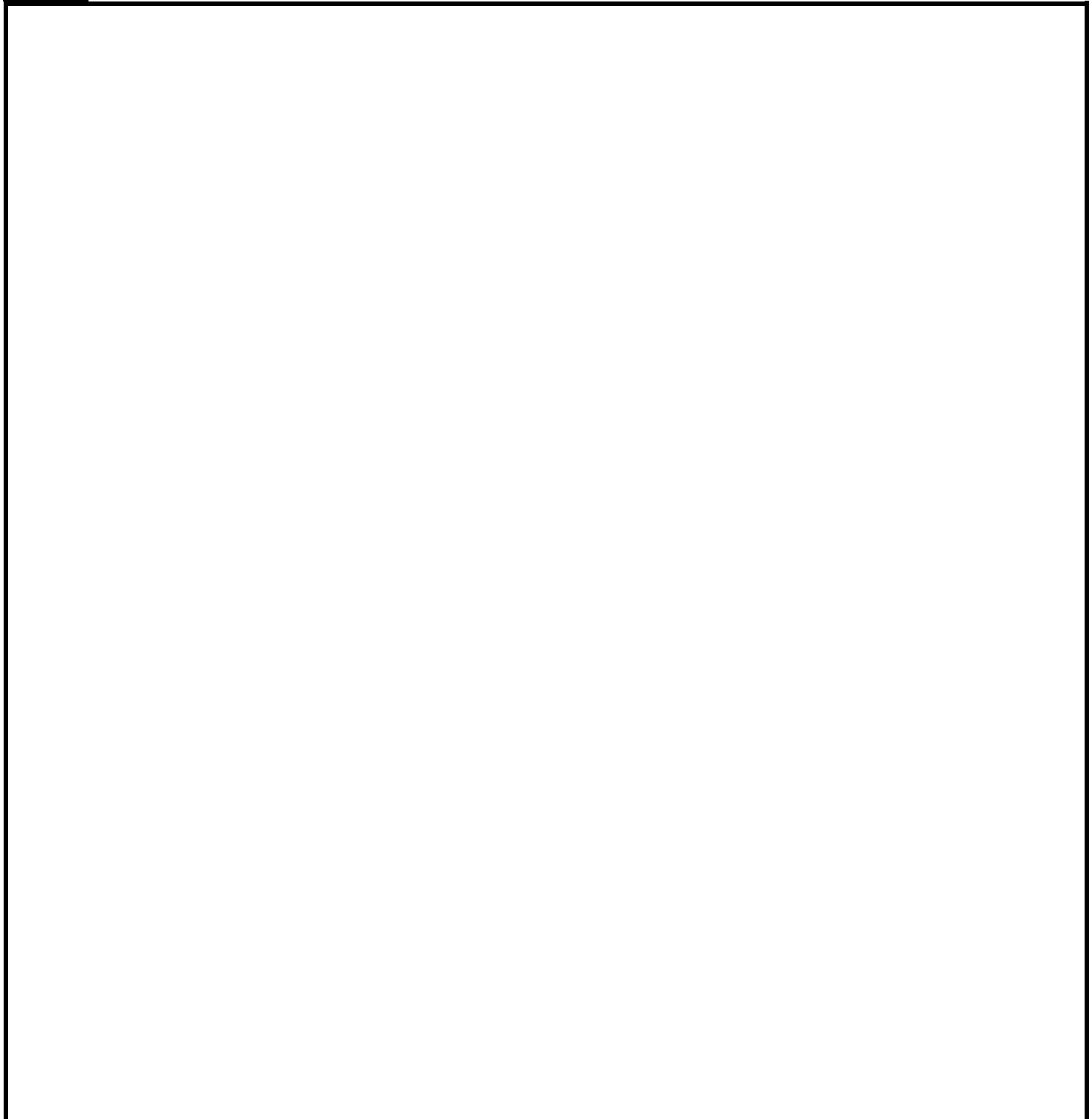


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MOUNT HOLLY SPRINGS, PA 17065

DPA Specification
Includes exceptions to MIL-STD-1580

<p align="center">THE RECORD OF APPROVAL FOR THIS DOCUMENT IS MAINTAINED ELECTRONICALLY WITHIN THE ERP SYSTEM</p>	CODE IDENT NO	SIZE	DWG. NO.	REV
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1.0 SCOPE

This drawing specifies the requirements which shall be utilized to determine the compliance of Vectron International designed and manufactured high reliability, MIL-PRF-55310-compliant, Class 2 crystal oscillators by Destructive Physical Analysis (DPA).

