

CRITICAL ITEMS LIST

PROJECT: SRMS (-3 OR -5 MCIU INSTALLED)
 ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM
 ASS'Y P/N: 51140PT177

SHEET: 1

IMEA REF.	IMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HWR / FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: N/A
3152	2	SPA INTER-CONNECTION DIAGRAM 2563716.	<p>MODE: DETERIORATION OF ISOLATION IMPEDANCE.</p> <p>CAUSE(S): (1) GROWTH OF CONDUCTIVE PATHS IN ERIE-FILTER-COM FILTERS IN POWER GROUND CIRCUIT FL10.</p>	<p>HIGH RIPPLE IN OUTPUT DUE TO EMC INTERFERENCE MAY CAUSE ERRATIC OPERATIONS OF IC'S RESULTING IN ERRATIC ARM RESPONSE. IF DEGRADATION IS BAD ENOUGH O.V. OR O.C. MAY TURN OFF JPC. EFFECT AS IN 3170 (3175 FOR -5 MCIU)</p> <p>WORST CASE ----- UNEXPECTED MOTION. SLAGGISH JOINT. UNANNOUNCIATED. CREW ACTION REQUIRED.</p> <p>REDUNDANT PATHS REMAINING ----- N/A</p>	<p>DESIGN FEATURES -----</p>	<p>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.</p> <p>TRANSFORMERS AND INDUCTORS ARE DESIGNED SPECIFICALLY FOR THE APPLICATION. THESE ARE TOROID - WOUND AND UTILIZE A FERRITE CORE MATERIAL. CHOICE OF WIRE SIZE AND OF INSULATION MATERIALS ENSURE THAT THE DERATING REQUIREMENTS OF SPAR-RMS-PA.003 ARE MET.</p> <p>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.</p>

RMS/ELEC - 833

PREPARED BY: MFWG

SUPERCEDING DATE: 21 OCT 87

APPROVED BY:

DATE: 26 JUL 91

CIL REV: 2

CRITICAL ITEMS LIST

PROJECT: SRHS (-3 OR -5 MCIU INSTALLED)
 ASS'Y NOMENCLATURE: SERVO MOTOR AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM
 ASS'Y P/N: 51140F1177

SHEET: 2

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: N/A
3152	2	SPA INTER-CONNECTION DIAGRAM 2563716.	<p>MODE: DETERIORATION OF ISOLATION IMPEDANCE.</p> <p>CAUSE(S): (1) GROWTH OF CONDUCTIVE PATHS IN BRIE-FILTER-COM FILTERS IN POWER GROUND CIRCUIT FL10.</p>	<p>HIGH RIPPLE IN OUTPUT DUE TO EMC INTERFERENCE MAY CAUSE ERRATIC OPERATIONS OF IC'S RESULTING IN ERRATIC ARM RESPONSE. IF DEGRADATION IS BAD ENOUGH O.V. OR O.C. MAY TURN OFF JPC. EFFECT AS IN 3170 (3175 FOR -5 MCIU)</p> <p>WORST CASE UNEXPECTED MOTION. SLUGGISH JOINT. UNANNOUNCED. CREW ACTION REQUIRED.</p> <p>REDUNDANT PATHS REMAINING</p> <p>N/A</p>	<p>1/1</p>	<p>ACCEPTANCE TESTS</p> <p>THE SPA IS SUBJECTED TO THE FOLLOWING ENVIRONMENTAL TESTING AS AN SRU.</p> <p>O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 4</p> <p>O 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 (TP518 RMS STRONGBACK AND TP552 FLAT FLOOR TESTS) WHICH VERIFIES THE ABSENCE OF THE FAILURE MODE.</p> <p>QUALIFICATION TESTS</p> <p>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>O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 4</p> <p>O SHOCK: 20G/11 MS/3 AXES (6 DIRECTIONS)</p> <p>O THERMAL VAC: +81 DEGREES C TO -36 DEGREES C (6 CYCLES) 1X10**6 TORR</p> <p>O HUMIDITY: TESTED WITH THE SHOULDER JOINT</p> <p>O EMC: MIL-STD-461 AS MODIFIED BY SL-E-0002 (TEST CE01, CE03, CS01, CS02, CS06, RE01, RE02 (N/B), RS01)</p> <p>FLIGHT CHECKOUT</p> <p>PORS OPS CHECKLIST (ALL VEHICLES) JSC 16987</p>

