

CRITICAL ITEMS LIST

PROJECT: SRMS
 ASS'Y MANUFACTURE: SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM
 ASS'Y P/N: 51120F1177

SHEET: 1

FMEA REF.	FMEA REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	MDM / FUNC. Z/IR CRITICALITY RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
2700	1	CLOCK AND SYNC PULSE CIRCUITS QTY-6 SCHEMATIC 2563722	MODE: LOSS OF SYNC PULSE. CAUSE(S): (1) ISOLATOR OR AMPLIFIER FAILURE.	ALL OTHER SPA'S WILL RECEIVE AND TRANSMIT CORRECTLY. AFFECTED SPA WILL NOT RECEIVE OR TRANSMIT NEW DATA. JOINT WILL ACT ON LAST GOOD DATA. MCIU WILL SEE ALL 0'S IN RETURN DATA FOR FAILED JOINT. CONSISTENCY CHECK (EACH DATA) WILL DETECT AND INITIATE AUTO BRAKES. ENCODER CHECK WILL INITIATE 'CK. CRT'. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. END EFFECTOR AUTO DRIVE MODE MAY NOT FUNCTION CORRECTLY. WORST CASE UNEXPECTED MOTION. JOINT RUNAWAY. AUTO BRAKES. REDUNDANT PATHS REMAINING 1) AUTOBRAKES (FOR SAFING THE SYSTEM). 2) DIRECT DRIVE AND EE MANUAL MODES (FOR CONTINUING OPERATIONS).	DESIGN FEATURES ----- COMPARATORS AND OPERATIONAL AMPLIFIERS ARE STANDARD LINEAR INTEGRATED CIRCUITS WITH MATURE MANUFACTURING TECHNOLOGY. APPLICATION CONSTRAINTS ARE IN ACCORDANCE WITH SPAR-RMS-PA.003. THE DIODE AND TRANSISTOR, WHICH COMPRISE AN OPTO-ISOLATOR, ARE SUBJECTED TO THE SAME QUALITY AND APPLICATION CONTROLS AS APPLIED TO DISCRETE SEMICONDUCTORS. 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. ALL RESISTORS AND CAPACITORS USED IN THE DESIGN ARE SELECTED FROM ESTABLISHED RELIABILITY (ER) TYPES. LIFE EXPECTANCY IS INCREASED BY ENSURING THAT ALL ALLOWABLE STRESS LEVELS ARE DERATED IN ACCORDANCE WITH SPAR-RMS-PA.003. ALL CERAMIC AND ELECTROLYTIC CAPACITORS ARE ROUTINELY SUBJECTED TO RADIOGRAPHIC INSPECTION.

RMS/ELEC - 431

PREPARED BY: HFWG

SUPERSEDING DATE: 11 SEP 86

DATE: 24 JUL 91 CIL REV: 1

CRITICAL ITEM LIST

PROJECT: SMS
 A-1 MANUFACTURING: **SPARO POWER AMPLIFIER**

SYSTEM: **ELECTRICAL SIMULATOR**
 ASSY P/R: **511071177**

SHEET: **2**

IMEA 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
2700	1	CIRCUIT AND SYNC PULSE CIRCUITS QTY 6 SCHEMATIC 2563722	MODE: LOSS OF SYNC PULSE. CAUSE(S): (1) ISOLATOR OR AMPLIFIER FAILURE.	ALL OTHER SPA'S WILL RECEIVE AND TRANSMIT CORRECTLY. AFFECTED SPA WILL NOT RECEIVE OR TRANSMIT NEW DATA. JOINT WILL ACT ON LAST GOOD DATA. MCIU WILL SEE ALL 0'S IN RETURN DATA FOR FAILED JOINT. CONSISTENCY CHECK (TACH DATA) WILL DETECT AND INITIATE AUTO BRAKES. ENCODER CHECK WILL INITIATE 'CK, CRT' LOSS OF LIMPING DURING END EFFECTOR CAPTURE. END EFFECTOR AUTO DRIVE MODE MAY NOT FUNCTION CORRECTLY. WORST CASE ----- UNEXPECTED MOTION, JOINT RUNAWAY, AUTO BRAKES. REDUNDANT PATHS REMAINING ----- 1) AUTOBRAKES (FOR SAFING THE SYSTEM). 2) DIRECT DRIVE AND EE MANUAL MODES (FOR CONTINUING OPERATIONS).	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 JOINT'S 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/S AKES (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, CSD6, RE01, RE02 (H/B), RS01) FLIGHT CHECKOUT ----- PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16987	

