

**CRITICAL ITEMS LIST**

PROJECT: SRMS (-5 MCIU INSTALLED)  
 ASS'Y NOMENCLATURE: MCIU

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 3155F160-5

SHEET: 1

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 3/IRB CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-FAIL, C-PASS
2535	0	POWER CONDITIONER QTY. 1. SCHEMATICS 812798 815444 2559054	<p>MODE: LOSS OF MCPC PROTECTION CIRCUITRY.</p> <p>CAUSE(S): 1) CURRENT SENSOR CIRCUIT FAILS. 2) LOSS OF UNDER VOLTAGE PROTECTION. 3) LOSS OF OVER VOLTAGE, OVER CURRENT PROTECTION. 4) REFERENCE VOLTAGES ABNORMALLY HIGH. 5) HIGH START-UP VOLTAGE.</p>	<p>NONE</p> <p>WORST CASE</p> <p>LOSS OF MCIU. LOSS OF COMPUTER SUPPORTED MODES.</p> <p>REDUNDANT PATHS REMAINING</p> <p>FOR SAFING THE SYSTEM: 1) MCPC FAILURE DETECTION. 2) AUTOBRAKES.</p>	<p>DESIGN FEATURES</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.368 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 MSFC-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 MHB 5300.4(3) AND JSC 08000.</p> <p>ALL RESISTORS AND CAPACITORS USED IN THE DESIGN ARE SELECTED FROM ESTABLISHED RELIABILITY (ER) TYPES. LIFE EXPECTANCY IS INCREASED BY ENSURING THAT ALL ALLOWABLE STRESS LEVELS ARE DERATED IN ACCORDANCE WITH SPAR-RMS-PA.003. ALL CERAMIC AND ELECTROLYTIC CAPACITORS ARE ROUTINELY SUBJECTED TO RADIOGRAPHIC INSPECTION.</p> <p>DISCRETE SEMICONDUCTION DEVICES SPECIFIED TO AT LEAST THE IX LEVEL OF MIL-S-19500. ALL DEVICES ARE SUBJECTED TO RE-SCREENING BY AN INDEPENDANT TEST HOUSE. SAMPLES OF ALL PROCURED LOTS/DATE CODES ARE SUBJECTED TO DESTRUCTIVE PHYSICAL ANALYSIS (DPA) TO VERIFY THE INTEGRITY OF THE MANUFACTURING PROCESSES. DEVICE STRESS LEVELS ARE, DERATED IN ACCORDANCE WITH SPAR-RMS-PA.003 AND VERIFIED BY DESIGN REVIEW.</p> <p>TRANSFORMERS (AND INDUCTORS) ARE DESIGNED SPECIFICALLY FOR THE APPLICATION. THE DESIGN CRITERIA, INCLUDING CHOICE OF MATERIALS AND TEST REQUIREMENTS ARE IN ACCORDANCE WITH MIL-T-27. WORST CASE STRESS LEVELS DO NOT EXCEED THOSE ALLOWED BY SPAR-RMS-PA.003.</p>	

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PREPARED BY: MMG

SUPERCEDING DATE: NONE

RMS/ELEC - 214

DATE: 11 JUL 91

CIL REV: 0

**CRITICAL ITEMS LIST**

PROJECT: SRMS (-5 MCIU INSTALLED)  
 ASS'Y NOMENCLATURE: MCIU

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 511558160-5

SHEET: 2

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HWR / FUNC. 3/1RB CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-FAIL, C-PASS
2535	0	POWER CONDITIONER QTY. 1. SCHEMATICS 812798 815444 2559054	MODE: LOSS OF MCPC PROTECTION CIRCUITRY.  CAUSE(S): 1) CURRENT SENSOR CIRCUIT FAILS. 2) LOSS OF UNDER VOLTAGE PROTECTION. 3) LOSS OF OVER VOLTAGE, OVER CURRENT PROTECTION. 4) REFERENCE VOLTAGES ABNORMALLY HIGH. 5) HIGH START-UP VOLTAGE.	NONE  WORST CASE ----- LOSS OF MCIU. LOSS OF COMPUTER SUPPORTED MODES.  REDUNDANT PATHS REMAINING ----- FOR SAFING THE SYSTEM: 1) MCPC FAILURE DETECTION. 2) AUTOBRAKES.		THE DESIGN OF THIS CIRCUIT ACCOMODATES ALL WORST CASE COMPONENT AND OPERATING ENVIRONMENTAL SPECIFICATIONS SUCH THAT ITS SPECIFIED PERFORMANCE REQUIREMENTS ARE MET AT ALL TIMES.

