CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: END EFFECTOR
SYSTEM: MECHANICAL ARM SUBSYSTEM
ASS'Y P/N: 51140E1470-TE-3
SHEET: 1

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1R CRITICALITY RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
3970	2	END EFFECTOR SCHEMATIC 51140E729 FOR P/N 51140E1470-1 AND 51140E2221 FOR P/N 51140E1470-3 SPAR-RMS-SG 459/011. QTY-1	MODE: CONTINUOUS SPEE POWER OUTPUT. CAUSE(S): (1) K1 CONTACT FAILS S/C.	CONTINUOUS 28V OUTPUT AT SPEE. IF RIGIDIZING TO PAYLOAD WHICH REQUIRES 5 AMPS, VOLTAGE DROP DOWN EE WIRING MAY CAUSE EEEU TO DROP OUT. ARM REMAINS LIMP UNTIL EE MODE SWITCH TO OFF DURING AN AUTO CAPTURE SEQUENCE. WORST CASE --- UNEXPECTED MOTION. INCOMPLETE CAPTURE/RELEASE SEQUENCE. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING --- BACKUP EE RELEASE.	DESIGN FEATURES --- RELAYS ARE HERMETICALLY SEALED TYPES, CONFORMING TO MIL-R-39016 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-RMS-PA.003. IN THE PACKAGING DESIGN, EMPHASIS HAS BEEN PLACED UPON RELAY MOUNTING TO ENSURE GOOD HEAT TRANSFER AND IMMUNITY FROM VIBRATION.

PREPARED BY: MFWG
SUPERCEDING DATE: 06 OCT 87
APPROVED BY:
DATE: 24 JUL 91
CIL REV: 2

CRITICAL ITEMS LIST

RMS NOMENCLATURE: END EFFECTOR

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

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1R CRITICALITY — RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
3970	2	END EFFECTOR SCHEMATIC 51140E729 FOR P/N 51140E1470-1 AND 51140E2221 FOR P/N 51140E1470-3 SPAR-RMS-GG 459/011. QTY-1	MODE: CONTINUOUS SPEE POWER OUTPUT. CAUSE(S): (1) K1 CONTACT FAILS S/C.	CONTINUOUS 28V OUTPUT AT SPEE. IF RIGIDIZING TO PAYLOAD WHICH REQUIRES 5 AMPS, VOLTAGE DROP DOWN EE WIRING MAY CAUSE EEEU TO DROP OUT. ARM REMAINS LIMP UNTIL EE MODE SWITCH TO OFF DURING AN AUTO CAPTURE SEQUENCE. WORST CASE --- UNEXPECTED MOTION. INCOMPLETE CAPTURE/RELEASE SEQUENCE. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING --- BACKUP EE RELEASE.	ACCEPTANCE TESTS --- THE EE ASSEMBLY IS TESTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTS: O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 7 O THERMAL VACUUM: +70 DEGREES C TO -25 DEGREES C (1 1/2 CYCLES) 1 X 10**6 TORR THE EE ASSEMBLY IS FURTHER TESTED IN THE IN THE RMS SYSTEM TEST (TP51B RMS STRONGBACK AND TP552 FLAT FLOOR TESTS) WHICH VERIFIES THE ABSENCE OF THE FAILURE MODE. QUALIFICATION TESTS --- THE EE ASSEMBLY QUALIFICATION TESTING CONSISTED OF THE FOLLOWING ENVIRONMENTS: O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 7 O SHOCK: 20G/11 MS - 3 AXES (6 DIRECTIONS) O THERMAL VACUUM: +81 DEGREES C TO -36 DEGREES C (6 CYCLES) 1 X 10**6 TORR 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. O EMC: MIL-STD-461A AS MODIFIED BY SL-E-0002 (TEST CE01, CE03, CS01, CS02, CS06, RE02 (N/B)) O STRUCTURAL STIFFNESS AND LOAD TEST FLIGHT CHECKOUT --- PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16987

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

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3970	2	END EFFECTOR SCHEMATIC 51140E729 FOR P/N 51140E1470-1 AND 51140E2221 FOR P/N 51140E1470-3 SPAR-RMS-SO 459/011. QTY-1	MODE: CONTINUOUS SPEE POWER OUTPUT. CAUSE(S): (1) K1 CONTACT FAILS S/C.	CONTINUOUS 28V OUTPUT AT SPEE. IF RIGIDIZING TO PAYLOAD WHICH REQUIRES 5 AMPS, VOLTAGE DROP DOWN EE WIRING MAY CAUSE EEEU TO DROP OUT. ARM REMAINS LIMP UNTIL EE MODE SWITCH TO OFF DURING AN AUTO CAPTURE SEQUENCE. WORST CASE --- UNEXPECTED MOTION. INCOMPLETE CAPTURE/RELEASE SEQUENCE. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING --- BACKUP EE RELEASE.	QA/INSPECTIONS --- HERMETICALLY SEALED RELAYS ARE PROCURED TO SPAR SPECIFICATION SG.459/011, AS A QUALIFIED PRODUCE, IN ACCORDANCE WITH THE REQUIREMENTS OF MIL-R-6106G, PART NO. MS27401-5, AS REQUIRED BY SPAR SPECIFICATION SG.459/011. SCREENING INSPECTION IS PERFORMED ON 100% OF THE RELAYS TO THE REQUIREMENTS OF SG.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 MSFC-STD-355. 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. PARTS ARE INSPECTED THROUGHOUT MANUFACTURE AND ASSEMBLY AS APPROPRIATE TO THE MANUFACTURING STAGE COMPLETED. THESE INSPECTIONS INCLUDE, 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. 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. PRIOR TO END EFFECTOR ACCEPTANCE TESTING RELAYS ARE FUNCTIONALLY TESTED TO THE END EFFECTOR SPEE POWER TRANSFER RELAY TEST PROCEDURE SPAR-RMS-TM.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). PRE-ACCEPTANCE TEST INSPECTION, WHICH INCLUDES AN AUDIT OF LOWER TIER INSPECTION COMPLETION, AS BUILT CONFIGURATION VERIFICATION TO AS DESIGN ETC., (MANDATORY INSPECTION POINT). 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). ACCEPTANCE TESTING (ATP) INCLUDES, AMBIENT, VIBRATION AND THERMAL-VAC TESTING, (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT)

