NOVATECH
INSTRUMENTS, INC.
Model 2975AR
Disciplined Rubidium Frequency Standard

The 2975AR Rubidium Frequency Standards provide sinewave outputs of 10MHz and 5MHz, along with a 50MHz synthesized output in a small bench-top case. 1pps IN and OUT signals are available on the rear panel. Featuring an auto-adaptive 1pps disciplining algorithm, these models provide Stratum1 performance from long-term stable 1pps sources such as GPS. When not disciplined to 1pps, they provide holdover of better than ±1µs for 24 hours and a long term stability of $\pm 5 \times 10^{-11}$. The synthesized output, internally locked to the Rb Oscillator, generates any frequency from 100Hz to 50MHz with a resolution of 1µHz. Front panel controls and display allow setting of the synthesized output, with the second line of the display indicating 1pps tracking status.

Specifications:

FREQUENCY STABILITY

Short Term:	τ=1s	$<3 \times 10^{-11}$
	τ=10s	$<1 \times 10^{-11}$
	τ=100s	$<3 \times 10^{-12}$

Aging:	Monthly	$<\pm 5 \times 10^{-11}$ after 1 month
	Yearly	$<\pm 5 \times 10^{-10}$ after 3 months
Holdover (24 Hours, ±2°C)		$<\pm 1 \times 10^{-11}$ ($<\pm 1$µs after >10x 1pps tracking time constant)
Temperature:	+5 to +45°C	$<\pm 1 \times 10^{-10}$
Line Voltage:	±10%	$<\pm 5 \times 10^{-12}$

FREQUENCY ACCURACY

At shipment: $<=\pm 5 \times 10^{-11}$ at 20°C.

Retrace: $<=\pm 5 \times 10^{-11}$ from last frequency after 1hr ON and 24hrs OFF (constant environment).

FIXED SINEWAVE OUTPUTS

10MHz and 5MHz, $1V_{RMS} \pm 0.25V_{RMS}$ into 50Ω.

SYNTHESIZED SINEWAVE OUTPUT

Programmable from 100Hz to 50MHz in 1µHz steps using either the front panel controls or the rear panel RS232 port. Amplitude: $1V_{RMS} \pm 0.25V_{RMS}$ at 5MHz into 50Ω (±3dB from 100Hz to 50MHz, referenced to 10MHz). Phase Noise: <-140dBc, 10kHz offset, 1MHz out. Harmonics: <-45dBc, spurious: <-55dBc.

SPECTRAL PURITY (10MHz outputs)

Harmonic <-25dBc, Spurious/Non-Harmonic/Sub-Harmonic: <-45dBc.

PHASE NOISE (Typical, 10MHz output, 50Ω load)

Frequency Offset	dBc
1Hz	-70
10Hz	-90
100Hz	-120
1kHz	-140
10kHz	-140

1pps IN and OUT

1pps IN, DC-coupled, accepts TTL. 1pps OUT TTL, 133µs negative pulse width. (differential output is optional)

ENVIRONMENTAL

Temperature: +0°C to +50°C operating.
Humidity: 80% to 31°C, decreasing linearly to 50% at 40°C.

SIZE

6.4cm H, 18.5cm W, 24.1cm L, excluding bail and feet.

CONNECTORS

BNCs on front panel for sine outputs. BNCs on rear panel for 1pps I/O. DE9 on rear panel for synthesizer RS232.

LINE POWER

120/240VAC ±10%, 50/60Hz. 30VA (50VA max during warm up, <20minutes).

FRONT PANEL DISPLAY

Two Line by 16 character back lighted LCD. Top line shows output frequency of synthesized output. Bottom line shows 1PPS tracking status.

ACCESSORY

GPS1: Matching GPS smart antenna system.

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Also Available

The Models 2960AR and 2965AR are the same as the 2975AR, except they delete the front panel display, and the 2960AR has three fixed-frequency outputs. The 2960AR is the best choice where a synthesized output is not required. The 2965AR provides RS232 control of the internal synthesizer. The 2960AR and 2965AR share other specifications in common with the 2975AR.

Model 2960AR Disciplined Rb Standard

The Model GPS1 is a complete Smart GPS Antenna which requires no user intervention or setup beyond installation with a clear view of the sky (up to 120 meters from the instrument) to provide a stable 1pps to the 2960AR, 2965AR or 2975AR Disciplined Rubidium Standards. The GPS1 automatically self-surveys and switches to an over-determined timing mode. The internal GPS receiver is equipped with TRAIM, so the GPS1 qualifies its received signals, discarding data from noisy or non-functional satellites ensuring a stable 1pps output (typically ±50ns). The 1pps LOCK LED on the 2960AR and the 2965AR is illuminated green when a stable 1pps is available and being tracked. The 2975AR displays "Tracking 1pps" when tracking a stable 1pps signal. Complete with cables, power supply and interface module.

Model GPS1 Smart Antenna

2965AR and 2975AR Synthesizer Serial Commands

Serial Command	Function
F xx.xxxxxxxxxxxx	Set Frequency in MHz to nearest 1µHz. Decimal point required.
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 synthesizer. EEPROM data is preserved and, if valid, it is used upon restart.
C	Clear. This command clears the EEPROM valid flag and restores all factory default values (5MHz output).
Qr	Query the volatile (RAM) memory storage. These are the values currently output by the synthesizer. These will equal the stored values in the EEPROM after an 'R' or power up only if no changes have been made in the settings.
Qe	Query the non-volatile memory (EEPROM) storage.

Available Models:
2960AR ......Disciplined Rubidium Standard, 10MHz, 10MHz and 5MHz.
2965AR ......Disciplined Rubidium Standard, 10MHz, 5MHz, and 50MHz Synthesized, RS232 control.
2975AR ......Disciplined Rubidium Standard, 10MHz, 5MHz, and 50MHz Synthesized, RS232 and front panel control.
GPS1 ....Smart GPS Antenna, 30M RS422 I/F cable, 1pps BNC cable, power source and interface module.

Consult Novatech Instruments, Inc. for other available options.