

Low Cost & Profile Rubidium Oscillator (LPRO)

High Precision & Performance Source



Telecom | Navigation | Broadcast | Defense | Instrument

Applications

Product Characteristics:

- Small volume : 26 in³.
- Frequency offset over temp. range : $\pm 1 \cdot 10^{-10}$
- Stability : $1 \cdot 10^{-12}$ / 100 sec.
- Long term stability : $< 2 \cdot 10^{-12}$ / day
- Low warm-up power : < 32 W

Main Features:

- Very low temperature sensitivity
- Excellent short term stability
- Low power consumption
- Pin compatible with industry std.
- Small volume / low profile
- Rb lamp extended life expectancy (20 years)
- Industry standard pin out
- RS 232 interface for center frequency adjustment and monitoring of the working parameters

Main Applications:

- Synchronization telecommunications (SDH, SONET, SS7, GSM, TETRA)
- Digital Audio Broadcast
- TV transmissions (analog & digital)
- Military communications
- Navigation
- Instrumentation
- Tracking and guidance control

Parameters accessible through RS232:

The working and monitoring parameters of the LPFRS are accessible for read and write operations through the serial RS-232 port (1200 bits/sec., no parity, 1 start bit, 8 data bits, 1 stop bit).

There are three different commands, which are: *M*, *Cxx* and *Fxx* followed by a carriage return.

M: monitors the basic factory adjustments of the atomic clock.
The returned answer looks like

HH GG FF EE DD CC BB AA <CR>

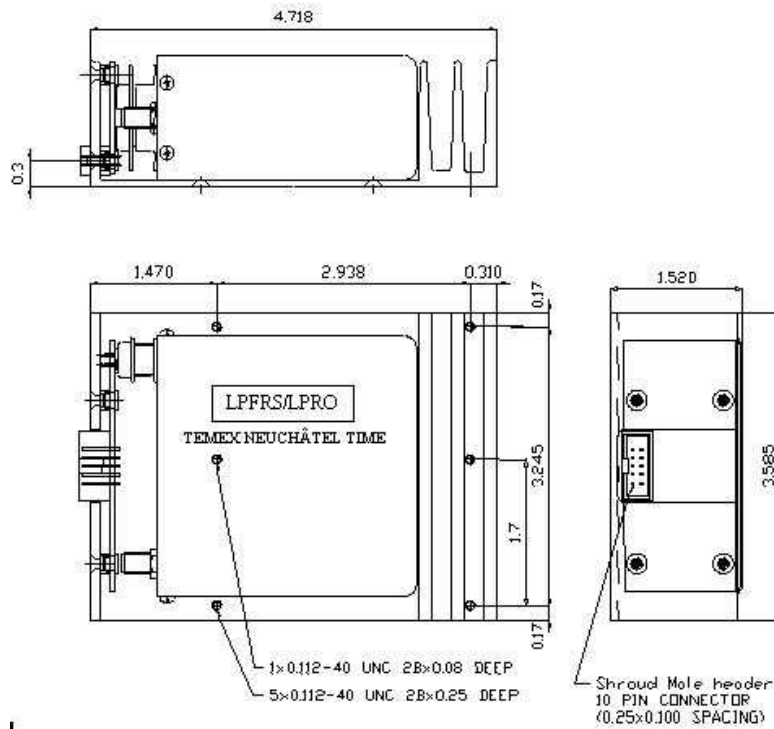
Where each returned byte is an ASCII coded hexadecimal value, separated by a <Space> character. All parameters are coded at full scale.

- HH*: DC-Voltage of the photocell (5V to 0V)
- GG*: peak voltage of Rb-signal (0 to 5V)
- FF*: not used
- EE*: varactor control voltage (0 to 5V)
- DD*: Read-back of the user provided frequency adjustment voltage on pin 2 (0 to 5V)
- CC*: Rb-lamp heating current (500mA to 0mA)
- BB*: Rb-cell heating current (500mA to 0mA)
- AA*: 90MHz power control signal (0 to 5V)

Cxx: output frequency correction through the synthesizer, by steps of 1×10^{-9} , where *xx* is a signed 8 bits word. This value is automatically stored in a EEPROM.

Fxx: output frequency correction through C-field, by steps of 1×10^{-11} , where *xx* is a signed 8 bits word.

