

INTRODUCTION TO APPENDIX C

- ITEM 1 - HYBRID RELAY MC455-0135
- ITEM 2 - GENERAL PURPOSE RELAY MC455-0129
- ITEM 3 - LATCHING RELAY MC455-0128
- ITEM 4 - RELAY MODULE MC455-0131
- ITEM 5 - GENERAL PURPOSE CONTACTOR MC455-0134
- ITEM 6 - POWER CONTACTOR MC455-0126

THE FOLLOWING TABLE LISTS FAILURE MODES AND CAUSES WHICH WERE CONSIDERED IN DERIVING THE FAILURE MODES AND EFFECTS ANALYSIS (PARA 5) FOR THE ITEMS LISTED ABOVE:

FAILURE MODE / Failure Cause	HYBRID RELAY	GEN PURP RELAY	LATCHING RELAY	RELAY MODULE	GEN PURP CONTACTOR	POWER CONTACTOR
OPEN, FAILS TO CONTACT, INADEQUATELY OFFERS, FAILS TO TRANSFER (a) Piece Part Failure (b) Contamination (c) Vibration (d) Mechanical Shock (e) Processing Anomaly (f) Thermal Stress	X X X X X X	X X X X X X	X X X X X X	X X X X X X	X X X X X	X X X X X
CLOSED, FAILS TO OPEN, PREMATURELY CLOSSES, SHORTS CONTACT-TO-CONTACT (a) Piece Part Failure (b) Contamination (c) Vibration (d) Mechanical Shock (e) Processing Anomaly (f) Thermal Stress	X X X X X X	X X X X X X	X X X X X X	X X X X X X	X X X X	X X X X X
SHORT TO STRUCTURE (GROUND) (a) Piece Part Failure (c) Vibration (d) Mechanical Shock (e) Processing Anomaly	X X X X	X X X X	X X X X	X X X X	X X X X	
SHORT POLE-TO-POLE (a) Piece Part Failure (c) Vibration (d) Mechanical Shock (e) Processing Anomaly	X X X X	X X X X	X X X X	X X X X		

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APPENDIX C ITEM 2 - GENERAL PURPOSE RELAY
MC455-0129-0001, -0003, 12 AMP, FOUR POLE DOUBLE THROW
MC455-0129-0002 & -0004 25 AMP, 3 POLE SINGLE THROW, PLUS
ONE 2 AMP POLE, DOUBLE THROW

DISPOSITION & RATIONALE

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

(A) DESIGN

EACH RELAY CONFIGURATION IS HOUSED IN A HERMETICALLY-SEALED, ALL WELDED STEEL CASE DESIGN, AND UTILIZE SILVER CONTACTS. DESIGNED TO MEET THE REQUIREMENTS OF MIL-R-6106.

(B) TEST

QUALIFICATION/CERTIFICATION

QUALIFICATION/CERTIFICATION TEST AND ANALYSIS COMPLETE.
CERTIFICATION TEST INCLUDE:

TEST	CAUSE CONTROL					
	a	b	c	d*	e	f
FUNCTIONAL AND PERFORMANCE	X	X			X	
ELECTROMAGNETIC INTERFERENCE (EMI)						
QUAL ACCEPTANCE VIBRATION TEST (QAVT)			X			
INSULATION RESISTANCE (IR AT 500 VDC)		X			X	
DIELECTRIC STRENGTH (DWV AT 1000 VRMS)					X	
LEAKAGE		X			X	
FLIGHT VIBRATION (0.15 g ² /HZ)			X		X	
THERMAL-VACUUM (15 CYCLES, -65 AND +160 °F AT 300K FOOT PRESSURE)	X				X	X
TRANSIENT SURGE (50 VDC) AND SPIKES (56 VDC)					X	

* MIL-R-6106 SHOCK TEST, 200 G.

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APPENDIX C ITEM 2 CONT'D

ACCEPTANCE AND SCREENING

ALL RELAYS (100+) ARE SUBJECTED TO ACCEPTANCE TESTS WHICH INCLUDE PERFORMANCE AND SCREENING:

TEST	CAUSE CONTROL					
	a	b	c	d	e	f
FIND		X			X	
INSULATION RESISTANCE (IR AT 500 VDC)		X			X	
DIELECTRIC STRENGTH (DWV AT 1000 Vrms)		X			X	
LEAKAGE (FINE < 1×10^{-8} SCC/SEC AND GROSS < 1×10^{-6} SCC/SEC)		X			X	
VIBRATION (0.04 g^2 /HZ)			X		X	
RUN-IN TEST (500 CYCLES MINIMUM FOR -0001 AND -0002)	X				X	
OPERATING LIFE/THERMAL SHOCK (-65 TO 160 °F WITH 2500 CYCLES AT EACH TEMPERATURE FOR -0003 AND -0004)	X				X	X
CONTACT VOLTAGE DROP		X			X	
OPERATING CHARACTERISTICS	X				X	

ACCEPTANCE TEST AT THE NEXT ASSEMBLY:

TEST	CAUSE CONTROL					
	a	b	c	d	e	f
FUNCTIONAL	X				X	
CONTINUITY	X	X			X	
INSULATION RESISTANCE		X			X	
VIBRATION (0.04 g^2 /HZ)	X		X		X	

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APPENDIX C ITEM 2 CONT'D

(C) INSPECTION

RECEIVING INSPECTION (FAILURE CAUSE a,b)

TEST REPORTS AND RECORDS ARE MAINTAINED CERTIFYING MATERIALS AND PHYSICAL PROPERTIES (RAW MATERIAL, PLATING, BRAZING, AND COATING). QUALITY CONTROL (QC) VERIFIES OPERATIONS (BRAZING, WELDING, PLATING) PERFORMED ON PROCURED ITEMS FROM SUBCONTRACTORS.

CONTAMINATION CONTROL (FAILURE CAUSE b)

HERMETIC SEALING OF ASSEMBLY VERIFIED BY INSPECTION AND TEST. LAMINAR FLOW AREA VERIFICATION FOR ULTRASONIC/VACUUM CLEANING PRIOR TO PRE-CAP INSPECTION. ULTRASONIC CLEANING PRIOR TO/AFTER RELAY HEADER ASSEMBLY IS VERIFIED BY INSPECTION.

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

HEADER ASSEMBLY PRE-CAP INSPECTION PERFORMED AT 10X MAGNIFICATION. RELAY HEADER BUILD-UP VERIFIED BY INSPECTION.

CRITICAL PROCESSES (FAILURE CAUSE a,b,e)

ALL CRITICAL PROCESSES, INCLUDING SOLDERING AND WELDING, ARE MONITORED AND VERIFIED BY INSPECTION.

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

ACCEPTANCE TESTING IS OBSERVED AND VERIFIED BY QUALITY CONTROL (QC), INCLUDING VIBRATION, THERMAL AND PIND.

HANDLING/PACKAGING (FAILURE CAUSE c,d)

IN-PROCESS OPERATIONS ARE VERIFIED TO PROTECT PARTS AND PRECLUDE MISHANDLING. HARDWARE IS ISOLATED, AND CONTROLLED WITH SPECIAL CONTAINERS AND WORK TRAVELERS. PARTS ARE PACKAGED TO APPLICABLE REQUIREMENTS AS VERIFIED.

(D) FAILURE HISTORY

BASIC RELAY USED ON THE 8-1 PROGRAM. NO GENERIC FAILURE MODES EXIST. NO FIELD FAILURES HAVE BEEN REPORTED FOR THESE CONFIGURATIONS.

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APPENDIX C ITEM 2 CONT'D

PREPARED BY:

APPROVED BY:

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DESIGN

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DES

I. Chase

SSM

W. C. Stone 11/3/87

RELIABILITY

M. HOVE

REL

M. Hove (Platton 11-337)

REL Richard D. H. Peterson 11/31

QUALITY

J. COURSEN

QE

J. Courson for K. L. ...

QE

Stanley ... 11/31