT PATH WIDTH AND SEPARATION AND TO CONFIRM APPROPRIATE DIMENSIONS OF CIRCUIT SOLDER PADS AND OF COMPONENT HOLE PROVISIONS.</p> <p>PARTS MOUNTING METHODS ARE CONTROLLED IN ACCORDANCE WITH NSFC-STD-136 WHICH DEFINES APPROVED MOUNTING METHODS, STRESS RELIEF, AND COMPONENT SECURITY.</p> <p>WHERE APPLICABLE, DESIGN DRAWINGS AND DOCUMENTATION GIVE CLEAR IDENTIFICATION OF HANDLING PRECAUTIONS FOR ESD SENSITIVE PARTS.</p> <p>BOARD ASSEMBLY DRAWINGS INCLUDE THE REQUIREMENTS FOR SOLDERING STANDARDS IN ACCORDANCE WITH NHB 5300.4(3) AND JSC 0800.</p>

RMS/ELEC - 1103

**CRITICAL ITEMS LIST**

PROJECT: SMS  
ASS'Y NOMENCLATURE: EEU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASS'Y P/N: 5140PT74 5

SHEET: 2

AREA REF.	REV.	NAME QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	NDNR / FUNC. 2/1RB CRITICALITY	RATIONALE FOR ACCEPTANCE
3591	.0	POWER CONDITIONER QTY-1 SCHEMATIC 2559002	MODE: LOSS OF A EEU FUSE.  CAUSE(S): (1) MECHANICAL DEFECT. (2 FUSES, 1 HAS SMALL RESISTOR IN SERIES).	NONE.  WORST CASE  LOSS OF MISSION. SUBSEQUENT FAILURE COULD CAUSE INCOMPLETE RIGIDIZE. UNANNUNCIATED.  REDUNDANT PATHS REMAINING  OTHER FUSE AND RESISTOR.		<p>ACCEPTANCE TESTS</p> <p>THE EEU IS SUBJECTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTAL TESTING AS AN SRU.</p> <ul style="list-style-type: none"> <li>O VIBRATION: LEVEL AND DURATION REFERENCE TABLE 6</li> <li>O THERMAL: +70 DEGREES C TO -25 DEGREES C (1 1/2 CYCLES)</li> </ul> <p>THE EEU 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 SMS SYSTEM TESTS (TP510 SMS STRONGBACK TEST AND TP552 FLAT FLOOR TEST) WHICH VERIFIES THE ABSCHIE OF THE FAILURE MODE.</p> <p>QUALIFICATION TESTS</p> <p>THE EEU IS SUBJECTED TO THE FOLLOWING SRU QUALIFICATION TEST ENVIRONMENTS.</p> <ul style="list-style-type: none"> <li>O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 6</li> <li>O SHOCK: 20G/11MS - 3 AXES (6 DIRECTIONS)</li> <li>O THERMAL: +81 DEGREES C TO -36 DEGREES C (6 CYCLES) 1 X 10" &amp; 10MM</li> <li>O HUMIDITY: TESTED IN THE END EFFECTOR HUMIDITY TEST.</li> <li>O EMC: MIL-STD-461 AS MODIFIED BY SL-E-0002 (TESTS CE01, CE02, CS01, CS02, CS06, RE01, RE02 (M/B) RS01).</li> </ul> <p>FLIGHT CHECKOUT</p> <p>PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16907</p>

RMS/ELEC - 1104

PREPARED BY: WHS SUPERSEDING DATE: 08 OCT 87 APPROVED BY: \_\_\_\_\_

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

**CRITICAL ITEMS LIST**

PROJECT: SANS  
ASSY NOMENCLATURE: EEEU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASSY P/R: 5110071174-5

SHEET: 1

PCA REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/1RD CRITICALITY	RATIONALE FOR ACCEPTANCE
3591	0	POWER CONDITIONER QTY-1 SCHEMATIC 73590B2	<p>MODE: LOSS OF A EEEU FUSE.</p> <p>CAUSE(S): (1) MECHANICAL DEFECT. (2) FUSES, 1 HAS SMALL RESISTOR IN SERIES).</p>	<p>NONE.</p> <p>WORST CASE</p> <p>LOSS OF MISSION, SUBSEQUENT FAILURE COULD CAUSE INCOMPLETE RIGIDIZE, UNANNUNCIATED.</p> <p>REDUNDANT PATHS REMAINING</p> <p>OTHER FUSE AND RESISTOR.</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>FUSES ARE PROCURED AS A EEE QUALIFIED PART TO SPECIFICATION NSFC 40M30259.</p> <p>EEE PARTS INSPECTION IS PERFORMED AS REQUIRED BY SPAR-RNS-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-RNS-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 SA 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 81101 AND INSPECTED AND TESTED TO NASA JSC0000 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 CONNECTION 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</p>

RMS/ELEC - 1105

PREPARED BY: HMG

SUPERSEDING DATE: 06 OCT 87

APPROVED BY:

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
ASSY NOMENCLATURE: EECU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASSY P/R: S11401174-5

