

**CRITICAL ITEMS LIST**

PROJECT: RMS  
 ASS'Y NOMENCLATURE: SERVO MOTOR AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 51140P1177

SHEET: 1

ITEM REF.	DEV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOUR / TIME, 2/100 CRITICALITY	RATIONALE FOR ACCEPTANCE
2000	0	POWER SIGNAL CONTROL QTY 6 SCHEMATIC 2543717	MODE: BRAKE OFF ON ONE JOINT.  CAUSE(S): (1) D/D BRAKE OFF DRIVE TRANSISTORS.	ONE JOINT HAS BRAKE ENERGIZED OFF WHEN ARM SELECTED. FAILED JOINT WILL HAVE ZERO RATE COMMAND. DYNAMIC BRAKING WILL OCCUR. AUTO BRAKES WILL BE INOPERATIVE FOR THIS JOINT.  WORST CASE ..... LOSS OF AUTO BRAKE. UNANNUNCIATED.  REDUNDANT PATHS REMAINING ..... SINGLE JOINT RUNAWAY FAILURE		DESIGN FEATURES ..... DISCRETE SEMICONDUCTOR DEVICES SPECIFIED TO AT LEAST THE 1X 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.

RMS/ELEC - 549

PREPARED BY: MELG

SUPERSEDED DATE: 19 SEP 66

APPROVED BY:

**CRITICAL ITEM LIST**

PROJECT: SRMS  
ASS'Y NUMERATION: SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM  
ASS'Y P/N: 2114071177 SHEET: 2

ITEM REF.	REV.	DATE BY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOW ? FREQ. 2/1RD CRITICALITY	RATIONALE FOR ACCEPTANCE
2800	0	POWER SIGNAL CONTROL BIT & SCHEMATIC 2563717	MODE: BRAKE OFF ON THE JOINT.  CAUSE(S): (1) O/D BRAKE OFF DRIVE TRANSISTORS.	ONE JOINT HAS BRAKE ENERGIZED OFF WHEN ARM SELECTED. FAILED JOINT WILL HAVE ZERO RATE COMMAND. DYNAMIC BRAKING WILL OCCUR. AUTO BRAKES WILL BE INOPERATIVE FOR THIS JOINT.  WORST CASE  LOSS OF AUTO BRAKE. UNANNUNCIATED.  REDUNDANT PATHS REMAINING  SINGLE JOINT RUNAWAY FAILURE		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 (TP510 RMS STRONGBACK AND TP552 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: +01 DEGREES C TO -36 DEGREES C (6 CYCLES) 1X10 <sup>-6</sup> 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

RMS/ELEC - 550

PREPARED BY: HMG

SUPPLEMENTING DATE: 11 SEP 86

APPROVED BY:

DATE:

**CRITICAL ITEM LIST**

PROJECT: SRMS  
 ASS'Y NOMENCLATURE: SERVO MOTOR AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 211601177

SHEET: 3

ITEM REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOW? FUNC. 2/100 CRITICALITY	RATIONALE FOR ACCEPTANCE
2000	0	POWER SIGNAL CONTROL QTY: 6 SCHEMATIC 2563717	MODE 1 BRAKE OFF ON ONE JOINT.  CAUSE(S): (1) O/D BRAKE OFF DRIVE TRANSISTORS.	ONE JOINT HAS BRAKE ENERGIZED OFF WHEN AAM SELECTED. JOINT WILL HAVE ZERO RATE COMMAND. DYNAMIC BRAKING WILL OCCUR. AUTO BRAKES WILL BE INOPERATIVE FOR THIS JOINT.  WORST CASE LOSS OF AUTO BRAKE. IMMANICATED.  REDUNDANT PATHS REMAINING  SINGLE JOINT RUNAWAY FAILURE	2/100	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 3 PIECES, MINIMUM 3 PIECES FOR EACH LOT NUMBER/DATE CODE OF PARTS RECEIVED.  WIRE IS PROCURED TO SPECIFICATION MIL-L-22759 OR MIL-W-81301 AND INSPECTED AND TESTED TO NASA JSCM0000 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 WHB 5300.4(3A) STANDARD, AS MODIFIED BY JSC 0800A.  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: NEMG

SUBMITTING DATE: 11 SEP 66

APPROVED BY:

RMS/ELEC - 551

**CRITICAL ITEMS LIST**

PROJECT: SRMS

ASSY NAME/FEATURE: SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM

ASSY P/N: 5175021177

SHEET: 4

P/N REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RISK / PRIORITY / CRITICALITY	RATIONALE FOR ACCEPTANCE
2800	0	POWER SIGNAL CONTROL QTY 6 SCHEMATIC 2563717	<p>MODE: BRAKE OFF ON ONE JOINT.</p> <p>CAUSE(S): (1) D/D BRAKE OFF DRIVE TRANSISTORS.</p>	<p>ONE JOINT HAS BRAKE ENERGIZED OFF WHEN ARM SELECTED. FAILED JOINT WILL HAVE ZERO RATE COMMAND. DYNAMIC BRAKING WILL OCCUR. AUTO BRAKES WILL BE INOPERATIVE FOR THIS JOINT.</p> <p>WORST CASE</p> <p>LOSS OF AUTO BRAKE. UNANNOUNCIATED.</p> <p>REDUNDANT PATHS REMAINING</p> <p>SINGLE JOINT RUNAWAY FAILURE</p>	HIGH	<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 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.</p> <p>JOINT LEVEL PRE-ACCEPTANCE TEST INSPECTION, INCLUDES AN AUDIT OF LOWER TIER INSPECTION COMPLETION, AS BUILT CONFIGURATION VERIFICATION TO AS DESIGN ETC.</p> <p>JOINT LEVEL 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 - 552