RMS/ELEC - 432

PREPARED BY: NING

SUPERCEDING DATE: 11 SEP 86

APPROVED BY: _____

DATE: 26 JUL 91

CIL REV: 1

CRITICAL ITEMS LIST

PROJECT: SRMS

ASS'Y NAME/TEMPERATURE: SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM

ASS'Y P/N: 5174DF1177

SHEET: 3

PMEA REF.	PMEA REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT OR END ITEM	HOWR / FUNC. 2/1R CRITICALITY RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
2700	1	CLOCK AND SYNC PULSE CIRCUITS QTY-6 SCHEMATIC 2563722	<p>MODE: LOSS OF SYNC PULSE.</p> <p>CAUSE(S): (1) ISOLATOR OR AMPLIFIER FAILURE.</p>	<p>ALL OTHER SPA'S WILL RECEIVE AND TRANSMIT CORRECTLY. AFFECTED SPA WILL NOT RECEIVE OR TRANSMIT NEW DATA. JOINT WILL ACT ON LAST GOOD DATA. HCU WILL SEE ALL 0'S IN RETURN DATA FOR FAILED JOINT. CONSISTENCY CHECK (TACH DATA) WILL DETECT AND INITIATE AUTO BRAKES. ENCODER CHECK WILL INITIATE CK. CRT. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. END EFFECTOR AUTO DRIVE MODE MAY NOT FUNCTION CORRECTLY.</p> <p>WORST CASE</p> <p>UNEXPECTED MOTION. JOINT RUNAWAY. AUTO BRAKES.</p> <p>REDUNDANT PATHS REMAINING</p> <p>1) AUTOBRAKES (FOR SAFING THE SYSTEM).</p> <p>2) DIRECT DRIVE AND EE MANUAL MODES (FOR CONTINUING OPERATIONS).</p>	<p>QA/INSPECTIONS</p> <p>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.</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 100X SCREENED AND BURNED IN, AS A MINIMUM, AS REQUIRED BY SPAR-RMS-PA.003, BY THE SUPPLIER. ADDITIONALLY, EEE PARTS ARE 100X 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-81381 AND INSPECTED AND TESTED TO NASA JSCM0000 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 NHB 5300.4(3A) STANDARD, AS MODIFIED BY JSC 0600A.</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 TIER INSPECTION COMPLETION, AS BUILT CONFIGURATION VERIFICATION TO AS DESIGN ETC., (MANDATORY INSPECTION POINT).</p>

RMS/ELEC - 433

PREPARED BY: MLWG

SUPERSEDING DATE: 11 SEP 86

APPROVED BY:

DATE: 24 JUL 91

CIL REV: 1

CRITICAL ITEM LIST

PROJECT: SRMS
 ASS'Y NAME/TEMP: STAB POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM
 ASS'Y P/N: 5112071177

SHEET: 6

FMEA REF.	FMEA REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT OR END ITEM	HOUR / FUNC. / CRITICALITY RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
2700	1	CLOCK AND SYNC PULSE CIRCUITS QTY-6 SCHEMATIC 2563722	MODE: LOSS OF SYNC PULSE. CAUSE(S): (1) ISOLATOR OR AMPLIFIER FAILURE.	ALL OTHER SPA'S WILL RECEIVE AND TRANSMIT CORRECTLY. AFFECTED SPA WILL NOT RECEIVE OR TRANSMIT NEW DATA. JOINT WILL ACT ON LAST GOOD DATA. MCIU WILL SEE ALL 0'S IN RETURN DATA FOR FAILED JOINT. CONSISTENCY CHECK (TACH DATA) WILL DETECT AND INITIATE AUTO BRAKES. ENCODER CHECK WILL INITIATE CK. CRT'. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. END EFFECTOR AUTO DRIVE MODE MAY NOT FUNCTION CORRECTLY. WORST CASE ----- UNEXPECTED MOTION. JOINT RUNAWAY. AUTO BRAKES. REDUNDANT PATHS REMAINING ----- 1) AUTOBRAKES (FOR SAFING THE SYSTEM). 2) DIRECT DRIVE AND EE MANUAL MODES (FOR CONTINUING OPERATIONS).	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 (ITP) 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)

RMS/ELEC - 434

PREPARED BY:

