Quadrax Cable and PCB Connectors

1. SCOPE

1.1. Content

This specification covers performance, tests and quality requirements for the TE Connectivity (TE) Quadrax plug/receptacle crimp cable connectors and printed circuit board plug connectors used in aerospace applications such as ARINC 600. These connectors consist of a screw machined shell, molded dielectric, and 4-four size 24 AWG pin and socket contacts with a 2 mm centerline (pitch). They are retained inside connector inserts with size 8 retention clips and are to be soldered to plated through holes in printed circuit boards and are designed to be front release/front removable or rear release/rear removable.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

1.3. Qualification Test Results

Successful qualification testing on the subject product line was completed on 28Mar03. The Qualification Test Report number for this testing is 501-574. This documentation is on file at and available from Engineering Practices and Standards (EPS).

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1. TE Document

501-574: Qualification Test Report (Quadrax Cable and PCB Connectors)

2.2. Industry Documents

- ARINC 600-13: Air Transport Avionics Equipment Interfaces
- MIL-STD-1344A: Test Methods for Electrical Connectors
- SFF-8410: Specification for HSS Copper Testing and Performance Requirements

2.3. Reference Document

Draft 2 of Supplement 14 of ARINC 600: Air Transport Avionics Equipment Interfaces

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing.

3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable product drawing.

3.3. Ratings

- Voltage: millivolt operation AC
- Current: 1 ampere for center contacts, 12 amperes for outer shell
- Temperature: -65 to 125°C
- Characteristic Impedance: 100 ohms nominal
- Frequency Range: 100/1000 Base T data rates up to 1000 MHz

3.4. Performance and Test Description

Product is designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1. Unless otherwise specified, all tests shall be performed at ambient environmental conditions per ARINC 600-13.

3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Initial examination of product.	Meets requirements of product drawing.	Visual and dimensional (C of C) inspection per product drawing.
Final examination of product.	Meets visual requirements.	Visual inspection.
ELECTRICAL		
Low level contact resistance.	15 milliohms maximum initial. 30 milliohms maximum final.	ARINC 600-13, Section 19.5.8. MIL-STD-1344A, Method 3002.1 Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage, 20 measurements.
Contact resistance at rated current.	Center contact: 15 milliohms maximum initial. 30 milliohms maximum final. Outer shell: 3 milliohms maximum initial. 4 milliohms maximum final.	ARINC 600-13, Section 19.5.7. MIL-STD-1344A, Method 3004.1 1 ampere DC for center contact, 20 measurements. 12 amperes DC for outer shell, 5 measurements.
Insulation resistance at ambient.	ARINC 600-13, Section 19.4.6. > 5000 megohms minimum.	ARINC 600-13, Section 19.5.3. MIL-STD-1344A, Method 3003.1 Subject unmated specimens to 500 volts DC for 2 minutes, 20 measurements.
Insulation resistance at high temperature.	ARINC 600-13, Section 19.4.7. > 1000 megohms minimum at 125°C.	ARINC 600-13, Section 19.5.4. MIL-STD-1344A, Method 3003.1 Subject unmated specimens to 500 volts DC for 2 minutes, 20 measurements.

Figure 1 (continued)

