

**CRITICAL ITEMS LIST**

PROJECT: SBMS  
ASS'Y NAME: END EFFECTOR

SYSTEM: MECHANICAL ARM SUBSYSTEM  
ASS'Y P/N: 51140E1470 18

SHEET 1

TIME REF.	REV.	DATE QTY & DRAWING REV. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	MODE / FREQ. ??? CRITICALITY	RATIONALE FOR ACCEPTANCE
1960	2	END EFFECTOR SCHEMATIC 51140E129 FOR P/N 51140E1470-1 AND SCHEMATIC 51140E2221 FOR P/N 51140E1470-1 SPAR HAS SE 459/D10 QTY: 1	MODE: NO POWER OUTPUT TO SPEE.  CAUSE(S): (1) COIL FAILS O/C.	CAUSE (1) NO 28V OUTPUT AT SPEE. ALL EE MODES AVAILABLE.  WORST CASE  LOSS OF MISSION LOSS OF SPEE POWER  REDUNDANT PATHS REMAINING  N/A		DESIGN FEATURES  RELAYS ARE HERMETICALLY SEALED TYPES, CONFORMING TO MIL R-19016 OR MIL R-6106 AS DICTATED BY THE DESIGN APPLICATION. IN ADDITION, ALL RELAYS ARE SCREENED TO NASA ST R-0001 REQUIREMENTS. CONTACT CURRENT AND VOLTAGE STRESSES ARE REDUCED IN ACCORDANCE WITH THE DERATING REQUIREMENTS OF SPAR HAS PA 003. IN THE PACKAGING DESIGN EMPHASIS HAS BEEN PLACED UPON RELAY MOUNTING TO ENSURE GOOD HEAT TRANSFER AND IMMUNITY FROM VIBRATION.

PREPARED BY: RMS

SUPERSEDING DATE: 06 OCT 87

APPROVED BY:

IC:

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
ASS'Y NOMENCLATURE: END EFFECTOR

SYSTEM: MECHANICAL ARM SUBSYSTEM  
ASS'Y P/N: 51140E1470-1B-3

SHEET: 2

P/N REF.	REV.	NAME QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HWR / FUNC. 2/2 CRITICALITY	RATIONALE FOR ACCEPTANCE
3960	2	END EFFECTOR SCHEMATIC 51140E729 FOR P/N 51140E1470-1 AND SCHEMATIC 51140E2221 FOR P/N 51140E1470-3 SPAR-RMS-SG 459/010 QT:1	MODE: NO POWER OUTPUT TO SPEE.  CAUSE(S): (1) COIL FAILS O/C.	CAUSE (1) NO 28V OUTPUT AT SPEE. ALL EE MODES AVAILABLE.  WORST CASE  LOSS OF MISSION. LOSS OF SPEE POWER.  REDUNDANT PATHS REMAINING  N/A		<p>ACCEPTANCE TESTS</p> <p>THE EE ASSEMBLY IS TESTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTS:</p> <ul style="list-style-type: none"> <li>O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 7</li> <li>O THERMAL VACUUM: +70 DEGREES C TO -25 DEGREES C (1 1/2 CYCLES) 1 X 10<sup>-6</sup> TORR</li> </ul> <p>THE EE ASSEMBLY IS FURTHER TESTED IN THE IN THE RMS SYSTEM TEST (TP518 RMS STRONGBACK AND TP552 FLAT FLOOR TESTS) WHICH VERIFIES THE ABSENCE OF THE FAILURE MODE.</p> <p>QUALIFICATION TESTS</p> <p>THE EE ASSEMBLY QUALIFICATION TESTING CONSISTED OF THE FOLLOWING ENVIRONMENTS:</p> <ul style="list-style-type: none"> <li>O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 7</li> <li>O SHOCK: 20G/11 MS - 3 AXES (6 DIRECTIONS)</li> <li>O THERMAL VACUUM: +81 DEGREES C TO -36 DEGREES C (6 CYCLES) 1 X 10<sup>-6</sup> TORR</li> <li>O HUMIDITY: 95% RH (65 DEGREES C MAINTAINED FOR 6 HRS) (65 DEGREES C TO 30 DEGREES C IN 16 HRS) 10 CYCLES 240 HRS.</li> <li>O ENC: MIL-STD-461A AS MODIFIED BY SL-E-0002 (TEST CE01, CE03, CS01, CS02, CS06, RE02 (N/B))</li> <li>O STRUCTURAL STIFFNESS AND LOAD TEST</li> </ul> <p>FLIGHT CHECKOUT</p> <p>PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16987</p>