PREPARED BY: NIMG

SUPERSEDING DATE: 11 SEP 86

APPROVED BY:

DATE:

**CRITICAL ITEM LIST**

PROJECT: SWS  
 ASS'Y IDENTIFICATION: STAVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 517401177

SHEET: 3

P/N REF.	REV.	PART QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RPN / D/C: 2/100 CRITICALITY	RATIONALE FOR ACCEPTANCE
2A00	0	PWR SIGNAL CONTROL QTY 6 SCHEMATIC 7561717	MODE: BRAKE OFF ON ONE JOINT.  CAUSE(S): (1) D/D BRAKE OFF DRIVE TRANSISTERS.	ONE JOINT HAS BRAKE ENERGIZED OFF WHEN ARM SELECTED. FAILED JOINT WILL HAVE ZERO RATE COMMAND. DYNAMIC BRAKING WILL OCCUR. AUTO BRAKES WILL BE INOPERATIVE FOR THIS JOINT.  WORST CASE ----- LOSS OF AUTO BRAKE. UNANNUNCIATED.  REDUNDANT PATHS REMAINING ----- SINGLE JOINT RUNAWAY FAILURE	RPN / D/C: 2/100 CRITICALITY	FAILURE HISTORY ----- THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SWS PROGRAM.

RMS/ELEC - 553

PREPARED BY: HMG

SUBMITTING DATE: 11 SEP 66

APPROVED BY:

**CRITICAL ITEMS LIST**

PROJECT: RMS  
 ASS'Y MON/REP: STROV POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/R: 517007177

SHEET: 6

YRCA REF.	REV.	NAME QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RATIONAL FOR ACCEPTANCE
2000	1	POWER SIGNAL CONTROL QTY 4 SCHEMATIC 2563717	MODE: BRAKE OFF ON ONE JOINT.  CAUSE(S): (1) D/O BRAKE OFF DRIVE TRANSISTORS.	ONE JOINT HAS BRAKE ENERGIZED OFF WHEN ARM SELECTED FAILED JOINT WILL HAVE ZERO RATE COMMAND. DYNAMIC BRAKING WILL OCCUR. AUTO BRAKES WILL BE INDICATIVE FOR THIS JOINT.  WORST CASE  LOSS OF AUTO BRAKE. UNANNUNCIATED  REDUNDANT PATHS REMAINING  SINGLE JOINT RUNAWAY FAILURE	OPERATIONAL EFFECTS ----- NONE. ARM WILL NOT STOP AUTOMATICALLY AFTER A SUBSEQUENT FAILURE. BUT FAILURE WILL BE ANNUNCIATED. BACKUP AVAILABLE.  CREW ACTION ----- TURN RMS POWER SW TO OFF TO APPLY BRAKES.  CREW TRAINING ----- THE CREW WILL BE TRAINED TO TURN RMS POWER TO OFF IF BRAKES FAIL TO STOP ARM.  MISSION CONSTRAINT ----- IF A FAILURE OF THE FUNCTION IS DETECTED, PRIMARY MODES SHOULD NOT BE USED. OPERATE AT LESS THAN VERNIER RATES WITHIN 10 FT OF STRUCTURE BY CYCLING DIRECT DRIVE SWITCH. THE OPERATOR MUST BE ABLE TO DETECT THAT THE ARM IS RESPONDING PROPERLY TO COMMANDS VIA WINDOW AND/OR CCTV VIEWS DURING ALL ARM OPERATIONS. AUTOTRAJECTORIES MUST BE DESIGNED TO COME NO CLOSER THAN 5 FT FROM STRUCTURE.  SCREEN FAILURES ----- 0: NO ORBITER ANNUNCIATION OR DISPLAY.  OMRSD OFFLINE ----- IN DIRECT DRIVE EACH JOINT. VERIFY JOINT STOPPING DISTANCE WHEN COMMAND IS REMOVED AND AUDIBLE BRAKE ACTUATION.  OMRSD ONLINE INSTALLATION ----- NONE  OMRSD ONLINE TURNAROUND ----- DRIVE EACH JOINT IN DIRECT MODE. VERIFY AUDIBLE BRAKE ACTUATION.

RMS/ELEC - 554

PREPARED BY: WMC

SUPERSEDING DATE: 04 OCT 87

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

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