TICAL ITEMS LIST

PROJECT: SHMS
ASS'Y NOMENCLATURE: SERVO AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 5114OF1177
SHEET: 1

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	MDUR / FUNC. 2/1RA CRITICALITY	RATIONALE FOR ACCEPTANCE
3120	1	MOTOR DRIVE RELAY QTY-6 P/N MS27743-1 AND ZENER DIODES. INTER-CONNECTION DIAGRAM 2563716.	MODE: ONE OR MORE N.O. CONTACTS FAILS OPEN. CAUSE(S): (1) MECHANICAL FAILURE. (2) DEBRIS BETWEEN CONTACT. (3) CONTACTS STUCK IN N.C. POSITION (4) COIL FAILURE.	MOTOR WILL NOT DRIVE IN BACKUP MODE. WORST CASE --------- LOSS OF MISSION. BACKUP INOPERATIVE. UNANNUNCIATED. REDUNDANT PATHS REMAINING --------- SINGLE AND DIRECT		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 SI-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: MEWG
SUPERCEDING DATE: 19 NOV 86
APPROVED BY:
DATE:

RMS/ELEC - 799

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 5114OF1177
SHEET: 2

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1RA CRITICALITY	RATIONALE FOR ACCEPTANCE
3120	1	MOTOR DRIVE RELAY QTY-6 P/N MS27743-1 AND ZENER DIODES. INTER-CONNECTION DIAGRAM 2563716.	MODE: ONE OR MORE N.O. CONTACTS FAILS OPEN. CAUSE(S): (1) MECHANICAL FAILURE. (2) DEBRIS BETWEEN CONTACT. (3) CONTACTS STUCK IN N.C. POSITION (4) COIL FAILURE.	MOTOR WILL NOT DRIVE IN BACKUP MODE. WORST CASE --- LOSS OF MISSION. BACKUP INOPERATIVE. UNANNUNCIATED. REDUNDANT PATHS REMAINING --- SINGLE AND DIRECT		ACCEPTANCE TESTS --- THE SPA IS SUBJECTED TO THE FOLLOWING ENVIRONMENTAL TESTING AS AN SRU. O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 4 O THERMAL: PLUS 70 DEGREES C TO -25 DEGREES C DURATION - 1 1/2 CYCLES THE SPA IS THEN TESTED AS PART OF THE JOINTS ACCEPTANCE TESTS (VIBRATION AND THERMAL VACUUM TEST). THE SPA'S/JOINTS UNDERGO RMS SYSTEM TESTS (IPS18 RMS STRONGBACK AND IPS52 FLAT FLOOR TESTS) WHICH VERIFIES THE ABSENCE OF THE FAILURE MODE. QUALIFICATION TESTS --- THE SPA IS SUBJECTED TO THE FOLLOWING SRU QUALIFICATION TEST ENVIRONMENTS. THE SPA WAS ALSO TESTED AS PART OF THE JOINT QUALIFICATION TESTS. O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 4 O SHOCK: 20G/11 MS/3 AXES (6 DIRECTIONS) O THERMAL VAC: +81 DEGREES C TO -36 DEGREES C (6 CYCLES) 1X10**6 TORR O HUMIDITY: TESTED WITH THE SHOULDER JOINT O EMC: MIL-STD-461 AS MODIFIED BY SL-E-0002 (TEST CE01, CE03, CS01, CS02, CS06, RE01, RE02 (W/B), RS01) FLIGHT CHECKOUT --- PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16987

PREPARED BY: MFWG
SUPERCEDING DATE: 19 NOV 86
APPROVED BY
IE:

RMS/ELEC - 800

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: SERV[illegible] AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 2114[illegible]177
SHEET: 3

