XPRO

High-Performance Rubidium Oscillator

Summary

Microchip's XPRO is a high-performance rubidium oscillator designed for a wide range of telecommunications and test and measurement applications. The XPRO is a drop-in replacement for the venerable LPRO, which has been widely installed in wireless base station applications, RF test equipment and other applications where an embedded high-performance oscillator is required.

The XPRO leverages over 35 years of proven rubidium atomic physics with advanced digital electronics architecture to provide an exceptionally stable oscillator that meets the most demanding performance requirements.

With its low profile and standard connector interface, the XPRO is designed for easy integration into time and frequency systems. Great care has been taken in the design to minimize EMI emissions and susceptibility, including the use of a filtered 9-pin D-connector, SMA for the RF output and a shielded outer cover.

The XPRO is designed for long operating periods without maintenance (long-life rubidium lamp and extended crystal control range). With a 5.0×10^{-11} per month aging, the oscillator will maintain 1.0×10^{-9} frequency accuracy for 10 years or longer without recalibration.

A low aging rate option is available for XPRO that will provide 1×10^{-11} per month aging, resulting in an even more robust reference source.

Standard outputs are 10 MHz, 1PPS and a rubidium lock status bit. All monitoring and control is done through the TTL level RS-232 style serial interface, allowing you access to comprehensive status and control parameters.

Standard Features

- 10 MHz output
- 1 PPS output
- $<5.0 \times 10^{-11}$ (optional $<1.0 \times 10^{-11}$) per month aging
- Digital monitor and control
- RoHS compliant
- Low EMI emission and susceptibility

Benefits

- Low profile with standard connector interface for easy integration
- Low maintenance
- Long lifecycle (>10 years) without recalibration operation

Specifications[1]

Electrical

RF Output	
Frequency	10 MHz
Format	Sinewave
Amplitude	7.8 ±0.8 dBm
Load impedance	50 Ω
Connector	SMA
Quantity	1
1PPS Output	
Rise time	<5 nS
Pulse width	<20 µS
Level	5V CMOS (Vh > 4.2V, 15 pF load)
Jitter	<1 ns RMS
Connector	DB-9
Quantity	1
Built-in Test Equipment Output	
Format	5V CMOS (Vh > 4.2V, 15 pF load)
Logic	0 = Normal Operation 1 = Alarm
Serial Communications	
Protocol	RS-232
Format	3.3V CMOS (not true RS-232)
Baud rate	57,600 (8, N, 1)
Power Input	
Max input (A) at 24V	<1.45 A (at –20ºC) <1.43 A (at 25ºC)
Input voltage range	19 VDC to 32 VDC
Voltage sensitivity	0.72×10^{-11}/V (over input voltage range)
Input power quiescent	24 VDC at 25°C <14 W 19 VDC at 65°C <9.5 W
Physical	
Input connector	(1) DB-9 (all input power, monitoring, 1PPS)
RF connector	(1) SMA
Dimensions	1.5" (3.81 cm) (H) × 3.7" (9.4 cm) (W) × 5.0" (12.7 cm) (D)
Weight	<1.1 lbs (<500 g)

Environmental	
Operating temperature	–25°C to 70°C baseplate
Altitude	–200' to 40,000'
Magnetic sensitivity	DC (≤2 Gauss), $<\pm1.0 \times 10^{-11}$/Gauss
Humidity	GR-63-CORE, issue 4, April 2012, section 4.1.2: 5–85% RH, operating
Vibration (operating)	Telcordia GR-63-CORE, Issue 4, April 2012, section 4.4.4 and 5.4.2 Opt2: Random Vibration 0.15 grms, unit remains locked
EMI	Compliant to FCC Part 15 Class B (conducted and radiated emissions) and complies with EN55022B emissions (radiated and conducted) and EN50082-1 (immunity)
Storage and Transport (Non-operating)	
Temperature	–55°C to 85°C
Altitude	–200' to 70,000'
Vibration	Telcordia GR-63-CORE, Issue 4, April 2012; section 4.4.5 and 5.4.3: Random Vibration 0.78 grms
Shock	Telcordia GR-63-CORE, Issue 4, April 2012; section 4.3.1 and 5.3.1.1: Packaged Drop from 1000 mm
Performance Parameters	
Aging (after 1 month continuous operation)	Monthly: $<\pm5.0 \times 10^{-11}$; $<1.0 \times 10^{-11}$ (option) 10 years: $<\pm1.0 \times 10^{-9}$
Frequency accuracy at shipment	$<\pm5.0 \times 10^{-11}$
Frequency retrace	$<\pm2.5 \times 10^{-11}$ (24 hours on, 48 hours off, 24 hours on)
Analog tuning	$\pm1.5 \times 10^{-9}$ (0V–5V)
Digital tuning	$\pm1.0 \times 10^{-6}$ (with 1.5×10^{-12} resolution)
Tempco	$<6.0 \times 10^{-10}$ (–25ºC to 70ºC), $<3.0 \times 10^{-10}$ (0ºC to 50ºC)