RMS/ELEC - 834

CRITICAL ITEMS LIST

PROJECT: SRMS (-3 OR -5 MCIU INSTALLED)
 ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM
 ASS'Y P/N: 2110FT177

SHEET: 3

FMEA REF.	FMEA REV.	NAME, QTY. & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. I/I CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: N/A
3152	2	SPA INTER-CONNECTION DIAGRAM 2563716.	<p>MODE: DETERIORATION OF ISOLATION IMPEDANCE.</p> <p>CAUSE(S): (1) GROWTH OF CONDUCTIVE PATHS IN ERIE-FILTER-COM FILTERS IN POWER GROUND CIRCUIT FL10.</p>	<p>HIGH RIPPLE IN OUTPUT DUE TO EMC INTERFERENCE MAY CAUSE ERRATIC OPERATIONS OF IC'S RESULTING IN ERRATIC ARM RESPONSE. IF DEGRADATION IS BAD ENOUGH O.V. OR D.C. MAY TURN OFF JPC. EFFECT AS IN 3170 (3175 FOR -5 MCIU)</p> <p>WORST CASE ----- UNEXPECTED MOTION. SLUGGISH JOINT. UNANNUNCIATED. CREW ACTION REQUIRED.</p> <p>REDUNDANT PATHS REMAINING ----- N/A</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 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-81381 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 NHB 5300.4(3A) STANDARD, AS MODIFIED BY JSC 0800A.</p> <p>CUMFORMAL 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 - 835

PREPARED BY:

NFWG

SUPERCEDING DATE: 21 OCT 87

APPROVED BY:

DATE: 24 JUL 91

CIL REV: 2

CRITICAL FAILURE LIST

SRMS (-5 OR -5 MCIU INSTALLED)
 ASSY IDENTIFICATION: SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM
 ASSY P/N: 511401177

SHEET 6

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HWWR / FUNC. I/I CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: N/A
3152	2	SPA INTER-CONNECTION DIAGRAM 2563716.	<p>MODE: DETERIORATION OF ISOLATION IMPEDANCE.</p> <p>CAUSE(S): (1) GROWTH OF CONDUCTIVE PATHS IN ERIE-FILTER-COM FILTERS IN POWER GROUND CIRCUIT FLTD.</p>	<p>HIGH RIPPLE IN OUTPUT DUE TO EMC INTERFERENCE MAY CAUSE ERRATIC OPERATIONS OF IC'S RESULTING IN ERRATIC ARM RESPONSE. IF DEGRADATION IS BAD ENOUGH O.V. OR O.C. MAY TURN OFF JPC. EFFECT AS IN 3170 (3175 FOR -5 MCIU)</p> <p>WORST CASE ----- UNEXPECTED MOTION. SLUGGISH JOINT. UNANNUNCIATED. CREW ACTION REQUIRED.</p> <p>REDUNDANT PATHS REMAINING ----- N/A</p>		<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 SBU - 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.</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 - 836

