

NOVATECH INSTRUMENTS

Models 2960AR, 2965AR & 2975AR

Disciplined Rubidium Frequency Standards



The 2960AR Rubidium Frequency Standard provides sinewave outputs of 10MHz(2) and 5MHz. The 2965AR and 2975AR have 10MHz, 5MHz and a 50MHz synthesized output. The 2975AR adds a display and front panel controls. All have 1pps IN and OUT signals 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. The synthesized output is internally locked to the Rb Oscillator and generates any frequency from 100Hz to 50MHz with a resolution of 1 μ Hz. Front panel controls and display allow setting of the synthesized output, with the second line of the 2975AR display indicating 1pps tracking status.

Specifications:

FREQUENCY STABILITY

Short Term:	$\tau = 1s$	$<3 \times 10^{-11}$
	$\tau = 10s$	$<1 \times 10^{-11}$
	$\tau = 100s$	$<3 \times 10^{-12}$
Aging:	Monthly	$<\pm 5 \times 10^{-11}$ after 1 month
	Yearly	$<\pm 5 \times 10^{-10}$ after 3 months
Holdover (24 Hours, $\pm 2^\circ C$)		$<\pm 1 \times 10^{-11}$ ($<\pm 1 \mu s$ after $>10x$ 1pps tracking time constant)
Temperature:	+5 to +45 $^\circ C$	$<\pm 1 \times 10^{-10}$
Line Voltage:	$\pm 10\%$	$<\pm 5 \times 10^{-12}$

FREQUENCY ACCURACY

At shipment:	$< \pm 5 \times 10^{-11}$ at 20 $^\circ C$.
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 50 Ω .

SYNTHESIZED SINEWAVE OUTPUT

Programmable from 100Hz to 50MHz in 1 μ Hz steps using either the front panel controls or the rear panel RS232 port. Amplitude: 1V_{RMS} $\pm 0.25V_{RMS}$ at 5MHz into 50 Ω ($\pm 3dB$ 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: $<-45dBc$. Crosstalk $<-40dBc$.

PHASE NOISE (Typical, 10MHz output, 50 Ω 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, 133 μs negative pulse width. (RS422 differential output optional)

ENVIRONMENTAL

Temperature: +0 $^\circ C$ to +50 $^\circ C$ operating.

Humidity: 80% to 31 $^\circ C$, decreasing linearly to 50% at 40 $^\circ C$.

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 $\pm 10\%$, 50/60Hz. 30VA (50VA max during warm up <25 minutes).

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.



Model 2960AR Disciplined Rb Standard

Models 2960AR and 2965AR

The Models 2960AR and 2965AR are offered without the 2975AR front panel display. The 2960AR has two 10MHz and one 5MHz fixed-frequency outputs. The 2965AR has a fixed 10MHz, a fixed 5MHz and a programmable 50MHz synthesized output. The 2965AR (like the 2975AR) provides RS232 serial communication for control of the internal synthesizer. The 2960AR, 2965AR and 2975AR share other specifications in common.



Model GPS1 Smart Antenna

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 $\pm 50\text{ns}$). 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.

2965AR and 2975AR Synthesizer Serial Commands

Serial Command	Function
F xx.xxxxxxxxxxxxx	Set Frequency in MHz to nearest 1 μ Hz. Decimal point required.
E x	Serial Echo Control. x=D for Echo D isable, x=E for Echo E nable. Default is Enabled.
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 Bench Top Disciplined Rubidium Standards:

2960ARDisciplined Rubidium Standard, 10MHz, 10MHz and 5MHz.

2965ARDisciplined Rubidium Standard, 10MHz, 5MHz, and 50MHz Synthesized, RS232 control.

2975ARDisciplined Rubidium Standard, 10MHz, 5MHz, and 50MHz Synthesized, RS232 and front panel control.

GPS1Smart GPS Antenna, 30M RS422 I/F cable, 1pps BNC cable, power source and interface module.

Consult Novatech Instruments for other available options.