MLWG

SUPERSEDING DATE: 11 SEP 86

APPROVED BY: _____

DATE: 24 JUL 91

CIL REV: 1

CRITICAL ITEM LIST

PROJECT: SRMS

ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM

ASS'Y P/N: 51140F1177

SHEET: 5

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 SCREENS: A-PASS, B-PASS, C-PASS
2700	1	CLOCK AND SYNC PULSE CIRCUITS QTY-6 SCHEMATIC 2563722	<p>MODE: LOSS OF SYNC PULSE.</p> <p>CAUSE(S): (1) ISOLATOR OR AMPLIFIER FAILURE.</p>	<p>ALL OTHER SPA'S WILL RECEIVE AND TRANSMIT CORRECTLY. AFFECTED SPA WILL NOT RECEIVE OR TRANSMIT NEW DATA. JOINT WILL ACT ON LAST GOOD DATA. MCU WILL SEE ALL 0'S IN RETURN DATA FOR FAILED JOINT. CONSISTENCY CHECK (TACH DATA) WILL DETECT AND INITIATE AUTO BRAKES. ENCODER CHECK WILL INITIATE 'CK. CRT'. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. END EFFECTOR AUTO DRIVE MODE MAY NOT FUNCTION CORRECTLY.</p> <p>WORST CASE ----- UNEXPECTED MOTION, JOINT RUNAWAY, AUTO BRAKES.</p> <p>REDUNDANT PATHS REMAINING ----- 1) AUTOBRAKES (FOR SAFING THE SYSTEM). 2) DIRECT DRIVE AND EE MANUAL MODES (FOR CONTINUING OPERATIONS).</p>	<p>FAILURE HISTORY ----- THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.</p>	

RMS/ELEC - 435

PREPARED BY: MMG

SUPERSEDING DATE: 11 SEP 96

APPROVED BY: _____

DATE: 24 JUL 91

CIL REV: 1

CRITICAL ITEMS LIST

PROJECT: SPMS
 ASSY IDENTIFICATION: SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM
 ASSY P/N: 5116071177 SHEET: 6

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOUR / FUNC. Z/TR CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
2700	1	CLOCK AND SYNC PULSE CIRCUITS QTY-6 SCHEMATIC 2563722	MODE: LOSS OF SYNC PULSE. CAUSE(S): (1) ISOLATOR OR AMPLIFIER FAILURE.	ALL OTHER SPA'S WILL RECEIVE AND TRANSMIT CORRECTLY. AFFECTED SPA WILL NOT RECEIVE OR TRANSMIT NEW DATA. JOINT WILL ACT ON LAST GOOD DATA. MCIU WILL SEE ALL 0'S IN RETURN DATA FOR TAILED JOINT. CONSISTENCY CHECK (TACH DATA) WILL DETECT AND INITIATE AUTO BRAKES. ENCODER CHECK WILL INITIATE 'CK. CRT'. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. END EFFECTOR AUTO DRIVE MODE MAY NOT FUNCTION CORRECTLY. WORST CASE UNEXPECTED MOTION. JOINT RUNAWAY. AUTO BRAKES. REDUNDANT PATHS REMAINING 1) AUTOBRAKES (FOR SAFING THE SYSTEM). 2) DIRECT DRIVE AND EE MANUAL MODES (FOR CONTINUING OPERATIONS).	OPERATIONAL EFFECTS	JOINT RUNAWAY. AUTOBRAKES. CANNOT USE COMPUTER SUPPORTED MODES. DIRECT DRIVE AND BACKUP AVAILABLE. ARM WILL NOT STOP AUTOMATICALLY IF AN UNDETECTED FAILURE OF THE AUTO BRAKES SYSTEM HAS PREVIOUSLY OCCURRED. BRAKES CAN BE APPLIED MANUALLY.
					CREW ACTION	APPLY BRAKES. USE DIRECT DRIVE.
					CREW TRAINING	THE CREW WILL BE TRAINED TO ALWAYS OBSERVE WHETHER THE ARM IS RESPONDING PROPERLY TO COMMANDS. IF IT ISN'T, APPLY BRAKES.
					MISSION CONSTRAINT	OPERATE UNDER VERNIER RATES WITHIN 10 FT OF STRUCTURE. THE OPERATOR MUST BE ABLE TO DETECT THAT THE ARM/PAYLOAD IS RESPONDING PROPERLY TO COMMANDS VIA WINDOW AND/OR CCTV VIEWS DURING ALL ARM OPERATIONS.
					OMRSD OFFLINE	DRIVE EACH JOINT IN COMPUTER CONTROLLED MODE. VERIFY MOTOR RESPONSE.
					OMRSD ONLINE INSTALLATION	NONE
					OMRSD ONLINE TURNAROUND	DRIVE EACH JOINT IN SINGLE. VERIFY TACHOMETER SIGNATURE.

RMS/ELEC - 436

PREPARED BY:

M/WO

SUPERSEDING DATE: 11 SEP 86

APPROVED BY:

DATE: 26 JUL 91

CIL REV: 1