

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : EPD&C - HYDRAULICS FMEA NO 05-6G -2086 -1 REV: 07/13/87

ASSEMBLY : AFT LCA 1, 2, AND 3 CRIT. FUNC: 12
P/N RI : 479-0684, -1363, -1463 CRIT. HDW: 3
P/N VENDOR: VEHICLE 102 103 104
QUANTITY : 6 EFFECTIVITY: X X X
: SIX (2 PER SYSTEM) PHASE(S): PL LO OO DO X LS

REDUNDANCY SCREEN: A-PASS B-FAIL C-PAS:
PREPARED BY: APPROVED BY: APPROVED BY (NASA):
DES J HERMAN DES *J. V. B...* H. B. SSM *J. V. B...* 3/19/87
REL T KIMURA REL *J. K. Kimura* CL. Kimura REL *J. K. Kimura*
QE J COURSEN QE *M. D. J. Courson* 7.19.87 QE *J. Courson*

ITEM: DIODE, ISOLATION, HYDRAULIC MAIN PUMP DEPRESS VALVE SOLENOID CIRCUIT

FUNCTION:
PROVIDES POWER RETURN ISOLATION FOR LCA'S. SYSTEM 1 - 54V76A121(J11-P)
55V76A122(J11-i); SYSTEM 2 - 55V76A122(J11-P), 56V76A123(J11-R); SYSTEM
3 - 56V76A123(J11-M), 54V76A121(J11-M)

FAILURE MODE:
FAILS OPEN

CAUSE(S):
VIBRATION, THERMAL STRESS, CONTAMINATION, MECHANICAL SHOCK

EFFECT(S) ON:
(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE (E) FUNCTIONAL
CRITICALITY:

- (A) LOSS OF REDUNDANT POWER RETURN TO MAIN PUMP DEPRESS SOLENOID
- (B) FIRST FAILURE - NO EFFECT. SECOND FAILURE - INABILITY TO ACTIVATE DEPRESS SOLENOID AFTER FIRST CYCLE (INABILITY TO RESTART APU ON AFFECTED SYSTEM). NOSEWHEEL STEERING AND HYDRAULIC LANDING GEAR DEPLOY CAPABILITY WOULD BE LOST IF HYDRAULIC SYSTEM 1 IS LOST.
- (C) FIRST FAILURE- NO EFFECT. SECOND FAILURE - POSSIBLE RETARGET LANDING SITE
- (D) FIRST FAILURE - NO EFFECT
- (E) POSSIBLE LOSS OF CREW/VEHICLE WITH THREE FAILURES (DIODE FAILS OPEN; LOSS OF FIRST POWER RETURN PATH, LOSS OF REDUNDANT POWER RETURN PATH; LOSS OF SECOND HYDRAULIC SYSTEM).

B SCREEN FAILS BECAUSE THIS FAILURE IS NOT FLIGHT DETECTABLE UNTIL SECOND FAILURE OCCURS (DIODE IN REDUNDANT CIRCUIT FAILS OPEN).

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DISPOSITION & RATIONALE:

(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE:

(A) DESIGN

VOIDLESS HERMETICALLY SEALED GLASS PACKAGE, METALLURGICALLY BONDED, AXI
LEADS OF SILVER CLAD COPPER, CORROSION RESISTANT, PART APPLICATION
ANALYZED TO ASSURE COMPLIANCE WITH THE 25% DERATING CRITERIA OF T
ORBITER PROJECT PARTS LIST (OPPL).

(B) TESTS

QUALITY CONFORMANCE TESTS INCLUDE - HTRB (125 DEG CELSIUS, 20 HOURS
BURN-IN (25 DEG CELSIUS, 48 HOURS), FUNCTIONAL ELECTRICALS. SAME
TESTS ARE - MECHANICAL SHOCK (2000 G), THERMAL SHOCK (100 TO 0 C
CELSIUS), RECURRING PULSE, HERMETIC SEAL (GROSS LEAK), SOLDERABILITY
PHYSICAL DIMENSIONS, TERMINAL STRENGTH, RESISTANCE TO SOLVENTS. 10
SCREEN TESTING INCLUDES - VISUAL AND MECHANICAL INSPECTION, REVER
CURRENT LEAKAGE, BREAKDOWN VOLTAGE, FORWARD VOLTAGE, THERMAL SHOCK, A
HERMETIC SEAL (GROSS LEAK).

