GREENRAY

TCXO

OCXO

VCXO

frequency control products

GREENRAY

Precision Crystal Oscillators

www.greenrayindustries.com

OCXO
Frequency Stability
to ± 0.005 ppm

TCXO
Frequency Stability
to ± 0.01 ppm

VCXO
Phase Noise
to -170 dBc/Hz

G-sensitivity
to 5 x 10^{-11}/g

Temperature Range
-55°C to +125°C

Output Options
Sine, CMOS,
PECL, LVDS

Markets We Serve
Telecommunications
GNS Satellite
Instrumentation
Test Equipment
Avionics

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frequency control solutions

About Greenray Industries

Greenray Industries, Inc. is a leading manufacturer of precision crystal oscillators. Since 1961, we have produced innovative, high performance, frequency control solutions for commercial, defense, aerospace, communications and instrumentation markets. Our quality management system is certified compliant to the requirements of SAE Aerospace Standard AS9100C for Aviation, Space and Defense, incorporating the requirements of ISO 9001:2008.

Now into our second half-century of operation, Greenray quartz crystal oscillators are optimized for low phase noise, tight stability and world-leading, ultra-low g-sensitivity performance – and they are opening new horizons to design engineers working in the defense, space, GNSS, picocell, femtocell, and Stratum communications industries.

Greenray OCXOs, TCXOs, VCXOs and XOs are designed for demanding applications from 1 Hz to 1 GHz. 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. We offer our customers in-house resources others cannot, while establishing new frequency control performance standards.

Greenray Product Features

- ☐ OCXO frequency stability to ±0.005 ppm
- ☐ TCXO frequency stability to ±0.01 ppm
- ☐ VCXO phase noise to -170 dBc/Hz
- ☐ G-Sensitivity to 5 x 10^{-11}/g
- ☐ Temperature range of -55°C to +125°C
- ☐ Sine wave, CMOS, PECL & LVDS outputs
- ☐ RoHS compliant upon request

In-house Electrical & Environmental Test Capabilities

- ☐ Aging
- ☐ Sine & random vibration testing
- ☐ Mechanical shock
- ☐ Acceleration
- ☐ Temperature cycling
- ☐ Stabilization bake
- ☐ Thermal shock
- ☐ Fine & gross leak testing
- ☐ Temperature testing
- ☐ Resistance to solvents
- ☐ Solderability

Certified System — SAI GLOBAL — AS9100 Aerospace

Certified System — SAI GLOBAL — ISO 9001 Quality

CAD/CAM

Automated Assembly

Manufacturing Expertise

GREENRAY INDUSTRIES, INC.
TEL 717-766-0223 FAX 717-790-9509 WEB www.greenrayindustries.com EM sales@greenrayindustries.com

TCXOs

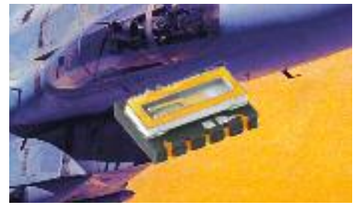
Greenray's TCXO products are designed for wired and wireless communications, instrumentation, aerospace, position/location, including GPS, as well as defense applications. Our TCXOs feature temperature stability performance of 1 ppm or better and are available from 1 Hz to 1 GHz.

Greenray offers Stratum 3 compliant TCXOs for wired and wireless communications, including small cell, Ethernet and 1588 synchronization requirements. Greenray T1238 and T1239 Series TCXOs offer superior temperature stability performance and long-term stability in compact, SMD, RoHS-compliant packages.

Our TCXOs are available in a variety of configurations including miniature DIP, ceramic, SMD, MIL-spec, and industry-standard sizes. More options are available – contact the factory for options not listed here.

Greenray TCXOs feature innovative, state-of-the-art packaging to complement their outstanding performance attributes, while stringent materials, test & assembly, and quality assurance protocols satisfy the rigorous requirements of defense contractors and commercial customers alike.