2.0 PURPOSE

This specification defines criteria and process results unique to Vectron designs that may, or may not, be identified as 'standard' in MIL-STD-1580 general requirements.

2.1 This document and its effective revision shall be identified on quotes and all subsequent documentation where Destructive Physical Analysis may be a requirement of the Vectron product.

Legacy Note: Vectron's MIL-PRF-55310 Product Level S/MIL-PRF-38534 Class K equivalent hardware is typically used in non-retrievable space applications, a user segment that Vectron MHS (formerly McCoy Electronics/Oak Frequency Control/Corning Frequency Control) has been supplying to for 35+ years, many of those years as a DLA/DSCC-certified QPL supplier.

3.0 APPLICABLE DOCUMENTS

The following documents of the issue in effect at the time of quotation form a part of this specification to the extent specified herein.

3.1 Government

MIL-PRF-38534 Hybrid Microcircuits, General Specification For
MIL-PRF-55310 Oscillator, Crystal Controlled, General Specification For
MIL-STD-883 Test Method Standard, Microcircuits
MIL-STD-1580 Destructive Physical Analysis for Electronic, Electromagnetic, and
Electromechanical Parts

3.2 Vectron International

DOC008955 (QR-52647) Hybrid Resonator Inspection Criteria
DOC008928 (QR-17096) Workmanship Standards for Hybrid Microcircuits
DOC005122 (GR-20907) Component and Crystal Clip Mounting Procedure
QR-37145 Package Assembly Lot Acceptance Test Specification
QR-37172 Crystal Element Evaluation, Class S, MIL-PRF-55310
QR-37197 Crystal Element Evaluation, Class B, MIL-PRF-55310
GR-37330 Process Spec for Crystal Clip Assy. and Cleaning Package and Assembly
Report # QA07009 Analysis of Crystal Clip Attachment Using Indium Solder

3.3 Order of Precedence. In the event of a conflict between the content of this document and the references cited herein, this document shall take precedence.

4.0 GENERAL REQUIREMENTS

MIL-STD-1580 describes the general requirements for performance of Destructive Physical Analysis (DPA) on parts. Hybrid quartz crystal oscillators shall be tested in accordance with Requirement 16 paragraph 16.3 and Requirement 12. Both Requirements' compliance criteria shall also include the manufacturer-specific requirements herein as part of the DPA evaluation.

4.1 DPA Samples. Devices for this evaluation shall be selected in accordance with the requirements of MIL-STD-1580 paragraph 4 or from customer specified sources within the production lot(s).

4.1.1 Sample Identification. The device's unique serial number begins with a numeric prefix that is Vectron's production lot / job number and must be included in the report, i.e. SN 123456-01. This number provides traceability back to the individual components and their manufacturing lots.

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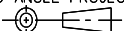
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- 4.2 Vectron Detailed Documentation and Proprietary Notice. The documents listed in paragraph 3.2 are required companions to this specification to the extent noted herein. All Vectron produced documentation provided in support of DPA testing must be handled as Proprietary.
- 4.3 Test and Inspection Methods. Test methods and limits (i.e. optical magnification, bond pulls...) used in the examination of devices shall not exceed those specified in MIL-PRF-55310, MIL-STD-883 or the manufacturer's standards as noted herein.
- 4.4 Test Documents. As a minimum, the applicable Assembly drawing for the device under test, DOC008955 and DOC008928 must be in-hand prior to initiating any DPA tests. These documents form an integral part of a concise DPA by including the manufacturer's end-item expectations and requirements as imposed upon its suppliers and internal processes.
- 4.5 Physical Baseline. Photographs of the device, prior to all testing and immediately following delidding for internal examination, shall be taken to record a physical baseline of the product's condition.
- 4.5.1 Photographs. External photographs shall include one (1) top view as a minimum. A minimum of two (2) photographs are required for a delidded device. Side or oblique views shall be as specified or otherwise considered to document design features.
- 4.5.2 Observations. Any observed anomalies such as damage, scratches or chips shall be photographed and labeled.
- 4.6 Prohibited Materials Testing. When required by the contract, prohibited materials analysis shall be performed to the requirements of the applicable contractor drawing.

