

# Greenray Quarterly

## FREQUENCY CONTROL SOLUTIONS



Since 1961 Greenray has produced innovative, high performance, frequency control solutions for Commercial, Military, Aerospace, Communications and Instrumentation markets. Design, Testing and Production is carried out at our facility in Mechanicsburg, PA.



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## ENGINEERING TALK

### On Phase Noise

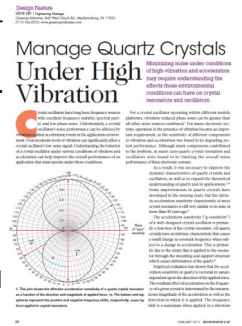
Phase noise performance under vibration is a major concern in many modern systems. Due to the inherent acceleration sensitivity of quartz, traditional crystal oscillators phase noise performance degrades significantly in vibratory environments. Greenray Industries has patented a technology which utilizes two crystals matched and arranged so that their individual acceleration sensitivities cancel out. These vibration compensated parts can achieve acceleration sensitivities of  $<5 \times 10^{-11}/g$ . Vibration compensated oscillators are available as an XO, TCXO, or OCXO depending on the applications temperature specification. This technology is also available in a wide variety of footprints and frequencies. The newest addition to the vibration compensation family is the T1307 which is Greenray Industries smallest vibration compensated part with a footprint of 9mm x 7mm.

## RECENTLY PUBLISHED

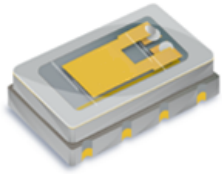
Microwaves & RF magazine recently published "Manage Quartz Crystals Under High Vibration" in their February edition. This article was written by Greenray's Engineering Manager, Steve Fry. "Minimizing noise under conditions of high-vibration and acceleration may require understanding the effects those environmental conditions have on crystal resonators and oscillators."

"Crystal oscillators have long been frequency sources with excellent frequency stability, spectral purity, and low phase noise. Unfortunately, a crystal oscillator's noise performance can be affected by vibration or other acceleration events in the application environment. Even moderate levels of vibration can significantly affect a crystal oscillator's low-noise signal. Understanding the behavior of a crystal oscillator under various conditions of vibration and acceleration can help improve the overall performance of an application that must operate under those conditions."

If you would like a finish reading this article please contact Amanda at: [asmith@greenrayindustries.com](mailto:asmith@greenrayindustries.com)



# New & Upcoming Products



Greenray would like to announce the release of our T1239 precision TCXO. The T1239 is a tight stability TCXO in a 5x3mm RoHS compliant package, and was specifically designed for wired and wireless communications. This TCXO is available from 10MHz up to 52MHz and is compliant to Stratum 3 requirements, with temperature stability as good as  $\pm 0.1$ ppM. Samples are now available.

In May, Greenray will be releasing the T1307. The T1307 is a much smaller SMT version of our Greenray T1300 vibration compensated TCXO. Available in a miniature 9x7mm package, the T1307 offers exceptionally low acceleration sensitivity of  $\leq 7 \times 10^{-11}$ /g for optimum phase noise performance during vibration and shock. The T1307 also offers tight frequency stability and excellent long term stability for harsh mobile and airborne environments. Frequencies are available from 10MHz to 50MHz.

In June, Greenray will be releasing the ANN106. Greenray's ANN106 is our newest product in our line of Artificial Neural Network TCXOs. The ANN TCXOs offer superior total stability to all other TCXOs currently available, with temperature stabilities better than  $\pm 10$ ppB. The ANN106 is a small 20.32x12.70mm DIP or SMT package, and uses minimal input power at 3.3 or 5.0VDC input. The ANN TCXOs offer OCXO stability without the excessive input power and warm-up time required of an OCXO. Frequencies are available from 10MHz to 50MHz. The ANN TCXOs are Stratum 3 and 3E compliant.

## Thank You

Greenray would like to take time to thank our customers for their business. Greenray understands that times are changing and with budget cuts and demand for even smaller parts, it makes doing business even more difficult. So Greenray would like to say "Thank You". Per AS9100 we are to use customer feedback to help improve our QMS. Customers may use this link [Customer Satisfaction Survey](#) to complete our survey. If you would like to send us your own supplier ratings that measure quality and delivery, please feel free to send them to: [asmith@greenrayindustries.com](mailto:asmith@greenrayindustries.com) and again **Thank You**.

## Have you seen us?

Many of you may not realize that Greenray is expanding visibility via the internet, Facebook, Twitter and LinkedIn. More than that, Greenray has a blog called "Greenray Today". In addition to social media, we've been advertising with Thomasnet, RF Globalnet, Military Systems and Technology and Direct Industry. Greenray is currently working to set-up accounts with Google+ and Yahoo. Links to all of these accounts and our website can be found on page 3.



February 25th to 27th Greenray's Operations Manager, Wayne Bolton, attended the world's biggest exhibition and conference of 2014, the Embedded World Conference in Nuremburg, Germany.

The 2014 conference and exhibition ended with a new record: 26,688 trade visitors from all over the world and 856 international exhibitors from 35 countries made the twelfth embedded world the biggest in the history of this event.

## GREENRAY'S YESTERDAYS



This is a Greenray Industries brochure from 1967 with this quote printed on the inside cover. "Through continuous research and specialization, Greenray Industries offers the most complete and advanced line of Frequency Standards and Oscillators in the industries." Raymond H. Green, President.



## Upcoming Events

### 2014 Brochure

Greenray will soon be releasing a new brochure for 2014. This brochure will feature more detailed information about our current as well as our new product line.

### 2014 IEEE Frequency Symposium May 19th to 22nd

Greenray's Senior Design Engineer, John Esterline, submitted an abstract to the IEEE Frequency Control System and was approved to present his paper "Compensation of Control Voltage Linearity using an Artificial Neural Network.". If you would like more information about this topic see John at the 2014 IMS-MTT show or you can contact us at:  
[asmith@greenrayindustries.com](mailto:asmith@greenrayindustries.com)

### 2014 IMS-MTT June 1st to June 6th

Greenray Industries will be attending the show this year in Florida. Stop by Booth: 223 to talk with our Sales Manager, Phil Myers and our Senior Design Engineer, John Esterline.

## VISIT GREENRAY

ThomasNet  
[www.thomasnet.com](http://www.thomasnet.com)

RF Globalnet  
[www.rfglobalnet.com](http://www.rfglobalnet.com)

Military System & Technology  
[www.militarysystems-tech.com](http://www.militarysystems-tech.com)

Greenray Industries  
[www.greenrayindustries.com](http://www.greenrayindustries.com)

Direct Industry  
[www.directindustry.com](http://www.directindustry.com)

## SOCIAL MEDIA

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<https://www.facebook.com/GreenrayInd>

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Greenray Today  
<http://greenraytoday.com/>

LinkedIn  
<http://www.linkedin.com/company/2457213>



frequency control solutions

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