

LOW NOISE CRYSTAL OSCILLATORS > HF BOOTSTRAP

FEATURES:

- Frequencies from 10 MHz to 25 MHz, fixed
- Ruggedized for Dynamic Environments
- Standard or Premium Phase Noise Options
- Effective G-Sensitivity to $\leq 2E-11/g$ per axis
- Internally Vibration Isolated Version Available with Effective G-Sensitivity to $5E-12/g(2\text{ kHz})$

APPLICATIONS:

- PN Measurement Reference
- Synthesizers
- High Energy Physics
- Stable Reference Oscillator



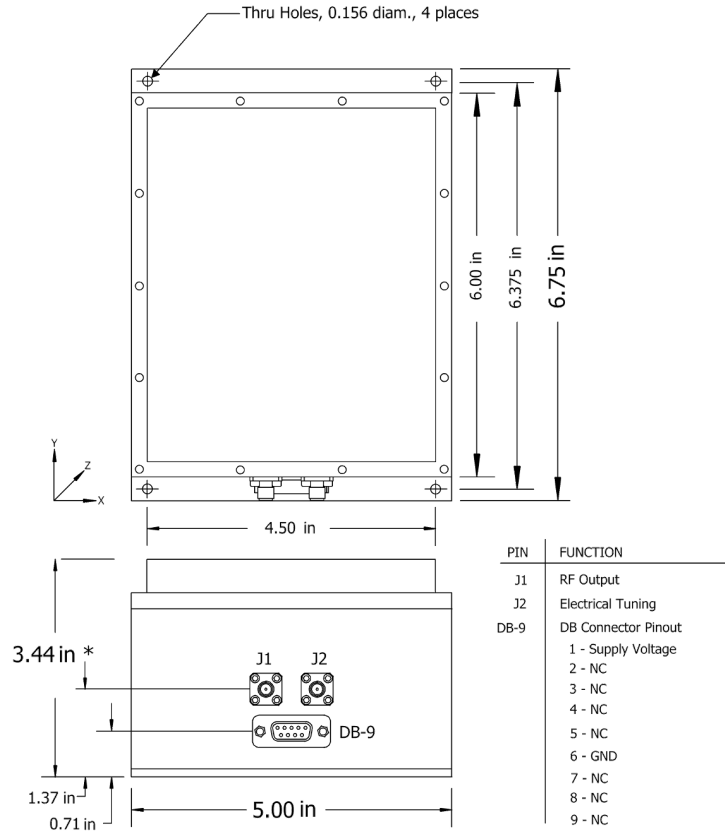
DESCRIPTION:

At HF frequencies, the Bootstrap oscillator provides unprecedented low-g sensitivity to $2E-11/g$. The Bootstrapping technique uses two rugged phase-locked crystal oscillators to compensate for the effects of vibration. The difference-voltage generated by changes in the phase locking voltage of the phase lock loop due to vibration, is applied to both oscillators to minimize the vibration effects. The HF oscillators are available at fixed frequencies from 10 MHz to 25 MHz with noise floors to -165 dBc/Hz . No additional phase noise degradation is observed from 5 Hz to 100 Hz, where normal vibration isolation systems will create a noise peak. An internal vibration isolation system may be added internally, which increases the phase noise below 50 Hz, but improves the noise to better than $2E-12$ at 200 Hz and beyond. This approach has been used in demanding rotary wing applications. The Bootstrap oscillator assembly is an ideal solution for the airborne and mobile applications where the noise excitation levels are very low frequency. An Ultra-Low Noise oscillator may be locked to the HF Bootstrap output to improve the phase noise under vibration and still provide -175 dBc/Hz noise floors. The Bootstrap assembly is housed in a $6.75" \times 5.0" \times 3.44"$ machined aluminum housing. An internal voltage regulator provides excellent power supply line rejection.

