



## RFS1B: Rubidium Oscillator with Integrated GPS/GNSS Receiver



**RFS1B with integrated GNSS receiver**

### Description

The RFS1B is a high-quality rubidium oscillator module with built in GNSS satellite receiver. It can either run in free run mode or be disciplined by the GNSS receiver connected to the world's satellite systems.

The integrated receiver operates with the following satellite systems: GPS, Galileo, GLONASS or BeiDou and can use the SBAS or QZSS augmentation systems.

A special feature of the RFS1B is the very low phase noise, typically  $-130$  dBc/Hz at a 10 Hz offset. This is typically 30 to 40 dB lower than competitive units. The entire oscillator is very reliable and has been designed for a 20-year life.

The RFS1B can be monitored and controlled by the supplied software.

### Windows Software

The RFS1B is supplied with windows software that can be used to monitor and control the device. A screen print of this software is shown below. The RFS1B is connected to a PC via RS232 or its USB interface.

Precision Test Systems: RFS1 Console

File View Tools Hardware Debug Help

System

1pps Input: OK  
1pps Output: OK

RF Amplifier: OK  
GPS Antenna: Open Circuit  
Temperature: 38.4°C

GPS Module: LEA-M8T (GPS Locked)

UTC: 27/11/2019 19:10:59  
Location:  
Lat: 52 22.66892 N  
Lng: 0 -09.93319 E  
Height: 25.219 m  
Satellites: (GP+GA+BD)  
In View: 30  
Used: 19  
Mode: Survey In  
V antenna: +5V  
Est. error: 2.380 m

Rubidium

Status: PLL Locked  
Set Frequency: -89  
+24V Heat: 23.03V  
+24V Electronics: 23.08V  
Case Temperature: 70.8°C

enable auto poll 1 Interval (sec) Refresh Data

Test COM Link Clear List Debug Request Refresh COM9

19:10:03.503 COMMS: Port Opened: COM9  
19:10:06.046 TX: Sending Test Comms Command  
19:10:06.058 RFS1 CPU: COM link confirmed

## Specifications

- 10 MHz Output: 10 MHz sine wave @ 0.5 Vrms,  $\pm 10\%$
- Output Pulse: 1 pps derived from the rubidium oscillator
- Aux Out: Programmable squarewave from 0 to 10 MHz in 1 Hz steps. The duty cycle is also programmable. This is derived from the GNSS receiver and may have up to 50 ns jitter.
- Input: 1pps. Rubidium oscillator is disciplined by either the internal GPS/GNSS receiver or an external 1 pps signal.
- Phase noise (SSB)  $< -95$  dBc/Hz (1 Hz offset),  $-130$  dBc/Hz (10 Hz),  $< -150$  dBc/Hz (100 Hz),  $< -155$  dBc/Hz (1 kHz),  $< -158$  dBc/Hz (10 kHz)
- Spurious  $< -130$  dBc (100 kHz BW)
- Harmonic distortion  $< -25$  dBc
- Return loss  $> 25$  dB @ 10 MHz
- Accuracy at shipment  $\pm 5 \times 10^{-11}$
- Aging (after 30 days in freerun)  $< 1 \times 10^{-11}$  (72 hours),  $< 5 \times 10^{-11}$  (monthly),  $< 5 \times 10^{-10}$  (yearly)
- Aging when connected to a GNSS satellite system: Zero. Fully disciplined by the satellite signal.
- Short-term stability  $< 2 \times 10^{-11}$  (1 s),  $< 1 \times 10^{-11}$  (10 s),  $< 2 \times 10^{-12}$  (100 s)
- Holdover 72-hour Stratum 1 level

- Time Drift in free run mode: < 1 us/72 hours typical (after 30 days continuous operation)
- Frequency retrace  $\pm 5 \times 10^{-11}$  (72 hrs. off then 72 hrs. on)
- Settability  $< 5 \times 10^{-12}$
- Trim range  $\pm 2 \times 10^{-9}$  (0 to 5 VDC),  $\pm 1$  ppm (via RS-232)
- Warm-up time <6 minutes (time to lock), <7 minutes (time to  $1 \times 10^{-9}$ )

## Electrical

- Input voltage +24 VDC  $\pm 5\%$
- Current 2.4 A (warm-up), 0.7 A (steady state), at 25 °C (Note 1)
- USB or RS232 Interface: Free Windows software can be used for monitor and control

## Environmental

- Operating temperature  $-20$  °C to  $+65$  °C (baseplate)
- Temperature stability  $\pm 1 \times 10^{-10}$  ( $-20$  °C to  $+65$  °C baseplate)
- Storage temperature  $-55$  °C to  $+85$  °C
- Magnetic field  $< 2 \times 10^{-10}$  for 1 Gauss field reversal
- Relative humidity 95 % (non-condensing)

## Miscellaneous

- Design life: 20 yrs.
- Size : 153 mm (depth) x 81 mm (wide) x 77 mm (high)
- Weight 0.7 kg

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Full specifications available from [www.ptsyst.com](http://www.ptsyst.com). Specifications and features subject to change without notice (101221)