

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 2 - FUSE, AXIAL LEAD / CARTRIDGE TYPE
ME451-0009-XXXX

DISPOSITION & RATIONALE

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

(A) DESIGN

HERMETICALLY-SEALED, BOARD MOUNTED AXIAL LEAD OR BOX-MOUNTED CARTRIDGE TYPE.

(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	
INTERRUPTING CAPACITY					X	
TERMINAL STRENGTH	X				X	
THERMAL SHOCK	X				X	X
HUMIDITY		X			X	
MECHANICAL SHOCK (78-G, 30 SHOCKS)	X			X		
FLIGHT VIBRATION (10-G SINE AND 0.2 g ² /HZ FOR 10 MIN/AXIS)	X		X			
LEAKAGE (FINE AND GROSS)		X			X	
TIME/CURRENT CHARACTERISTICS					X	

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APPENDIX D ITEM 2 CONT'D

ACCEPTANCE AND SCREENING

ALL PRODUCTION UNITS SUBJECTED TO 100% ACCEPTANCE TESTING WHICH INCLUDE 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 MIN.)					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 OF FUSE ELEMENTS.

CONTAMINATION CONTROL (FAILURE CAUSE b)

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

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

MATERIAL (SPOOL) IS REVERIFIED PRIOR TO START OF EACH LOT BUILD. FUSE ELEMENT PLATING THICKNESS VERIFICATION AFTER PLATING. VISUAL INSPECTION OF CRITICAL DIMENSIONS IS 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 ARE VERIFIED BY SHOP TRAVELER MANDATORY INSPECTION POINTS (MIP'S).

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APPENDIX D ITEM 2 CONT'D

NONDESTRUCTIVE EVALUATION (NDE) (FAILURE CAUSE a,b,e)

X-RAY INSPECTION IS PERFORMED FOR EVIDENCE OF SOLDER MIGRATION, LOOSE PARTS, AND ASSEMBLY ANOMALIES; 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 IS OBSERVED AND VERIFIED BY QC, INCLUDING VIBRATION, BURN-IN, DIMENSION CHECK, WEIGHT, DC RESISTANCE, AND 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

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

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