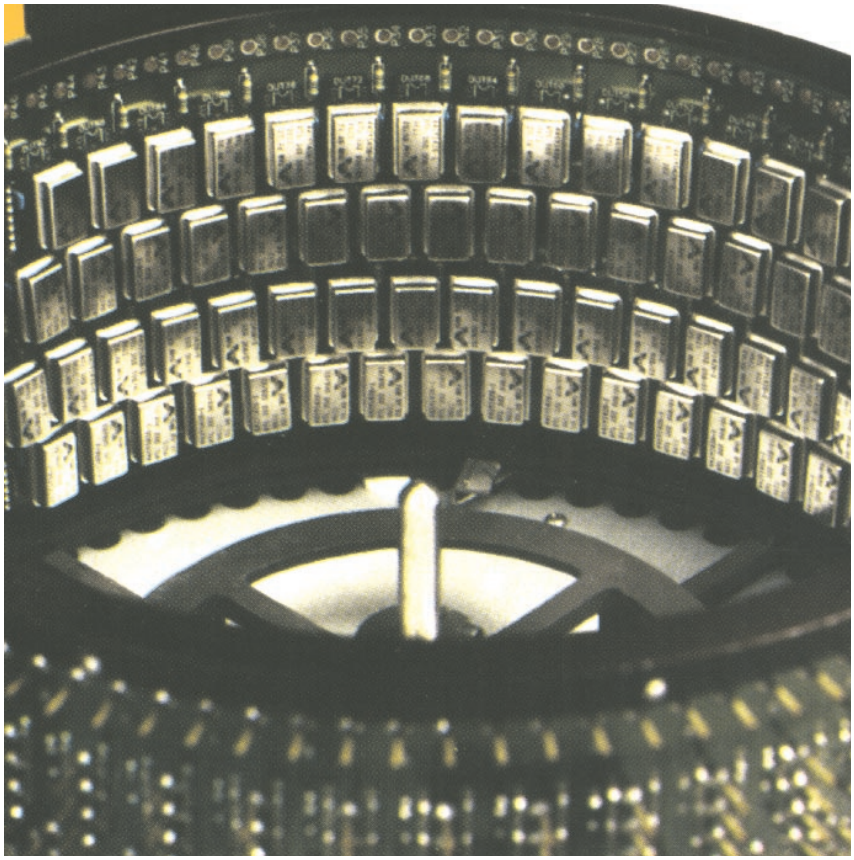
HEWLETT® PACKARD

VXI Systems Helps Test Crystal Oscillators



Electronic Manufacturing Test Case Study

Customer:
A U.S. manufacturer of crystal oscillators, employing some 200 people.

Introduction:
Crystal oscillators are used to generate precise, stable radio frequencies and are found in a wide variety of electronic equipment, including computers, frequency synthesizers, telecommunications systems, time systems, navigational and guidance equipment, and telemetry.

Situation:
In producing crystal oscillators, the manufacturer must conduct tests to characterize design, ensure reliability, and extensively document each crystal. This testing also helps sort out good products from bad (i.e., quality control). In the process of functional testing, various parameters must be measured, including temperature, humidity, pressure, current, amplitude, and frequency.

Problem:
With its aging and unreliable central test system, the company found it was experiencing increasingly long test times. This in turn created problems with shipments getting out on time. Prior to using VXI, the company had purchased used equipment, which had a shorter built-in life expectancy.

Implications:
Without meeting its shipment dates, the company would experience a loss of profits. Moreover, its customers would not accept crystals that were unaccompanied by test documentation, nor would untested units pass relevant regulatory requirements. If bad units were shipped to the customer, major warranty and quality issues would arise.

Solution:
An HP VXI test system was chosen to replace the company's existing system, along with selected products from other manufacturers. The primary reasons for choosing VXI were that 1) it was a modular, scaleable architecture and that 2) it offered much more effective data management capabilities than the old system. Because it is modular, VXI offered the ability to move measurement and data processing from a large, centralized system to small, decentralized stations, or "nodes". Each node collects data from 24 temperature test chambers and each operates independently; however, all reside on the central MIS network.

HP was chosen as the vendor because of its reputation for reliability, cost-effectiveness, and support. The HP 53132A universal counter, HP 34401A digital multimeter, HP 54615B two-channel oscilloscope, and HP E3630A power supply were chosen for their excellent cost/performance ratios.