PREPARED BY:

MFWG

SUPERSEDING DATE: NONE

RMS/ELEC - 215

DATE: 11 JUL 91

CIL REV: 0

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**CRITICAL ITEMS LIST**

PROJECT: SRMS (-5 MCIU INSTALLED)  
 ASS'Y NOMENCLATURE: MCIU

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 51155F160-5

SHEET: 3

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOUR / FUNC. 3/1RB CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-FAIL, C-PASS
2535	0	POWER CONDITIONER QTY. 1. SCHEMATICS 812790 815444 2559054	<p>MODE: LOSS OF MCPC PROTECTION CIRCUITRY.</p> <p>CAUSE(S): 1) CURRENT SENSOR CIRCUIT FAILS. 2) LOSS OF UNDER VOLTAGE PROTECTION. 3) LOSS OF OVER VOLTAGE, OVER CURRENT PROTECTION. 4) REFERENCE VOLTAGES ABNORMALLY HIGH. 5) HIGH START-UP VOLTAGE.</p>	<p>NONE</p> <p>WORST CASE ----- LOSS OF MCIU. LOSS OF COMPUTER SUPPORTED MODES.</p> <p>REDUNDANT PATHS REMAINING ----- FOR SAFING THE SYSTEM: 1) MCPC FAILURE DETECTION. 2) AUTOBRAKES.</p>		<p>ACCEPTANCE TESTS ----- THE MCIU IS SUBJECTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTAL TESTING AS AN LRU.</p> <p>O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 3.2</p> <p>O THERMAL: +40 DEGREES C TO -16 DEGREES C (2 CYCLES)</p> <p>QUALIFICATION TESTS ----- THE MCIU IS SUBJECTED TO THE FOLLOWING LRU QUALIFICATION ENVIRONMENTS:</p> <p>O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 3.2</p> <p>O SHOCK: BY SIMILARITY TO -3 MCIU</p> <p>O THERMAL: +51 DEGREES C TO -27 DEGREES C (10 CYCLES)</p> <p>O HUMIDITY: BY SIMILARITY TO -3 MCIU</p> <p>O EMC: MIL-STD-461 AS MODIFIED BY SI-E-0002 (TESTS CE01, CE03, CS01, CS02, CS06, RE02 (M/B), RS01, RS02)</p> <p>O LIFE: 630 OPERATING HOURS 1000 POWER ON/OFF CYCLES</p> <p>FLIGHT CHECKOUT ----- NONE.</p>

PREPARED BY: MFMG

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**CRITICAL ITEMS LIST**

PROJECT: SRMS (-5 MCIU INSTALLED)  
 ASS'Y NOMENCLATURE: MCIU

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 31155F160-5

SHEET: 4

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HWR / FUNC. 3/1RB CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-FAIL, C-PASS
2535	0	POWER CONDITIONER QTY. 1. SCHEMATICS 81279B 815444 2559054	<p>MODE: LOSS OF MCPC PROTECTION CIRCUITRY.</p> <p>CAUSE(S): 1) CURRENT SENSOR CIRCUIT FAILS. 2) LOSS OF UNDER VOLTAGE PROTECTION. 3) LOSS OF OVER VOLTAGE, OVER CURRENT PROTECTION. 4) REFERENCE VOLTAGES ABNORMALLY HIGH. 5) HIGH START-UP VOLTAGE.</p>	<p>NONE</p> <p>WORST CASE</p> <p>LOSS OF MCIU. LOSS OF COMPUTER SUPPORTED MODES.</p> <p>REDUNDANT PATHS REMAINING</p> <p>FOR SAFING THE SYSTEM: 1) MCPC FAILURE DETECTION. 2) AUTOBRAKES.</p>		<p>QA/INSPECTIONS</p> <p>DOCUMENTED QUALITY CONTROLS ARE EXERCISED THROUGHOUT DESIGN PROCUREMENT, PLANNING, RECEIVING, PROCESSING FABRICATION, ASSEMBLY, TESTING AND SHIPPING OF THE MCIU. GOVERNMENT SOURCE INSPECTION IS INVOKED AT VARIOUS LEVELS OF COMPONENT ASSEMBLY AND TEST OPERATIONS. MANDATORY INSPECTION POINTS ARE EMPLOYED AT VARIOUS LEVELS OF ASSEMBLY AND TEST.</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 3 PIECES FOR EACH LOT NUMBER/DATE CODE OF PARTS RECEIVED.</p> <p>WIRE IS PROCURED, INSPECTED, AND TESTED TO SPAR-RMS-PA.003.</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(3A-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> <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</p>