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	MODE / FUNC. 2/1RA CRITICALITY	RATIONALE FOR ACCEPTANCE
3120	1	MOTOR DRIVE RELAY QTY-6 P/N MS27743-1 AND ZENER DIODES. INTER-CONNECTION DIAGRAM 2563716.	MODE: ONE OR MORE N.O. CONTACTS FAILS OPEN. CAUSE(S): (1) MECHANICAL FAILURE. (2) DEBRIS BETWEEN CONTACT. (3) CONTACTS STUCK IN N.C. POSITION (4) COIL FAILURE.	MOTOR WILL NOT DRIVE IN BACKUP MODE. WORST CASE ---------- LOSS OF MISSION. BACKUP INOPERATIVE. UNANNUNCIATED. REDUNDANT PATHS REMAINING ---------- SINGLE AND DIRECT		QA/INSPECTIONS ---------- MOTOR DRIVE RELAYS ARE PROCURED AS A EEE QUALIFIED PRODUCT IN ACCORDANCE WITH THE REQUIREMENTS OF SPECIFICATION MIL-R-39016 AS REQUIRED BY SPAR-RMS-PA.003. ADDITIONALLY ALL RELAYS ARE 100% SCREENED TO THE REQUIREMENTS OF JSC SPECIFICATION SF-R.001 AS REQUIRED BY SPAR-RMS-PA.003. SCREENING TESTING CONSIST OF THERMAL SHOCK, HIGH AND LOW TEMPERATURE OPERATION, INSULATION RESISTANCE, CONTACT RESISTANCE, OPERATING VOLTAGES, RADIOGRAPHIC INSPECTION AND PIND TEST. 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. WIRE IS PROCURED TO SPECIFICATION MIL-W-22759 OR MIL-W-81381 AND INSPECTED AND TESTED TO NASA JSCM8080 STANDARD NUMBER 95A. 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, PRINTED CIRCUIT BOARD INSPECTION FOR TRACK SEPARATION, DAMAGE AND ADEQUACY OF PLATED THROUGH HOLES, 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. CONFORMAL COATING INSPECTION FOR ADEQUATE PROCESSING IS PERFORMED USING ULTRAVIOLET LIGHT TECHNIQUES. POST P.C. BD. INSTALLATION INSPECTION, CLEANLINESS AND WORKMANSHIP (SPAR/GOVERNMENT REP. MANDATORY INSPECTION POINT) P.C. BD. INSTALLATION INSPECTION, CHECK FOR CORRECT BOARD INSTALLATION, ALIGNMENT OF BOARDS, PROPER CONNECTOR CONTACT MATING, WIRE ROUTING, STRAPPING OF WIRES ETC., PRE-CLOSURE INSPECTION, WORKMANSHIP AND CLEANLINESS (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT) PRE-ACCEPTANCE TEST INSPECTION, WHICH INCLUDES AN AUDIT OF LOWER TIER INSPECTION COMPLETION, AS BUILT CONFIGURATION

PREPARED BY: MFMG
SUPERCEDING DATE: 19 NOV 86
APPROVED BY: _____ DATE: _____

RMS/ELEC - 801

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 51140F1177
SHEET: 4

FMEA REF.	REV.	NOMENCLATURE, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1RA CRITICALITY	RATIONALE FOR ACCEPTANCE
3120	1	MOTOR DRIVE RELAY QTY-6 P/N MS27743-1 AND ZENER DIODES. INTER-CONNECTION DIAGRAM 2563716.	MODE: ONE OR MORE N.O. CONTACTS FAILS OPEN. CAUSE(S): (1) MECHANICAL FAILURE. (2) DEBRIS BETWEEN CONTACT. (3) CONTACTS STUCK IN N.C. POSITION (4) COIL FAILURE.	MOTOR WILL NOT DRIVE IN BACKUP MODE. WORST CASE ..... LOSS OF MISSION. BACKUP INOPERATIVE. UNANNUNCIATED. REDUNDANT PATHS REMAINING ..... SINGLE AND DIRECT		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 PERFORMANCE, THERMAL AND VIBRATION TESTING, (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT). INTEGRATION OF UNIT TO JOINT SRU - INSPECTIONS INCLUDE GROUNDING CHECKS, CONNECTORS FOR BENT OR PUSHBACK CONTACTS, VISUAL, CLEANLINESS, INTERCONNECT WIRING AND POWER UP TEST TO THE APPROPRIATE JOINT INSPECTION TEST PROCEDURE (IIP) ETC. JOINT LEVEL PRE-ACCEPTANCE TEST INSPECTION, INCLUDES AN AUDIT OF LOWER TIER INSPECTION COMPLETION, AS BUILT CONFIGURATION VERIFICATION TO AS DESIGN ETC. JOINT LEVEL ACCEPTANCE TESTING (ATP) INCLUDES AMBINET, 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)