Visual Basic and C++ were selected as the test software. The software is split into four functional layers – graphic user interface (GUI), test command interpreter, instrumentation engine, and report generators.

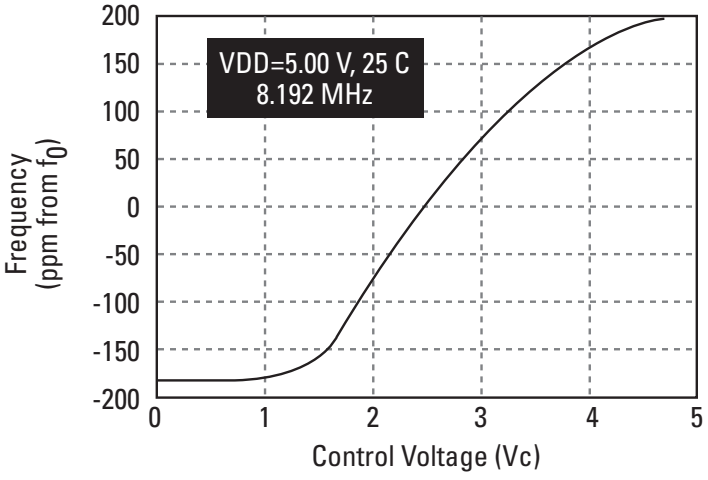
Description of Test:
Each crystal undergoes various functional tests, including:

- Start-up (frequency vs. time, current vs. time, and cold start verification)
- Temperature (frequency vs. temperature, current vs. temperature, and output amplitude vs. temperature)
- Aging (frequency vs. time, long-term and short-term)
- Voltage controlled oscillation sweep (analog frequency linearity and digital frequency linearity)
- Single parameters (frequency, current, amplitude, phase noise, rise/fall times, and logic levels)
- Global parameters (temperature, humidity, and pressure)

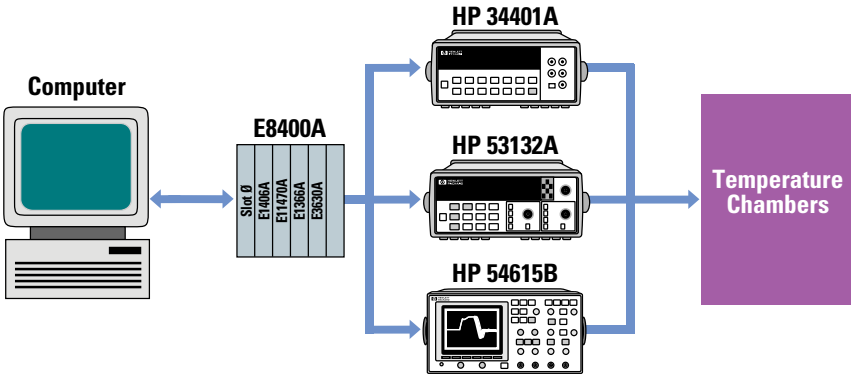
Results:
Definite benefits have been noted in several areas – cost saved, time saved, and improved quality.

With the new VXI test system, all test criteria and procedures are stored in a standardized central database, along with electrical test specifications and automatic test scripts. Test results are stored in the central database and automatically downloaded to the central server as needed. The results of the tests have established a database which can be easily accessed for reports, as well as for reference in creating future tests. Multiple departments can access the data and print reports from any computer terminal in the facility. Global parameters such as room temperature, pressure, and humidity are also stored on the database.

The company has now standardized on HP VXI test systems. It will continue to use both B-size and C-size systems for the foreseeable future. Eventually, the total number of test systems could reach 100, consisting of VXI instruments, stand-alone instruments, and rack cabinets.



VCXO Frequency Deviation vs. Control Voltage



Configuration:	
Computer	Pentium PC/AT with Windows NT
VXI	HP E8400A C-size, 13-slot VXI mainframe
	HP E1406A, RF and DC switching modules
	HP E1470A 60-ch RF multiplexer
	HP E1366A dual 1x4 50-ohm RF multiplexer
	HP E3630A power supply
Other instruments	HP 34401A digital multimeter
	HP 53132A universal counter
	HP 54615B two-channel oscilloscope
Software	Visual Basic and C++
Fixtures	Modular fixtures and racks
Other	Programmable temperature chambers
	RS-485 interface

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