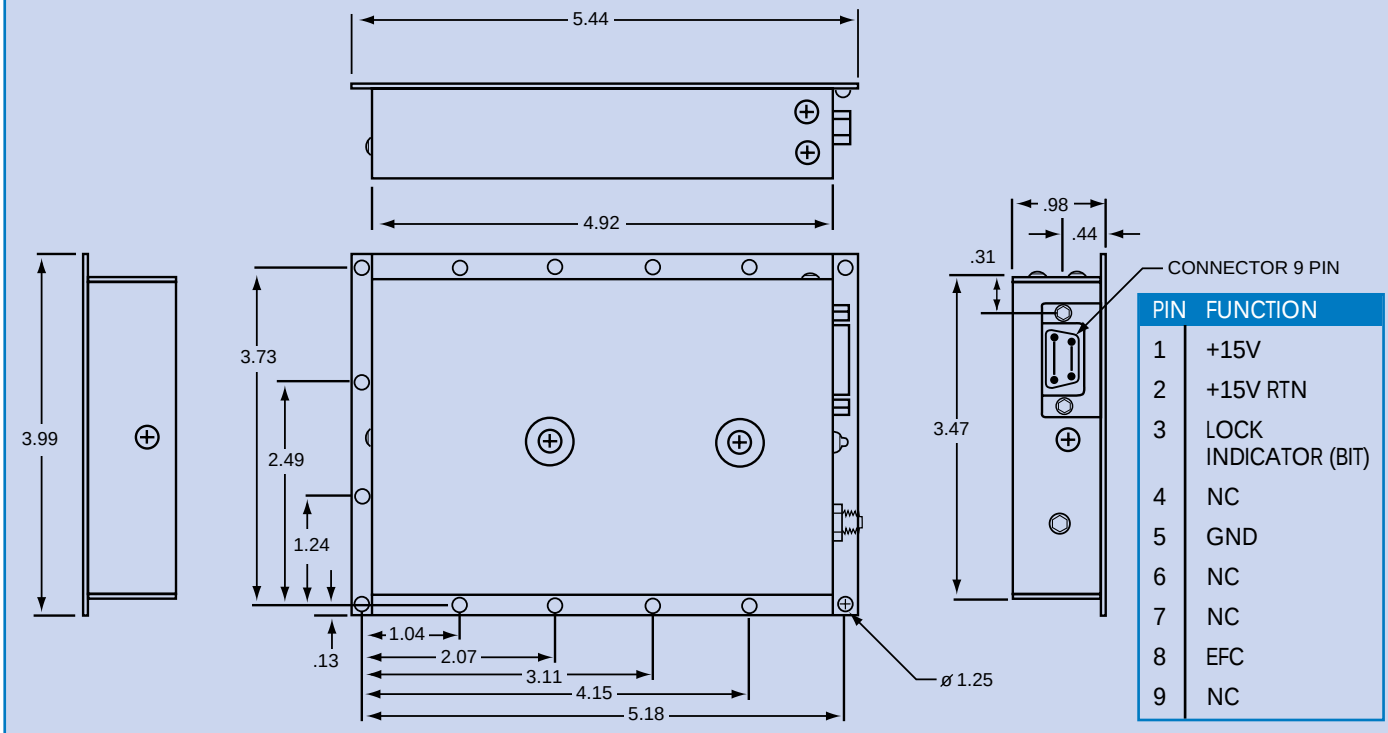
OPTIONS BY TYPE

OPTION NO.	OUTPUT FREQUENCY
01	50.255055 MHz Sine Wave
03	5 MHz
04	15 MHz
05	13 MHz
06	2.048 MHz
07	10.23 MHz
08	Customer Frequency
	TEMPERATURE RANGE
36-44	Consult Factory
OPTION NO.	**FREQUENCY STABILITY**
28	4×10^{-12}/day, 5×10^{-10}/year
29	2×10^{-10}/year after 1 year (4×10^{-11}/month)
31	Allan Dev = $5 \times 10^{-12}\sqrt{\tau}$
32	f vs. T = $\pm 1 \times 10^{-10}$
45	1×10^{-11}/month
48	f vs. T = $\pm 5 \times 10^{-11}$