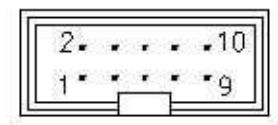
Package of LPFRS/LPRO model (all dimensions in inch)



I

PIN FUNCTION LAYOUT						
LPFRS-01/LPRO TEMEX			LPRO DATUM			
Parameter	Requirements	Parameter	requirements			
Interface Circuits connector : (10 pin contact two rows)	Pin 1(output)	10 Mhz RF	Interface Circuits connector : (10 pin contact two rows)	Pin 1(output)	10 Mhz RF	Chassis ground
	Pin 2(output)	RF return		Pin 2(output)	RF return	
	Pin 3(RF return)	RF return Dc insulated		Pin 3(NA...)	Reserved Requires open in use	RF return-DC isolated
	Pin 4(output)	GND		Pin 4(output)	Chassis ground	
	Pin 5(RxD)	RXD (TTL) RS232 input (0-5V)		Pin 5(optional output)	Lamp voltage monitor (Acceptable level :3V to 13V after warm up)	
	Pin 6(output (with CMOS load))	Lock monitor * See Option Spec.		Pin 6(output (with CMOS load))	Lock monitor (Z=2K Ohm±10%) 0V to 0.05V locked, 4.2V to 5.4V unlocked	
	Pin 7(input) V adjust	>1.5x10 ⁻⁹ to 5V <-1.5x10 ⁻⁹ to 0V		Pin 7(input)	>1.5x10 ⁻⁹ to 5V <-1.5x10 ⁻⁹ to 0V	
	Pin 8(GND)	GND		Pin 8(output)	Vin return	
	Pin 9(TxD)	TxD (TTL) RS232 output (0-5V)		Pin 9(optional output)	Xtal monitor Z=20K Ohm ±10%	
	Pin10(input) 24V/12V	24V (12V)		Pin10(input)	Vin power	

Connector front vue:



SPECIFICATIONS**ELECTRICAL:**

Type	LPFRS/LPRO	
	Standard version	Options
Frequency	10 MHz	Optional 20 MHz, 5 MHz
Frequency change within operating temperature range (Thermal chamber with air flow)	$\leq \pm 1 \times 10^{-10}$ over -25°C to +70°C	$\leq \pm 1 \times 10^{-10}$ (option Code 60) over 0°C to +60°C
Long term stability (Measured after 3 months of continuous operation)	$< 5 \times 10^{-11}$ / month (typical: 3×10^{-11} / month)	$< 3 \times 10^{-11}$ / month (option code A) (typical: $\pm 1 \times 10^{-11}$ / month)
Short term stability	3×10^{-11} / 1 s 1×10^{-11} / 10 s 3×10^{-12} / 100 s	Improved short term stability (option code S) 1×10^{-11} / 1 s 3×10^{-12} / 10 s 1×10^{-12} / 100 s
Phase noise (10 MHz)	-75 dBc/Hz at 1 Hz -89 dBc/Hz at 10 Hz -128 dBc/Hz at 100 Hz -140 dBc/Hz at 1kHz -147 dBc/Hz at 10 kHz	-80 dBc/Hz at 1 Hz -100 dBc/Hz at 10Hz -130 dBc/Hz at 100 Hz -140 dBc/Hz at 1kHz -150 dBc/Hz at 10 kHz (option code Q3)
Frequency retrace (in stable temperature, gravity, pressure and magnetic field conditions)	$< 5 \times 10^{-11}$ within 1 h after 24 h off	
Warm-up time [minutes]	standard version 4×10^{-10} after 10' at +25°C	
Analog frequency adjustment For stable operation, an external voltage adjust. value shall be applied (DC voltage of 0 to 5V) to pin 7. OR the cursor of the build-in 10kΩ variable resistor provide this adjustment voltage with 10 Kohm serial resistor	OV on pin 7 OR pot unscrewed: $< -1.5 \times 10^{-9}$ 5V on pin 7 OR pot screwed: $> +1.5 \times 10^{-9}$	
Digital frequency adjustment through serial RS-232 port.	$\pm 1.2 \times 10^{-7}$ (resolution: 1×10^{-9}) 5×10^{-9} (resolution: 2×10^{-11}) $\pm 20\%$	
Output level	sinewave 0.5 Vrms $\pm 10\%$, 50 Ω	
Return loss	-20 dB	
Harmonics	< -25 dBc	< -40 dBc (option code X)
Spurious $f_0 \pm 100$ kHz	< -80 dBc	< -110 dBc (option code X)
Subharmonics	< -60 dBc	< -100 dBc (option code X)
Supply voltage	24V option : 18 to 32 V	12V option : 11.2 to 17 V
Supply voltage sensitivity	$< 2 \times 10^{-11}$ for 10% voltage change	
Input power	-25°C: < 28 W +25°C: < 12 W +70°C: < 7 W warm up: < 32 W	
Lock monitor : 5V CMOS load	Lock: < 0.4 V	Unlock: > 4.2 V
Electrical Protection power +24V (12V) RF output TxD output RxD input Frequency adjust input Lock indicator	An internal diode protects against reverse polarity connection ESD and short-cut protected ESD and short-cut protected ESD protected ESD protected Over current protected	

