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EIA STANDARD

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Environmental Test Methodology for Determining the Susceptibility of Contacts to Fretting Corrosion

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July 2011



Electronic Components Industry Association

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(From Standards Proposal No. 5382.06, formulated under the cognizance of the CE-2.0 Committee on EIA National Connector and Sockets Standards)

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TEST SEQUENCE No. 1005

ENVIRONMENTAL TEST METHODOLOGY
FOR
DETERMINING THE SUSCEPTIBILITY OF
CONTACTS TO FRETTING CORROSION

(From EIA Standards Proposal No. 5203, formulated under the cognizance EIA CE-2.0 Committee on National Connector Standards.

1 Introduction

1.1 Scope

This standard describes recommended test sequences to determine the susceptibility of contacts to fretting corrosion that is a major and significant failure mechanism that can be caused by vibration and thermal cycling.

1.2 Object

1.2.1 Fretting corrosion is caused by micromotion between two surfaces in contact which may result in a significant change in resistance. It is created when non-noble materials or dissimilar metals (gold vs. tin) are in contact. It can also occur with gold/gold systems when gold has been worn through exposing the non-noble underplate or substrate.

1.2.2 For further information on this phenomenon, a partial bibliography of technical papers is shown in annex C.

2 Test specimen

2.1 Description

Unless otherwise specified in the referencing document, test specimens shall be composed of terminated plug and receptacle connectors, or sockets, with applicable accessories. Connectors or sockets that mate with other types of mating devices (e.g., Printed Circuit Board (PCB) cards, Pin Grid Arrays (PGA), etc.) shall be tested with "dummy devices" including heat sinks as applicable and other similar accessories.

2.1.1 Variable measurements

Unless otherwise specified, a minimum of 50 mated contact pairs per connector or 25% of the contact population whichever is more shall be measured for LLCR (low level circuit resistance). For connectors with less than 50 contacts, the number of measurements shall be agreed upon between test sponsor and test laboratory. Positions being monitored shall be distributed throughout the contact arrangement.

2.2 Preparation

2.2.1 Unless otherwise specified in the referencing document, contacts shall be tested terminated to their applicable conductors (crimp or solder cup) or to test boards (solder or compliant technology). Contacts shall be assembled to their applicable connector housings with all accessories normally associated with the connector styles involved.

2.2.2 Provision shall be provided on conductors and/or applicable test boards to establish connection points or areas for applicable low level circuit resistance measurements.

2.3 Cleaning

Connectors shall be tested in their as received condition. Cleaning may be performed after termination to test boards post soldering or compliant pin insertion only, test specimens that have contact lubricants applied shall not be cleaned.

3 Test procedure

3.1 General

Unless otherwise specified in the referencing document, all tests shall be performed in accordance with the procedures indicated in clause 4. Special conditions, durations, requirements and/or techniques that may be required shall be specified by the qualifying agency and documented in the test report. Any severity level that may be indicated in this document shall be considered as default levels.

3.2 Test sequence

3.2.1 This standard shall not be substituted for any standard defining qualification of connectors or sockets. It does not address the full range of product performance which is required for qualification. The intent of this standard is to determine the susceptibility of connectors or sockets to the failure mechanism of fretting corrosion only.

3.2.2 Unless otherwise specified in the referencing document, the recommended test sequence shall be as shown in the test plan flow diagram figure 1.

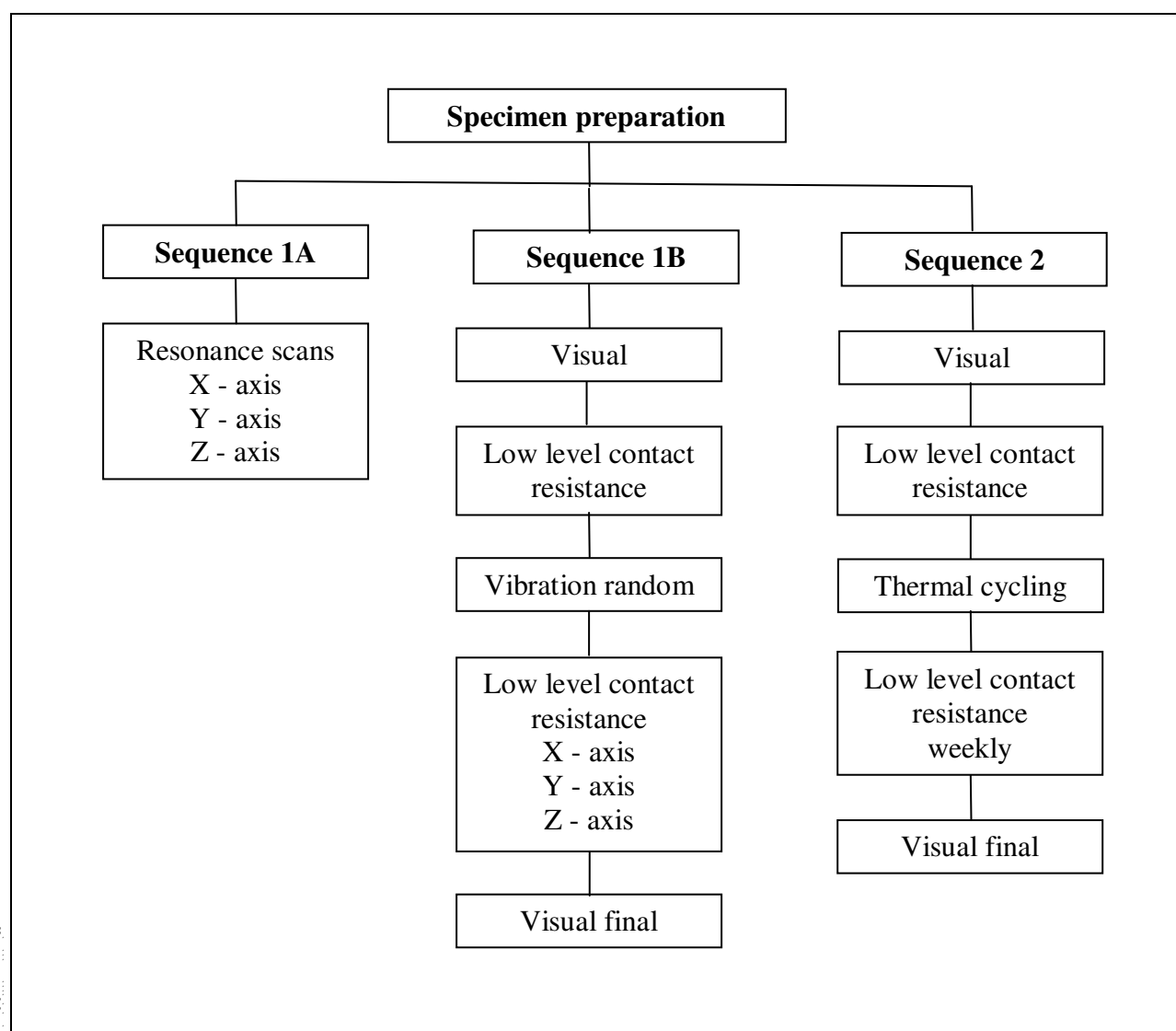


Figure 1 – Test sequences

3.2.3 Test sequences, unless otherwise specified

3.2.3.1 Sequence 1A shall be performed when test severity levels and conditions are unknown. The data generated in this sequence will determine the areas of resonance. The collected data can then be used to develop the vibration profiles to be used for Sequence 1B. This sequence need not be performed when the severity level and conditions are specified in the referencing document.

3.2.3.2 Sequence 1B shall be performed when the vibration conditions are specified in the referencing documents and/or as generated by the results of Sequence 1A when performed.

3.2.3.3 Sequence 2 shall be performed in accordance with the test plan flow diagram and the test conditions indicated unless otherwise specified in the referencing document.

3.2.3.4: It is recommended that Sequence 1A be performed if required. Sequences 1B and 2 are mandatory sequences except in the instance that vibration or thermal cycling has been determined not to be applicable. In this case, the sequence may be omitted at the discretion of the test sponsor. An explanation of said decision shall be documented in the test report.

3.3 Specimen size

Unless otherwise specified in the referencing document the following sample size shall apply:

- Sequence 1A: 4 mated pairs
- Sequence 1B: 4 mated pairs for LLCRC measurements and 2 mated pairs for discontinuity monitoring
- Sequence 2: 5 mated pairs for LLCRC measurements

4 Test procedure

4.1 Visual examination

4.1.1 Unless otherwise specified in the referencing document, initial visual examination of the contact areas (pins, blades, PCB pads, etc.; are observed) shall be examined under a minimum of 10X magnification. If any particulate matter, plating salts, organic films, metal filings/flakes, etc. the test sponsor shall be notified. Testing shall not proceed until instructions are issued to the test lab by the test sponsor.

4.1.2 Final visual examination of the contact areas shall be performed under a minimum of 10X magnification. Any abnormal discoloration, blemishes, black spots or debris fields (typical of fretting corrosion) shall be noted and the test sponsor notified. Additional surface analysis may be required if additional definition of the defects are required, see clause 5 for additional information.

4.1.3 When applicable, socket contacts which are recessed in its housing, may not be accessible for direct examination. Notation of this shall be recorded in the test report. Socket contacts shall be carefully removed from its housing and examined accordingly. This may be performed by the test laboratory or the test sponsor at the discretion of the test sponsor.

4.1.4 Unless otherwise specified in the referencing document, if all requirements as specified have been met, final visual examination may be omitted, see clause 5.

4.2 Resonance scans, Sequence 1A

4.2.1 The test specimens shall be secured within the test fixtures as agreed upon between the test sponsor and the test laboratory, see 4.4.1.