

# PRECISION

FREQUENCY CONTROL SOLUTIONS

# QUARTZ



**Shortform Oscillator Catalog**  
OCXO/TCXO Edition



## About Greenray Industries

Greenray Industries, Inc. is a leading manufacturer of precision crystal oscillators.

Since 1961, Greenray has provided innovative, high performance frequency control solutions for the military, aerospace, communications and instrumentation markets.

Greenray's product capabilities include OCXOs, TCXOs, VCXOs and clock oscillators designed for demanding applications from 1Hz to 1GHz. Our state-of-the-art design, assembly and test operations enhance our ability to provide superior frequency control components, expert application support and extraordinary customer service.

Design, testing and production is carried out at our facility in Mechanicsburg, Pennsylvania, and our quality management system is certified to the ISO 9001:2008 standard.

Greenray's engineering focus is on tight frequency stabilities and low phase noise. Based on extensive experience with the defense and aerospace industries, our oscillators are optimized for long-term performance under the acceleration, shock and vibration conditions encountered in mobile and airborne applications. In addition, we offer custom build and small volume production capabilities.

Greenray product features include:

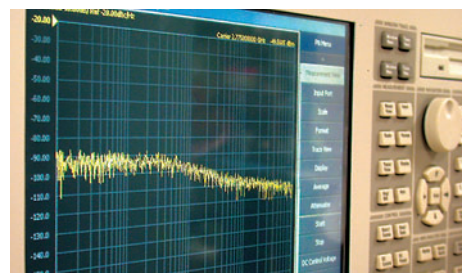
- OCXO frequency stability to  $\pm 0.005\text{ppm}$
- TCXO frequency stability to  $\pm 0.04\text{ppm}$
- VCXO frequency pull to  $\pm 1000\text{ppm}$
- Temperature range of  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Sine wave, CMOS, ECL, PECL & TTL outputs
- RoHS Compliant

Greenray's extensive in-house electrical and environmental test capabilities include:

- Aging
- Sine Vibration
- Mechanical Shock
- Acceleration
- Temperature Cycle
- Stabilization Bake
- Temperature Shock
- Fine/Gross Leak
- Random Vibration
- Temperature
- Resistance to Solvents
- Solderability



CAD/CAM



World Class In-House Testing



Automated Test Systems

# OCXOs

Greenray precision oscillators offer exceptional frequency stability, vibration, shock, and acceleration sensitivity performance.

Greenray OCXOs are preferred for demanding communications, military, and aerospace applications, and are optimized for low phase noise, tight stability over temperature, and long-term performance. Greenray oscillators deliver performance and reliability for wired and wireless communications, GPS, SATCOM, and instrumentation applications, as well as for emerging technologies like WiMAX and Femtocell.



**YH1420**

**Frequency** 10 - 100 MHz  
**Attributes** Small Size  
 Low Phase Noise  
**Best Stability**  $\pm 5 \times 10^{-8}$   
**Output** CMOS, Sine wave  
**Size** 20.32 x 12.70 x 9.14 mm  
 0.8 x 0.5 x 0.36 in., DIP



**YH1440**

**Frequency** 10 - 100 MHz  
**Attributes** SMT Pkg.  
 Low Phase Noise  
**Best Stability**  $\pm 5 \times 10^{-8}$   
**Output** CMOS, Sine wave  
**Size** 25.4 x 22.10 x 11.43 mm  
 1.0 x 0.87 x 0.45 in., SMT



**YH1600**

**Frequency** 10 - 100 MHz  
**Attributes** Vib. Compensation  
 Ultra-low g-Sensitivity  
**Best Stability**  $\pm 5 \times 10^{-10}$   
**Output** CMOS, Sine wave  
**Size** 38.10 x 38.10 x 19.05 mm  
 1.5 x 1.5 x 0.75 in.



**YH1322**

**Frequency** 10 - 120 MHz  
**Attributes** Ultra-low  
 Phase Noise  
**Best Stability**  $\pm 5 \times 10^{-9}$   
**Output** Sine wave  
**Size** 50.80 x 50.80 x 19.05 mm  
 2.0 x 2.0 x 0.75 in., SMA



**YH1460**

**Frequency** 10 - 100 MHz  
**Attributes** Tight Stability  
 Low Phase Noise  
**Best Stability**  $\pm 5 \times 10^{-9}$   
**Output** CMOS, Sine wave  
**Size** 25.40 x 25.40 x 13.46 mm  
 1.0 x 1.0 x 0.53 in.



