

**ICAL ITEM LIST**

PROJECT: RMS (S MCIU INSTALLED)  
 ASS'Y NAME: SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 51240F1177

SHEET: 1

IMEA REF.	IMEA REV.	NAME OF DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
2745	0	FLAG PROCESSING DTY-B SCHEMATIC 2563723 2563719	MODE: SPA 20V BITE FLAG FAILS HIGH.  CAUSE(S): (1) REF PARIS FAILURE.	AUTOBRAKES ARE APPLIED. ARM COMES TO REST. LOSS OF COMPUTER SUPPORTED MODES. FALSE ALARMS FOR SPA +20V. 2ND FAILURE UNDETECTED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE.  WORST CASE UNABLE TO RELEASE BRAKES. LOSS OF ARM DRIVE CAPABILITY.  REDUNDANT PATHS REMAINING TO CONTINUE OPERATIONS: 1) DIRECT DRIVE. 2) BACK-UP DRIVE. 3) JETTISON (TO SECURE ORBITER).		DESIGN FEATURES  THE DESIGN UTILIZES PROVEN CIRCUIT TECHNIQUES AND IS IMPLEMENTED USING CMOS LOGIC DEVICES.  CMOS DEVICES OPERATE AT LOW POWER AND HENCE DO NOT ENHANCE SIGNIFICANT OPERATING STRESSES. THE TECHNOLOGY IS MATURE, AND DEVICE RELIABILITY HISTORY IS WELL DOCUMENTED. ALL STRESSES ARE ADDITIONALLY REDUCED BY DERATING THE APPROPRIATE PARAMETERS IN ACCORDANCE WITH SPA RMS-PA.003. SPECIAL HANDLING PRECAUTIONS ARE USED AT ALL STAGES OF MANUFACTURE TO PRECLUDE DAMAGE/STRESS DUE TO ELECTROSTATIC DISCHARGE.

RMS/ELEC - 469

PREPARED BY: MTWG SUPERSEDING DATE: NONE

DATE: 11 JUN 91 CFI REV: 0

51240F1177  
 ATTACHMENT  
 PAGE 1 OF 2

**CRITICAL ITEMS LIST**

PROJECT: SAMS (3 MCIU INSTALLED)  
 ASS'Y NAME/PART/ITER: SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: S11C071177

SHEET: 2

IMEA REF.	IMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOUR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A PASS, B-PASS, C PASS
2745	0	FLAG PROCESSING QTY 8 SCHEMATIC 2563723 2563710	<p>MODE: SPA 20V BITE FLAG FAILS HIGH.</p> <p>CAUSE(S): (1) EEE PARTS FAILURE.</p>	<p>AUTOBRAKES ARE APPLIED. ARM COMES TO REST. LOSS OF COMPUTER SUPPORTED MODES. FALSE ALARMS FOR SPA +20V. 2ND FAILURE UNDETECTED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE.</p> <p>WORST CASE UNABLE TO RELEASE BRAKES. LOSS OF ARM DRIVE CAPABILITY.</p> <p>REDUNDANT PATHS REMAINING TO CONTINUE OPERATIONS: 1) DIRECT DRIVE. 2) BACK-UP DRIVE. 3) JETTISON (TO SECURE ORBITER).</p>	<p>ACCEPTANCE TESTS THE SPA IS SUBJECTED TO THE FOLLOWING ENVIRONMENTAL TESTING AS AN SRU.</p> <p>0 VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 4</p> <p>0 THERMAL: PLUS 70 DEGREES C TO -25 DEGREES C DURATION - 1 1/2 CYCLES</p> <p>THE SPA IS THEN TESTED AS PART OF THE JOINTS ACCEPTANCE TESTS (VIBRATION AND THERMAL VACUUM TEST).</p> <p>THE SPA'S/JOINTS UNDERGO RMS SYSTEM TESTS (TP510 RMS STRONGBACK AND TP552 FLA) FLOOR TESTS) WHICH VERIFIES THE ABSENCE OF THE FAILURE MODE.</p> <p>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.</p> <p>0 VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 4</p> <p>0 SHOCK: 20G/11 MS/3 AXES (6 DIRECTIONS)</p> <p>0 THERMAL VAC: +81 DEGREES C TO -36 DEGREES C (6 CYCLES) 1X10<sup>-6</sup> TORR</p> <p>0 HUMIDITY: TESTED WITH THE SHOULDER JOINT</p> <p>0 EMC: MIL-STD-461 AS MODIFIED BY SI-E-0002 (TEST CE01, CE03, CS01, CS02, CS06, RE01, RE02 (N/B), RS01)</p> <p>FLIGHT CHECKOUT PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16987</p>	

