

FTS 1000B ULTRA-STABLE CRYSTAL OSCILLATORS

KEY FEATURES

- Low aging, 5E-11 per day
- Low phase noise, -160 dBc at 10 kHz
- Independently buffered outputs
- Linearized electronic frequency control
- Fast warm-up, 15 minutes to 2E-8
- High reliability available

DESCRIPTION

The FTS 1000B crystal oscillator is designed for a wide range of applications, including military and industrial environments. Aging rates of $<1E-10$ per day, linear voltage tuning, and multiple, independently buffered outputs are featured.

State-of-the-art design techniques result in very low values of single-sideband phase noise, fast warm-up, and excellent temperature stability. The FTS 1000B is ideally suited for use in microwave multiplier chains, phase noise calibration equipment, test equipment, and as a frequency standard.

APPLICATIONS

- Precision frequency counters and synthesizers
- GPS receivers
- Microwave multiplier chains
- Phase noise calibration test equipment
- Stratum 2 oscillators for telecommunications
- Radar and tactical communications
- Secure communications
- Satellite ground terminals
- High reliability versions for spaceflight applications



FEATURES

The FTS 1000B achieves low aging rates by utilizing high performance SC-cut quartz crystal resonators. The specified aging is reached within 30 days of continuous operation, and typically continues to improve. Following years of continuous operation, aging rates as low as $1E-12$ per day have been observed. A dewar-insulated oven provides superior temperature stability over the full temperature range. The maximum frequency change over the operating temperature range 0 to 55 C is $<5E-9$. An oven temperature indicator (10mV per degree K) is provided at the power connector.

The oscillator circuit design produces state-of-the-art phase noise of -116 dBc at 1 Hz and -160 dBc at 10 kHz.

Low noise, high isolation buffer amplifiers provide two or four independent outputs. The buffer amplifiers isolate outputs from load variations. An internal voltage regulator minimizes fluctuations due to power supply ripple.

Linearized electronic frequency control allows the use of servo loop techniques for fine frequency tuning. Linearity is better than 5% over the specified tuning range.

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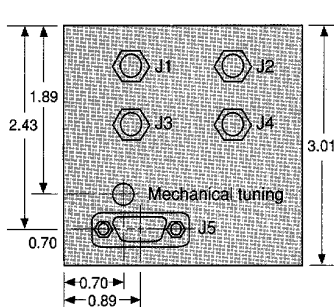
SPECIFICATIONS

Output Frequency Option 1 (-503) Option 2 (-507)	5 MHz 10 MHz & 5 MHz	
Aging Per Day (See Note 1)	<1E-10	
Short Term Stability y (T) for averaging time T of:		
1s	1E-12	
10s	1E-12	
100s	1E-12	
Phase Noise (-dBc/ Hz)	@5 MHz	@10MHz
10 ⁰	-116 dB	--
10 ¹	-140 dB	-134dB
10 ²	-150 dB	-144 dB
10 ³	-157 dB	-150 dB
10 ⁴	-160 dB	-153 dB
10 ⁵	-160 dB	--
Outputs (Independently buffered)		
Frequency	@5MHz	@10MHz
Option 1 (-503) 4 outputs	Four	One
Option 2 (-507) 2 outputs	One	One
Output Amplitude		
Option 1 (-503): Two @	1.0 V rms	
Two @	0.5 V rms	
Option 2 (-507): 1 each @	1.0 V rms	1.0 V rms
Harmonic distortion	-40 dBc	-40 dBc
Spurious signals	-100 dBc	-100 dBc
Frequency Adjustment Range	Option 1	Option 2
Mechanical	None	4E-7
Electrical		
Tuning slope	Positive	Negative
Control Range	0 to 10 V	-10 to 10 V
Maximum Frequency Change (peak-to-peak) as a Function of Operating Temperature: 0 to 55 °C	Option 1	Option 2
	1E-9	5 E-9

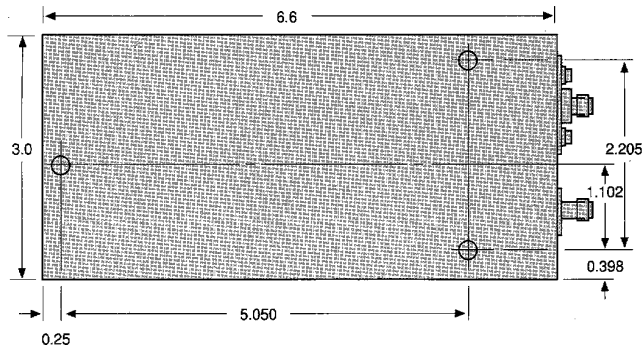
Load Change (50 ± 10%)	5 E-11
Input Voltage Oven Supply Electronics Supply	18 to 30 Vdc 18 to 30 Vdc
Supply Sensitivity 1% V _{in} 18 to 30V	< 1E-11
EMI Susceptibility (side bands) 0.1 Vrms on power supply inputs 10 Hz to 10 ⁴ Hz	< - 100 dBc
Operating Temperature Range	0 C to 55 C
Non-Operating Temperature Range	-28 C to 90 C
Power Requirement (typical 10%) Warm Up Operating @ 25 C	13W 3.2W
Warm-Up to 2x10⁻⁸ of final f	15 minutes
Oven Monitors Temperature	10 mV/ K
Weight	1.5lb (0.78 kg)
Dimensions	3"x3"x6.6"
Connectors Rf (J1-J4) Power (J5)	SMA 9 pin D Subminiature

NOTE 1: Aging typically improves to a level of parts in 1E-11 per day (1E-8/year.) After years of unperturbed operation some users observed aging rates as low as 1E-12.

METAL CASE OUTLINE



Front View



Bottom View