[1]All specifications at 25C and 24 Vdc, unless noted otherwise.

RF Output Phase Noise (SSB)

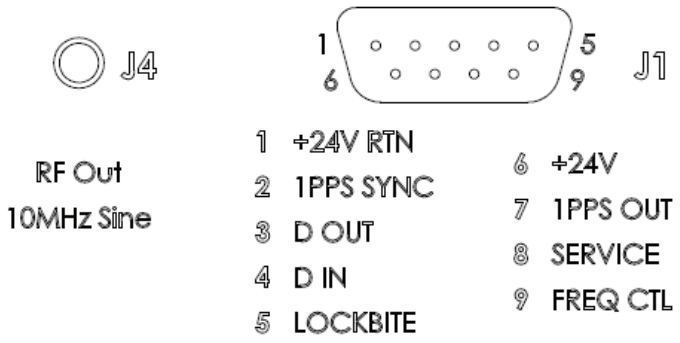
Frequency	Phase Noise
1 Hz	≤–80 dBc/Hz
10 Hz	≤–90 dBc/Hz
100 Hz	≤–128 dBc/Hz
1 kHz	≤–143 dBc/Hz
10 kHz	≤–148 dBc/Hz

Spectral purity: <–60 dBc (harmonics), <–80 dBc (non-harmonics)

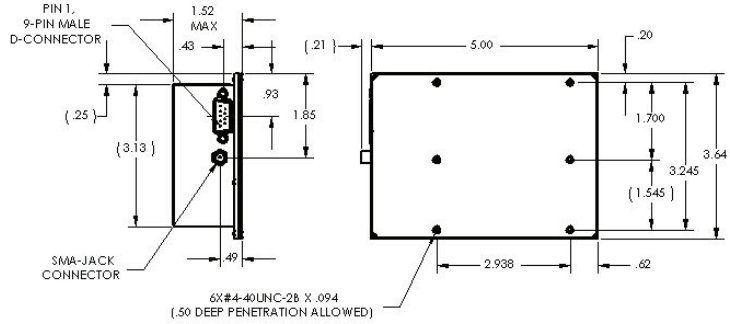
Frequency Stability (Allan Deviation)

Time	Allan Deviation
TAU = 1 second	$<1.0 \times 10^{-11}$
TAU = 10 seconds	$<3.2 \times 10^{-12}$
TAU = 100 seconds	$<1.0 \times 10^{-12}$

XPRO Connection Diagram



XPRO Outline Diagram



Warm-Up Time

Parameter	–20°C	25°C
To lock	<8.7 minutes	<6 minutes
To $<1 \times 10^{-9}$	<10.2 minutes	<8 minutes
To $<4 \times 10^{-10}$	<12.7 minutes	<10.6 minutes

Ordering Information[2]

Part Number	Description
16192-003	1×10^{-11}/month aging, AT disabled, RoHS 6/6
16192-004	1×10^{-11}/month aging, AT enabled, RoHS 6/6
16192-103	5×10^{-11}/month aging, AT disabled, RoHS 6/6
16192-104	5×10^{-11}/month aging, AT enabled, RoHS 6/6

[2]AT = analog tuning.

For More Information

www.microsemi.com

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