

FTS 5045 CESIUM FREQUENCY STANDARD MODULE

ADVANTAGES AND SPECIAL FEATURES

- Cesium **Accuracy** to 3×10^{-12}
- Cesium **Stability** to Parts In 10^{-14}
- Up To **8-Year Warranty** - Tube & Electronics
- **Automatic** Microprocessor Control
- **RS232** Control & Monitor Interface
- **Automated Control** of Phase/Time or Frequency
- Major And Minor **Alarm Relay** Outputs
- External Dc Input ± 18 To 64 V

APPLICATIONS

The FTS 5045 is designed for a wide variety of applications with stringent requirements for precision time and frequency control:

- Laboratory Primary Reference for Metrology, Research, and Calibration
- Telecom Applications such as Stratum 1 Primary Reference Source for Digital Communications Systems, in both Public and Private Telephone Networks
- Synchronization of Satellite Ground Terminals and Remote Stations
- Shipboard, Aircraft, and Land-Mobile Systems for Navigation, Timing, and Communications
- Positioning for Oil Exploration and Mapping

GENERAL DESCRIPTION

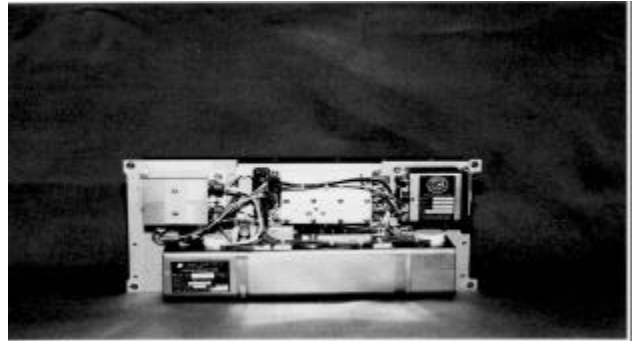
The state-of-the-art FTS 5045 Cesium Frequency Standard is a primary frequency reference. The major function of the FTS 5045 is to produce accurate, stable, and spectrally pure sinusoidal signals. To accomplish this, a cesium beam tube resonator is used to stabilize the output of an ovenized quartz crystal oscillator. The oscillator drives an output signal at 10 MHz

DESIGN FEATURES

A microprocessor is used to perform the following tasks:

- Digital demodulation and integration of the servo loop signals
 - Monitoring of 24 system parameters
- Control of adaptive servos provides dependable precision performance
- OCXO frequency locked to cesium resonance pedestal (search phase) and peak (normal operation)
 - C-Field locked to Zeeman resonance peak
 - Microwave power level continuously optimized
 - Automatic compensation for cesium tube signal level changes

When turned on, the system checks 24 key parameters and then an automatic lock routine ensure lock to the correct cesium resonance. Following turn-on, the system continues to monitor and control system parameters to insure optimum performance.



OTHER FEATURES

- Improved performance, especially accuracy over environment and long-term stability
- Remote control and monitoring via an RS232 interface
- Frequency settability to a resolution of 1×10^{-13}
- Phase/time control to 1 nanoseconds resolution
- An additional programmable TTL output at 0.1, 1, 5, or 10 MHz
- Storage mode, allowing occasional or continuous operation of the cesium beam tube ion pump while the unit is not being used
- Adjustment of the cesium control loop time constant to optimize performance

Control, monitor and status data are available via the RS232 bus and a PC-MSDOS-based program provided with the instrument.

OPTIONS

Option **075** 8-year Warranty - tube & electronics
 Option **076** High Performance - cesium beam tube, for applications requiring the best short-term frequency stability and accuracy. Warranty is three years.

FTS 5045A CESIUM FREQUENCY STANDARD

PERFORMANCE PARAMETER	STANDARD PERFORMANCE	HIGH PERFORMANCE
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Frequency vs. Environment Temperature 0 to 50 C Magnetic field per Gauss Humidity 0 to 95% Pressure/Altitude 0.47 P, equiv.to 20,000 ft (6 km)	$\pm 3.5 \times 10^{-12}$ $\pm 1.0 \times 10^{-12}$ $\pm 2 \times 10^{-13}$ $\pm 2 \times 10^{-13}$	$\pm 1 \times 10^{-12}$ $\pm 0.5 \times 10^{-13}$ $\pm 2 \times 10^{-13}$ $\pm 2 \times 10^{-13}$
Warm-up Time (typical)	30 min	30 min
Reproducibility	$\pm 2 \times 10^{-12}$	$\pm 1 \times 10^{-12}$
Stability Averaging Time (s) 10^0 10^1 Note 3 10^2 $*10^3$ $*10^4$ $*10^5$ *floor * excluding environmental effects	Allan Deviation 2.0×10^{-11} 2.1×10^{-11} 5.0×10^{-12} 1.6×10^{-12} 5.0×10^{-13} 2.0×10^{-13} 8.0×10^{-14}	Allan Deviation 8.5×10^{-12} 3.5×10^{-12} 8.5×10^{-13} 2.7×10^{-13} 8.5×10^{-14} 3.0×10^{-14} 2.0×10^{-14}
SSB Phase Noise Offset (Hz) 10^0 10^1 Note 3 10^2 10^3 10^4 10^5	10 MHz (dBc) -90 -120 -140 -145 -145 -150	10 MHz (dBc) -90 -120 -140 -145 -145 -150
SETTABILITY Range Resolution Control	$\pm 1 \times 10^{-9}$ 1×10^{-15} remote control program	

Note 1: lab environment of 22±2 C

Note 2: full environment: temperature 0 to 50 C; R.H. 0 to 95%;
magnetic field to 2 Gauss dc, 50, 60, 400 Hz; pressure to
0.47 P (20,000 ft)

Note 3: 5 s loop time constant

(11/98 - Specifications subject to change without notice)

RF OUTPUTS

Frequency	1 at 10 MHz
Amplitude	1 ±0.1 V rms
Harmonic signals	< -30 dBc
Non-harmonic distortion	< -80 dBc
Connector type	SMA
Load Impedance	50 ohms
Programmable Output	0.1, 1, 5, 10 MHz
Amplitude/waveshape	>2 V pk into 50 ohms, square
Connector type	SMB
RF Phase Control	
Range	±10,000 ns
Resolution	1 ns
Rate	0.1 ns/s
Location	remote control program

GENERAL

Power Requirements	
Operating Voltage	18 to 64 V dc
Power (operating) (warm-up)	30 W 55 W
Dimensions (without cover)	
Height	7.8" (198 mm)
Width	4.9" (124 mm)
Depth	16.6" (422 mm)
Weight	
Standard performance	23 lbs (10.4 kg)
High performance	26 lbs (11.8 kg)
Additional shipping weight for re-usable HAZMAT container	TBD