SHEET: 4

PREL REF.	REV.	NAME QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOMR / FUNC. Z/IRB CRITICALITY	RATIONALE FOR ACCEPTANCE
3591	D	POWER CONDITIONER QTY-1 SCHEMATIC 2559002	MODE: LOSS OF A EECU FUSE.  CAUSE(S): (1) MECHANICAL DEFECT. (2 FUSES, 1 HAS SMALL RESISTOR IN SERIES).	NONE.  WORST CASE ----- LOSS OF MISSION. SUBSEQUENT FAILURE COULD CAUSE INCOMPLETE RIGIDIZE. UNANNUNCIATED.  REDUNDANT PATHS REMAINING ----- OTHER FUSE AND RESISTOR.		<p>LOWER TIER INSPECTION COMPLETION, AS BUILT CONFIGURATION VERIFICATION TO AS DESIGN ETC., (MANDATORY INSPECTION POINT).</p> <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 IIP-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 - 1106

PREPARED BY: MEM SUPERSEDING DATE: 05 OCT 07 APPROVED BY:

VE: \_\_\_\_\_

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
ASS'Y NOMENCLATURE: EECU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASS'Y P/N: 511001178 5

SHEET: 5

P/N REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOMR / FUNC. 2/IRB CRITICALITY	RATIONALE FOR ACCEPTANCE
3591	0	POWER CONDITIONER QTY-1 SCHEMATIC 2559002	MODE: LOSS OF A EECU FUSE.  CAUSE(S): (1) MECHANICAL DEFECT. (2) FUSE HAS SMALL RESISTOR IN SERIES).	NONE.  WORST CASE ----- LOSS OF MISSION. SUBSEQUENT FAILURE COULD CAUSE INCOMPLETE RIGIDIZE. UNANNUNCIATED.  REDUNDANT PATHS REMAINING ----- OTHER FUSE AND RESISTOR.		FAILURE HISTORY ----- THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.

RMS/ELEC - 1107

PREPARED BY: WMS SUPERSEDING DATE: 06 OCT 87 APPROVED BY: \_\_\_\_\_

**CRITICAL ITEMS LIST**

PROJECT: RMS  
 ASSY NOMENCLATURE: EEU

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASSY P/N: 21101174

SHEET: 4

PNR REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	MODE / FUNK. 2/180 CRITICALITY	RATIONALE FOR ACCEPTANCE
3591	0	POWER CONDITIONED QTY-1 SCHEMATIC 2559007	<p>MODE: LOSS OF A EEU FUSE.</p> <p>CAUSE(S): (1) MECHANICAL DEFECT. (2) FUSES, 1 HAS SMALL RESISTOR IN SERIES.</p>	<p>NONE.</p> <p>WORST CASE</p> <p>LOSS OF MISSION. SUBSEQUENT FAILURE WOULD CAUSE INCOMPLETE RIGIDIZE. UNANNUNCIATED.</p> <p>REDUNDANT PATHS REMAINING</p> <p>OTHER FUSE AND RESISTOR.</p>		<p>OPERATIONAL EFFECTS</p> <p>NONE. FOR SUBSEQUENT FAILURES EE DOES NOT OPERATE NOMINALLY WHEN COMMANDED AND ARM REMAINS LIMP UNTIL EE MODE SWITCH IS TURNED OFF DURING AN AUTO CAPTURE SEQUENCE.</p> <p>CREW ACTION</p> <p>NONE. FOR ANY OFF NOMINAL OPERATION OF THE EE, THE EE MODE SWITCH SHOULD BE TURNED OFF. ATTEMPT TO CAPTURE IN THE ALTERNATE MODE. IF THE SHARES REMAIN OPEN, MANUEVER ARM AWAY FROM PAYLOAD. IF THE SHARES ARE PARTIALLY CLOSED, ATTEMPT RELEASE USING A PRIMARY EE MODE. IF SHARES OPEN, MANUEVER THE ARM AWAY FROM THE PAYLOAD. IF SHARES DON'T OPEN, ATTEMPT TO RELEASE IN BACKUP MODE. IF SHARES OPEN, MANUEVER ARM AWAY FROM THE PAYLOAD. MANUEVER ORBITER AWAY FROM PAYLOAD. IF SHARES CANNOT BE OPENED IN ANY MODE, EVA CAN BE USED TO RELEASE THE PAYLOAD OR THE ARM/PAYLOAD COMBINATION CAN BE JETTISONED.</p> <p>CREW TRAINING</p> <p>CREW WILL BE TRAINED TO RECOGNIZE OFF NOMINAL EE OPERATIONS AND TO MANUEVER THE ORBITER AWAY FROM A FREE FLYING PAYLOAD AT ANY TIME DURING ARM OPERATIONS.</p> <p>MISSION CONSTRAINT</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>SCREEN FAILURES</p> <p>D:EE OPERATOR NOMINALLY WITH LOSS OF REDUNDANCY. INDEPENDENT PATHS NOT INSTRUMENTED.</p> <p>OWSD OFFLINE</p> <p>VERIFY INDIVIDUAL FUSES</p> <p>OWSD ONLINE INSTALLATION</p> <p>NONE</p> <p>OWSD ONLINE TURNAROUND</p> <p>VERIFY INDIVIDUAL FUSES</p>

RMS/ELEC - 1108

PREPARED BY: HEB

SUPERSEDING DATE: 04 OCT 97

APPROVED BY: