



INTEGRA
TECHNOLOGIES
An Employee Owned Company

Connector Upscreening for Space Applications

CMSE

April 25-28, 2023

Ted Bartlett

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316 630 6801



INTEGRA TECHNOLOGIES



CELEBRATING 40 YEARS IN BUSINESS IN 2023

DMEA TRUSTED FACILITY

LARGEST OSAT REMAINING IN THE UNITED STATES AND ONE OF THE ONLY DOMESTIC DOD PROVIDERS OF THESE SERVICES (100% U.S. OWNED AND OPERATED)

SIGNIFICANT EXPERIENCE AT OFFSHORE VOLUME MANUFACTURING WITHIN THE COMPANY

480 EMPLOYEES: 237 EMPLOYEES – WICHITA, KS, 240 EMPLOYEES – MILPITAS, CA

EMPLOYEE-OWNED COMPANY (ESOP)

500+ ACTIVE CUSTOMERS FROM AVIONIC, MILITARY, AEROSPACE, MEDICAL, AUTOMOTIVE, COMMERCIAL AND INDUSTRIAL SECTORS (70% A&D)

SERVICE 14 OF THE 16 CRITICAL INFRASTRUCTURE SEGMENTS

CUSTOMER SATISFACTION RATING OF 97%

NASA/TP—2003–212242



EEE-INST-002: Instructions for EEE Parts Selection, Screening, Qualification, and Derating

Prepared by:
Dr. Kusum Sahu

Reviewed by:
Dr. Henning Leidecker

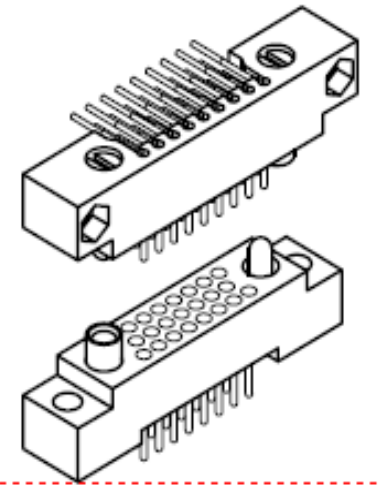
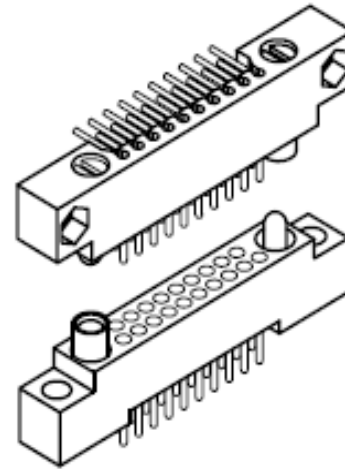
Approved by:
Darryl Lakins

AIRBORN "R" SERIES CONNECTOR



Daughterboard to Motherboard or Chassis

Right angle plug mating to
straight receptacle.



SELECT PARTY TYPE CATEGORY OF CONNECTORS (PARTIAL)

Part Type	Document Section	Parts Specialists	FSC
General Instructions for All Part Categories	1	Dr. Kusum Sahu kusum.k.sahu@nasa.gov	N/A
Capacitors	C1	Tom Duffy tduffy@pop300.gsfc.nasa.gov	5910
Connectors and Contacts	C2	Terry King tking@pop300.gsfc.nasa.gov	5935
Crystals	C3	Gerard F. Kiernan gkiernan@qssmeds.com	5955
Crystal Oscillators	C4	Gerard F. Kiernan gkiernan@qssmeds.com	5955
Fiber Optics, Passive		Dr. Tracee Jamison tracee.l.jamison@nasa.gov Marcellus Proctor marcellus.a.proctor@nasa.gov	60GP
Filters	F2	Tom Duffy tduffy@pop300.gsfc.nasa.gov	5915
Fuses	F3	Thom Perry tperry@pop300.gsfc.nasa.gov	5920
Heaters	H1	Tom Duffy tduffy@pop300.gsfc.nasa.gov	4520
Magnetics	M1	Gerard F. Kiernan	5950

EEE-INST-002 TABLE 2D SCREEN REQUIREMENTS FOR PCB CONNECTORS (PARTIAL)