GROUND TURNAROUND TEST:

V58AJ0.010, "MAIN PUMP EDV ELECTRICAL CHECK" (PERFORMED PRIOR TO EA
FLIGHT). VERIFY SOLENOID RESPONDS TO SWITCH COMMANDS IN CONJUNCTION
WITH CONTROL BUS DROPS.

(C) INSPECTION

RECEIVING INSPECTION

MANUFACTURER IS REQUIRED TO VERIFY TESTS CONDUCTED IN ACCORDANCE WITH
SPECIFICATION AC479-0011. INCOMING PARTS ARE CHECKED AND VERIFIED FOR
MATERIAL AND PROCESS CERTIFICATIONS BY INSPECTION. ALL CERTIFIED
DOCUMENTATIONS ARE MAINTAINED ON FILE FOR VERIFICATION AND TRACEABILITY
IN ACCORDANCE WITH MIL-S-19500 APPENDIX D.

CONTAMINATION CONTROL

THE MANUFACTURER IS REQUIRED TO DOCUMENT MINIMUM REQUIREMENTS FOR
CLEANLINESS AND ATMOSPHERE CONTROL IN CRITICAL WORK AREAS PER FED-S-21.
CORROSION PREVENTION IS CHECKED WITH METHODS 1041 OF MIL-S-750 AND 101
MIL-S-202.

ASSEMBLY/INSTALLATION

THE MANUFACTURER IS REQUIRED TO INCLUDE CRITICAL POINT INSPECTIONS IN THE
PROCESSING LINE AND PERFORM 100% INSPECTION AT THESE POINTS (-0684, -126
TO MONITOR PARAMETER DISTRIBUTION OF PARTS. THE MANUFACTURER IS REQUIRED
TO PROVIDE THE WORK INSTRUCTIONS FOR THE OPERATORS RELATIVE TO EQUIPMENT
REQUIRED, SAFETY PRECAUTIONS, MANUFACTURING PROCEDURE, MATERIAL PROCESSING
PRODUCTION FLOW. INSPECTION ALSO CHECKS THE INSTRUCTION FOR VERIFICATION
BY THE PROCURING ACTIVITY.

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CRITICAL PROCESSES

COATING OR RECOATING OF SILVER LEADS PERFORMED BY THE MANUFACTURER IS MONITORED IN ACCORDANCE WITH THE REQUIREMENTS. HERMETIC SEAL TO PREVENT ANY GROSS OR FINE LEAK IS VERIFIED TO THE SPECIFIED REQUIREMENT (RATE). MANUFACTURER'S SOLDERABILITY IS REQUIRED TO BE VERIFIED IN ACCORDANCE WITH MIL-5-202.

NONDESTRUCTIVE EVALUATION

RADIOGRAPHIC INSPECTION WHICH IS CONDUCTED BY THE MANUFACTURER IN ACCORDANCE WITH MIL-5-202 IS REQUIRED TO BE VERIFIED. GLASS ENCAPSULATED DEVICES ARE EXAMINED BY FLUORESCENT DYE PENETRANT INSPECTION AND RESULTS ARE VERIFIED PER AC479-0011 REQUIREMENT.

TESTING

ACCEPTANCE TESTS INCLUDING THE SCREENING OF PARTS TO THE BASIC ELECTRICAL, TECHNICAL, MECHANICAL AND DIMENSIONAL CHARACTERISTICS SPECIFIED BY MIL-5-750 ARE REQUIRED OF THE MANUFACTURER. TEST RESULTS AND CALIBRATION RECORDS OF TEST EQUIPMENTS ARE PREPARED BY THE MANUFACTURER FOR VERIFICATION.

HANDLING/PACKAGING

DEVICES PACKAGED AND PROTECTED FROM DAMAGE AND CONTAMINATION ARE REQUIRED TO BE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

ORBITER PROGRAM HISTORY INDICATES THAT NO GENERIC FAILURES EXIST FOR THE DEVICE.

(E) OPERATIONAL USE

NONE - HOWEVER, APU START MAY BE ATTEMPTED IN AUTO-SHUTDOWN INHIBIT.