Test Description	Requirement	Procedure
Withstanding voltage at sea level.	ARINC 600-13, Section 19.4.8. 1 minute hold with no breakdown or flashover.	ARINC 600-13, Section 19.5.5. MIL-STD-1344A, Method 3001.1 Mated and unmated specimens. > 1000 volts rms between signal contacts, 20 measurements. > 500 volts rms between signal contacts and outer shell, 5 measurements.
Withstanding voltage at altitude.	ARINC 600-13, Section 19.4.8., except altitude is 70000 feet. 1 minute hold with no breakdown or flashover.	ARINC 600-13, Section 19.5.6., except test potential is > 125 volts rms between signal contacts, 20 measurements. > 125 volts rms between signal contacts and outer shell, 5 measurements. MIL-STD-1344A, Method 3001.1. Mated and unmated specimens.
RF insertion loss.	Measure and record.	SFF-8410.
RF return loss.	Measure and record.	SFF-8410.
Characteristic impedance.	Measure and record.	SFF-8410.
Near End Crosstalk (NEXT).	Measure and record.	SFF-8410.
Eye patterns.	Measure and record.	SFF-8410.
MECHANICAL		
Vibration, random.	ARINC 600-13, Section 19.4.15. No discontinuities of 1 microsecond or longer duration. See Note.	ARINC 600-13, Section 19.5.12. MIL-STD-1344A, Method 2005.1, Test Condition V, Test Letter E.
Mechanical shock.	ARINC 600-13, Section 19.4.16. No discontinuities of 1 microsecond or longer duration. See Note.	ARINC 600-13, Section 19.5.13. MIL-STD-1344A, Method 2004.1, Condition A.
Durability.	ARINC 600-13, Section 19.4.17. See Note.	ARINC 600-13, Section 19.5.14. Mate and unmate specimens for 500 cycles at a maximum rate of 250 cycles per hour.
Mating/unmating force.	Quadrax Assembly: 2.75 pounds maximum mating force per contact. 11 position insert assembly: 1.25 pounds minimum unmating force per contact.	ARINC 600-13, Section 19.5.2. MIL-STD-1344A, Method 2013
ENVIRONMENTAL		
Salt spray.	ARINC 600-13, Section 19.4.19. See Note.	ARINC 600-13, Section 19.5.16. MIL-STD-1344A, Method 1001.1, Test Condition B. Subject specimens to 5% salt concentration for 48 hours.

Figure 1 (continued)

Test Description	Requirement	Procedure
Thermal shock.	ARINC 600-13, Section 19.4.11. See Note.	ARINC 600-13, Section 19.5.9., except temperature extremes between -65 and 125°C . MIL-STD-1344A, Method 1003.1, Test Condition A. Subject specimens to 5 cycles between -65 and 125°C with 30 minute dwell at temperature extremes.
Humidity/temperature cycling.	ARINC 600-13, Section 19.4.14. See Note.	ARINC 600-13, Section 19.5.11. MIL-STD-1344A, Method 1002.2, Type II with cold shocks.
Temperature life.	ARINC 600-13, Section 19.4.18. See Note.	ARINC 600-13, Section 19.5.15. MIL-STD-1344A, Method 1005.1, Test Condition 5, Test Time Condition D. Subject mated specimens to 125°C for 1000 hours.

NOTE

Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figure 2.

Figure 1 (end)

3.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)				
	1	2	3	4	5
	Test Sequence (b)				
Initial examination of product	1	1	1	1	
Low level contact resistance	2,8				
Contact resistance at rated current	3,9			3,7	
Insulation resistance at ambient			2,6	4,8	
Insulation resistance at high temperature			8		
Withstanding voltage at sea level			3,7	5,9	
Withstanding voltage at altitude			9		
RF insertion loss					5
RF return loss					4
Characteristic impedance					1
Near End Crosstalk (NEXT)					2
Eye patterns					3
Vibration, random	5				
Mechanical shock	6				
Durability	7				
Mating/unmating force	4,10			2,10	
Salt spray		2(c)			
Thermal shock			4		
Humidity/temperature cycling			5		
Temperature life				6(d)	
Final examination of product	11	3	10	11	

NOTE

(a) See paragraph 4.1.A.
(b) Numbers indicate sequence in which tests are performed.
(c) Salt spray testing to be performed on contacts only.
(d) Precondition specimens with 10 durability cycles.

Figure 2

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Specimen Selection

Specimens shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production. Each test group shall consist of a minimum of 5 specimens installed in ARINC connectors with printed circuit board type or crimp style Quadrax contacts.

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 2.

4.2. Requalification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

4.3. Acceptance

Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.4. Quality Conformance Inspection

The applicable quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.