**Table 2D SCREENING REQUIREMENTS FOR PRINTED CIRCUIT CONNECTORS
(REF MIL-DTL-55302; Page 1 of 2)**

Inspection / Test	Test Methods, Conditions, and Requirements	Quantity (Accept No.)					
		Level 1		Level 2		Level 3	
		Mil	Com'1 /SCD	Mil	Com'1 /SCD	Mil	Com'1 /SCD
Visual 1/	Perform workmanship inspection per Table 4A .	100%	100%	100%	100%	100%	100%
Mechanical 1/	Dimensions per detail specifications		2 (0)		2 (0)		
Dielectric Withstanding Voltage (Sea Level) 1/, 2/, 7/	MIL-STD-1344 (Connector Test Methods), Method 3001, mated, may be board mounted. Test all contacts in the sample. Apply voltage for 60 seconds between closest contacts and between contacts and hardware (guidepins, jackscrews, jackposts, etc.)		2 (0)		2 (0)		
Insulation Resistance (Room Temperature) 1/ 2/	MIL-STD-1344 , Method 3003, mated and may be board mounted. Apply pin to pin and pin to hardware of plug. Measurement shall not be less than 5000 megohms.		2 (0)		2 (0)		
Contact Engagement and Separation Forces (In process inspection for Socket Contacts) 1/	MIL-STD-1344 , Method 2014. Test 20% of the sample's contacts, 3 min. Insert SAE-AS31971 test gage pin to a depth of .140 ± .02 inch. Max engagement force shall be 12 oz. per contact (size 22 contacts) for standard force contacts and 4 oz. per contact for low insertion force contacts. Min separation force is 0.5 oz. per contact (each type).		2 (0)				
Mating and Unmating Force 1/	MIL-DTL-55302 , paragraph 4.5.4. Precondition with 3 cycles of mating and unmating. For size 22 standard force contacts, max mating force shall be 0.56X no. of contacts and min withdrawal force 0.08X no. of contacts. For low insertion force contacts, max. mating force shall be 0.25X no of contacts min, and withdrawal force shall be 0.04X no. of contacts. Inspect for contact damage or pushout from connector.		2 (0)				

EEE-INST-002 PCB CONNECTOR VISUAL INSPECTION REQUIREMENTS TABLE 4A (PARTIAL)



Table 4A WORKMANSHIP REQUIREMENTS FOR CONNECTORS 1/

Defect	Circular & Umbilical	DSUB-miniature	Micro-miniature	PC	RF	Plug-In Sockets & Strips	Twinax 1553 Databus	Nano-miniature
Insert/Insulator Body								
Insert to shell positioning and orientation	X	X	X					X
Cracks, chips, busters, pinholes	X	X	X	X	X	X	X	X
Marking	X	X	X	X	X	X	X	X
Hermetic Sealed Connectors								
Negative meniscus (glass to contact & glass to shell)	X	X			X			
Soldercup misalignment, rear of connector	X	X						
Contact Positioning (Molded inserts with soldertails or soldercup contacts)								
Consistent centering between contacts	X	X	X	X	X	X		X
Soldercup misalignment, rear of connector	X	X	X			X		X

