

FTS 5030 MODULAR CESIUM TIME AND FREQUENCY STANDARD

ADVANTAGES

- ◆ Cesium accuracy
- ◆ Fast warm-up
- ◆ Low power
- ◆ Small size/weight
- ◆ Microprocessor control
- ◆ Unattended turn-on
- ◆ Remote monitoring
- ◆ Excellent maintainability

APPLICATIONS

The **FTS 5030** is designed for a wide variety of custom system applications with stringent requirements for precision time and frequency:

- shipboard, aircraft, fixed and land-mobile
- navigation, timing and communications
- satellite ground terminals and remote stations
- systems needing redundant cesium

GENERAL DESCRIPTION

The **FTS 5030 Modular Cesium Time and Frequency Standard** is a compact, lightweight, self-contained module. The major function of the FTS 5030 is to produce accurate, stable and spectrally pure sinusoidal signals. To accomplish this, a cesium beam tube resonator is used to stabilize the output frequency of a quartz crystal oscillator. The oscillator drives output signals at both 10 and 5 MHz. The FTS 5030 features both 5 MHz and 10 MHz outputs with the option of obtaining a 1 pulse-per-second signal.

DESIGN FEATURES

A **microprocessor** is used to perform the following tasks:

- Digital demodulation and integration of the servo loop Signals
- Monitoring of system parameters
- Control of adaptive servos including control of the loop time constant during instrument warm-up
- Diagnostic functions to aid in troubleshooting

The FTS 5030 is designed for **hands-off operation**. When turned on, a monitor routine examines internal status signals to assure proper operation. Subsequently, an automatic lock routine assures lock to the correct cesium resonance by checking and correcting:

- Oscillator control voltage
- Oscillator drift rate
- Operation of modulation circuits
- Cesium beam current level



The 37-pin **Control and Monitor Connector** permits the user to access important functions of the cesium standard. Controls include:

- Manual adjustment of the cesium control loop (modulation and feed-back loop); useful for troubleshooting.
- Automatic alignment; assures lock to the correct cesium resonance and calibrates beam current level if necessary.
- Scanning of either the frequency control voltage or the loop gain; useful for troubleshooting.
- Fine frequency C-field adjustment; useful for aligning the frequency of the FTS 5030 with another frequency standard; degaussing terminals also available.

Driver circuits for LED indicators are provided for frequency lock/alarm and monitor alarm. **Remote Monitor** analog functions available at Control and Monitor connector are:

- Oscillator oven power
- Cesium oven temperature
- Cesium beam current
- Oscillator control voltage
- Ion pump current

Recognizing that module maintainability is crucial to the success of primary reference operations, the FTS 5030 has designed-in serviceability:

- Software monitoring and diagnostics as well as automatic or manual adjustments described above
- Functional isolation for board level exchange or repair
- Slide out assemblies and quick connect cables
- Complete maintenance documentation available
- Full or partial spares kits available
- FTS 6006 Control and Monitor Module is recommended for module operation, repair and troubleshooting (refer to separate data sheet).

11/98 - Specifications subject to change without notice

STANDARD OPTIONS

Option 003 - 1 PPS Output with synchronization to 150 ns.
 Option 075 - Cesium Beam Tube - 8 year warranty
 Special features and options can be designed into the standard 5030 module to fit unique program requirements. Contact your sales representative for assistance.

5030 SPECIFICATIONS (at 25° unless otherwise specified)

PERFORMANCE SPECIFICATION

Accuracy	7 x 10 ⁻¹²	
Retrace (Reproducibility)	3 x 10 ⁻¹²	
Settability (Frequency)	2 x 10 ⁻¹³	
Frequency Change		
Over operating temperature	< 5 x 10 ⁻¹²	
Under dc magnetic field (2 guass)	< 2 x 10 ⁻¹²	
Over input voltage	< 1 x 10 ⁻¹²	
Operating Temperature Range	0 to 50C	
Stability		
<u>Averaging Time</u>		
1s	7 x 10 ⁻¹²	
10s	7 x 10 ⁻¹²	
100s	5 x 10 ⁻¹²	
1000s	2 x 10 ⁻¹²	
10,000s	5 x 10 ⁻¹³	
long term (days)	stabilities in the 10 ⁻¹⁴ range may be expected in a quiet environment	
Over the life of the beam tube (excluding environmental effects)	3 x 10 ⁻¹²	
SSB Phase Noise (1 Hz Bandwidth) <u>Offset from Carrier (f)</u>	@10 MHz	@5 MHz
1 Hz	-99 dBc	-108 dBc
10 Hz	-130 dBc	-140 dBc
100 Hz	-140 dBc	-150 dBc
1000 Hz	-150 dBc	-157 dBc
Spectral Purity		
Harmonics	-40 dBc	-40 dBc
Spurious Signals	-80 dBc	-80 dBc
Signal-to-phase noise ratio in 30 kHz noise BW	> 81 dB	> 87 dB
Warm-up Time	30 min	
Sinusoidal RF-Outputs Amplitude	10 MHz, 5 MHz (1 ea) 1 V rms into 50 ohm load	
1 Pulse-Per-Second (option 003)		
<u>Pulse Output</u> Amplitude	10 1V pk into 50 ohms	
Width	20 μs ± 10%	
Rise Time	< 50 ns	
Fall Time	< 2 μs	
<u>Synchronization Input</u> Amplitude	4 to 10 V pk into 50 ohms	
Width	> 500 ns	
Rise Time	< 50 ns	
Synchronization Accuracy	< = 150 ns	

GENERAL SPECIFICATION

Power Requirements	
Input Voltage Range	22 to 30 V dc
Warm-up Power	60 W
Operating Power	20 W
Mating Connectors	
RF and 1 PPS Signals, SYNC Input Control & Monitor Connector Power Connector	SMA coaxial, (OSM#215) 37 contact, male (Cannon#DC-37P) 9 contact, female (Cannon#DE-9S)
Dimensions	
Height	7.8" (198 mm)
Width	5.2" (132 mm)
Depth	15.8" (401 mm)
Weight	20 lb. (9.1 kg)

ENVIRONMENT

Temperature, Operating	0 to 50 C
Temperature, Non-operating	
Storage	-40 to + 50C
Short-term	-40 to + 75C
Humidity, Operating	95% up to 50C
Magnetic Field	0 to 2 gauss

FTS 5030 EXTERNAL DIMENSIONS