5.0 MANUFACTURER-SPECIFIC DETAILED REQUIREMENTS

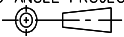
As specified in MIL-STD-1580 paragraph 4.2 and MIL-STD-883, Method 5009 paragraph 3.5, features and characteristics pertinent to the manufacturer's designs as a custom fabricator shall be recognized and detailed so that tailoring of 'standard' requirements can effectively evaluate the finished product.

- 5.1 Origination of Vectron Specific Requirements. MIL-PRF-55310 Appendix A, paragraph A.3.1, instructs the manufacturer to produce detailed documentation to provide standards and controls that assure a reproducible, and statistically sound, high quality product. These documents comprise applicable requirements beginning with product design, then as imposed upon the suppliers of procured materials, and through the manufacturer's AI&T process controls leading to product acceptance and shipment.
- 5.1.1 Applicable Criteria and Inspection Methods. DOC008928 paragraph 3.0 identifies those inspection methods satisfied by MIL-Standard conditions and those areas requiring the additional manufacturer-specific details provided herein.
- 5.2 Component and Element Evaluation Program Plan. MIL-PRF-55310 Appendix B, paragraph B.3.3, instructs the manufacturer to produce and implement a detailed component and element evaluation system. Specifically addressed within the element evaluation program are those component and process requirements not detailed by industry standards.
- 5.3 Quartz Crystal Elements
- 5.3.1 Quartz Crystal Blank Visual Criteria. As stated in QR-37172 and QR-37197 for crystal element evaluation, DOC008955 includes criteria for both the pre-metalized quartz blank and the plated crystal at the supplier. Those criteria also represent the inspection requirements of the crystal within the device.
- 5.3.2 Packaged Quartz Crystal Visual Criteria. A quartz crystal assembly, housed in a sealed package, shall be evaluated at two inspection levels.

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- 5.3.2.1 The crystal blank shall be evaluated to the applicable requirements of DOC008955 prior to its removal from any supporting structure or package.
- 5.3.2.2 The packaged crystal assembly, minus the crystal blank, shall be evaluated to the requirements of MIL-STD-1580 Requirement 12 and MIL-PRF-3098.
- 5.4 Hybrid Assembly Visual Inspection Criteria
External and internal visual inspections shall be conducted in accordance with the applicable requirements of DOC008928.
- 5.5 Hybrid Assembly Techniques
 - 5.5.1 Crystal Clip Attach (per GR-37330, ref. QA07009). When crystal mounting clips are attached to the ceramic substrate using an Indium solder cream (81Pb, 19In) as the attachment media. Following solder reflow, the resultant internal voiding in the solder joint evident by x-ray is inherent to this process. The following paragraphs are in response to the voiding as a questioned anomaly.
 - 5.5.1.1 Visual Requirements. The applicable MIL-Standards do not contain clip attach criteria for lap-solder reflow connections. Vectron workmanship criteria require that each clip must have a visible solder fillet around 100% of the clip base as the strength of the joint comes from the fillet rather than from the amount of solder underneath the clip.
 - 5.5.1.2 Crystal Clip Acceptance Testing. A printed substrate Lot Acceptance Test (LAT), that includes pull tests on a minimum of 6 clips per QR-37145, is performed on each lot. The pull data is part of the End-Item Data Package (EIDP) and can be provided upon request.
 - 5.5.1.2 Radiographic Inspection. The radiographic criteria of MIL-STD-883, Method 2012 is not applicable to Vectron's crystal clip solder attachment. Report # QA07009 can be provided by the manufacturer upon request.
- 6.0 **QUALITY ASSURANCE PROVISIONS**
In accordance with MIL-STD-1580 paragraph 4.2, requirements of the detailed part specification or baseline documentation shall be included in the DPA criteria. Devices shall meet all applicable requirements as stated herein.
- 6.1 Nonconformances. Any anomalies or defects shall be documented in accordance with MIL-STD-1580 paragraph 4.2.4 and forwarded to the manufacturer for review and comment.

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