PHYSICAL DIMENSIONS

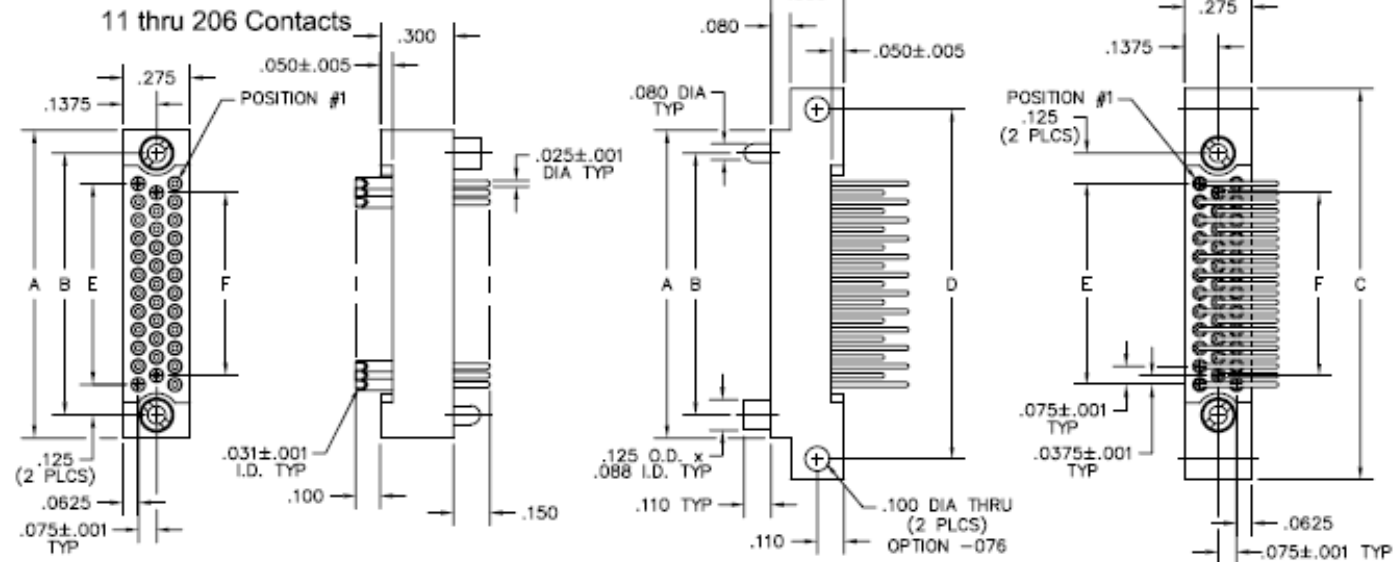
Airborn.com



3 • ROW Motherboard or Chassis to Daughterboard

.075"

RM3



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		Level 1		Level 2		Level 3	
		Mil	Com'1 /SCD	Mil	Com'1 /SCD	Mil	Com'1 /SCD
Visual 1/	Perform workmanship inspection per Table 4A.	100%	100%	100%	100%	100%	100%
Mechanical 1/	Dimensions per detail specifications		2 (0)		2 (0)		
Dielectric Withstanding Voltage (Sea Level) 1/, 2/, 7/	MIL-STD-1344 (Connector Test Methods), Method 3001, mated, may be board mounted. Test all contacts in the sample. Apply voltage for 60 seconds between closest contacts and between contacts and hardware (guidepins, jackscrews, jackposts, etc.)		2 (0)		2 (0)		
Insulation Resistance (Room Temperature) 1/ 2/	MIL-STD-1344 , Method 3003, mated and may be board mounted. Apply pin to pin and pin to hardware of plug. Measurement shall not be less than 5000 megohms.		2 (0)		2 (0)		
Contact Engagement and Separation Forces (In process inspection for Socket Contacts) 1/	MIL-STD-1344 , Method 2014. Test 20% of the sample's contacts, 3 min. Insert SAE-AS31971 test gage pin to a depth of .140 ± .02 inch. Max engagement force shall be 12 oz. per contact (size 22 contacts) for standard force contacts and 4 oz. per contact for low insertion force contacts. Min separation force is 0.5 oz. per contact (each type).		2 (0)				
Mating and Unmating Force 1/	MIL-DTL-55302 , paragraph 4.5.4. Precondition with 3 cycles of mating and unmating. For size 22 standard force contacts, max mating force shall be 0.56X no. of contacts and min withdrawal force 0.08X no. of contacts. For low insertion force contacts, max. mating force shall be 0.25X no of contacts min, and withdrawal force shall be 0.04X no. of contacts. Inspect for contact damage or pushout from connector.		2 (0)				

MIL-STD-1344 TEST METHOD 3001-DWV (PARTIAL)



MIL-STD-1344A

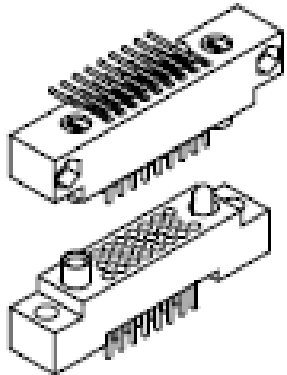
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METHOD 3001.1

DIELECTRIC WITHSTANDING VOLTAGE

1. PURPOSE. The purpose of this test is to prove that a given electrical connector or coaxial contacts can operate safely at its rated voltage and withstand momentary overpotentials due to switching, surges, and other similar phenomena. The dielectric withstanding voltage shall be established as 75 percent of the minimum breakdown voltage of the connector or coaxial contacts. It is suggested that the operating rated voltage of the connector or coaxial contacts be established as one-third of the dielectric withstanding voltage.

Performance Reference MIL-C-55302



Contact Rating:	3-amperes (2 amperes for .016 diameter)	
Solderability:	Terminals (except wire wrap [®] , crimp and stackables) tested in accordance with MIL-STD-202, Method 208	
Wire Size:	Stranded #26 AWG	
Operating Temperature:	-65° to +125° C or -85° to +257° F	
<u>Category:</u>	<u>Requirements:</u>	<u>Test Method Per:</u>
Test Voltage:	750 V, RMS, 60 Hz @ sea level 250 V, RMS, 60 Hz @ 70,000 feet	SAE AS 13441 #3001
Insulation Resistance:	5,000 megohms minimum @ 500 VDC	#3003