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PREPARED BY: MMG

SUPERCEDING DATE: NONE

DATE: 11 JUL 91

CIR REV: 0

**CRITICAL ITEMS LIST**

PROJECT: SRMS (-5 MCIU INSTALLED)  
 ASS'Y NOMENCLATURE: MCIU

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 51155180-5

SHEET: 5

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDMR / FUNC. 3/1RB CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-FAIL, C-PASS
2535	0	POWER CONDITIONER QTY. 1. SCHEMATICS 812798 815444 2559054	<p>MODE: LOSS OF MCPC PROTECTION CIRCUITRY.</p> <p>CAUSE(S): 1) CURRENT SENSOR CIRCUIT FAILS. 2) LOSS OF UNDER VOLTAGE PROTECTION. 3) LOSS OF OVER VOLTAGE OVER CURRENT PROTECTION. 4) REFERENCE VOLTAGES ABNORMALLY HIGH. 5) HIGH START-UP VOLTAGE.</p>	<p>NONE</p> <p>WORST CASE</p> <p>-----</p> <p>LOSS OF MCIU. LOSS OF COMPUTER SUPPORTED MODES.</p> <p>REDUNDANT PATHS REMAINING</p> <p>-----</p> <p>FOR SAFING THE SYSTEM: 1) MCPC FAILURE DETECTION. 2) AUTOBRAKES.</p>		<p>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, VIBRATION, AND THERMAL TESTING (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT).</p>

PREPARED BY: MMWG

SUPERCEDING DATE: NONE

DATE: 11 JUL 91

CU REV: 0

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**CRITICAL ITEMS LIST**

PROJECT: SRMS (-5 MCIU INSTALLED)  
 ASS'Y NOMENCLATURE: MCIU

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 51155F180-5

SHEET: 6

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 3/1RB CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-FAIL, C-PASS
2535	0	POWER CONDITIONER QTY. 1. SCHEMATICS 812798 815444 2559054	MODE: LOSS OF MCPC PROTECTION CIRCUITRY.  CAUSE(S): 1) CURRENT SENSOR CIRCUIT FAILS. 2) LOSS OF UNDER VOLTAGE PROTECTION. 3) LOSS OF OVER VOLTAGE, OVER CURRENT PROTECTION. 4) REFERENCE VOLTAGES ABNORMALLY HIGH. 5) HIGH START-UP VOLTAGE.	NONE  WORST CASE ----- LOSS OF MCIU. LOSS OF COMPUTER SUPPORTED MODES.  REDUNDANT PATHS REMAINING ----- FOR SAFING THE SYSTEM: 1) MCPC FAILURE DETECTION. 2) AUTOBRAKES.		FAILURE HISTORY ----- THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.

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EXPEDITE PROCESSING

PREPARED BY: MFVG SUPERCEDING DATE: NONE

DATE: 11 JUL 91 CIL REV: 0

**CRITICAL ITEMS LIST**

PROJECT: SRMS (-5 MCIU INSTALLED)  
 ASS'Y NOMENCLATURE: MCIU

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 51155F160-5

SHEET: 7

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HWR / FUNC. 3/1RB CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-FAIL, C-PASS
2535	0	POWER CONDITIONER QTY. 1. SCHEMATICS 812798 815444 2559054	<p>MODE: LOSS OF MCPC PROTECTION CIRCUITRY.</p> <p>CAUSE(S): 1) CURRENT SENSOR CIRCUIT FAILS. 2) LOSS OF UNDER VOLTAGE PROTECTION. 3) LOSS OF OVER VOLTAGE OVER CURRENT PROTECTION. 4) REFERENCE VOLTAGES ABNORMALLY HIGH. 5) HIGH START-UP VOLTAGE.</p>	<p>NONE</p> <p>WORST CASE ----- LOSS OF MCIU. LOSS OF COMPUTER SUPPORTED MODES.</p> <p>REDUNDANT PATHS REMAINING ----- FOR SAFING THE SYSTEM: 1) MCPC FAILURE DETECTION. 2) AUTOBRAKES.</p>	<p>NONE</p> <p>OPERATIONAL EFFECT ----- NONE BUT SUBSEQUENT FAILURE MAY CAUSE MCIU TO BE OVERSTRESSED.</p> <p>CREW ACTION ----- NONE.</p> <p>CREW TRAINING ----- CREW IS TRAINED: TO ALWAYS OBSERVE WHETHER THE ARM IS RESPONDING PROPERLY TO COMMANDS. IF IT ISN'T, APPLY BRAKES. TO RECOGNIZE AND RESPOND TO ALL OFF-NOMINAL OPERATIONS OF THE END EFFECTOR.</p> <p>MISSION CONSTRAINT ----- NONE</p> <p>SCREEN FAILURES ----- B: NO ORBITER ANNUNCIATION OR DISPLAY.</p> <p>OMRSD OFFLINE ----- INDUCE HIGH VOLTAGES AT MCPC TEST POINTS. VERIFY MCPC SHUTS DOWN.</p> <p>OMRSD ONLINE INSTALLATION ----- NONE</p> <p>OMRSD ONLINE TURNAROUND ----- NONE</p>	

PREPARED BY: MFWG

SUPERCEDING DATE: NONE

RMS/ELEC - 220

DATE: 11 JUL 91

CIL REV: 0

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