PREPARED BY: MFG

SUPERCEDING DATE: 06 OCT 87

APPROVED BY:

RMS/MECH - 168

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
ASS'Y NOMENCLATURE: END EFFECTOR

SYSTEM: MECHANICAL ARM SUBSYSTEM  
ASS'Y P/N: 51140E1470-1A SHEET: 1

FMEA REF.	REV.	NAME QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDMR / FUNC. 2/2 CRITICALITY	RATIONALE FOR ACCEPTANCE
3960	.2	END EFFECTOR SCHEMATIC 51140E729 FOR P/N 51140E1470-1 AND SCHEMATIC 51140E2221 FOR P/N 51140E1470-3 SPAR-RMS-SG 459/010 QTY-1	MODE: NO POWER OUTPUT TO SPEE.  CAUSE(S): (1) COIL FAILS O/C.	CAUSE (1) NO 28V OUTPUT AT SPEE. ALL EE MODES AVAILABLE.  WORST CASE  LOSS OF MISSION. LOSS OF SPEE POWER.  REDUNDANT PATHS REMAINING  N/A	QA/INSPECTIONS	<p>HERMETICALLY SEALED RELAYS ARE PROCURED TO SPAR SPECIFICATION SC.459/011, AS A QUALIFIED PRODUCT, IN ACCORDANCE WITH THE REQUIREMENTS OF MIL-R-6106G, PART NO. MS27401-5, AS REQUIRED BY SPAR SPECIFICATION SC.459/011. SCREENING INSPECTION IS PERFORMED ON 100% OF THE RELAYS TO THE REQUIREMENTS OF SC.459/001. SCREENING INSPECTION CONSIST OF THE FOLLOWING EXAMINATION AND TESTS, CONTACT RESISTANCE, COIL CURRENT, DC COIL RESISTANCE, PICKUP AND DROPOUT VOLTAGE/CURRENT, OPERATE AND RELEASE TIME, CONTACT BOUNCE, DIELECTRIC WITHSTANDING VOLTAGE, INSULATION RESISTANCE, SELA, HIGH, LOW ROOM TEMPERATURE RUN-IN, ELECTRICAL CHARACTERISTICS, PIND AND RADIOGRAPHIC INSPECTION IN ACCORDANCE WITH NSFC-STD-355.</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>COMPONENT MOUNTING INSPECTION FOR CORRECT SOLDERING, WIRE LOOPING, STRAPPING, ETC. OPERATORS AND INSPECTORS ARE TRAINED AND CERTIFIED TO NASA NHB 5300.4(3A) STANDARD, AS MODIFIED BY JSC 08800A.</p> <p>RELAYS ARE OPERATIONAL TESTED AND INSPECTED AS PART OF THE END EFFECTOR POWER UP TESTS IN ACCORDANCE WITH THE REQUIREMENTS OF SPAR INSPECTION TEST PROCEDURE ITP.251D.</p> <p>PRIOR TO END EFFECTOR ACCEPTANCE TESTING RELAYS ARE FUNCTIONALLY TESTED TO THE END EFFECTOR SPEE POWER TRANSFER RELAY TEST PROCEDURE SPAR-RMS-TR.1056. TESTING INCLUDES, E/E TEST SET FLAG STATUS, EXTEND, RIGIDIZED, DERIGIDIZED, SNARE OPEN, SNARE CLOSED, PAYLOAD CAPTURE AND BITE FLAG (PRE-RUN CONDITION), (AFTER APPLYING CAPTURE COMMAND), (AFTER APPLYING POWER TRANSFER RELAY SWITCH) AND (AFTER APPLYING RELEASE COMMAND).</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 QUALITY ASSURANCE IN CONJUNCTION WITH ENGINEERING, RELIABILITY, CONFIGURATION CONTROL, SUPPLIER AS APPLICABLE, AND THE GOVERNMENT REPRESENTATIVE, PRIOR TO THE START OF ANY NORMAL TESTING (ACCEPTANCE OR QUALIFICATION).</p> <p>ACCEPTANCE TESTING (ATP) INCLUDES, AMBIENT, VIBRATION AND THERMAL-VAC TESTING, (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT)</p>

