

CRITIC

LIBT

PROJECT: SRMS
ASS'Y NOMENCLATURE: E11

SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 51140F1174-38-5

SHEET: 1

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
3350	2	COMMAND LOGIC QTY-1 REFERENCE SCHEMATIC 2563765	MODE: LOSS OF RIG, DERIG AND CAPTURE. CAUSE(S): (1) U7A FAILS H. U8C FAILS L.	ARM REMAINS LIMP UNTIL MODE SW TO OFF DURING AN AUTO CAPTURE SEQUENCE. RIG/DERIG WILL BE INHIBITED. WHEN CAP OR RELEASE COMMANDED, RELEASE DRIVE WILL OCCUR. IF SNARES ARE CLOSING, MOTOR WILL REVERSE. IF RELEASED, AND CAPTURE COMMANDED MOTOR WILL STALL OR SLIP CLUTCH. WORST CASE ----- UNEXPECTED PAYLOAD MOTION. INCOMPLETE RIGIDIZATION. CREW ACTION REQ. REDUNDANT PATHS REMAINING ----- 1) MANUAL EE MODE RELEASE. 2) BACKUP EE RELEASE.	2/1R	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 - 1007

PREPARED BY:

MWG

SUPERSEDING DATE: 06 OCT 87

DATE: 24 JUL 91

CIL REV: 1

CRITICAL ITEMS LIST

PROJECT: SRMS
 ASS'Y NOMENCLATURE: EEEU

SYSTEM: ELECTRICAL SUBSYSTEM
 ASS'Y P/N: 51120FT174-3E-5

SHEET: 2

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/1R CRITICALITY RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
3350	2	COMMAND LOGIC QTY-1 REFERENCE SCHEMATIC 2563765	MODE: LOSS OF RIG, DERIG AND CAPTURE. CAUSE(S): (1) U7A FAILS H. U8C FAILS L.	ARM REMAINS LIMP UNTIL MODE SW TO OFF DURING AN AUTO CAPTURE SEQUENCE. RIG/DERIG WILL BE INHIBITED. WHEN CAP OR RELEASE COMMANDED, RELEASE DRIVE WILL OCCUR. IF SHARES ARE CLOSING, MOTOR WILL REVERSE. IF RELEASED, AND CAPTURE COMMANDED MOTOR WILL STALL ON SLIP CLUTCH. WORST CASE UNEXPECTED PAYLOAD MOTION. INCOMPLETE RIGIDIZATION. CREW ACTION REQ. REDUNDANT PATHS REMAINING ----- 1) MANUAL EE MODE RELEASE. 2) BACKUP EE 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 K 10 ⁻⁶ TORR O HUMIDITY: TESTED IN THE END EFFECTOR HUMIDITY TEST. O EMC: MIL-STD-461 AS MODIFIED BY SL-E-0002 (TESTS CE01, CE03, CS01, CS02, CS06, RE01, RE02 (N/B) RS01). FLIGHT CHECKOUT ----- PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16987

RMS/ELEC - 1008

PREPARED BY:

MFG

SUPERSEDING DATE: 06 OCT 87

APPROVED BY:

DATE: 24 JUL 91

CIL REV: 1

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: EEEU

SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 51120FT174-38-5

SHEET: 3

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
3350	2	COMMAND LOGIC QTY-1 REFERENCE SCHEMATIC 2563765	<p>MODE: LOSS OF RIG, DERIG AND CAPTURE.</p> <p>CAUSE(S): (1) U7A FAILS H. UBC FAILS L.</p>	<p>ARM REMAINS LIMP UNTIL MODE SW TO OFF DURING AN AUTO CAPTURE SEQUENCE. RIG/DERIG WILL BE INHIBITED. WHEN CAP OR RELEASE COMMANDED, RELEASE DRIVE WILL OCCUR. IF SWARES ARE CLOSING, MOTOR WILL REVERSE. IF RELEASED, AND CAPTURE COMMANDED MOTOR WILL STALL ON SLIP CLUTCH.</p> <p>WORST CASE ----- UNEXPECTED PAYLOAD MOTION. INCOMPLETE RIGIDIZATION. CREW ACTION REQ.</p> <p>REDUNDANT PATHS REMAINING ----- 1) MANUAL EE MODE RELEASE. 2) BACKUP EE RELEASE.</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 3 PIECES FOR EACH LOT NUMBER/DATE CODE OF PARTS RECEIVED.</p> <p>WIRE IS PROCURED TO SPECIFICATION MIL-W-22759 OR MIL-W-81389 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 - 1009

