

# High-Performance Rubidium Oscillator

## XPRO



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  $5.0 \times 10^{-11}$  per month aging, the oscillator will maintain  $1.0 \times 10^{-9}$  frequency accuracy for 10 years or longer without recalibration.

A low aging rate option is available for XPRO that will provide  $1 \times 10^{-11}$  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 RS232 style serial interface, allowing you access to comprehensive status and control parameters.

## KEY 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

## KEY BENEFITS

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

## Specifications

RF Output	
Frequency	10 MHz
Format	Sinewave
Amplitude	7.8 ±0.8 dBm
Load impedance	50Ω
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 -20°C) <1.43 A (at 25°C)
Input voltage range	19 VDC to 32 VDC
Voltage sensitivity	$0.72 \times 10^{-11}/V$ (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 ( $\leq 2$ Gauss), <±1.0 × 10 <sup>-11</sup> /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: <±5.0 × 10 <sup>-11</sup> ; <1.0 × 10 <sup>-11</sup> (option) 10 years: <±1.0 × 10 <sup>-9</sup>
Frequency accuracy at shipment	<±5.0 × 10 <sup>-11</sup>
Frequency retrace	<±2.5 × 10 <sup>-11</sup> (24 hours on, 48 hours off, 24 hours on)
Analog tuning	±1.5 × 10 <sup>-9</sup> (0V–5V)
Digital tuning	±1.0 × 10 <sup>-6</sup> (with 1.5 × 10 <sup>-12</sup> resolution)
Tempco	<6.0 × 10 <sup>-10</sup> (-25°C to 70°C), <3.0 × 10 <sup>-10</sup> (0°C to 50°C)

## 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)

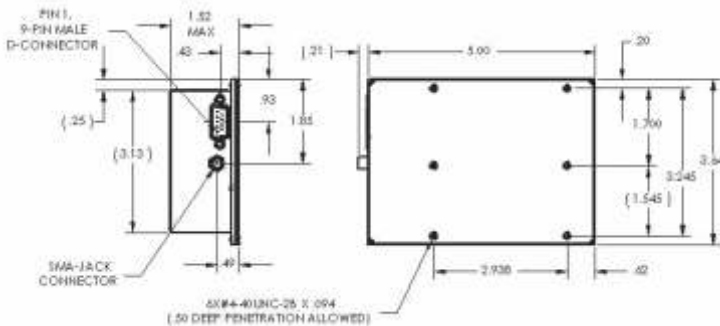
## Frequency Stability (Allan Deviation)

Time	Allan Deviation
TAU = 1 second	<1.0 × 10 <sup>-11</sup>
TAU = 10 seconds	<3.2 × 10 <sup>-12</sup>
TAU = 100 seconds	<1.0 × 10 <sup>-12</sup>

## XPRO Connection Diagram



## XPRO Outline Diagram



## Warm-Up Time

Parameter	-20°C	25°C
To lock	<8.7 minutes	<6 minutes
To <1 × 10 <sup>-9</sup>	<10.2 minutes	<8 minutes
To <4 × 10 <sup>-10</sup>	<12.7 minutes	<10.6 minutes

## Ordering Information<sup>2</sup>

Part Number	Description
16192-003	1 × 10 <sup>-11</sup> /month aging, AT disabled, RoHS 6/6
16192-004	1 × 10 <sup>-11</sup> /month aging, AT enabled, RoHS 6/6
16192-103	5 × 10 <sup>-11</sup> /month aging, AT disabled, RoHS 6/6
16192-104	5 × 10 <sup>-11</sup> /month aging, AT enabled, RoHS 6/6

<sup>2</sup>AT = analog tuning.