PREPARED BY: MFNG

SUPERSEDING DATE: 21 OCT 87

DATE: 26 JUL 91

CIL REV: 2

CRITICAL ITEM LIST

PROJECT: SRMS (-3 OR -5 MCIU INSTALLED)
 ASS'Y NOMENCLATURE: SERVO POWER AMPLIFIER

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

SHEET: 5

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HWWR / FUNC. I/1 CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: N/A
3152	2	SPA INTER-CONNECTION DIAGRAM 2563716.	<p>MODE: DETERIORATION OF ISOLATION IMPEDANCE.</p> <p>CAUSE(S): (1) GROWTH OF CONDUCTIVE PATHS IN ERIE-FILTER-CON FILTERS IN POWER GROUND CIRCUIT FL10.</p>	<p>HIGH RIPPLE IN OUTPUT DUE TO EMC INTERFERENCE MAY CAUSE ERRATIC OPERATIONS OF IC'S RESULTING IN ERRATIC ARM RESPONSE. IF DEGRADATION IS BAD ENOUGH O.V. OR O.C. MAY TURN OFF JPC. EFFECT AS IN 3170 (3175 FOR -5 MCIU)</p> <p>WORST CASE ----- UNEXPECTED MOTION. SLUGGISH JOINT. UNANNUNCIATED. CREW ACTION REQUIRED.</p> <p>REDUNDANT PATHS REMAINING ----- N/A</p>	<p>1/1</p>	<p>FAILURE HISTORY ----- THE FOLLOWING FAILURE ANALYSIS REPORT(S) ARE RELEVANT:</p> <p>FAR 2400: S/N 201/M1 JUNE 87</p> <p>DESCRIPTION ----- ISOLATION RESISTANCE OUT OF SPEC. DUE TO FILTER CON.</p> <p>CORRECTIVE ACTION ----- WAIVER W0534.</p>

RMS/ELEC - 837

PREPARED BY:

MEWG

SUPERCEDING DATE: 21 OCT 87

APPROVED BY:

DATE: 24 JUL 91

CIL REV: 2

CRITICAL ITEMS LIST

PROJECT: SRMS (3 OR 5 MCIU INSTALLED)
 ASSY: MANUFACTURE: SERVO POWER AMPLIFIER

SYSTEM: ELECTRICAL SUBSYSTEM
 ASS'Y P/N: 511401177 SHEET: 6

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT OR END ITEM	HWR / FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: N/A
3152	2	SPA INTER-CONNECTION DIAGRAM 2563716.	MODE: DETERIORATION OF ISOLATION IMPEDANCE. CAUSE(S): (1) GROWTH OF CONDUCTIVE PATHS IN ERIE-FILTER-COM FILTERS IN POWER GROUND CIRCUIT FLTD.	HIGH RIPPLE IN OUTPUT DUE TO EMC INTERFERENCE MAY CAUSE ERRATIC OPERATIONS OF IC'S RESULTING IN ERRATIC ARM RESPONSE. IF DEGRADATION IS BAD ENOUGH O.V. OR O.C. MAY TURN OFF JPC. EFFECT AS IN 3170 (3175 FOR -5 MCIU) WORST CASE UNEXPECTED MOTION, SLUGGISH JOINT, UNANNOUNCIATED. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING ----- N/A	OPERATIONAL EFFECTS ----- ARM DOES NOT RESPOND PROPERLY TO HAND CONTROLLER COMMANDS OR AUTOSEQUENCE. CREW INHERENTLY COMPENSATES FOR ANY UNDESired ARM TRAJECTORIES IN MANUAL AUGMENTED MODES. CREW ACTIONS ----- APPLY BRAKES. SELECT BACKUP. CREW TRAINING ----- THE CREW WILL BE TRAINED TO OBSERVE WHETHER THE ARM IS RESPONDING PROPERLY TO COMMANDS. IF IT IS NOT APPLY BRAKES. MISSION CONSTRAINTS ----- OPERATE UNDER VERMIER RATES WITHIN 10 FEET OF STRUCTURE. THE OPERATOR MUST BE ABLE TO DETECT THAT THE ARM IS RESPONDING PROPERLY TO COMMANDS VIA WINDOW AND DR/CCTV VIEWS DURING ALL ARM OPERATIONS. AUTO TRAJECTORIES MUST BE DESIGNED TO COME NO CLOSER THAN 5 FEET FROM STRUCTURE. SCREEN FAILURES ----- N/A OMSRD OFFLINE ----- VERIFY ABE DATA FOR WRAP AROUND. OMSRD ONLINE INSTALLATION ----- NONE OMSRD ONLINE TURNAROUND ----- VERIFY THAT ABE WARNING IS NOT PRESENT.	

RMS/ELEC - 838

PREPARED BY: MFWG _____

SUPERCEDING DATE: 21 OCT 87 _____

DATE: 26 JUL 91 _____

CIL REV: 2