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**Table 2D SCREENING REQUIREMENTS FOR PRINTED CIRCUIT CONNECTORS
(REF MIL-DTL-55302; Page 2 of 2)**

Inspection / Test	Test Methods, Conditions, and Requirements	Quantity (Accept No.)					
		Level 1		Level 2		Level 3	
		Mil	Com'1 /SCD	Mil	Com'1 /SCD	Mil	Com'1 /SCD
Solderability & Resistance to Solder Heat	<p>PC Type Contacts: MIL-STD-202, Method 210, Test Condition C (260°C for 10 seconds).</p> <p>Solder Cup Contacts: MIL-DTL-55302, paragraph 4.5.16, four second duration. Perform post solder visual exam at 10X magnification. There shall be no evidence of damage or distortion to the insert. Contact floating conditions, if applicable, shall be maintained. Solder shall demonstrate proper wetting and adhesion to surfaces of the soldercup or PC terminations.</p> <p>Surface Mount Contacts (intended for soldering to a printed wiring board): An anti-wicking feature as an integral part of the contact is recommended, and such designs shall not exhibit solder wicking into the contact that would interfere with mating and performance.</p>		2 (0)				
Low Signal Level Contact Resistance 1/, 6/	MIL-STD-1344 , Method 3002 and Note 6. Resistance values shall comply with Note 6. Environmental conditioning is not required.		2 (0)		2 (0)		

LOW LEVEL CONTACT RESISTANCE VS CONTACT RESISTANCE



- Low Level Contact Resistance – Performed using low voltage/low current
- Contact Resistance – Performed using rated current of the connector

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(REF MIL-DTL-55302; Page 2 of 2)**