Electrical Specifications	
Output Frequency (fixed; specify within range)	10 MHz to 25 MHz
Output Level	+13 dBm ± 2 dB into 50 ohms
Aging	(10 MHz model, typical)
Per day after 30 days operating, typical	5×10^{-10}
Second year, typical	5×10^{-8}
Per year thereafter, typical	3×10^{-8}
Temperature Stability (consult factory for other ranges)	(10 MHz model, typical)
Range E: 0 to +50°C (Ref: +25°C)	$\leq \pm 5 \times 10^{-8}$
Range F: -20 to +70°C (Ref: +25°C)	$\leq \pm 1 \times 10^{-7}$
Range G: -55 to +85°C (Ref: +25°C)	$\leq \pm 5 \times 10^{-7}$
Phase Noise	(Frequency Dependent: See Std. Specifications and Part Numbers table below for details)
Harmonics	$\leq -30\text{ dBc}$
Sub-Harmonics	N/A
PLL Products (Phase Lock models only)	$\leq -60\text{ dBc}$
Spurious	$\leq -80\text{ dBc}$
Natural Mount Resonant Frequency	$\sim 20\text{ Hz}$ (Vibe Iso Model Only)
Tuning	
- Mechanical Tuning	N/A
- Electrical Tuning	
Tuning A: 0 to +10 VDC	$\geq \pm 1 \times 10^{-6}$, typical
Tuning B: ± 5 VDC	$\geq \pm 1 \times 10^{-6}$, typical
Slope: Negative	(Positive Slope available on some ET only models)
Supply Voltage	+15 VDC $\pm 5\%$
Warm-up	$\leq 18\text{ Watts}$ for 5 minutes at +25°C
Total	$\leq 10\text{ Watts}$ at +25°C
Crystal Type	SC-cut
Acceleration Sensitivity	Effective G-Sensitivity to $2 \times 10^{-11}/g$ Effective G-Sensitivity to $5 \times 10^{-12}/g$, isolated
Mechanical	
Packaging	Aluminum Compact Case Assembly
Dimensions	6.75 x 5 x 3.44"
Connectors / Mounting	SMA(f) x2 and solder pins on side - Package A Thru Hole Mounting, 0.156" diam., 4 places



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* Internally vibration isolated version shown.
Case height will be 2.5" on non-isolated models.

Standard Specifications and Part Numbers * *

Part Number	Output Frequency * (MHz)	Typical Phase Noise (dBc/Hz), Static *					Output Level * (dBm) into 50 ohms	Temperature Stability * (Ref: +25°C)	Supply Voltage (VDC)	Package / Connectors	Package Size (inches)
		10 Hz	100 Hz	1 kHz	10 kHz	100 kHz					
501-27502-11	5	-150	-170	-176	-176	-176	+13 ±2	± 5 x 10 ⁻¹⁰ , 0° to +50°C	+15	A: SMA(f) & Pins on Side	4 x 3 x 2
501-27502-15	5, dual	-150	-170	-176	-176	-176	+13 ±2	± 5 x 10 ⁻¹⁰ , 0° to +50°C	+15	B: SMA(f) x 2 & Pins on Side	4 x 3 x 2
501-27502-31	5	-150	-170	-176	-176	-176	+13 ±2	± 5 x 10 ⁻¹⁰ , 0° to +50°C	+12	A: SMA(f) & Pins on Side	4 x 3 x 2
501-27502-35	5, dual	-150	-170	-176	-176	-176	+13 ±2	± 5 x 10 ⁻¹⁰ , 0° to +50°C	+12	B: SMA(f) x 2 & Pins on Side	4 x 3 x 2
501-27503-11	10	-135	-160	-173	-174	-174	+13 ±2	± 5 x 10 ⁻¹⁰ , 0° to +50°C	+15	A: SMA(f) & Pins on Side	4 x 3 x 2
501-27503-15	10, dual	-135	-160	-173	-174	-174	+13 ±2	± 5 x 10 ⁻¹⁰ , 0° to +50°C	+15	B: SMA(f) x 2 & Pins on Side	4 x 3 x 2
501-27503-31	10	-135	-160	-173	-174	-174	+13 ±2	± 5 x 10 ⁻¹⁰ , 0° to +50°C	+12	A: SMA(f) & Pins on Side	4 x 3 x 2
501-27503-35	10, dual	-135	-160	-173	-174	-174	+13 ±2	± 5 x 10 ⁻¹⁰ , 0° to +50°C	+12	B: SMA(f) x 2 & Pins on Side	4 x 3 x 2
501-27504-15	5 and 10	-150	-170	-176	-176	-176	+13 ±2	± 5 x 10 ⁻¹⁰ , 0° to +50°C	+15	B: SMA(f) x 2 & Pins on Side	4 x 3 x 2
501-27504-35	5 and 10	-150	-170	-176	-176	-176	+13 ±2	± 5 x 10 ⁻¹⁰ , 0° to +50°C	+12	B: SMA(f) x 2 & Pins on Side	4 x 3 x 2

* Consult factory for custom frequency, phase noise performance, output level and temperature stability options.

** See website for additional Standard Part Numbers and Specifications.