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: EEEE

SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 51140F1174-36-5 SHEET: 4

TMEA REF.	TMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/1R CRITICALITY RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
3350	2	COMMAND LOGIC QTY-1 REFERENCE SCHEMATIC 2563765	<p>MODE: LOSS OF RIG, DERIG AND CAPTURE.</p> <p>CAUSE(S): (1) U7A FAILS H. U8C FAILS L.</p>	<p>ARM REMAINS LIMP UNTIL MODE SW TO OFF DURING AN AUTO CAPTURE SEQUENCE. RIG/DERIG WILL BE INHIBITED. WHEN CAP OR RELEASE COMMANDED, RELEASE DRIVE WILL OCCUR. IF SHARES ARE CLOSING, MOTOR WILL REVERSE. IF RELEASED, AND CAPTURE COMMANDED MOTOR WILL STALL OR SLIP CLUTCH.</p> <p>WORST CASE ----- UNEXPECTED PAYLOAD MOTION. INCOMPLETE RIGIDIZATION. CREW ACTION REQ.</p> <p>REDUNDANT PATHS REMAINING ----- 1) MANUAL EE MODE RELEASE. 2) BACKUP EE RELEASE.</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, CONNECTERS FOR BENT OR PUSHBACK CONTACTS, VISUAL, CLEANLINESS, INTERCONNECT WIRING ETC. AND POWER-UP TEST TO SPAR INSPECTION TEST PROCEDURE ITP-2510.</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>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 - 1010

CRITICAL ITEMS LIST

PROJECT: SPH
ASS'Y NAME: WIRE: FCEU

ELECTRICAL SUBSYSTEM
P/N: 51140F1174-38-5

SHEET: 5

FMEA REF.	FMEA REV.	NAME QTY. & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	DOWN / FUNC. 2/1R CRITICALITY RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
3350	2	COMMAND LOGIC QTY-1 REFERENCE SCHEMATIC 2563765	<p>MODE: LOSS OF RIG, DERIG AND CAPTURE.</p> <p>CAUSE(S): (1) U7A FAILS H. U8C FAILS L.</p>	<p>ARM REMAINS LIMP UNTIL MODE SW TO OFF DURING AN AUTO CAPTURE SEQUENCE. RIG/DERIG WILL BE INHIBITED. WHEN CAP OR RELEASE COMMANDED, RELEASE DRIVE WILL OCCUR. IF SNARES ARE CLOSING, MOTOR WILL REVERSE. IF RELEASED, AND CAPTURE COMMANDED MOTOR WILL STALL OR SLIP CLUTCH.</p> <p>WORST CASE ----- UNEXPECTED PAYLOAD MOTION. INCOMPLETE RIGIDIZATION. CREW ACTION REQ.</p> <p>REDUNDANT PATHS REMAINING ----- 1) MANUAL EE MODE RELEASE. 2) BACKUP EE RELEASE.</p>	<p>FAILURE HISTORY ----- THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.</p>