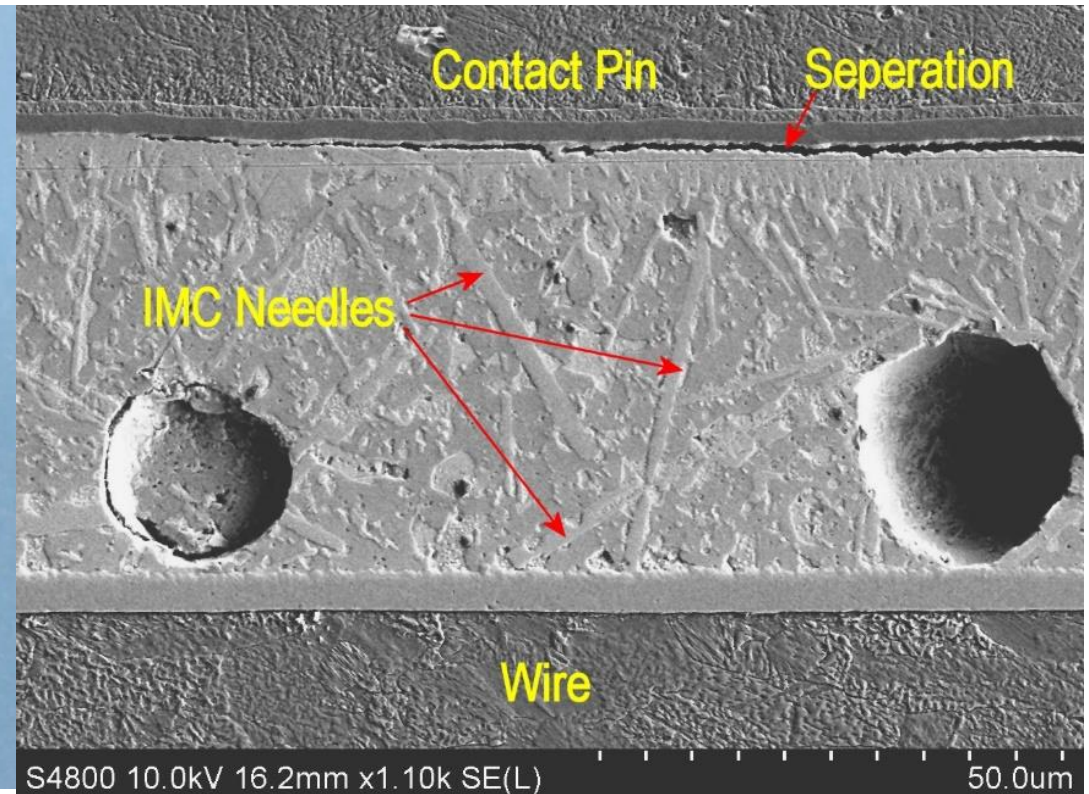
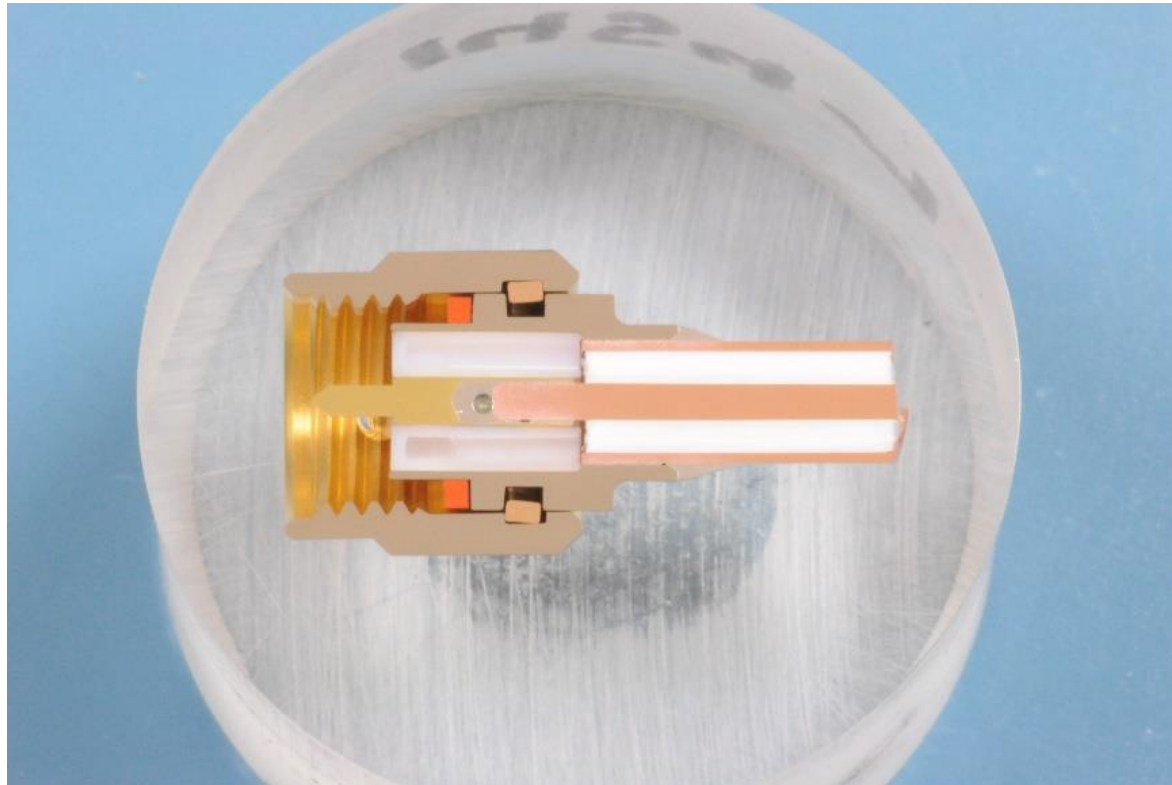
Inspection / Test	Test Methods, Conditions, and Requirements	Quantity (Accept No.)					
		Level 1		Level 2		Level 3	
		Mil	Com'1 /SCD	Mil	Com'1 /SCD	Mil	Com'1 /SCD
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Low Signal Level Contact Resistance 1/, 6/	MIL-STD-1344 , Method 3002 and Note 6. Resistance values shall comply with Note 6. Environmental conditioning is not required.		2 (0)		2 (0)		
Circuit Testing (Flexible Circuit Printed Wiring Board Terminations) 12/	Refer to section W1 (Wire and Cable), table 2E (Screening) and 3E (Qualification). Perform circuit continuity and insulation resistance on all flexible circuits prior to termination. Thermal stress testing shall be performed on samples.	100%	100%	100%	100%		
Processing for Outgassing (When Contamination must be controlled)	Notes 11, 11.6, and Outgassing, page 2 of this section.		100%		100%		100%

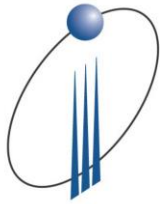
Outgassing occurs in a vacuum when connector materials, contaminants or moisture can mix, react and cause degraded performance of components within its environment.

- Outgassing Testing is usually done on 1-2 samples to ASTM-E595 where devices are weighed, heated over time to release volatile materials, then weighed again to calculate mass loss.
- Processing for Outgassing is vacuum baking to remove surface contaminants and moisture. Usually, a 24hour bake at 125C at partial vacuum. Integra bakes with vacuum at ~500 Torr.

SMA CONNECTOR FAILURE AT DPA

- Needle like grains of Au/Sn intermetallics formed due to time and temperature and available gold on the contact finish.





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