CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 51140F1177
SHEET: 1

TREA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. Z/IR CRITICALITY	RATIONALE FOR ACCEPTANCE
3100	1 -	BRAKE RELEASE CONTROL QTY 6 SCHEMATIC 2563717	MODE: LOSS OF CAPABILITY TO RELEASE BRAKE WHEN BACKUP DRIVE IS SELECTED. CAUSE(S): (1) DIODE FAILURE IN BACKUP DRIVE.	JOINT CANNOT BE DRIVEN IN BACKUP MODE. THE BACKUP MODE CANNOT PROVIDE SUFFICIENT TORQUE TO OVER DRIVE BRAKE. WORST CASE --- LOSS OF MISSION BACKUP INOPERATIVE UNANNUNCIATED. REDUNDANT PATHS REMAINING --- SINGLE AND DIRECT		DESIGN FEATURES --- DISCRETE SEMICONDUCTOR DEVICES SPECIFIED TO AT LEAST THE TX LEVEL OF MIL-S-19500. ALL DEVICES ARE SUBJECTED TO RE-SCREENING BY AN INDEPENDANT TEST HOUSE. SAMPLES OF ALL PROCURED LOTS/DATE 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.003 AND VERIFIED BY DESIGN REVIEW.

PREPARED BY: MJUG
SUPERCEDING DATE: 24 NOV 86
APPROVED BY:
DATE:

RMS/ELEC - 763

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 51V40F1177
SHEET: 2

ITEM REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE
3100	1 -	BRAKE RELEASE CONTROL QTY-6 SCHEMATIC 2563717	MODE: LOSS OF CAPABILITY TO RELEASE BRAKE WHEN BACKUP DRIVE IS SELECTED. CAUSE(S): (1) DIODE FAILURE IN BACKUP DRIVE.	JOINT CANNOT BE DRIVEN IN BACKUP MODE. THE BACKUP MODE CANNOT PROVIDE SUFFICIENT TORQUE TO OVER DRIVE BRAKE. 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 (IP51B RMS STRONGBACK AND IP552 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 (N/B), RS01) FLIGHT CHECKOUT --------- PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16987

PREPARED BY: MFMG
SUPERCEDING DATE: 24 NOV 86
APPROVED BY:

ICAL ITEMS LIST

PROJECT: SAMS
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 2114071177
SHEET: 3

ITEM REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	ROW / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE
3100	1	BRAKE RELEASE CONTROL QTY-6 SCHEMATIC 2563717	MODE: LOSS OF CAPABILITY TO RELEASE BRAKE WHEN BACKUP DRIVE IS SELECTED. CAUSE(S): (1) DIODE FAILURE IN BACKUP DRIVE.	JOINT CANNOT BE DRIVEN IN BACKUP MODE. THE BACKUP MODE CANNOT PROVIDE SUFFICIENT TORQUE TO OVER DRIVE BRAKE. WORST CASE --------- LOSS OF MISSION BACKUP INOPERATIVE UNANNUNCIATED. REDUNDANT PATHS REMAINING --------- SINGLE AND DIRECT		QA/INSPECTIONS --------- 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. 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 VERIFICATION TO AS DESIGN ETC., (MANDATORY INSPECTION POINT).

PREPARED BY: MEWG
SUPERCEDING DATE: 24 NOV 86
APPROVED BY: _____ DATE: _____

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 5114DF1177
SHEET: 4

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE
3100	1	BRAKE RELEASE CONTROL QTY-6 SCHEMATIC 2563717	MODE: LOSS OF CAPABILITY TO RELEASE BRAKE WHEN BACKUP DRIVE IS SELECTED. CAUSE(S): (1) DIODE FAILURE IN BACKUP DRIVE.	JOINT CANNOT BE DRIVEN IN BACKUP MODE. THE BACKUP MODE CANNOT PROVIDE SUFFICIENT TORQUE TO OVER DRIVE BRAKE. WORST CASE --------- LOSS OF MISSION BACKUP INOPERATIVE UNANNUNCIATED. REDUNDANT PATHS REMAINING --------- SINGLE AND DIRECT		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 (TIP) 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: MFUG
SUPERCEDING DATE: 24 NOV 86
APPROVED
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TICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 51T40T1177
SHEET: 5

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE
3100	1 1	BRAKE RELEASE CONTROL QTY-6 SCHEMATIC 2563717	MODE: LOSS OF CAPABILITY TO RELEASE BRAKE WHEN BACKUP DRIVE IS SELECTED. CAUSE(S): (1) DIODE FAILURE IN BACKUP DRIVE.	JOINT CANNOT BE DRIVEN IN BACKUP MODE. THE BACKUP MODE CANNOT PROVIDE SUFFICIENT TORQUE TO OVER DRIVE BRAKE. WORST CASE ..... LOSS OF MISSION BACKUP INOPERATIVE UNANNUNCIATED. REDUNDANT PATHS REMAINING ..... SINGLE AND DIRECT		FAILURE HISTORY ..... THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.

PREPARED BY: MEMG
SUPERCEDING DATE: 24 NOV 86
APPROVED BY:
DATE:

RMS/ELEC - 767

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: SIT40PT177
SHEET: 6

FMEA REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE
3100	2	BRAKE RELEASE CONTROL QTY-6 SCHEMATIC 2563717	MODE: LOSS OF CAPABILITY TO RELEASE BRAKE WHEN BACKUP DRIVE IS SELECTED. CAUSE(S): (1) DIODE FAILURE IN BACKUP DRIVE.	JOINT CANNOT BE DRIVEN IN BACKUP MODE. THE BACKUP MODE CANNOT PROVIDE SUFFICIENT TORQUE TO OVER DRIVE BRAKE. 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 --- B: N/A (STANDBY REDUNDANT) OMRSD OFFLINE --- IN BACK UP WITH ELBOW DENATED VERIFY THAT EACH JOINT DRIVES. IN BACKUP VERIFY BRAKE ACTUATION AUDIBLE. OMRSD ONLINE INSTALLATION --- NONE OMRSD ONLINE TURNAROUND --- IN BACKUP DRIVE EACH JOINT. VERIFY BRAKE ACTUATION AUDIBLE.

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