RMS/ELEC - 470

PREPARED BY: MING

SUPERSEDING DATE: NONE

DATE: 11 JUL 91 CIR REV: 0

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**CRITICAL ITEM LIST**

PROJECT: SRMS (S MLIU INSTALLED)  
 ASS'Y NUMBER (PARTURE): SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: SIT&DF1177

SHEET: 3

IMEA REF.	IMEA REV.	NAME QTY. & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOW / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A PASS, B-PASS, C PASS
2745	0	FIG PROCESSING QTY: 8 SCHEMATIC 2563723 2563719	<p>MODE: SPA 20V BITE FLAG FAILS HIGH.</p> <p>CAUSE(S):                      (1) EEE PARTS FAILURE.</p>	<p>AUTOBRAKES ARE APPLIED. ARM COMES TO REST. LOSS OF COMPUTER SUPPORTED MODES. FALSE ALARMS FOR SPA +20V. 2ND FAILURE UNDETECTED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE.</p> <p>WORST CASE                      UNABLE TO RELEASE BRAKES. LOSS OF ARM DRIVE CAPABILITY.</p> <p>REDUNDANT PATHS REMAINING                      TO CONTINUE OPERATIONS:                      1) DIRECT DRIVE.                      2) BACK-UP DRIVE.                      3) JETTISON (TO SECURE ORBITER).</p>	<p>QA/INSPECTIONS</p> <p>UM IS 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.</p> <p>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).</p> <p>WIRE IS PROCURED TO SPECIFICATION MIL-W-22759 OR MIL-W-81301 AND INSPECTED AND TESTED TO NASA JSCM8000 STANDARD NUMBER 95A.</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>PRINTED CIRCUIT BOARD INSPECTION FOR TRACK SEPARATION, DAMAGE AND ADEQUACY OF PLATED THROUGH HOLES,</p> <p>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.</p> <p>CONFORMAL COATING INSPECTION FOR ADEQUATE PROCESSING IS PERFORMED USING ULTRAVIOLET LIGHT TECHNIQUES.</p> <p>POST P.C. BD. INSTALLATION INSPECTION, CLEANLINESS AND WORKMANSHIP (SPAR/GOVERNMENT REP. MANDATORY INSPECTION POINT)</p> <p>P.C. BD. INSTALLATION INSPECTION, CHECK FOR CORRECT BOARD INSTALLATION, ALIGNMENT OF BOARDS, PROPER CONNECTOR CONTACT MATING, WIRE ROUTING, STRAPPING OF WIRES ETC.,</p> <p>PRE-CLOSURE INSPECTION, WORKMANSHIP AND CLEANLINESS (SPAR/GOVERNMENT REP. MANDATORY INSPECTION POINT)</p> <p>PRE-ACCEPTANCE TEST INSPECTION, WHICH INCLUDES AN AUDIT OF LOWER USER INSPECTION COMPLETION, AS BUILT CONFIGURATION VERIFICATION TO AS DESIGN ETC., (MANDATORY INSPECTION POINT).</p>	

RMS/ELEC - 471

EXPLOSION PROOF

SPECIFIED ATTACHMENT PAGE 122 OF 127

PREPARED BY:

MFWG

SUPERSEDING DATE: NONE

DATE: 11 JUL 91

CIL REV: 0

**CRITICAL ITEM LIST**

PROJECT SRMS (5 MCHG INSTALLED)  
 ASS'Y IDENTIFICATION: SCRDV POUH ADPTIFR

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/R: 511607177

SHEET: 4

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT (W/ END ITEM)	HOWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTABLE SCREENS: A PASS, B PASS, C-PASS
2745	0	FLAG PRIMESSING OIF & SCHEMATIC 2563723 2563719	MODE: SPA 20V BITE FLAG FAILS HIGH.	AUTOBRAKES ARE APPLIED. ARM COMES TO REST. LOSS OF COMPUTER SUPPORTED MODES. FALSE ALARMS FOR SPA +20V 2ND FAILURE UNDETECTED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE.	2/1R	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 AMBIENT, 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)
			CAUSE(S): (1) EYE PARTS FAILURE.	WORST CASE ..... UNABLE TO RELEASE BRAKES. LOSS OF ARM DRIVE CAPABILITY.		
				REDUNDANT PATHS REMAINING ..... TO CONTINUE OPERATIONS:  1) DIRECT DRIVE.  2) BACK-UP DRIVE.  3) JETTISON (TO SECURE ORBITER).		