Mobile/Remote Communications



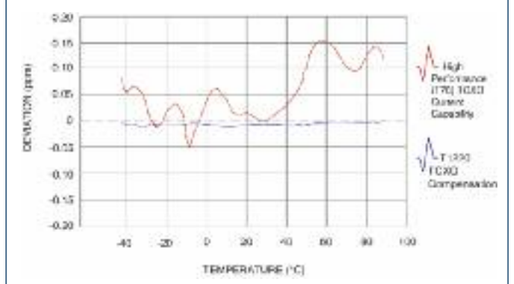
Smart Munitions

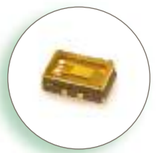
Instrumentation

Model Number	Frequency Range (MHz)	Input Voltage (Vdc)	Best Stability (ppm)	Output Signal	Input Current (mA)	g-Sensitivity Standard	g-Sensitivity Low g-Sens Option	Package (mm), Type
T52	10 to 50	2.7 to 5	±0.1	CMOS/Clipped Sine	2 to 6	<2.5 x 10^{-9}/g	<7 x 10^{-10}/g	3.2 x 5.0, SMD
T70	10 to 50	2.7 to 5	±0.1	CMOS/Clipped Sine	2 to 6	<2.5 x 10^{-9}/g	<7 x 10^{-10}/g	5.0 x 7.0, SMD
T75	10 to 50	2.7 to 5	±0.3	CMOS/Clipped Sine	2 to 6	<2.5 x 10^{-9}/g	<7 x 10^{-10}/g	5.0 x 7.0, SMD
T120	10 to 100	3.3 to 5	±0.5	CMOS	30	<2.5 x 10^{-9}/g	<7 x 10^{-10}/g	17.78 x 22.86, SMD
T121	50 to 100	3.3 to 5	±0.3	Sine	25	<2.5 x 10^{-9}/g	<7 x 10^{-10}/g	17.27 x 17.27, SMD
T1215	0.75 to 800	3.0 to 5	±0.3	CMOS/Cl. Sine/PECL/LVDS	75	<2.5 x 10^{-9}/g	<7 x 10^{-10}/g	7.49 x 9.14, SMD
T1238	10 to 40	2.7 to 5	±0.1	CMOS/Clipped Sine	2 to 6	<2.5 x 10^{-9}/g	n/a	5.0 x 7.0, SMD
T1239	10 to 40	2.7 to 5	±0.1	CMOS/Clipped Sine	2 to 6	<2.5 x 10^{-9}/g	n/a	3.2 x 5.0, SMD
T1300	10 to 50	3.3 to 5	±0.1	CMOS	20	n/a	<7 x 10^{-11}/g	12.70 x 20.32, DIP
T1307	10 to 50	3.3 to 5	±0.5	CMOS/Clipped Sine	5	n/a	<7 x 10^{-11}/g	7.49 x 9.14, SMD
ZT600	10 to 500	3.3 to 5	±0.3	CMOS/Sine	25	<2.5 x 10^{-9}/g	n/a	25.4 x 29.2, SMD
ZT610	10 to 100	5	±0.5	CMOS	25	<2.5 x 10^{-9}/g	<7 x 10^{-10}/g	12.70 x 20.32, DIP
T1220	10 to 50	3 to 5	±0.01	CMOS/Clipped Sine	25	<2.5 x 10^{-9}/g	<7 x 10^{-10}/g	12.70 x 20.32, DIP

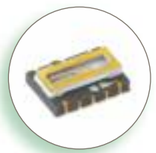
Note: Contact Factory for High Shock/Vibration Options & Availability

Temperature Performance Comparison

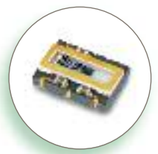




T52



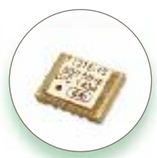
T70



T75

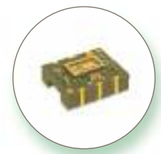
T120

T121



T1215

T1300



T1307

ZT600

ZT610

T1220

VCXOs

Greenray VCXOs are often specified when low phase noise, tight precision and precise adjustment of the operating frequency are required.