PREPARED BY: MFWG
SUPERCEDING DATE: 19 NOV 86
APPROVED BY:

CRITICAL ITEMS LIST

PROJECT: SPMS
ASS'Y NOMENCLATURE: SERVO AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 2114DE1177
SHEET: 5

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	MODE / FUNC. 2/1RA CRITICALITY	RATIONALE FOR ACCEPTANCE
3120	1	MOTOR DRIVE RELAY QTY-6 P/N MS27743-1 AND ZENER DIODES. INTER-CONNECTION DIAGRAM 2563716.	MODE: ONE OR MORE N.O. CONTACTS FAILS OPEN. CAUSE(S): (1) MECHANICAL FAILURE. (2) DEBRIS BETWEEN CONTACT. (3) CONTACTS STUCK IN N.C. POSITION (4) COIL FAILURE.	MOTOR WILL NOT DRIVE IN BACKUP MODE. WORST CASE ---------- LOSS OF MISSION. BACKUP INOPERATIVE. UNANNUNCIATED. REDUNDANT PATHS REMAINING ---------- SINGLE AND DIRECT		FAILURE HISTORY ---------- THE FOLLOWING FAILURE ANALYSIS REPORT(S) ARE RELEVANT: FAR 3317: S/N 304 JUL 82 BACK-UP TRANSF. RELAY FAILED TO OPERATE DUE TO BROKEN WIRE. CORRECTIVE ACTION ---------- WIRE ROUTING CORRECTED.

PREPARED BY: MFWG
SUPERCEDING DATE: 19 NOV 86
APPROVED BY:
DATE:

RMS/ELEC - 803

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: SI1A0F1177
SHEET: 6

FMEA REF.	REV.	NAME QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. Z/IRA CRITICALITY	RATIONALE FOR ACCEPTANCE
3120	2	MOTOR DRIVE RELAY QTY-6 P/N MS27743-1 AND ZENER DIODES. INTER-CONNECTION DIAGRAM 2563716.	MODE: ONE OR MORE N.O. CONTACTS FAILS OPEN. CAUSE(S): (1) MECHANICAL FAILURE. (2) DEBRIS BETWEEN CONTACT. (3) CONTACTS STUCK IN N.C. POSITION (4) COIL FAILURE.	MOTOR WILL NOT DRIVE IN BACKUP MODE. WORST CASE --- LOSS OF MISSION. BACKUP INOPERATIVE. UNANNUNCIATED. REDUNDANT PATHS REMAINING --- SINGLE AND DIRECT		OPERATIONAL EFFECTS --- LOSS OF NEXT REDUNDANT PATH RESULTS IN BEING ONE FAILURE AWAY FROM INABILITY TO CRADLE ARM. JOINT WILL NOT DRIVE IN BACKUP ONCE PRIMARY MODES HAVE FAILED. THE BACKUP STANDBY SYSTEM WILL NOT PROVIDE THE CAPABILITY TO CRADLE THE ARM. ARM CAN BE JETTISONED. CREW ACTION --- PERFORM AN EVA TO STOW THE ARM OR JETTISON. CREW TRAINING --- NONE MISSION CONSTRAINT --- ARM SHOULD NOT BE MANEUVERED TO POSITION WHERE JETTISON CANNOT BE SAFELY PERFORMED. SCREEN FAILURES --- A: INDEPENDANT PATH NOT INSTRUMENTED. B: N/A (STANDBY REDUNDANT) OMRSD OFFLINE --- DRIVE EACH JOINT IN BACKUP VERIFY EACH JOINT DRIVES VERIFY 10KHZ OMRSD ONLINE INSTALLATION --- NONE OMRSD ONLINE TURNAROUND. --- FOR EACH JOINT VERIFY 10 KHZ WHEN JOINT COMMANDED IN BACKUP

PREPARED BY: MWG
SUPERCEDING DATE: 06 OCT 87
APPROVED BY: