

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
ASS'Y MONTECARLO: ECEU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASS'Y P/N: 517407174 S

SHEET: 1

P/N REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOUR / FUNC. ?/IAB CRITICALITY	RATIONALE FOR ACCEPTANCE
3541	1	BRAKE/CLUTCH ENABLE QTY-1 7543764.	<p>MODE: CONTINUOUS CAPTURE/RELEASE HIGH ON (BC/CC) ACTIVATOR ENABLE OUTPUT.</p> <p>CAUSE(S): CAUSE (S): (1) Q14 S/C Q13 S/C.</p>	<p>CAPTURE BRAKE AND CLUTCH BIAS WILL NOT BE POWERED UNTIL THE ENABLE OR ACTIVATE PULSE IS RECEIVED THEN SYSTEM WILL OPERATE AS COMMANDED.</p> <p>WORST CASE</p> <p>LOSS OF RESISTOR SUBSEQUENT FAILURE COULD GIVE UNCOMMANDED RELEASE.</p> <p>REDUNDANT PATHS REMAINING</p> <p>REMAINING ACTIVE OR ENABLE.</p>		<p>DESIGN FEATURES</p> <p>DISCRETE SEMICONDUCTOR 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/DATA 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.001 AND VERIFIED BY DESIGN REVIEW.</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.001. ALL CERAMIC AND ELECTROLYTIC CAPACITORS ARE ROUTINELY SUBJECTED TO RADIOGRAPHIC INSPECTION.</p> <p>THE POWER DISSIPATING COMPONENTS ARE BASE MOUNTED AND STRAPPED.</p>

RMS/ELEC - 1069

PREPARED BY: WMS SUPERSEDING DATE: 29 SEP 87 APPROVED BY: \_\_\_\_\_

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
ASS'Y NOMENCLATURE: EEEU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASS'Y P/N: S1100P1174-5

SHEET: 2

P/N & REV.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOMR / FUNC. 2/100 CRITICALITY	RATIONALE FOR ACCEPTANCE
3541	J	BRAKE/CLUTCH ENABLE QTY-1 2563764.	<p>MODE: CONTINUOUS CAPTURE/RELEASE HIGH OR (BC/CC) ACTIVATOR ENABLE OUTPUT.</p> <p>CAUSE(S): CAUSE (S): (1) OIA S/C (1) S/C.</p>	<p>CAPTURE BRAKE AND CLUTCH BUS WILL NOT BE POWERED UNTIL THE ENABLE OR ACTIVATE PULSE IS RECEIVED THEN SYSTEM WILL OPERATE AS COMMANDED.</p> <p>WORST CASE LOSS OF MISSION SUBSEQUENT FAILURE COULD GIVE UNCOMMANDED RELEASE.</p> <p>REDUNDANT PATHS REMAINING</p> <p>REMAINING ACTIVE OR ENABLE.</p>		<p>ACCEPTANCE TESTS</p> <p>THE EEEU IS SUBJECTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTAL TESTING AS AN SRU.</p> <p>O VIBRATION: LEVEL AND DURATION REFERENCE TABLE 6</p> <p>O THERMAL: +70 DEGREES C TO -25 DEGREES C (1 1/2 CYCLES)</p> <p>THE EEEU IS INTEGRATED INTO THE END EFFECTOR AND IS FURTHER EXPOSED TO THE END EFFECTOR ACCEPTANCE TEST ENVIRONMENTS (VIBRATION AND THERMAL VALUES).</p> <p>THE END EFFECTOR ASSEMBLY IS PART OF THE INTEGRATED SRMS SYSTEM TESTS (TP510 SRMS STRONGBACK TEST AND TP552 FLAT FLOOR TEST) WHICH VERIFIES THE ABSENCE OF THE FAILURE MODE.</p> <p>QUALIFICATION TESTS</p> <p>THE EEEU IS SUBJECTED TO THE FOLLOWING SRU QUALIFICATION TEST ENVIRONMENTS.</p> <p>O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 6</p> <p>O SHOCK: 20G/11MS 3 AXES (6 DIRECTIONS)</p> <p>O THERMAL: +41 DEGREES C TO -16 DEGREES C (6 CYCLES) 1 R 100% &amp; 100%</p> <p>O HUMIDITY: TESTED IN THE END EFFECTOR HUMIDITY TEST.</p> <p>O EMC: MIL-STD-461 AS MODIFIED BY SL-E-0002 (TESTS CE01, CE03, CS01, CS02, CS06, RE01, RE02 (W/O) RS01).</p> <p>FLIGHT CHECKOUT</p> <p>PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16907</p>