**YH1300**

**Frequency** 10 - 50 MHz  
**Attributes** Small Size  
 Ultra-low g-Sensitivity  
**Best Stability**  $\pm 1 \times 10^{-7}$   
**Output** CMOS, Sine wave  
**Size** 20.32 x 12.70 x 9.14 mm  
 0.8 x 0.5 x 0.36 in., DIP



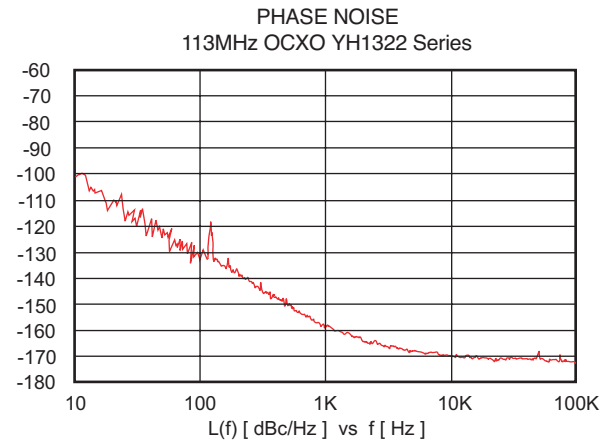
**ZYH1002**

**Frequency** 10 - 50 MHz  
**Attributes** Low Input Power  
**Best Stability**  $\pm 5 \times 10^{-8}$   
**Output** CMOS, Clipped Sine  
**Size** 20.32 x 12.70 x 9.14 mm  
 0.8 x 0.5 x 0.36 in., DIP



**YH1310**

**Frequency** 10 - 100 MHz  
**Attributes** Tight Stability  
 Low Phase Noise  
**Best Stability**  $\pm 1 \times 10^{-8}$   
**Output** CMOS, Sine wave  
**Size** 35.56 x 25.40 x 12.70 mm  
 1.4 x 1.0 x 0.50 in., DIP

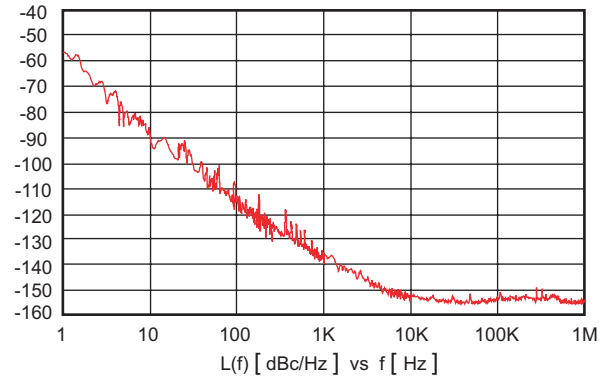


# TCXOs

Greenray's comprehensive range of TCXO products for communications, instrumentation, and military applications feature temperature stability performance of 1ppm or less and are available from 1Hz to 1GHz.

Greenray TCXOs are available in a variety of package configurations including miniature DIP, ceramic, SMT, MIL-spec, and industry-standard sizes. Greenray's stringent materials, assembly, test, and quality assurance protocols satisfy the rigorous requirements of defense contractors and commercial customers alike.

PHASE NOISE  
20MHz TCXO T75 Series



**T1300**

**Frequency** 10 - 50 MHz  
**Attributes** Hermetic Pkg.  
 Ultra-low g-Sensitivity  
**Best Stability** ±0.3 ppm  
**Output** CMOS, Sine wave  
**Size** 20.32 x 12.70 x 9.14mm  
 0.8 x 0.5 x 0.36 in., DIP



**ZT610**

**Frequency** 10 - 50 MHz  
**Attributes** Ultra-low  
 Phase Noise  
**Best Stability** ±1.0 ppm  
**Output** CMOS, Sine wave  
**Size** 20.32 x 12.70 x 9.14 mm  
 0.8 x 0.5 x 0.36 in., DIP



**T1215**

**Frequency** 10 - 800 MHz  
**Attributes** Hermetic Pkg.  
**Best Stability** ±0.3 ppm  
**Output** CMOS, Clipped Sine,  
 LVPECL  
**Size** 9.0 x 7.0 x 2.8 mm  
 0.35 x 0.28 x 0.11 in., SMT



**T90**

**Frequency** 10 - 50 MHz  
**Attributes** Low Phase Noise  
 High Shock & Vibration  
**Best Stability** ±0.3 ppm  
**Output** CMOS, Clipped Sine  
**Size** 9.0 x 7.0 x 3.9 mm  
 0.35 x 0.28 x 0.15 in., SMT



**T121**

**Frequency** 50 - 100 MHz  
**Attributes** High Shock & Vib.  
 Low g-Sensitivity  
**Best Stability** ±0.5 ppm  
**Output** Sine wave  
**Size** 17.27 x 17.27 x 5.08 mm  
 0.68 x 0.68 x 0.2 in., SMT



**T75**

**Frequency** 10 - 50 MHz  
**Attributes** Tight Stability  
 High Shock & Vibration  
**Best Stability** ±0.3 ppm  
**Output** CMOS, Clipped Sine  
**Size** 7.0 x 5.0 x 2.5 mm  
 0.28 x 0.20 x 0.10 in., SMT



**ZT600**

**Frequency** 10 - 500 MHz  
**Attributes** Low Phase Noise  
 High Frequency  
**Best Stability** ±0.3 ppm  
**Output** CMOS, Sine wave  
**Size** 29.21 x 25.4 x 5.08 mm  
 1.15 x 1.0 x 0.2 in., SMT



**T53**

**Frequency** 10 - 50 MHz  
**Attributes** Tight Stability  
 High Shock & Vibration  
**Best Stability** ±0.3 ppm  
**Output** CMOS, Clipped Sine  
**Size** 5.0 x 3.0 x 2.2 mm  
 0.20 x 0.12 x 0.09 in., SMT



**T124**

**Frequency** 650 Hz - 1.25 MHz  
**Attributes** Low Frequency  
 Tight Stability  
**Best Stability** ±0.3 ppm  
**Output** CMOS  
**Size** 17.27 x 17.27 x 5.08 mm  
 0.68 x 0.68 x 0.2 in., SMT



**T1185**

**Frequency** 100 - 800 MHz  
**Attributes** V. High Frequency  
**Best Stability** ±0.3 ppm  
**Output** LVPECL  
**Size** 9.0 x 14.0 x 5.1 mm  
 0.35 x 0.55 x 0.20 in., SMT

For more TCXO information visit  
[www.greenrayindustries.com/tcxo.html](http://www.greenrayindustries.com/tcxo.html)

# Military, Aerospace & Defense

For nearly 50 years, Greenray Industries has supported the military and defense markets with high performance, precision oscillators. Our engineering experience and manufacturing expertise have helped make Greenray a key supplier on many military programs, providing cost-efficient, leading-edge solutions combined with a long-term service commitment.

Greenray frequency control devices support key applications including Smart Munitions, Missile Guidance, Airborne Communications, Airborne Instrumentation, Portable Communications and Equipment, Radar, Satellite Communications, Telemetry, GPS, Jammers, Detection and Identification.



Mobile Communications

Greenray Specialized MIL Capabilities include:

- Testing and processes per MIL-PRF-55310
- Screening
- MIL parts construction
- IPC-A-610 trained operators
- In-house qualification testing
- Reliability calculations
- Phase Noise vs. Vibration Test



Patriot Missile System

Greenray qualified MIL Programs include:

- |                   |           |
|-------------------|-----------|
| □ Patriot         | □ F-16    |
| □ WIN-T           | □ JTRS    |
| □ Apache          | □ Harrier |
| □ CSEL            | □ Raptor  |
| □ Falcon II & III | □ AEGIS   |
| □ NLOS            | □ ERGM    |

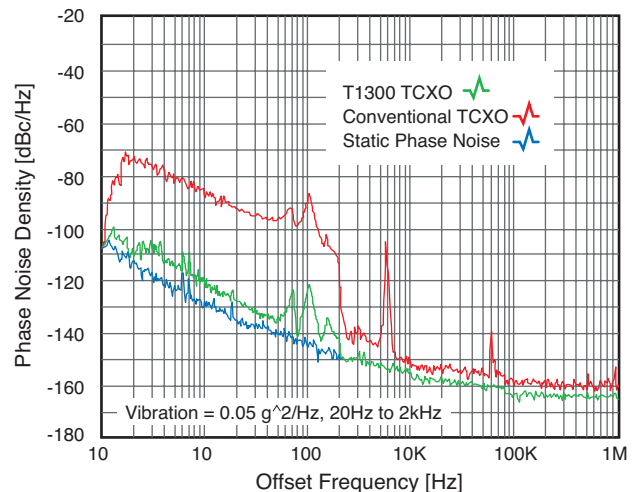


Projectile Electronics

Greenray is focused on the manufacture of very rugged TCXO and OCXO products designed to withstand the most severe environmental requirements associated with military applications including MIL-PRF-55310, MIL-STD-202, MIL-STD-883, MIL-E-5400, and MIL-M-38510.

For example, utilizing our in-house vibration test lab, we have developed superior oscillator performance under dynamic operating conditions, including phase noise during vibration, as can be seen in the T1300 TCXO graph to the right.

VIBRATION INDUCED PHASE NOISE PERFORMANCE  
T1300 TCXO





*Greenray Industries  
Mechanicsburg, Pennsylvania*

*Greenray Industries' synergetic relationship with sister companies Statek Corporation ([www.statek.com](http://www.statek.com)) and Advanced Technical Ceramics Company ([www.adtechceramics.com](http://www.adtechceramics.com)), both leaders in their respective industries, affords Greenray's customers leading-edge innovation and world-class manufacturing – all from a single source.*



*Statek Corporation  
Orange, California*



*AdTech Ceramics  
Chattanooga, Tennessee*



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