Low Cost & Profile Rubidium Oscillator (LPRO)

High Precision & Performance Source

Telecom | Navigation | Broadcast | Defense | Instrument

Applications

©SpectraTime
sales@spectratime.com
spectratime.com

Europe Headquarters
+41.32.732.16.66

North America Sales Offices
+1.512.470.3980

Specifications are subject to change without prior notice

Product Characteristics:

- •• Small volume   : 26 in^3.
- •• Frequency offset over temp. range   : < $2 \cdot 10^{-10}$ over -0°C to +60°C /
                        < $4 \cdot 10^{-10}$ over -25°C to +70°C
- •• 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
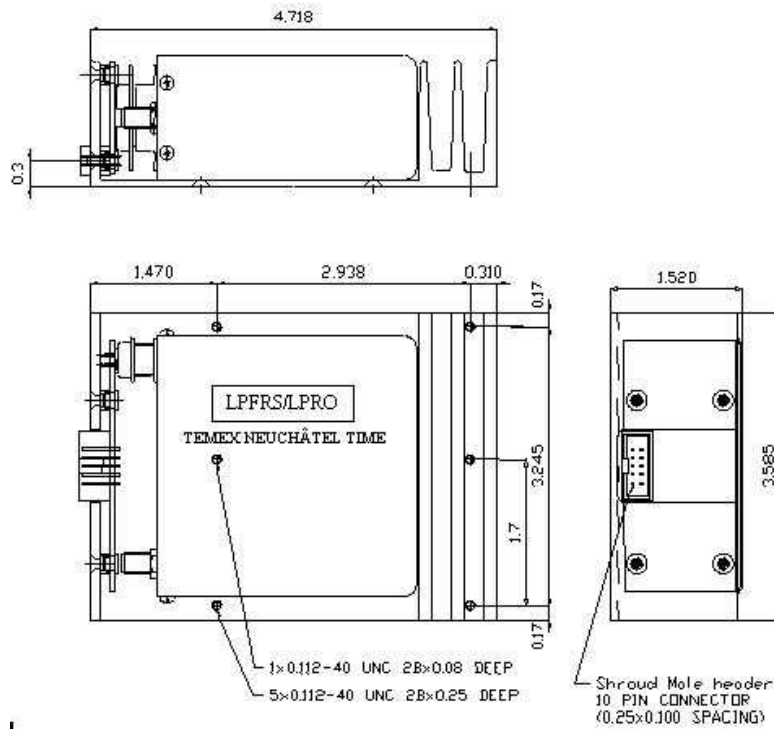
     HH GG FF EE DD CC BB AA <CR>

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.

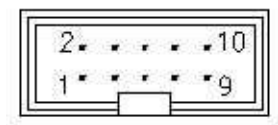*Fxx*:   output frequency correction through C-field, by steps of 1×10^{-11} , where xx is a signed 8 bits word.

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

PIN FUNCTION LAYOUT				
LPFRS-01/LPRO SPECTRATIME		**LPRO** DATUM		
Parameter	Requirements	Parameter	requirements	
Pin 1(output)	10 Mhz RF	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	$>1.5 \times 10^{-9}$ to 5V $<-1.5 \times 10^{-9}$ to 0V	Pin 7(input)	$>1.5 \times 10^{-9}$ to 5V $<-1.5 \times 10^{-9}$ 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	

Left side label (vertical): Interface Circuits connector : (10 pin contact two rows)
Right side label (vertical): Interface Circuits connector : (10 pin contact two rows)

Connector front vue:

©**SpectraTime**
sales@spectratime.com
spectratime.com

Europe Headquarters
+41.32.732.16.66

North America Sales Offices
+1.512.470.3980

Page 3 of 6

SPECIFICATIONS

ELECTRICAL:

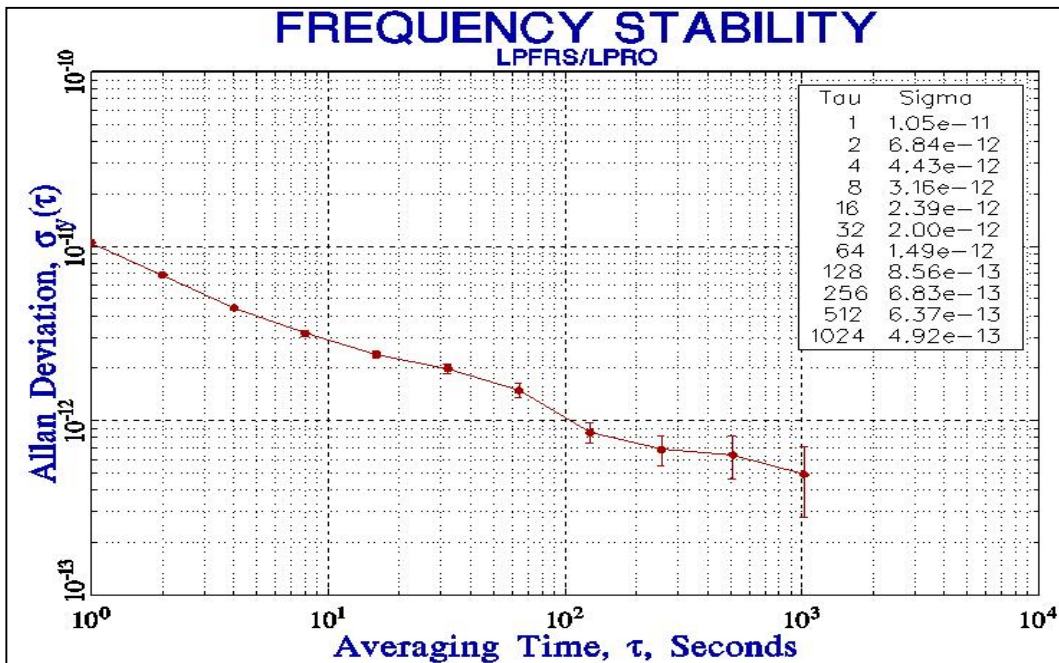| Type	LPFRS/LPRO	
	Standard version	**Options**
Frequency	10 MHz	Optional 20 MHz, 5 MHz
Frequency change within operating temperature range (Thermal chamber with air flow)	$< 2 \times 10^{-10}$ over -0°C to +60°C $< 4 \times 10^{-10}$ over -25°C to +70°C	$<= \pm 1 \times 10^{-10}$ **(option Code 60)** 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 $< 2 \times 10^{-10}$ /year **(option code A)** $< 1 \times 10^{-9}$ /10 years (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	< -25dBc	< -40 dBc **(option code X)**
Spurious $f_0 \pm 100$kHz	< -80dBc	< -110 dBc **(option code X)**
Subharmonics	< -60dBc	< -100 dBc **(option code X)**
Supply voltage Max Power Supply Ripple	**24V option** : 18 to 32 V	**12V option** : 11.2 to 17 V
	< 50 mV peak to peak (from 1Hz to 1 MHz frequency band)	
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: > 4.2V
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	

©SpectraTime
sales@spectratime.com
spectratime.com

Europe Headquarters
+41.32.732.16.66

North America Sales Offices
+1.512.470.3980

Page 4 of 6

ENVIRONMENTAL

Magnetic field sensitivity	$< 2 \times 10^{-11}$ / Gauss in X and Y axis $< 1 \times 10^{-10}$ / Gauss in Z axis	Low Magnetic Sensitivity **(option code LM)** $< 2 \times 10^{-10}$ / 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	$< 1 \times 10^{-10}$ per ppm of Helium concentration change	
g-tip-over test	2×10^{-10} / g on worst sensitive axis	Low Magnetic Sensitivity **(option code LM)** $< 5 \times 10^{-10}$ / g / all axis

