

## GPS-12RG

### GLONASS/GPS-Controlled Rubidium Frequency Standard

- GLONASS and GPS-disciplined Rubidium clock for near-Cesium stability
- Frequency and timing outputs are traceable to both GPS and GLONASS
- Use of both GLONASS and GPS gives better signal coverage
- Internal battery option for ultimate stability during transportation and mains-free field use
- 5 & 10 MHz outputs standard for metrology use
- 1-pps timing output
- 1.544 or 2.048 MHz outputs for telecom applications



The Pendulum GPS-12RG Portable Reference clock is an ultra-stable GLONASS and GPS-disciplined Rubidium reference, targeted for both laboratory and telecommunications applications. The built-in battery option enables transportation of lab accuracy to field applications. When locked to GLONASS and/or GPS, its near-Cesium performance makes the GPS-12RG an ideal calibrator for metrology and test systems.

#### Very High Stability

The GPS-12RG is a very precise GLONASS- and GPS-controlled Rubidium reference clock for various telecom and metrology applications. In its standard configuration, the 10 MHz or 5MHz outputs provides a calibration reference and a reference for other measurement instruments in the lab or in the test rack.

The combined use of both GLONASS and GPS received signals, improves the geographic coverage and leads to a better signal reception also in urban areas, and for field use. Its telecom outputs can be set to either 1.544 MHz (T1) or 2.048 MHz (E1) reference clock outputs, for calibration or synchronization of telecom test instruments and network elements.

The 1-pps output provides an ultra-stable timing reference, with excellent hold-over specifications (less than 1 $\mu$ s after 24 h hold-over). This is useful in applications where timing is critical, like synchronization of DAB, DVB or WCDMA transmitters or for synchronization of radar antenna array systems.

#### Optional Configurations

The GPS-12RG is equipped with both metrology and telecom clock frequencies as standard. There are three 10 MHz and one 5MHz outputs, plus two user selectable front-panel telecom outputs (1.544 MHz/T1 or 2.048 MHz/E1), plus a 1-pps (1-pulse-per-second) output. There are also additional optional output frequency possibilities like extra 1, 5 and 10 MHz outputs or extra telecom outputs of 2.048/1.544 MHz and 2.048/1.544 Mbps.

#### Truly Portable

The GPS-12RG is compact, lightweight and has an internal battery option to maintain stability during transportation or to allow field use without access to AC mains for over 2 hours. It is now possible to transport an atomic frequency standard into the field and have instant access to the full stability, with zero warm-up time.

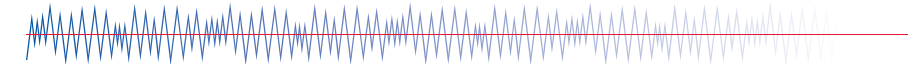
The GPS-12RG provides a portable reference clock for ALL kinds of instrumentation. It can also be used as a permanent ultra-stable in-house frequency reference for R&D, test systems, or manufacturing.

#### Flexible and Easy-to-Use

Its configurable alarm outputs give urgent or non-urgent alarms for hardware failures, loss of Rubidium oscillator lock, entering Hold-over mode, and more. User settings and display are selectable for six languages. The GPS-12RG is an excellent metrology reference for calibration of test equipment such as Wandermeters, SDH/Sonet network analyzers, and general test and measurement equipment time bases.

#### Distribution systems

The GPS-12RG can be used with Pendulum distribution amplifier systems, to distribute the ultra-stable reference from GPS-12RG. The DA-35 and DA-36 distribute the reference signal via optical fibers over long distances (up to 2km) to other rooms, floors or even buildings. This fiber distribution is free from electromagnetic noise pick-up and ground current loops.



### Frequency stability

**(Allan dev.), at temp. 20°C to 26°C:**

$<2 \times 10^{-12}$  ( $\tau = 24$  h), locked to GPS

$<5 \times 10^{-12}$  ( $\tau = 100$  s)

$<1.7 \times 10^{-11}$  ( $\tau = 10$  s)

$<5 \times 10^{-11}$  ( $\tau = 1$  s)

**Phase noise:** -140 dBc/Hz @10 kHz offset

**Warm up (+25°C):**

10 minutes to  $1 \times 10^{-9}$  (typ.)

### Frequency stability - Hold-over

**Aging/month:**  $<5 \times 10^{-11}$

**Temp. (0°C to 50°C):**  $<1 \times 10^{-10}$

### Standard Outputs

**1.544 MHz or 2.048 MHz (2 front-panel outputs, user selectable)**

**Connectors:** BNC female (2)

**Frequency:**

1.544 MHz (T1) or 2.048 MHz (E1) square wave, user selectable on the front panel

**Output level:**

-1.2 V to +1.2 V  $\pm 10\%$  in 75 W (G.703:10)

**3x 10 MHz and 1x 5MHz (rear panel)**

**Connector:** BNC female

**Output level:**

Sine wave,  $>1$  Vrms in 50 W load

**1pps (1 front-panel output)**

**Connector:** BNC female

**Output level:**

approx. 0V to +2.0 V in 50 W load

**Duty cycle:** approx. 20% (GPS-locked)

**Jitter (GPS-locked):**  $<1$  ns rms

**Hold-over accuracy:**

approx. 1  $\mu$ s drift after 1 day of Hold-over

**Alarm output (rear)**

**Signal coding:**

*Relay open:* alarm mode;