PREPARED BY: HWG

SUPERSEDING DATE: 06 OCT 07

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

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

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
 ASS'Y NOMENCLATURE: END EFFECTOR

SYSTEM: MECHANICAL ARM SUBSYSTEM  
 ASS'Y P/N: 51140E1470-1A 3

SHEET: 4

FREA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HWR / FUNC. 2/2 CRITICALITY	RATIONALE FOR ACCEPTANCE
3960	2	END EFFECTOR SCHEMATIC 51140E729 FOR P/N 51140E1470-1 AND SCHEMATIC 51140E2221 FOR P/N 51140E1470-3 SPAR-RMS-SC 459/010 QTY-1	MODE: NO POWER OUTPUT TO SPEE.  CAUSE(S): (1) COIL FAILS O/C.	CAUSE (1) NO 28V OUTPUT AT SPEE. ALL EE MODES AVAILABLE.  WORST CASE LOSS OF MISSION. LOSS OF SPEE POWER.  REDUNDANT PATHS REMAINING ----- N/A		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)

PREPARED BY: MFVG

SUPERCEDING DATE: 06 OCT 97

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

RMS/MECH - 170

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
 ASS'Y NOMENCLATURE: END EFFECTOR

SYSTEM: MECHANICAL ARM SUBSYSTEM  
 ASS'Y P/N: 51140E1470-1A-3

SHEET: 5

FMEA REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDMR / FUNC. 2/2 CRITICALITY	RATIONALE FOR ACCEPTANCE
3960	2	END EFFECTOR SCHEMATIC 51140E729 FOR P/N 51140E1470-1 AND SCHEMATIC 51140E2221 FOR P/N 51140E1470-3 SPAR-RMS-SG 459/010 QTY: 1	MODE: NO POWER OUTPUT TO SPEE.  CAUSE(S): (1) COIL FAILS O/C.	CAUSE (1) NO 28V OUTPUT AT SPEE. ALL EE MODES AVAILABLE.  WORST CASE  LOSS OF MISSION. LOSS OF SPEC POWER.  REDUNDANT PATHS REMAINING  N/A	FAILURE HISTORY  THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.	

PREPARED BY: WZMG

SUPERSEDING DATE: 06 OCT 87

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

**CRITICAL ITEMS LIST**

PROJECT: SRHS  
 ASS'Y NOMENCLATURE: END EFFECTOR

SYSTEM: MECHANICAL ARM SUBSYSTEM  
 ASS'Y P/N: 51140E1470-11-3

SHEET: 6

PMA REF.	REV.	NAME QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	MDM / FUNC. 2/2 CRITICALITY	RATIONALE FOR ACCEPTANCE
3960	2	END EFFECTOR SCHEMATIC 51140E229 FOR P/W 51140E1470-1 AND SCHEMATIC 51140E2221 FOR P/W 51140E1470-3 SPAR-RHS-SG 459/010 QTY-1	MODE: NO POWER OUTPUT TO SPEE.  CAUSE(S): (1) COIL FAILS O/C.	CAUSE (1) NO 28V OUTPUT AT SPEE. ALL EE MODES AVAILABLE.  WORST CASE  LOSS OF MISSION. LOSS OF SPEE POWER.  REUNDANT PATHS REMAINING  N/A		OPERATIONAL EFFECTS ----- NO SPEE POWER TO PAYLOAD.  CREW ACTION ----- NONE  CREW TRAINING ----- NONE  MISSION CONSTRAINT ----- NONE  SCREEN FAILURES ----- N/A  OHRSD OFFLINE ----- VERIFY 20 VOLTS AT SPEE WHEN SPEE POWER SELECTED. OHRSD ONLINE INSTALLATION ----- NONE  OHRSD ONLINE TURNAROUND ----- VERIFY 20 VOLTS AT SPEE WHEN SPEE POWER SELECTED.

PREPARED BY: WENG

SUPERSEDING DATE: 06 OCT 87

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

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