RMS/ELEC - 472

PREPARED BY:

MFG

SUPRECEDING DATE: NONE

DATE: 11 JUL 91

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**TICAL ITEMS LIST**

PROJECT: SRMS (1.5 MCJU INSTALLED)  
 ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/N: 51140FT177

SHEET: 5

ITEM REF.	IMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
2745	0	FLAG PROCESSING QTY 6 SCHEMATIC 2563723 2563719	MODE: SPA 20V BITE FLAG FAILS HIGH.  CAUSE(S): (1) EEE PARIS FAILURE.	AUTOBRAKES ARE APPLIED. ARM COMES TO REST. LOSS OF COMPUTER SUPPORTED MODES. FALSE ALARMS FOR SPA +20V. 2ND FAILURE UNDETECTED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE.  WORST CASE UNABLE TO RELEASE BRAKES. LOSS OF ARM DRIVE CAPABILITY.  REDUNDANT PATHS REMAINING TO CONTINUE OPERATIONS: 1) DIRECT DRIVE. 2) BACK-UP DRIVE. 3) JETTISW (TO SECURE ORBITER).		FAILURE HISTORY  THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.

RMS/ELEC - 473

PREPARED BY:

MWNG

SUPERCEDING DATE: NONE

DATE: 31 JUL 91

CEL REV: 0

DATE RECEIVED

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 ATTACHMENT  
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**CRITICAL ITEMS LIST**

PROJECT: SRMS ( 5 MCIU INSTALLED)  
 ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM  
 ASS'Y P/R: 5114071177

SHEET: 6

IMEA REF.	IMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT (IN END ITEM)	HOWR / FUNC. Z/IR CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
2745	0	FLAG PROCESSING QTY: 6 SCHEMATIC 2563723 2563719	MODE: SPA 28V BITE FLAG FAILS HIGH.  CAUSE(S): (1) EEE PARTS FAILURE.	AUTOBRAKES ARE APPLIED. ARM COMES TO REST. LOSS OF COMPUTER SUPPORTED MODES. FALSE ALARMS FOR SPA +28V. 2ND FAILURE UNDETECTED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE.  WORST CASE UNABLE TO RELEASE BRAKES. LOSS OF ARM DRIVE CAPABILITY.  REDUNDANT PATHS REMAINING TO CONTINUE OPERATIONS: 1) DIRECT DRIVE. 2) BACK-UP DRIVE. 3) JETTISON (TO SECURE ORBITER).		OPERATIONAL EFFECTS COMPUTER SUPPORTED MODES CANNOT BE USED TO COMPLETE THE MISSION. DIRECT DRIVE AND BACK-UP MODES REMAIN. IF PAYLOAD ATTACHED, THE ARM SHOULD BE MANEUVERED TO A SAFE POSITION FOR PAYLOAD RELEASE. LOSS OF NEXT REDUNDANT PATH RESULTS IN BEING ONE FAILURE AWAY FROM INABILITY TO CRADLE ARM. IF WITH SUBSEQUENT FAILURES ALL DRIVE MODES ARE LOST, THE ARM MAY BE JETTISONED.  CREW HAS ABILITY TO OVERRIDE A SINGLE FAILURE.  CREW ACTION  USE DIRECT DRIVE  CREW TRAINING  NONE  MISSION CONSTRAINT  NONE  OMRSD OFFLINE VERIFY ABSENCE OF TACHMETER BITE (ON ABE DATA).  OMRSD ONLINE INSTALLATION NONE  OMRSD ONLINE TURNAROUND VERIFY ABSENCE OF TACHMETER BITE ON ABE DATA.

RMS/ELEC - 474

PREPARED BY:

MEMG

SUPERSEDING DATE: NONE

DATE: 19 JUL 91

CEL REV: 0

5114071177  
 ATTACHMENT  
 PAGE 001 OF 001