

# NOVATECH INSTRUMENTS, INC.

## Multi-Channel Disciplined Frequency Standard Model 1450B



The Model 1450B Rubidium Frequency Standard provides sinewave outputs of 10MHz, 5MHz, 1MHz, or 100kHz, along with up to four internal synthesizers. Containing an Atomic Resonance Rubidium Oscillator, the 1450B has stability of better than  $\pm 5 \times 10^{-11}$  per month. The 1450B can be synchronized to a 1pps input to allow tracking of GPS or other primary standards. When tracking, the 1450B maintains better than  $\pm 2 \times 10^{-12}$ /day with a holdover of less than  $\pm 1 \times 10^{-11}$ /day. During 1pps tracking, the 1450B can be auto-calibrated. The synthesized outputs, which are locked to the Rubidium Oscillator, can be used to generate any frequency up to 50MHz with a resolution of 1 $\mu$ Hz.

### Specifications:

#### FREQUENCY STABILITY (typ)

Short Term .....  $t=1s: \pm 3 \times 10^{-11}$   
 $t=10s: \pm 1 \times 10^{-11}$   
 $t=100s: \pm 3 \times 10^{-12}$   
Aging ..... Monthly:  $\pm 5 \times 10^{-11}$  after 3 months  
Yearly:  $\pm 5 \times 10^{-10}$  after 3 months  
Temperature ..... +5 to +40°C;  $\pm 1 \times 10^{-10}$   
Line Voltage ( $\pm 10\%$ ) .....  $\pm 2 \times 10^{-12}$   
Holdover (24 Hours,  $\pm 2^\circ\text{C}$ ) .....  $< \pm 1 \times 10^{-11}$   
( $< \pm 1 \mu\text{s}$  after learning phase  $> 10\tau$ )

#### FREQUENCY ACCURACY (typ)

At shipment:  $\pm 5 \times 10^{-11}$  at 23°C ambient temperature.  
Retrace:  $\pm 5 \times 10^{-11}$  of previous frequency (constant environment) after 72 hours ON and up to 24 hours OFF.

#### SINEWAVE OUTPUTS

Fixed: one @10MHz.  
Up to eight auxiliary outputs can be factory set to 10MHz, 5MHz, 1MHz, or 100kHz. Optional synthesizers allow programmable values from 100Hz to 50MHz with 1 $\mu$ Hz resolution. Connectors: Rear mounted BNC Female, 50 $\Omega$  $\pm 10\%$ . DE9F for RS232 control of optional synthesizers.

#### OUTPUT AMPLITUDE

Approximately 1Vrms into 50 $\Omega$  all outputs. (TTL levels optional on auxiliary outputs).

#### SPECTRAL PURITY (Sine only, Typical)

10MHz, 5MHz, 1MHz, or 100kHz: Harmonic:  $< -25\text{dBc}$ , Non-Harmonic:  $< -70\text{dBc}$ . **Synthesized:** Harmonic  $< -35\text{dBc}$ , Non-Harmonic  $< -60\text{dBc}$ ; Phase Noise (typ.)  $-120\text{dBc}$ , 10kHz offset, 5MHz. Spurious (all outputs):  $< -35\text{dBc}$ .

#### PHASE NOISE (10MHz output, typical dBc/Hz)

Freq. Offset	dBc/Hz
10Hz	-90
100Hz	-120
1kHz	-140
10kHz	-140

#### 1pps IN and OUT

Rear Panel BNCs for 1pps IN and 1pps OUT. 1pps IN accepts TTL level 1pps signals. 1pps OUT is TTL level when series terminated (derived from internal rubidium).

#### ENVIRONMENTAL

Temperature: 5°C to 40°C operating  
Humidity: 80% to 31°C, decreasing linearly to 50% at 40°C

#### SIZE

8.8cm H, 42.5cm W, 30.5cm D excluding rack handles and connectors. (Standard 2U, 19-inch rack)

#### LINE POWER

120/240 VAC  $\pm 10\%$ , 50/60Hz. 50 VA (70 VA during warm-up,  $< 30$  minutes).

#### FRONT PANEL STATUS INDICATORS

1PPS TRACK: LED illuminates when the 1450B is locked to and tracking a stable 1pps input.  
POWER OK: LED illuminates when power is OK.  
STANDARD LOCK: LED (and rear panel TTL) is red during warm-up and green when the internal standard is locked.

#### OPTIONS

Outputs can be configured to have up to four different synthesized frequencies, either at TTL levels or 1Vrms sine waves. Custom versions are available. A matching GPS smart antenna system is available.

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