PHYSICAL

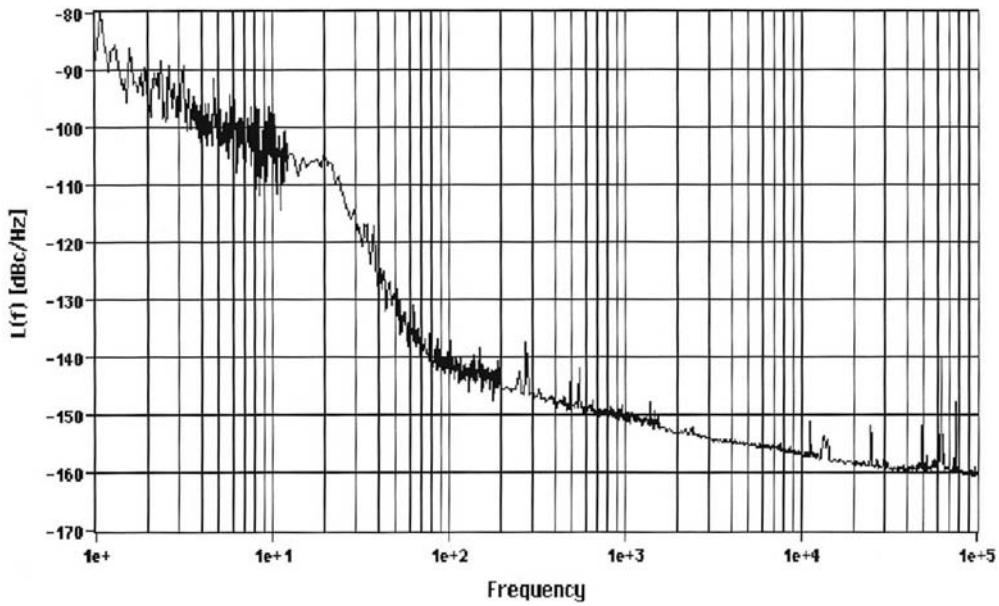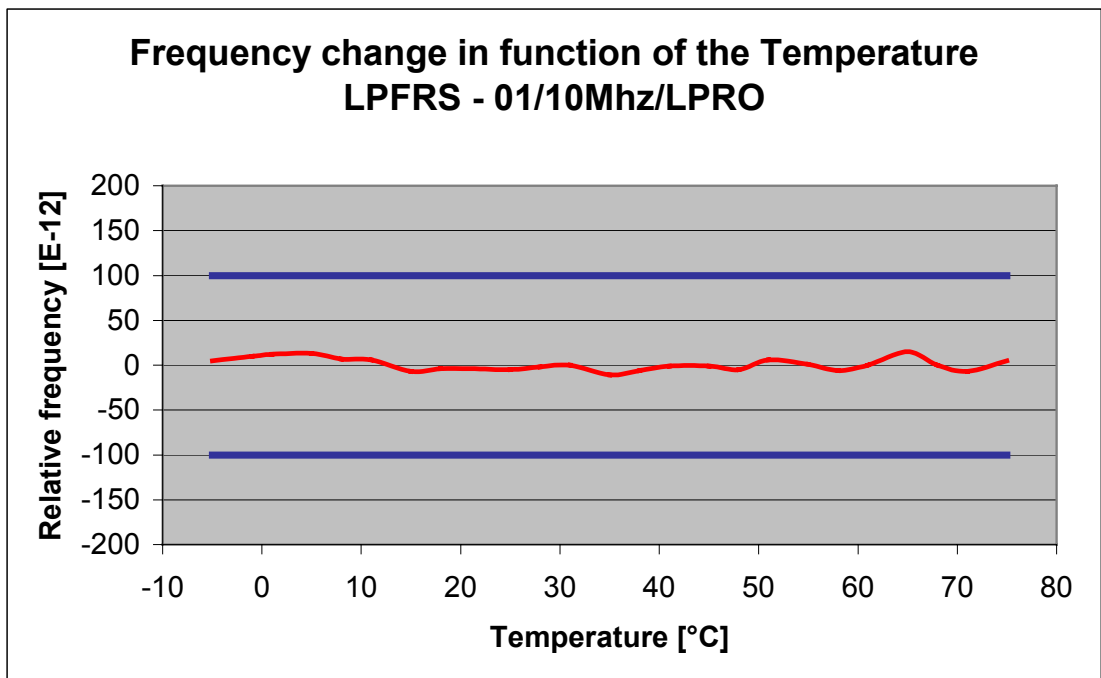|	
Size	$120 \times 90 \times 38$ mm. (4.72 × 3.6 × 1.52 inches)
Weight	550 g max. (1.1 Lbs. max)
Volume	0.4 liter (26 cubic inches)
Connector	10 pins male contact , 2 row , 100mils spacing Mate with AMP 87133-2

Performances data:

LPFRS/LPRO Typical short term stability:

LPFRS/LPRO Typical Phase Noise curve:

LPFRS/LPRO Typical thermal Characteristics:

Ordering Information:

LPFRS/LPRO / XX / 10 M / 12 V

Type   Option   Frequency   Supply voltage