*Relay closed:* normal mode;

1 urgent output;

1 non-urgent output

**Max switching voltage:** 60 VDC

**Max switching current:** 200 mA

**GPS Antenna Input (rear)**

**Connector:** Type 'N', female

**DC Antenna Supply:**

+5VDC, center-pin positive, through 'N' connector

### Options Available

**Option 70B outputs**

**Frequency:**

3x 10 MHz, 1x 5MHz

**Output level:**

Sine wave,  $>1$  Vrms in 50  $\Omega$

**Option 71B outputs**

**Frequency:**

0.1, 1, 5, 10 MHz

**Output level:**

Sine wave,  $>1$  Vrms in 50  $\Omega$

**Option 72B Outputs**

2x 2.048 MHz and 2x 2.048 Mbps outputs (G.703)

**Output level:** -1.2V to +1.2V  $+10\%$  in 75  $\Omega$

**Option 74B Outputs**

2x 1.544 MHz and 2x 1.544 Mbps outputs (G.703)

**Output level:** -1.2V to +1.2V  $+10\%$  in 75  $\Omega$

**Option 78/HS**

Internal rechargeable NiMH battery for GPS-12RG. Includes additional inlet

for +12 VDC external power supply/charging

**Operation time:** 2h

**Stand-by time:** 2.5h

**Ext. +12 VDC inlet:** +10.5 to +18 V, 5A

**Option 79/01**

1x External 1 PPS disciplining input (TTL-levels in 50  $\Omega$ )

1x 1 PPS output (TTL-levels in 50  $\Omega$ )

2x 10 MHz outputs (1Vrms sine)

### Environmental

**Temperature:**

0°C to +50°C (operating);

-40°C to +70°C (storage);

Internal temperature controlled fan

**Safety:**

Compliant to CE: EN 61010-1 2nd edition, Cat II, Pollution degree 2

**EMI:**

Compliant to CE: EN 61326-1 (1997)

### Power Supply

**Line voltage:**

100 V to 240 Vrms ( $\pm 10\%$ );

50 Hz to 400 Hz ( $\pm 10\%$ );

$<60$  W during warm-up,

$<35$  W during normal operation

**Optional external DC supply:**

+12 V nominal (+10.5 to +18 V),

5A (option 78/HS)

**Internal Battery:**

Via internal NiMH battery, capacity

45 Wh, 12 VDC connector for charging and continuous operation (option 78/HS)

**Freq. Stability:**  $<2 \times 10^{-12}$  when switching

between any power source; AC MAINS,

internal battery, or external +12 VDC.

**Line voltage:**

100 V to 240 Vrms ( $\pm 10\%$ );

50 Hz to 400 Hz ( $\pm 10\%$ )

$<60$  W during warm-up,

$<35$  W during normal operation

### Mechanical Data

**WidthxHeightxDepth:**

210 x 108 x 395 mm

(8.25" x 3.6" x 15.6")

**Weight:**

Net 3,1 kg (6.6 lbs); excl batteries

Shipping 4.1 kg (8.8 lbs); excl batteries

### Ordering Information

**Basic Model**

**GPS-12RG:**

Glonass/GPS-controlled Rubidium Frequency Standard with 3x 10 MHz, 1x 5MHz, 1x 1pps, and 2x 1.544 MHz or 2.048 MHz outputs

*Included with Instrument:*

User manual on CD

Calibration certificate

18 months warranty

### Built-In Options

**Option 70B:** 3x 10 MHz plus 1x 5MHz extra outputs, sine, 1Vrms

**Option 71B:** Multiple reference outputs 0.1/1/5/10 MHz, sine, 1Vrms

**Option 72B:** 2x 2.048 MHz and 2x 2.048 Mbps outputs (G.703)

**Option 74B:** 2x 1.544 MHz and 2x 1.544 Mbps outputs (G.703)

**Option 78/HS:** Internal Battery and external +12 VDC power supply inlet

**Option 79/01:** 1x ext. 1 PPS disciplining input, 1x 1 PPS out, 2x 10 MHz sine out

### Optional Accessories

**Option 01/90:** GNSS antenna, 40 dB gain, N connector, includes mounting kit

**Option 22/90:** 19" rack mount kit

**Option 27:** Soft carrying case

**Option 27H:** Heavy-duty transport case

**Option 29/12:** GPS-12 Monitor, Control and Monitoring SW (via USB)

**Option 02:** Antenna cable, 20 m

**Option 02/50:** Antenna cable, 50 m

**Option 02/130:** Antenna cable, 130 m

**Option 90/07:** Calibration certificate with protocol, Rubidium oscillator

**Option 90/00:** Calibration certificate hold-over aging/week

**Option 95/05:** Extended warranty to 5 years

**OM-12:** Printed Users Manual (PDF-file is included as standard)