RMS/ELEC - 1011

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NUMBER/CATURE: EEU

SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 517401174-38-5

SHEET: 6

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOUR / FUNC. 2/1R CRITICALITY RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
3350	2	COMMAND LOGIC QTY-1 REFERENCE SCHEMATIC 2563765	MODE: LOSS OF RIG, DERIG AND CAPTURE. CAUSE(S): (1) U7A FAILS H. U8C FAILS L.	ARM REMAINS LIMP UNTIL MODE SW IS OFF DURING AN AUTO CAPTURE SEQUENCE. RIG/DERIG WILL BE INHIBITED. WHEN CAP OR RELEASE COMMANDED, RELEASE DRIVE WILL OCCUR. IF SNARES ARE CLOSING, MOTOR WILL REVERSE. IF RELEASED, AND CAPTURE COMMANDED MOTOR WILL STALL OR SLIP CLUTCH. WORST CASE UNEXPECTED PAYLOAD MOTION. INCOMPLETE RIGIDIZATION. CREW ACTION REQ. REDUNDANT PATHS REMAINING 1) MANUAL EE MODE RELEASE. 2) BACKUP EE RELEASE.	OPERATIONAL EFFECTS ----- UNABLE TO RIGIDIZE/DERIGIDIZE. 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. CREW ACTION ----- THE EE MODE SWITCH SHOULD BE TURNED OFF. CREW SHOULD OBSERVE THE CAPTURE SEQUENCE AND DETERMINE THAT THE GRAPPLE 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 A PRIMARY EE MODE. IF SNARES OPEN, MANEUVER THE ARM AWAY FROM THE PAYLOAD. IF SNARES DON'T OPEN, ATTEMPT TO RELEASE IN BACKUP MODE. IF SNARES OPEN, MANEUVER ARM AWAY FROM THE PAYLOAD. MANEUVER ORBITER AWAY FROM PAYLOAD. IF SNARES CANNOT BE OPENED IN ANY MODE, THEN THE ARM/PAYLOAD COMBINATION CAN BE JETTISONED. CREW TRAINING ----- CREW TO BE TRAINED TO RECOGNIZE OFF NOMINAL OPERATION OF THE EE AND TO TURN MODE SWITCH TO OFF AFTER SPEC TIME AND MANEUVER THE ORBITER AWAY FROM A FREE FLYING PAYLOAD AT ANY TIME DURING ARM OPERATIONS. MISSION CONSTRAINT ----- WHEN CAPTURING A FREE FLYING PAYLOAD, THE EE MUST BE FAR ENOUGH AWAY FROM STRUCTURE TO PROHIBIT CONTACT REGARDLESS OF PAYLOAD ROTATIONS. OMRSD OFFLINE ----- PERFORM EE MANUAL CAPTURE, RIGID AND DERIGID VERIFY CORRECT TIME FOR CLOSE FLAG, RIGID FLAG, AND EXTEND FLAG TO CHANGE STATE OMRSD ONLINE INSTALLATION ----- NONE OMRSD ONLINE TURNAROUND ----- PERFORM EE MANUAL CAPTURE, RIGID AND DERIGID VERIFY CORRECT TIME FOR CLOSE FLAG, RIGID FLAG, AND EXTEND

RMS/ELEC - 1012

PREPARED BY: MFMG

SUPERSEDING DATE: 06 OCT 87

APPROVED BY:

DATE: 24 JUL 91

CIL REV: 1

CRITICAL ITEMS LIST

PROJECT: SRI
ASS'Y NOMENCLATURE: EEEU

SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 5110P1174-3E-5

SHEET: 7

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/1R CRITICALITY RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
3350	2	COMMAND LOGIC QTY-1 REFERENCE SCHEMATIC 2563765	<p>MODE: LOSS OF RIG, DERIG AND CAPTURE.</p> <p>CAUSE(S): (1) U7A FAILS H. U0C FAILS L.</p>	<p>ARM REMAINS LIMP UNTIL MODE SW TO OFF DURING AN AUTO CAPTURE SEQUENCE. RIG/DERIG WILL BE INHIBITED. WHEN CAP OR RELEASE COMMANDED, RELEASE DRIVE WILL OCCUR. IF SNARES ARE CLOSING, MOTOR WILL REVERSE. IF RELEASED, AND CAPTURE COMMANDED MOTOR WILL STALL OR SLIP CLUTCH.</p> <p>WORST CASE ----- UNEXPECTED PAYLOAD MOTION. INCOMPLETE RIGIDIZATION. CREW ACTION REQ.</p> <p>REDUNDANT PATHS REMAINING ----- 1) MANUAL EE MODE RELEASE. 2) BACKUP EE RELEASE.</p>	<p>FLAG TO CHANGE TO GREY</p>

RMS/ELEC - 1013