CRITICAL ITEMS LIST

PROJECT: SRMS (5 MCIU INSTALLED) SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER ASS'Y P/N: 511C0F1177 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
7725	0	FLAG PROCESSING QTY 6 SCHEMATIC 2565723 2565719	MODE: CONTINUOUS TACHO BITE FLAG. CAUSE(S): (1) TACHO BITE LOGIC FAILURE (2) OUTPUT SHIFT REGISTER DEDICATED BIT STUCK AT '1'.	MCIU WILL INITIATE AUTO BRAKING. ARM COMES TO REST. LOSS OF COMPUTER SUPPORTED MODES. 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 EXPERIENCE 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 SPAR-RMS-PA.003. SPECIAL HANDLING PRECAUTIONS ARE USED AT ALL STAGES OF MANUFACTURE TO PRECLUDE DAMAGE/STRESS DUE TO ELECTROSTATIC DISCHARGE.

PREPARED BY: MDAC SUPERSEDING DATE: NONE DATE: 11 JUL 91 CIL REV: 0

CRITICAL ITEMS LIST

PROJECT: SRMS (5 MCIU INSTALLED) SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER ASS'Y P/N: 51T60FT177 SHEET: 2

FMEA ITEM	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. CRITICALITY 2/1R	RATIONALE FOR ACCEPTANCE
2725	D	FLAG PROCESSING QTY 6 SCHEMATIC 2561723 2561719	MODE: CONTINUOUS TACHO BIAS FLAG. CAUSE(S): (1) TACHO BIAS LOGIC FAILURE (2) OUTPUT SHIFT REGISTER DEDICATED BIT STUCK AT '1'.	MCIU WILL INITIATE AUTO BRAKING. ARM COMES TO REST. LOSS OF COMPUTER SUPPORTED MODES. 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)	SCREENS: A-PASS, B PASS, C PASS 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 (TPS1B RMS STRONGBACK AND TPS52 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 (H/B), RS01) FLIGHT CHECKOUT PORS OPS CHECKLIST (ALL VEHICLES) JSC 16987

PREPARED BY: MEWG SUPERCEDING DATE: NONE

DATE: 11 JUL 91 CII REV: D

RMS/ELEC - 450

CRITICAL ITEMS LIST

PROJECT: SRMS (5 MCIU INSTALLED) SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER ASS'Y P/N: 51T40FT177 SHEET: 1

FMEA REF	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOUR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE
2725	0	FLAG PROCESSING QTY 6 SCHEMATIC 2563723 2563719	MODE: CONTINUOUS TACHO BITE FLAG. CAUSE(S): (1) TACHO BITE LOGIC FAILURE (2) OUTPUT SHEFT REGISTER DEDICATED BIT STUCK AT '1'.	MCIU WILL INITIATE AUTO BRAKING. ARM COMES TO REST. LOSS OF COMPUTER SUPPORTED MODES. 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)	SCREENS: A-PASS, B-PASS, C PASS 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: MEUG SUPERCEDING DATE: NONE

DATE: 11 JUL 91 CIL REV: 0

RMS/ELEC - 451

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CRITICAL ITEMS LIST

PROJECT: SRMS (-5 MELU INSTALLED)
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 51T20F1177
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
2725	0	FLAG PROCESSING QTY 6 SCHEMATIC 2563723 2563719	MODE: CONTINUOUS TACHO BITE FLAG. CAUSE(S): (1) TACHO BITE LOGIC FAILURE (2) OUTPUT SHIFT REGISTER DEDICATED BIT STUCK AT '1'.	MELU WILL INITIATE AUTO BRAKING. ARM COMES TO REST. LOSS OF COMPUTER SUPPORTED MODES. 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)	SCREENS: A PASS, B PASS, C PASS 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)

PREPARED BY: MFWG
SUPERCEDING DATE: NONE
DATE: 11 JUL 91
CIL REV: 0

RMS/ELEC - 452

CRITICAL ITEMS LIST

PROJECT: SRMS (5 MCIU INSTALLED)
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 51140FT177
SHEET: 5

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. CRITICALITY
2725	0	FLAG PROCESSING QTY-6 SCHEMATIC 2563723 2563719	MODE: CONTINUOUS TACHO BITE FLAG. CAUSE(S): (1) TACHO BITE LOGIC FAILURE (2) OUTPUT SHIFT REGISTER DEDICATED BIT STUCK AT '1'.	MCIU WILL INITIATE AUTO BRAKING. ARM COMES TO REST. LOSS OF COMPUTER SUPPORTED MODES. 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)	2/1R

RATIONALE FOR ACCEPTANCE

SCREENS: A-PASS, B-PASS, C-PASS

FAILURE HISTORY

THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.

PREPARED BY: MEWG
SUPERCEDING DATE: NONE
DATE: 11 JUL 91
CIL REV: 0

RMS/ELEC - 453

CRITICAL ITEMS LIST

PROJECT: SRMS (5 MLIU INSTALLED)
ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER
SYSTEM: ELECTRICAL SUBSYSTEM
ASS'Y P/N: 511A0F1177
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
2725	0	FLAG PROCESSING QTY 6 SCHEMATIC 2563723 2563719	MODE: CONTINUOUS TACHO BITE FLAG. CAUSE(S): (1) TACHO BITE LOGIC FAILURE (2) OUTPUT SHIFT REGISTER DEDICATED BIT STUCK AT '1'.	MLIU WILL INITIATE AUTO BRAKING. ARM COMES TO REST. LOSS OF COMPUTER SUPPORTED MODES. 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)	SCREENS: A-PASS, B-PASS, C-PASS 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 TACHOMETER BITE ON ABE DATA. OMRSD ONLINE INSTALLATION NONE OMRSD ONLINE TURNAROUND VERIFY ABSENCE OF TACHOMETER BITE ON ABE DATA.

PREPARED BY: MEWG
SUPERCEDING DATE: NONE
DATE: 11 JUL 91
CIL REV: 0

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