PREPARED BY: MFWG SUPERCEDING DATE: 06 OCT 87 APPROVED BY: _____ DATE: 24 JUL 91 CIL REV: 2

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: END EFFECTOR

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

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1R CRITICALITY RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
3970	2	END EFFECTOR SCHEMATIC 51140E729 FOR P/N 51140E1470-1 AND 51140E2221 FOR P/N 51140E1470-3 SPAR-RMS-SQ 459/011. QTY-1	MODE: CONTINUOUS SPEE POWER OUTPUT. CAUSE(S): (1) K1 CONTACT FAILS S/C.	CONTINUOUS 28V OUTPUT AT SPEE. IF RIGIDIZING TO PAYLOAD WHICH REQUIRES 5 AMPS, VOLTAGE DROP DOWN EE WIRING MAY CAUSE EEEU TO DROP OUT. ARM REMAINS LIMP UNTIL EE MODE SWITCH TO OFF DURING AN AUTO CAPTURE SEQUENCE. WORST CASE --- UNEXPECTED MOTION. INCOMPLETE CAPTURE/RELEASE SEQUENCE. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING --- BACKUP EE RELEASE.	SRMS SYSTEMS INTEGRATION, THE INTEGRATION OF MECHANICAL ARM SUBASSEMBLIES AND THE FLIGHT CABIN EQUIPMENT TO FORM THE SRMS. [illegible]IONS ARE PERFORMED AT EACH PHASE OF INTEGRATION WHICH [illegible]S 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)

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SUPERCEDING DATE: 06 OCT 87

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CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: END EFFECTOR
SYSTEM: MECHANICAL ARM SUBSYSTEM
ASS'Y P/N: 51140E1470-1&-3
SHEET: 5

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
3970	2	END EFFECTOR SCHEMATIC 51140E729 FOR P/N 51140E1470-1 AND 51140E2221 FOR P/N 51140E1470-3 SPAR-RMS-SG 459/011. QTY-1	MODE: CONTINUOUS SPEE POWER OUTPUT. CAUSE(S): (1) K1 CONTACT FAILS S/C.	CONTINUOUS 28V OUTPUT AT SPEE. IF RIGIDIZING TO PAYLOAD WHICH REQUIRES 5 AMPS, VOLTAGE DROP DOWN EE WIRING MAY CAUSE EEEU TO DROP OUT. ARM REMAINS LIMP UNTIL EE MODE SWITCH TO OFF DURING AN AUTO CAPTURE SEQUENCE. WORST CASE --- UNEXPECTED MOTION. INCOMPLETE CAPTURE/RELEASE SEQUENCE. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING --- BACKUP EE RELEASE.	FAILURE HISTORY --- THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.

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CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: END EFFECTOR
SYSTEM: MECHANICAL ARM SUBSYSTEM
ASS'Y P/N: 51140E1470-1&-3
SHEET: 6

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1R CRITICALITY — RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
3970	2	END EFFECTOR SCHEMATIC 51140E729 FOR P/N 51140E1470-1 AND 51140E2221 FOR P/N 51140E1470-3 SPAR-RMS-SG 459/011. QTY-1	MODE: CONTINUOUS SPEE POWER OUTPUT. CAUSE(S): (1) K1 CONTACT FAILS S/C.	CONTINUOUS 28V OUTPUT AT SPEE. IF RIGIDIZING TO PAYLOAD WHICH REQUIRES 5 AMPS, VOLTAGE DROP DOWN EE WIRING MAY CAUSE EEEU TO DROP OUT. ARM REMAINS LIMP UNTIL EE MODE SWITCH TO OFF DURING AN AUTO CAPTURE SEQUENCE. WORST CASE ---------- UNEXPECTED MOTION. INCOMPLETE CAPTURE/RELEASE SEQUENCE. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING ---------- 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 JETTISONNED. 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 ---------- VERIFY THAT 28V IS NOT PRESENT AT SPEE WHEN SPEE POWER NOT SELECTED OMRSD ONLINE INSTALLATION ---------- NONE OMRSD ONLINE TURNAROUND ---------- VERIFY THAT 28V IS NOT PRESENT AT SPEE WHEN SPEE POWER NOT SELECTED

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