RMS/ELEC - 1070

PREPARED BY: WMO

SUPERSEDING DATE: 29 SEP 87

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

# CRITICAL ITEMS LIST

PROJECT: SRMS  
ASS'Y NOMENCLATURE: EECU

SYSTEM: ELECTRICAL SUBSYSTEM  
ASS'Y P/N: ST1101174-5

SHEET 1

PREA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOUR / FUNC. 2/1RD CRITICALITY	NATIONALE FOR ACCEPTANCE
3541	1	BRAKE/CLUTCH ENABLE QTY-1 2563764.	<p>MODE: CONTINUOUS CAPTURE/ RELEASE HIGH ON (BC/CC) ACTIVATOR ENABLE OUTPUT.</p> <p>CAUSE(S): CAUSE (S): (1) Q14 S/C (1) S/C.</p>	<p>CAPTURE BRAKE AND CLUTCH BUS WILL NOT BE POWERED UNTIL THE ENABLE OR ACTIVATE PULSE IS RECEIVED THEN SYSTEM WILL OPERATE AS COMMANDED.</p> <p>WORST CASE</p> <p>LOSS OF MISSION</p> <p>SUBSEQUENT FAILURE COULD GIVE UNCOMMANDED RELEASE.</p> <p>REBUNDANT PATHS REMAINING</p> <p>REMAINING ACTIVE OR ENABLE.</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. OPA IS PERFORMED AS REQUIRED BY PA.003 ON A RANDOMLY SELECTED SR OF PARTS, MAKING 5 PIECES, MINIMUM 1 PIECES FOR EACH LOT NUMBER/DATE CODE OF PARTS RECEIVED.</p> <p>WIRE IS PROCURED TO SPECIFICATION MIL-W-27759 OR MIL-W-81303 AND INSPECTED AND TESTED TO NASA JSC8000 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 - 1071

PREPARED BY: WMC

SUPERSEDING DATE: 29 SEP 87

APPROVED BY:

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
 ASS'Y NOMENCLATURE: ECU

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 511401174 5

SHEET: 6

P/N REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HWMR / FUNC. 2/IRB CRITICALITY RATIONALE FOR ACCEPTANCE
3541	1	BRAKE/CLUTCH ENABLE QTY-1 2563764.	MODE: CONTINUOUS CAPTURE/RELEASE HIGH ON (BC/CC) ACTIVATOR ENABLE OUTPUT.  CAUSE(S): CAUSE (S): (1) Q14 S/C Q13 S/C.	CAPTURE BRAKE AND CLUTCH BUS WILL NOT BE POWERED UNTIL THE ENABLE OR ACTIVATE PULSE IS RECEIVED THEN SYSTEM WILL OPERATE AS COMMANDED.  WORST CASE ----- LOSS OF MISSION SUBSEQUENT FAILURE COULD GIVE UNCOMMANDED RELEASE.  REDUNDANT PATHS REMAINING ----- REMAINING ACTIVE OR ENABLE.	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 (ACCEPTABLE 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 SPAR INSPECTION TEST PROCEDURE ITP-2510.  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 - 1072