*Consult factory

	OUTPUT
02	RS232 control*
09	Square Wave
16	-80 dBc Spurious for ± 5 MHz
21	1.0 Vrms Output
26	LOCK=TTL High
30	Analog Tuning: 0 to 10v
35	7×10^{-9} C-Field Adjust
	INPUT VOLTAGE OPTIONS
25	22 VDC to 32 VDC
	OTHER
18	Conformally Coated
22	MIL environment (foamed)
46	Reverse Voltage Protection

OUTLINE DRAWING



PIN	FUNCTION
1	+15V
2	+15V RTN
3	LOCK INDICATOR (BIT)
4	NC
5	GND
6	NC
7	NC
8	EFC
9	NC

DIMENSIONS IN INCHES

FEI Communications, Inc.
A Subsidiary of Frequency Electronics, Inc.
55 Charles Lindbergh Blvd., Mitchel Field, NY 11553
TEL: 516-794-4500 • FAX: 516-794-4340
Visit us at: www.freqelec.com

RUBIDIUM ATOMIC FREQUENCY STANDARD
FE-5680A SERIES

Low Cost Atomic Standard... the Perfect Replacement for Precision Quartz.

Low Phase Noise for Communications and Timing Systems

- Less than 1" high

ACTUAL SIZE

FEATURES

- Extremely low silhouette: less than 1"
- Stability over temperature: to 5×10^{-11}
- Digitally Programmable to 1×10^{-13}
- Frequency: 1 Hz to 20 MHz
- Fast warm up: < 5 min
- Stability: to $5 \times 10^{-12}/\sqrt{t}$
  to 2×10^{-10}/year

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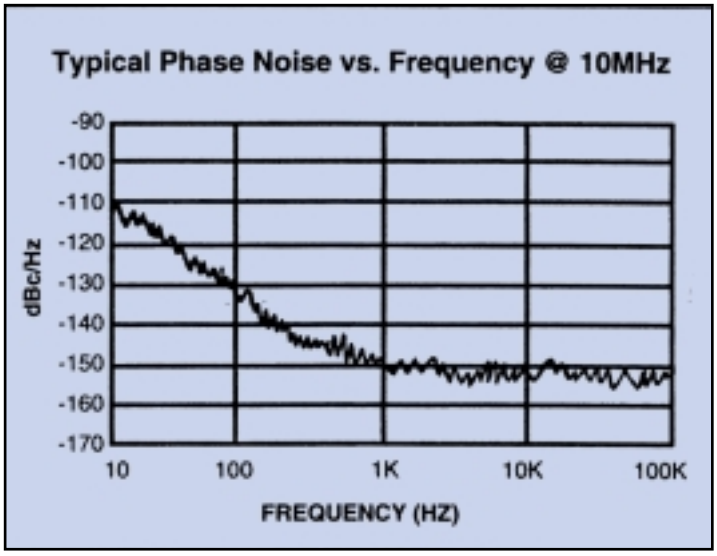
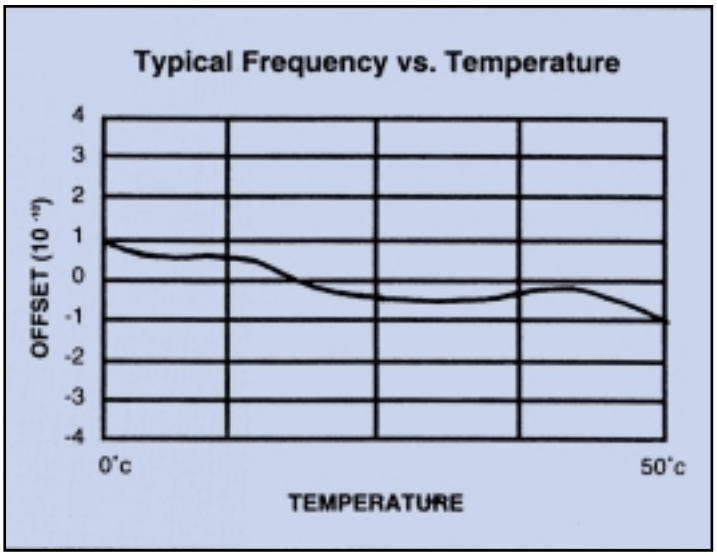
TECHNICAL CHARACTERISTICS