ENVIRONMENTAL

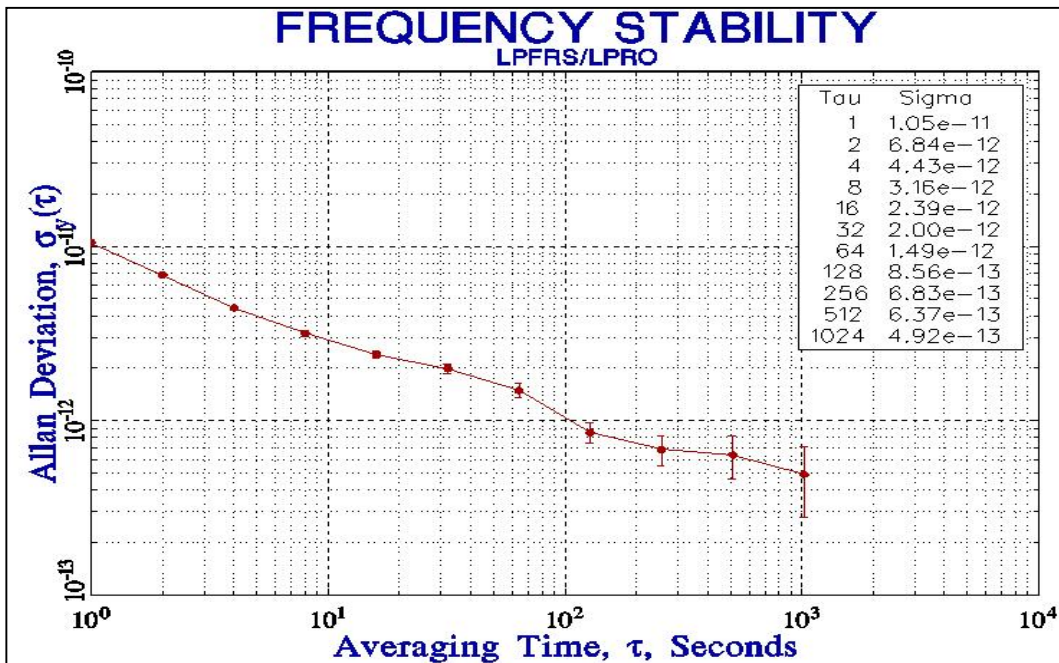
Magnetic field sensitivity	< 2 x 10 ⁻¹¹ / Gauss in X and Y axis < 1 x 10 ⁻¹⁰ / Gauss in Z axis	Low Magnetic Sensitivity (option code LM) < 2 x 10 ⁻¹⁰ / all axis
Storage Temperature	- 55°C to + 85°C	
Operating Temperature	-25°C to +70°C (70°C is the maximal temperature of the thermal chamber with air flow around the unit or maximum baseplate temperature)	
Overall Environment Effects * (Altitude, Vibration, Shocks)	Meets or exceeds MIL-T-28800B for Type III, class 5 equipment + MIL Std 810 + 516.2 /160g, 4ms, half sinus	
Humidity	RTCA/DO-160C hot humidity, 35°C, 95% relative humidity	
Helium concentration sensitivity	< 1 x 10 ⁻¹⁰ per ppm of Helium concentration change	
g-tip-over test	2 x 10 ⁻¹⁰ / g on worst sensitive axis	Low Magnetic Sensitivity (option code LM) < 5 x 10 ⁻¹⁰ / g / all axis