Model Number	Frequency Range (MHz)	Input Voltage (Vdc)	Best Stability (ppm)	Output Signal	Input Current (mA)	g-Sensitivity ("lg"= Low g-Sens Option; shown if avail.)	Package (mm), Type
ZN260	50 to 100	3	±15.0	CMOS	35	to <7 x 10^{-11}/g	17.43 x 17.43, SMD
N615	50 to 125	3 or 5	±15.0	CMOS/Sine	25	to <1 x 10^{-9}/g	9.14 x 14.22, SMD

Note: Frequency Adjust is Available on All TCXOs and VCXOs with External Voltage

ZN260

N615

OCXOs

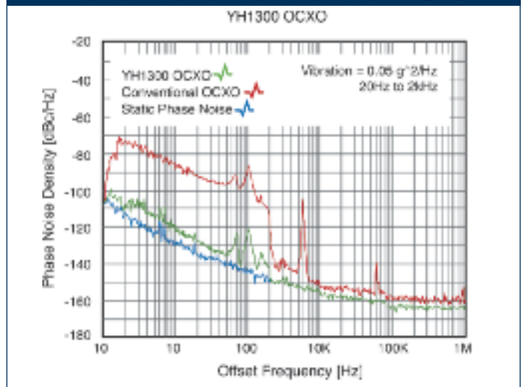
Greenray precision oscillators offer exceptional frequency stability, vibration, shock, and acceleration sensitivity performance.

Greenray OCXOs are optimized for low phase noise, tight stability over temperature, and long-term performance and reliability. Preferred by many for the most demanding communications, aerospace and defense applications, Greenray OCXOs deliver performance and reliability for wired and wireless communications, instrumentation and base station applications, and technologies like Stratum 3e.

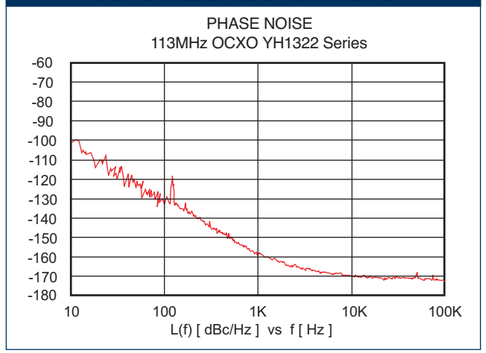
Model Number	Frequency Range (MHz)	Input Voltage (Vdc)	Best Stability (ppm)	Output Signal	Input Power (Turn On/Idle)	Package (mm), Type
YH1420	10 to 100	3.3 or 5	±0.1	CMOS/Sine	3W / 1W	12.7 x 20.32, DIP
YH1440	10 to 100	3.3 or 5	±0.1	CMOS/Sine	5W / 1.5W	22.1 x 25.4, SMD
YH1460	10 to 120	3.3 to 15	±0.01	CMOS/Sine	5W / 1.5W	25.4 x 25.4, Thru-Hole
YH1300*	10 to 50	3.3 or 5	±0.2	CMOS	3W / 1W	12.7 x 20.32, DIP
YH1310	10 to 30	5 to 15	±0.2	CMOS/Sine	5W / 2W	26.90 x 35.05, Thru-Hole
YH1320	10 to 120	5 to 15	±0.01	Sine	5W / 2W	50.8 x 50.8, Thru-Hole
YH1322	10 to 120	5 to 15	±0.01	Sine	5W / 2W	50.8 x 50.8, SMA Connector

*YH1300 offers g-Sensitivity to <7 x 10^{-11}/g

Vibration Induced Phase Noise Performance



OCXO Phase Noise Performance



SATCOM, Base Stations

Mobile Communications

YH**1420**

YH**1440**

YH**1460**

YH**1300**

YH**1310**

YH**1320**

YH**1322**

Specification Parameters

In order to help you get the best solution for your particular application, please refer to the following **Specifications Codes** when speaking with your sales representative. Options not shown here may be available. If you'd like additional information or need assistance specifying a device, please call the plant or send us an e-mail at: ***technical@greenrayindustries.com***.