MODEL	FE-5680A
FREQUENCY	10 MHz*
OUTPUT	0.5 V rms into 50 Ω**
SETTABILITY	1 x 10^{-11} (range 2 x 10^{-7}) "C " field potentiometer and 0 to 5V fine tune voltage: (Range: 2 x 10^{-9}) Internal DDS switches Steps: 1.2 x 10^{-9} Range: 2 x 10^{-7}
POWER	11 Watts (steady state) @ 25˚C 32 Watts peak
WARM UP TIME	<5 min. to lock @ 25˚C
STABILITY	
ALLAN VARIANCE	1.4 x $10^{-11}/\sqrt{t}$
DRIFT	2 x 10^{-9}/year 2 x 10^{-11}/day
RETRACE	5 x 10^{-11}
INPUT VOLTAGE SENSITIVITY	2 x 10^{-11}/15 to 16V
FREQUENCY VS. TEMPERATURE	± 3 x 10^{-10} (-5 to + 50˚C)
PHASE NOISE (@10 MHz)	@ 10 Hz: -100 dBc @ 100 Hz: -125 dBc @ 1000 Hz: -145 dBc
SPURS	-60 dBc
HARMONICS	-30 dBc
WEIGHT	15.3 oz 434 grams
POWER SUPPLY	
INPUT VOLTAGE	15 to 18V @ 700 mA
RIPPLE INPUT	15V: < 0.1 Vrms
SIZE	0.98 x 3.47 x 4.92 in. 25 x 88 x 125mm



