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 30MHz with a resolution of 1μHz.

Specifications:

FREQUENCY STABILITY

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(± 10%) ..... $\pm 2 \times 10^{-12}$

Holdover (24 Hours, ±2°C) ..... $< \pm 1 \times 10^{-11}$
(<±1μs after learning phase >10τ)

FREQUENCY ACCURACY

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.
Eight auxiliary outputs can be factory set to 10MHz, 5MHz, 1MHz, or 100kHz. Optional synthesizers allow programmable values from 100Hz to 30MHz with 1μHz resolution.
Connectors: Rear mounted BNC Female, 50Ω±10%. DE9F for RS232 control of optional synthesizers.

OUTPUT AMPLITUDE

Approximately 1Vrms into 50Ω all outputs. (TTL levels optional on auxiliary outputs).

SPECTRAL PURITY (Sine only, Typical)

10MHz, 5MHz, 1MHz, or 100kHz: Harmonic <-25dBc, Non-Harmonic <-70dBc. **Synthesized:** Harmonic <-35dBc, Non-Harmonic <-60dBc; Phase Noise (typ.) -120dBc, 10kHz offset, 5MHz frequency setting.

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

Freq. Offset	dBc/Hz
10Hz	-92
100Hz	-125
1kHz	-140
10kHz	-142

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 ±10%, 50/60Hz. 50 VA (70 VA during warm-up, <30 minutes).

FRONT PANEL STATUS INDICATORS

POWER OK: LED indicates power status.
RUBIDIUM LOCK: LED (and rear panel TTL) indicates Rubidium Oscillator lock status.
PPS LOCK: LED indicates when the 1450B is locked to and tracking a stable 1pps input.

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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Synthesizer Serial Commands.

Serial Command	Function
F0 xx.xxxxxxxxxxx	Set Frequency in MHz to nearest 1μHz. Decimal point required.
P1 N	Set Phase. N is an integer from 0 to 16383. Phase is set to N*360^{o}/16384 or N*π/8192 radians. Sets the relative phase of the synthesized output sine wave. This is useful for adjusting relative phase after the Rubidium has obtained lock.
Vi N	Set voltage level of output. N can range from 0 (off) to 4095 (no decimal point allowed). Voltage level is scaled to N/4096. If N >4095, the scaling is turned off and the output is set to maximum.
E x	Serial Echo Control. x=D for Echo **D**isable, x=E for Echo **E**nable. Default is **E**nabled.
S	Save current state into EEPROM and sets valid flag. State saved is used as default upon next power up or reset.
R	Reset. This command resets the unit. EEPROM data is preserved and, if valid, it is used upon restart. This is the same as cycling power or toggling the open collector RES* line on the connector.
CLR	Clear. This command clears the EEPROM valid flag and restores all factory default values.
QUE	Read present frequency, phase and status. Returns an 42-character string of internal settings, lock status and software revision number. Hexadecimal format.

ORDERING INFORMATION:

Base Model

1450B 10MHz, 5MHz, 1MHz, or 100kHz. Auxiliary outputs can be set to one of these.
1450B/01 Adds one synthesizer. Customer to specify configuration.
1450B/02 Adds two synthesizers. Customer to specify configuration.
1450B/03 Adds three synthesizers. Customer to specify configuration.
1450B/04 Adds four synthesizers. Customer to specify configuration.

Configurations are designated by adding a two-character dashed suffix to the Base Model. For example, a special version of the 1450B/01 might be designated the 1450B/01-AA. These suffixes are uniquely assigned per configuration and depend upon customer requested outputs.

ACCESSORY:

Model

GPS1 Auto-surveying GPS smart antenna system for 1pps locking and tracking. Includes antenna, 30 meter cable, mating connectors, power supply and instructions.