Ordering Example

Model	Temp/Stability	Output	Vdc	g-Sens	Frequency
T52	N17	C	3.3	LG	10 MHz

Temperature Range °C	Temperature Code
0 to +50	B
-30 to +70	D
0 to +60	F
-10 to +60	G
-10 to +50	H
0 to +70	K
-10 to +70	L
-20 to +60	M
-20 to +70	N
-25 to +70	O
-30 to +80	P
-35 to +85	Q
-40 to +60	R
-40 to +70	S
-40 to +85	T
-55 to +85	U
-55 to +95	V
-55 to +105	W
-55 to +125	X
Frequency Stability v. Temp (ppm)	**Stability Code**
±0.001	19
±0.01	18
±0.1	17
±1.0	16
±1.5	156
±2.0	26
Output Signal	**Output Code**
CMOS	C
PECL	PE
LVDS	DS
Sine	S
g-Sensitivity	**g-Sens Code**
Standard	SD
Low g-Sensitivity Option	LG

Aerospace & Defense

Greenray Industries has supported the aerospace and defense markets with high performance, precision oscillators for over half a century. Our engineering experience and manufacturing expertise have helped to establish Greenray as a key component supplier for a variety of programs, providing cost-efficient, leading-edge solutions and a long-term service commitment.

Today, Greenray oscillators feature various combinations of rugged packaging, ultra-low g-sensitivity and enhanced phase noise performance; many have been engineered to perform accurately and reliably in adverse environments, including those of extreme shock, temperature and vibration.

For the defense market, Greenray oscillators support **smart munitions**, **missile guidance**, **airborne communications**, **airborne instrumentation**, **portable communications and equipment**, **radar**, **satellite communications**, **telemetry**, **GPS**, **jammers**, **detection** and **identification**. Our expertise includes the design and manufacture of oscillators that withstand the severe environmental requirements of defense applications including MIL-PRF-55310, MIL-STD-202, MIL-STD-883, MIL-E-5400, and MIL-M-38510.

Greenray Specialized MIL Capabilities

- ☐ Testing and processing to MIL-PRF-55310
- ☐ Established reliable construction
- ☐ IPC-A-610 & J-STD-001 trained operators
- ☐ In-house qualification testing
- ☐ Phase noise under vibration testing
- ☐ Shock testing to 50,000 g
- ☐ Vibration testing to >50 g RMS
- ☐ Tin whisker mitigation

Avionics

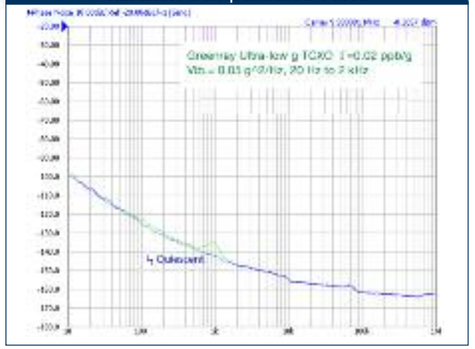
Communications & Instrumentation

Greenray Industries offers specialized products for commercial applications including Stratum 3 compliant TCXOs suitable for wired and wireless, small cell, Ethernet and 1588 synchronization requirements. Greenray TCXOs feature superior temperature and long-term stability in compact, RoHS compliant packages.

We offer ruggedized TCXOs for applications like GNSS/GPS that require tight stability, excellent low micro-jump performance and the best performance under shock available today.

Greenray VCXOs feature very low noise for PLL applications to support instrumentation and SATCOM market needs, with phase noise of -170 dBc/Hz and compact, cost-efficient SMD packages.

Vibration Compensated TCXO



Communications, SATCOM

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Quartz Precision
for Industry. And Defense.

Greenray Industries, Mechanicsburg, PA


Statek Corporation, Orange, CA


AdTech Ceramics, Chattanooga, TN

Solutions[3]

Greenray is unique in its ability to draw on the specialized resources of our sister companies Statek Corporation (*www.statek.com*) and Advanced Technical Ceramics Company (*www.adtechceramics.com*). They provide high performance, miniature crystals and innovative, hermetic packaging for products like our T70 Series TCXOs. Working together for customers, we are able to offer state-of-the-art design, engineering and manufacturing solutions – that's ***SOLUTIONS[3]***.

To learn more about how you can benefit from this unique set of resources, call your Greenray technical representative or visit ***www.greenrayindustries.com***.

Certified System
SAI GLOBAL
AS9100
Aerospace

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frequency control solutions

Certified System
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ISO 9001
Quality

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