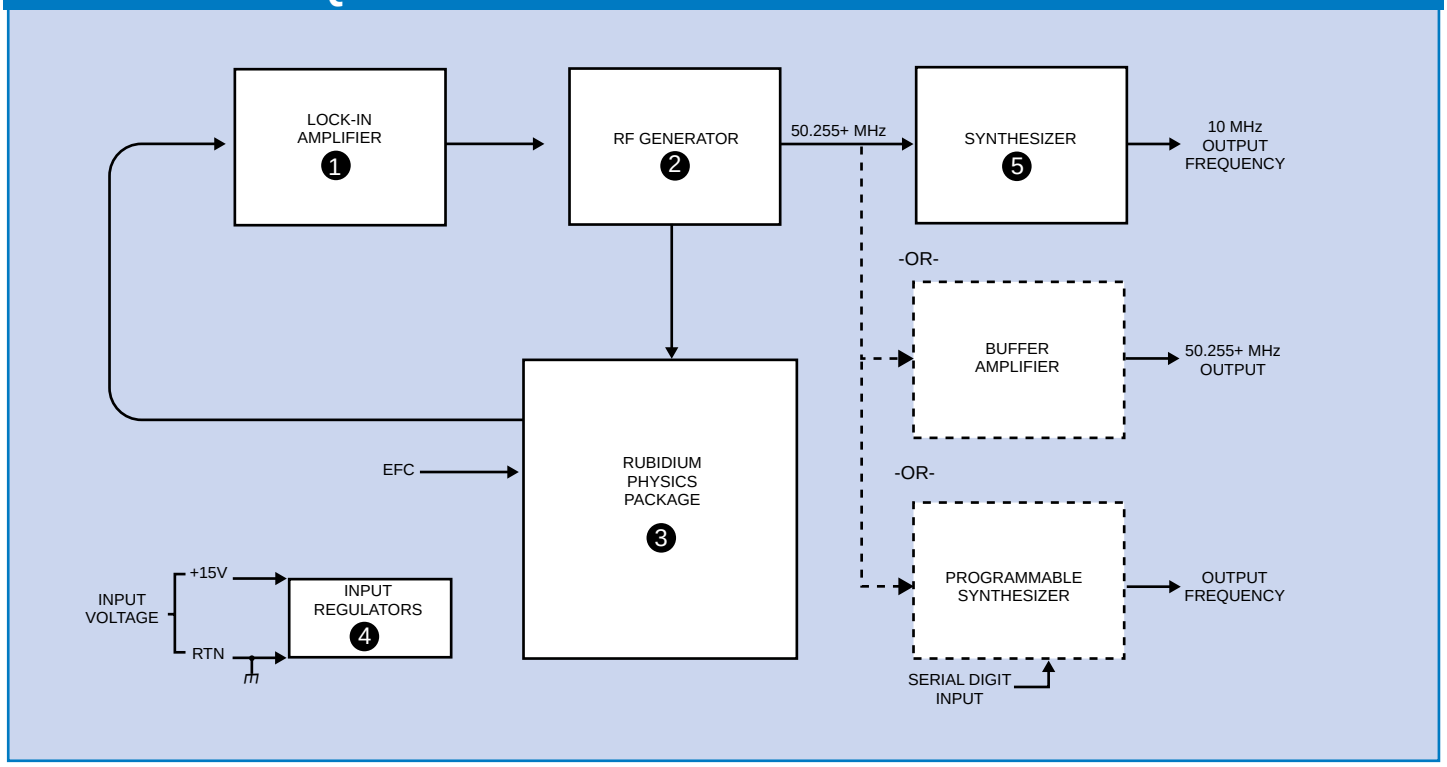


* Frequency Electronics Model FE-5680A Commercial Rb Standard can be factory set at any frequency from 1 Hz to 20 MHz.

** 1 Hz to 10 MHz sq. wave, TTL Comp., 5 MHz to 20 MHz sine wave.

The FE-5680A features an extremely low silhouette unit for usage in a multitude of equipments. Additional features include low power consumption, fast warm up time, outstanding accuracy, low phase noise and low spurious. The FE-5680A is a reliable and versatile atomic standard which provides consistent, high quality performance over a wide range of applications and environmental conditions.

RUBIDIUM FREQUENCY STANDARD MODEL FE-5680A SERIES



FUNCTIONAL DESCRIPTION

The RFS uses the property of atomic resonance in a Rubidium Physics Package to control the output frequency of a 50.255+ MHz Voltage Controlled Crystal Oscillator (VCXO) via a Frequency Lock Loop (FLL). The FLL functional blocks consists of an RF Generator, Lock-in Amplifier, and the Rubidium Physics Package. Frequency locking of the VCXO is accomplished by operating the Rubidium Physics Package as a frequency discriminator, i.e., departures of a frequency derived from an input signal (50.255+ MHz from the VCXO) from a defined center frequency (Rubidium atomic resonance) produce a dc output signal (control voltage). Once the FLL has been established, the system generates a loop-locked indication which can be monitored on pin 3. Depending on the option selected, the 50.255+MHz VCXO output is used as the clock input for the DDS within the Synthesizer or the Digital Programmable Synthesizer or Buffer Amplifier.

The Rubidium Physics Package utilizes the ground-state hyperfine transition of the Rubidium atom, at approximately 6.8+GHz. In order to use this atomic transition, the Rubidium Physics Package incorporates a Rubidium cell, Rubidium lamp, and servo electronics. The VCXO is locked to the Rubidium atomic resonance at 6.8+GHz. The VCXO frequency of 50.255+MHz is an exact sub-multiple (x136) of the atomic resonance at 6.8+GHz.

The error signal is generated in the physics package. Light from the Rubidium lamp, produced by an excited plasma discharge is filtered and passed through the Rubidium resonance cell where it interacts with Rubidium atoms in the vapor. After passing through the resonance cell, this light is incident upon a photocell. When the applied microwave frequency is equal to 6.8+GHz, the rubidium atoms are resonated by the microwave field in the cavity; this causes the light reaching the photocell to decrease. The decrease in light, when the microwave frequency is equals to the sharply defined Rubidium frequency, is then converted electronically to an error signal with phase and amplitude information that is used to steer the VCXO via its control voltage and keep it on frequency at 50.255+MHz.