PHYSICAL

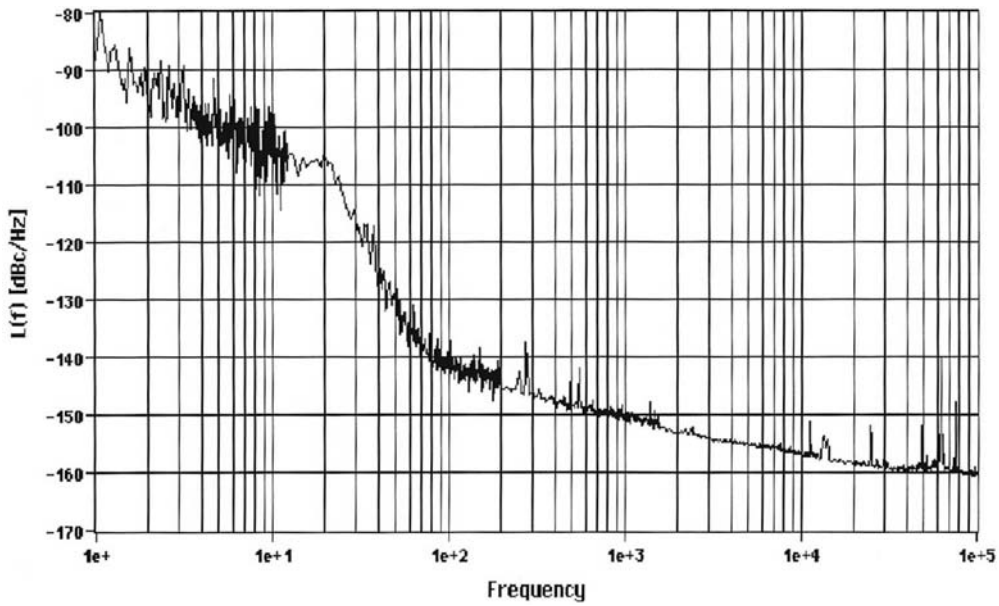
Size	120 x 90x 38 mm. (4.72 x 3.6 x 1.52 inches)
Weight	550 g max. (1.1 Lbs. max)
Volume	0.4 liter (26 cubic inches)
Connector	10 pins male contact , 2 row , 100mils spacing Mate with AMP 87133-2

Performances data:

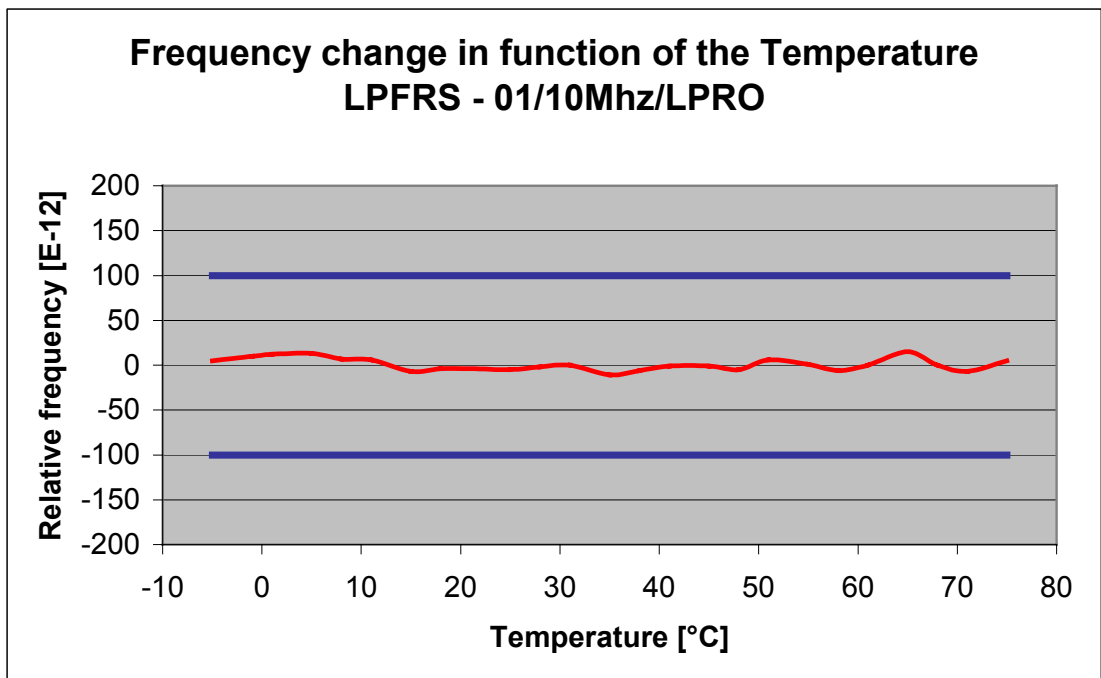
LPFERS/LPRO Typical short term stability:



LPFRS/LPRO Typical Phase Noise curve:



LPFRS/LPRO Typical thermal Characteristics:



Ordering Information:

