

INTRODUCTION TO APPENDIX D

- ITEM 1 - CIRCUIT BREAKER
 ITEM 2 - FUSE, AXIAL LEAD / CARTRIDGE
 ITEM 3 - FUSE, HIGH CURRENT
 ITEM 4 - FUSE, PLUG-IN
- MC454-0026 / MC454-0032
 ME451-0009
 ME451-0016
 ME451-0018

FAILURE MODES AND CAUSES:

THE FOLLOWING TABLE LISTS FAILURE MODES AND CAUSES WHICH WERE CONSIDERED IN DERIVING FAILURE MODES AND EFFECTS ANALYSIS (EMEA'S) FOR THE ITEMS LISTED ABOVE:

FAILURE MODE	FAILURE CAUSE	CIRCUIT BREAKER	FUSE MC451-0009	FUSE MC451-0016	FUSE MC451-0018
FAILS OPEN, FAILS TO CONDUCT, FAILS TO CLOSE	(a) Structural Failure	X	X	X	X
	(b) Contamination	X	X	X	X
	(c) Vibration	X	X	X	X
	(d) Mechanical Shock	X	X	X	X
	(e) Processing Anomaly	X	X	X	X
	(f) Thermal Stress	X	X	X	X
	(g) Thermal Stress	X	X	X	X
FAILS CLOSED FAILS TO OPEN, (MECHANICALLY)	(a) Structural Failure	X	X	X	X
	(b) Contamination	X	X	X	X
	(c) Vibration	X	X	X	X
	(d) Mechanical Shock	X	X	X	X
	(e) Processing Anomaly	X	X	X	X
FAILS TO INTERRUPT UNDER OVERLOAD *	(a) Structural Failure	X			

* SEE NEXT PAGE.

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APPENDIX D ITEM 4 - FUSE, PLUG-IN TYPE
ME451-0018-XXXX

DISPOSITION & RATIONALE

(A) DESIGN, (B) TEST, (C) INSPECTION, (D) FAILURE HISTORY:

(A) DESIGN

HERMETICALLY-SEALED, PANEL MOUNTED PLUG-IN TYPE,
 ENCLOSURE PROTECTED.

(B) TEST

QUALIFICATION/CERTIFICATION

QUALIFIED TO MC451-0010. QUALIFICATION/CERTIFICATION TEST AND
 ANALYSIS COMPLETE. CERTIFICATION TESTS INCLUDE:

TEST	CAUSE CONTROL					
	a	b	c	d	e	f
ACCEPTANCE					X	
VISUAL					X	
DC RESISTANCE		X			X	
INTERRUPTION CAPACITY					X	
TERMINAL STRENGTH	X				X	
THERMAL SHOCK	X				X	X
HUMIDITY		X			X	
MECHANICAL SHOCK (78-G, 30 SHOCKS TOTAL)	X			X		
FLIGHT VIBRATION (10-G SINE AND 0.2 g ² /HZ, 10 MINUTES PER AXIS)	X		X			
LEAKAGE (FINE AND GROSS)		X			X	
TIME CURRENT CHARACTERISTICS					X	

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APPENDIX D ITEM 4 CONT'D

ACCEPTANCE AND SCREENING

ALL PRODUCTION UNITS SUBJECTED TO 100% ACCEPTANCE TESTING WHICH INCLUDES THE FOLLOWING SCREENS:

TEST	CAUSE CONTROL					
	a	b	c	d	e	f
EXAMINATION		X			X	
SINE VIBRATION	X		X			
LEAKAGE		X			X	
DC RESISTANCE		X			X	
RADIOGRAPHIC INSPECTION		X			X	
BURN-IN (100% RATED CURRENT, 2 HR MINIMUM)					X	

(C) INSPECTION

RECEIVING INSPECTION (FAILURE CAUSE a,b)

PERFORMS VISUAL, AND DIMENSIONAL EXAMINATION OF ALL INCOMING PARTS. FUSE ELEMENT MATERIAL IS VERIFIED. CERTIFICATION RECORDS/TEST REPORTS ARE MAINTAINED CERTIFYING MATERIALS AND PHYSICAL PROPERTIES.

CONTAMINATION CONTROL (FAILURE CAUSE b)

CONTAMINATION CONTROL PROCESSES AND CORROSION PROTECTION PROVISIONS VERIFIED BY INSPECTION. FUSE CLEANED PRIOR TO AND AFTER ELEMENT SOLDERING.

ASSEMBLY/INSTALLATION (FAILURE CAUSE a,b,e)

MATERIAL (SPOOL), REVERIFIED PRIOR TO START OF EACH LOT BUILD. FUSE ELEMENT PLATING THICKNESS VERIFICATION AFTER PLATING. VISUAL INSPECTION OF CRITICAL DIMENSIONS PERFORMED IN-PROCESS AND AFTER ASSEMBLY.

FUSE ASSEMBLY PERSONNEL ARE RESPONSIBLE FOR DETAILED IN- PROCESS CHECKS INCLUDING THOSE FOR SOLDER AND JOINTS, FOREIGN MATTER, CHIPPED BODY, LEADS FOR NICKS UNDER 20X MAGNIFICATION, LINK, AND FERRULE DEFECTS. ALL MANUFACTURING OPERATIONS VERIFIED BY SHOP TRAVELER MANDATORY INSPECTION POINTS (MIP'S).

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APPENDIX D ITEM 4 CONT'D

NONDESTRUCTIVE EVALUATION (NDE) (FAILURE CAUSE b)

HERMETIC SEAL IS VERIFIED WITH FLUID/DYE PENETRANT UNDER 20X MAGNIFICATION.

CRITICAL PROCESSES (FAILURE CAUSE a,e)

SOLDERING OPERATIONS ARE VERIFIED BY QUALITY CONTROL (QC). PERIODIC EYE EXAMINATIONS FOR ALL ASSEMBLERS ARE VERIFIED.

TESTING (FAILURE CAUSE a,b,c,e)

ACCEPTANCE TEST OBSERVED AND VERIFIED BY QC, INCLUDING VIBRATION, BURN-IN, DIMENSION CHECK, WEIGHT, DC RESISTANCE, CASE LEAKAGE.

HANDLING/PACKAGING (FAILURE CAUSE c,d)

PARTS PACKAGED AND PROTECTED ARE SAMPLE INSPECTED AND VERIFIED BY QC TO APPLICABLE REQUIREMENTS.

(D) FAILURE HISTORY

EXTENSIVE PRIOR PROGRAM HISTORY (APOLLO, SKYLAB). NO GENERIC FAILURE MODES EXIST.

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