

GPS-Controlled Frequency Standard

- GPS-disciplined Rubidium clock for near-Cesium stability
- 2.048 MHz, 1-pps standard outputs for telecom applications
- 1.544 MHz (T1) optional
- 1, 5 & 10 MHz optional low-noise outputs for general lab use
- Internal battery option for transportation and mains-free field use
- Optional -48 VDC option for stationary use in telephone exchange stations



The Pendulum GPS-12R Portable Reference clock is an ultra-stable GPS-disciplined Rubidium reference, targeted for telecommunications application. Its high stability and low noise output, makes GPS-12R the ideal reference source for telecom instrumentation and testers, like SDH/PDH/Sonet Analyzers. Its Cesium standard performance, when locked to GPS, makes GPS-12R an ideal calibrator for metrology and test systems.

Ideal for telecom applications

The GPS-12R is a very precise GPS-controlled Rubidium reference clock for various telecom applications. In its standard configuration it is a 2.048 MHz reference clock for calibration or synchronization of test instruments and network elements.

Its 1-pps output provides an ultra-stable timing reference with excellent hold-over specifications (less than 1 μ s after 24h 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.

Its battery option makes the GPS-12R an excellent portable reference, since the internal Rubidium standard is continuously powered during transports.

And the optional -48 VDC operation makes the GPS-12R equally suited for permanent use as local frequency standard in telephone exchange stations, via this redundant power supply possibility.

GPS-12R can be used as a permanent reference input to SSU:s thanks to PRC specifications as long as GPS lock is maintained and during days in hold-over mode.

Optional configurations

The GPS-12R is equipped with two 2.048 MHz outputs plus a 1-pps (one pulse-per-second) output as standard. But there are more output frequency possibilities.

You can choose from five optional frequency outputs, of which two can be mounted in parallel.

- *Option 70B* includes one 5 MHz and three 10 MHz low-noise outputs, for test systems or metrology applications.

- *Option 71B* includes four sine wave outputs of resp. 10 MHz, 5 MHz, 1 MHz and 0.1 MHz.

- *Option 72B* includes two extra 2.048 MHz plus two 2.048 Mbps (E1) for use in telecom applications (SDH).

- *Option 73B*, includes four 13 MHz outputs for GSM radio base station tests

- *Option 74B* includes two 1.544 MHz and two 1.544 Mbps (T1) outputs for use in telecom applications (SONET).

Truly portable

The GPS-12R 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 the first time ever, 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.

When ordered with 5/10 MHz outputs, the GPS-12R fits as a portable reference clock to ALL kinds of instrumentation. It can also be used as a permanent ultra-stable frequency in-house reference, in the lab or in test systems.

Its configurable alarm outputs give urgent or non-urgent alarms for e.g. HW failures, loss of antenna connection, loss of GPS contact, etc.

The GPS-12R is an excellent reference for external calibration of Wandermeters (e.g. the WM-11 from Pendulum Instruments) and SDH/SONET network analyzers.

GPS-12R Technical Specifications

GPS-12R Frequency stability

Frequency stability

(Allan dev.), at temperature 20° - 26° C:

$<2 \times 10^{-12}$ ($\tau = 24h$), locked to GPS
 $<5 \times 10^{-12}$ ($\tau = 100s$)
 $<1.7 \times 10^{-11}$ ($\tau = 10 s$)
 $<5 \times 10^{-11}$ ($\tau = 1 s$)

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

Warm up (+25°C): 7 minutes to 1×10^{-9}

Frequency stability - Hold-over

Aging/month: $<5 \times 10^{-11}$
Temp. (0°C - 50°C): $<1 \times 10^{-10}$

Standard Outputs

Standard reference outputs

2.048 MHz (2 outputs in the front panel):

Frequency: 2.048 MHz square wave
Output level: -1.2V to +1.2V $\pm 10\%$ in 75 Ω (G.703:10)

1 pps (1 output in the front panel):

Output level: approx. 0 V to +2.0V in 50 Ω load
Duty cycle: approx. 20% (GPS-locked)
Jitter (GPS-locked): <1 ns rms relative to UTC or GPS (position hold)
Hold-over accuracy: approx. 1 μ 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

Options

Option 70B outputs

Frequency: 3x 10 MHz, 1x 5 MHz
Output level: Sine wave, >1V rms in 50 Ω

Option 71B outputs

Frequency: 0.1, 1, 5, 10 MHz
Output level: Sine wave, >1V rms in 50 Ω

Option 72B

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

Option 73B

Frequency: 4x 13 MHz
Output level: square wave, approx. 0 V to +2.0V in 50 Ω load

Option 74B

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

Option 77

-48 VDC supply for external power source

Option 78

Internal battery (2h) and an inlet for +12 VDC external power supply/charging

Antenna (option 01)

Type: active L1
Height: 81 mm (3.2")
Weight: 230 g (8 oz.)
Gain: >30 dB

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 2:nd edition, Cat II, Pollution degree 2
EMI: Compliant to CE: EN61326-1 (1997)

Power consumption

Line voltage: 100 to 240 V ($\pm 10\%$); 47 to 63Hz
<65W during warm-up, <35W during normal operation

Optional external DC supply:

-48 VDC (option 77)
+12 VDC (option 78)

Optional Battery: Via internal NiMH battery, capacity 19.2 Wh, 12 VDC connector
Backup: for charging and continuous operation (option 78)

Mechanical Data

WxHxD: 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

GPS-12R: GPS-controlled Rubidium Frequency Standard 2x 2.048 MHz and 1x 1pps outputs

Included with shipment

User manual on CD
Calibration certificate
18 months warranty

Built-in options

Option 70B: 3x 10MHz 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 outputs plus 2 x 2.048 Mbps outputs
Option 73B: 4x 13 MHz outputs, square 0V to +2V
Option 74B: 2x 1.544 MHz outputs plus 2 x 1.544 Mbps outputs
Option 77: -48 VDC supply (for external power source)
Option 78: Internal Battery (2h) + inlet for +12VDC external power supply/charging

Optional accessories

Option 22/90: 19" rack mount kit
Option 27: Soft carrying case
Option 27H: Heavy-duty transport case
Option 01: GPS Antenna
Option 01/50: GPS Antenna Mounting Kit
Option 02: Antenna cable, 20m
Option 02/50: Antenna cable, 50 m
Option 90/10: Calibration certificate with protocol
Option 90/00: Calibration certificate hold-over ageing/week
Option 95/03: Extended warranty to 3 years
Option 95/05: Extended warranty to 5 years
OM-12: Printed Users Manual (PDF-file is included as standard)

Specifications subject to change without notice

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- Experts in time & frequency calibration, measurement and analysis