Small Instrumentation Modules

SIM940 — 10 MHz rubidium frequency standard

- ***Three 10 MHz outputs***
- ***1 pps input and output for GPS synchronization***
- ***20 year aging less than 0.005 ppm***
- ***Ultra-low phase noise (< –130 dBc/Hz at 10 Hz)***
- ***72 hour Stratum 1 level holdover***

SIM940 10 MHz Rubidium Frequency Standard

The SIM940 integrates a rubidium oscillator (SRS model PRS10) into the SIM900 platform. It provides stable and reliable performance with an estimated 20 year aging of less than 5×10^{-9} and a demonstrated rubidium oscillator MTBF of over 200,000 hours. The SIM940 is an ideal instrument for calibration and R&D laboratories or any application requiring a precision frequency standard.

There are three 10 MHz outputs with exceptionally low phase noise (–130 dBc/Hz at 10 Hz offset) and one second Allan variance ($<2 \times 10^{-11}$). The SIM940 can be phase-locked to an external 1 pps reference (like GPS), providing Stratum 1 performance. A 1 pps output is also provided that has less than 1 ns of jitter and may be set with 1 ns resolution.

All functions of the SIM940 can be controlled from a computer via the SIM900 Mainframe. Both RS-232 and GPIB interfaces are supported by the mainframe.

Output

Output frequency	10 MHz sine, 10 µs wide 1 pps pulse
Amplitude (±10 %)	0.5 Vrms (+7 dBm) into 50 Ω
1 pps pulse amplitude	2.5 V into 50 Ω, 5 V into high impedance loads
Phase noise (SSB)	< –130 dBc/Hz (10 Hz) < –140 dBc/Hz (100 Hz) < –150 dBc/Hz (1 kHz) < –155 dBc/Hz (10 kHz)
Spurious	< –100 dBc (100 kHz BW)
Harmonics	< –60 dBc
Accuracy at shipment	$\pm 5 \times 10^{-11}$
Aging (after 30 days)	$<5 \times 10^{-11}$ (monthly) $<5 \times 10^{-10}$ (yearly) 5×10^{-9} (20 years, typ.)
Short-term stability (Allan variance)	$<2 \times 10^{-11}$ (1 s) $<1 \times 10^{-11}$ (10 s) $<2 \times 10^{-12}$ (100 s)
Holdover	72 hour Stratum 1 level (1×10^{-11})
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) ±0.5 ppm (remote interface)
Warm-up time	<6 minutes (time to lock) <7 minutes (time to 1×10^{-9})

Front-Panel Indicators (LEDs)

Locked	Indicates frequency is locked to rubidium
Unlocked	Indicates frequency is unlocked
1 pps input	Blinks with each 1 pps reference input applied to rear panel
1 pps sync	"On" when 1 pps output is synchronized within ±1 µs of 1pps input

Rear-Panel Connections

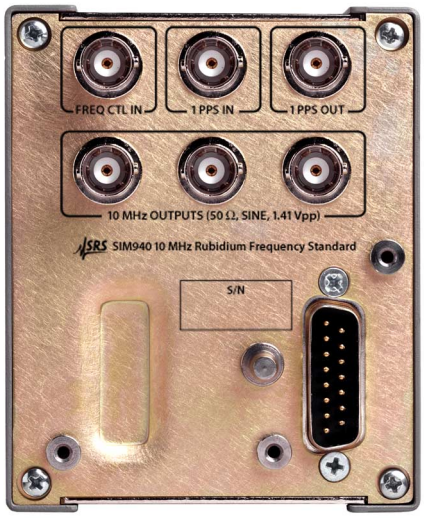
Frequency adjust	0 to 5 VDC adjusts frequency by ±0.002 ppm
1 pps input	100 kΩ input. Requires CMOS level pulses (0 to 5 VDC). If an external 1 pps input is applied, lock is maintained between the 1 pps input and 1 pps output with computer adjustable time constant from 8 minutes to 18 hours.
1 pps output	50 Ω pulse output
10 MHz outputs	Three 10 MHz sine outputs (50 Ω)
DB15/M	SIM interface (power & communication)

Environmental

Operating temperature	+10 °C to +40 °C
Temperature stability	$\Delta f/f < \pm 1 \times 10^{-10}$ (+10 °C to +40 °C)
Storage temperature	–55 °C to +85 °C
Magnetic field	$\Delta f/f < 2 \times 10^{-10}$ for 1 Gauss field reversal
Relative humidity	95 % (non-condensing)

General

Interface	Serial via SIM interface,direct to PRS10
Power	+24 V (2.2 A at start-up, 0.6 A after warm-up period)
Dimensions	3.0" × 3.6" × 7.0" (WHL)
Weight	5 lbs.
Warranty	One year parts and labor on defects in materials and workmanship



SIM940 rear panel

Ordering Information

SIM940 10 MHz rubidium frequency std.