PREPARED BY: WMM

SUPERSEDING DATE: 29 SEP 87

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

DATE: \_\_\_\_\_

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
 ASS'Y NOMENCLATURE: EECU

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 51401174-5

SHEET: 5

AREA REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	DOWN / FUNC. 2/1RD CRITICALITY	RATIONALE FOR ACCEPTANCE
3541	-1	BRAKE/CLUTCH ENABLE QTY-1 2563764.	MODE: CONTINUOUS CAPTURE/RELEASE HIGH ON (BC/CC) ACTIVATOR ENABLE OUTPUT.  CAUSE(S): CAUSE (S): (1) Q10 S/C Q13 S/C.	CAPTURE BRAKE AND CLUTCH BUS WILL NOT BE POWERED UNTIL THE ENABLE OR ACTIVATE PULSE IS RECIEVED THEN SYSTEM WILL OPERATE AS COMMANDED.  WORST CASE LOSS OF MISSION SUBSEQUENT FAILURE COULD GIVE UNCOMMANDED RELEASE.  REDUNDANT PATHS REMAINING REMAINING ACTIVE OR ENABLE.		FAILURE HISTORY ----- THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.

RMS/ELEC - 1073

PREPARED BY: HHS

SUPERSEDING DATE: 29 SEP 87

APPROVED BY:

**CRITICAL ITEMS LIST**

PROJECT: SRS  
 ASS'Y NOMENCLATURE: EEU

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 21201177-5

SHEET: 4

P/N REF.	REV.	NAME BY DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOW / TIME 2/100 CRITICALITY	RATIONALE FOR ACCEPTANCE
3501	1	BRAKE/CLUTCH ENABLE OFF-1 2563764.	MODE: CONTINUOUS CAPTURE/ RELEASE HIGH ON (BC/CC) ACTIVATOR ENABLE OUTPUT.  CAUSE(S): CAUSE (S): (1) Q14 S/C Q13 S/C.	CAPTURE BRAKE AND CLUTCH BUS WILL NOT BE POWERED UNTIL THE ENABLE OR ACTIVATE PULSE IS RECEIVED THEN SYSTEM WILL OPERATE AS COMMANDED.  WORST CASE ----- LOSS OF MISSION SUBSEQUENT FAILURE COULD GIVE UNCOMMANDED RELEASE.  REDUNDANT PATHS REMAINING ----- REMAINING ACTIVE OR ERABLE.		OPERATIONAL EFFECTS ----- NONE PAYLOAD WILL BE RELEASED WITH NO OPERATOR COMMAND OR ANNUNCIATION IF PREVIOUS UNDETECTED FAILURE HAS OCCURRED. IF THIS OCCURS WHILE THE ARM IS BEING DRIVEN, THE PAYLOAD WILL TAKE AN UNEXPECTED TRAJECTORY.  CREW ACTION ----- NONE. FOR SUBSEQUENT FAILURE MANEUVER ARM AND ORBITER AWAY FROM PAYLOAD.  CREW TRAINING ----- CREW MUST BE TRAINED TO MANEUVER THE ORBITER AWAY FROM A FREE PAYLOAD AT ANY TIME DURING ARM OPERATIONS.  MISSION CONSTRAINT ----- OPERATE UNDER VELOCITY RATES WITHIN 10 FT OF STRUCTURE. THE OPERATOR MUST BE ABLE TO DETECT THAT THE ARM/PAYLOAD IS RESPONDING PROPERLY TO COMMANDS VIA WINDOW AND/OR CCTV VIEWS DURING ALL ARM OPERATIONS.  SCREEN FAILURES ----- B:SERIES PATH NOT INSTRUMENTED.  OPSO OFFLINE ----- IN THE EE STANDBY MODE MONITOR RELEASE BRAKE/CLUTCH TEST POINTS.  OPSO ONLINE INSTALLATION ----- NONE  OPSO ONLINE TUNBAROUND ----- IN THE EE STANDBY MODE MONITOR RELEASE BRAKE/CLUTCH TEST POINTS.

PREPARED BY: HEM SUPERSEDING DATE: 29 SEP 87 APPROVED @

DATE: \_\_\_\_\_

RMS/ELEC - 1074