ELECTRONICS & DEFENSE

LPFRS RUBIDIUM OSCILLATOR

High Precision & Performance Source

Main Features

- Very low temperature sensitivity
- Excellent short term stability
- Low power consumption
- Fast warm-up
- Small volume / low profile
- Rb lamp extended life expectancy (20 years)
- Industry standard pin out
- RS 232 interface for centre frequency adjustment and monitoring of the working parameters

Applications

Telecom

Navigation

Broadcast

Defense

Instrument

Safran Electronics & Defense is with you every step of the way, building in the intelligence that gives you a critical advantage in observation, decision-making and guidance.

SAFRAN

Product Characteristics

- Small volume 13 in^3
- Freq. offset over temp. range $\pm 1x10^{-10}$
- Stability $1x10^{-12}$/100 sec.
- Long term stability $< 5x10^{-10}$/year
- Low warm-up current < 0.9A

Main Applications

- Synchronisation 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>

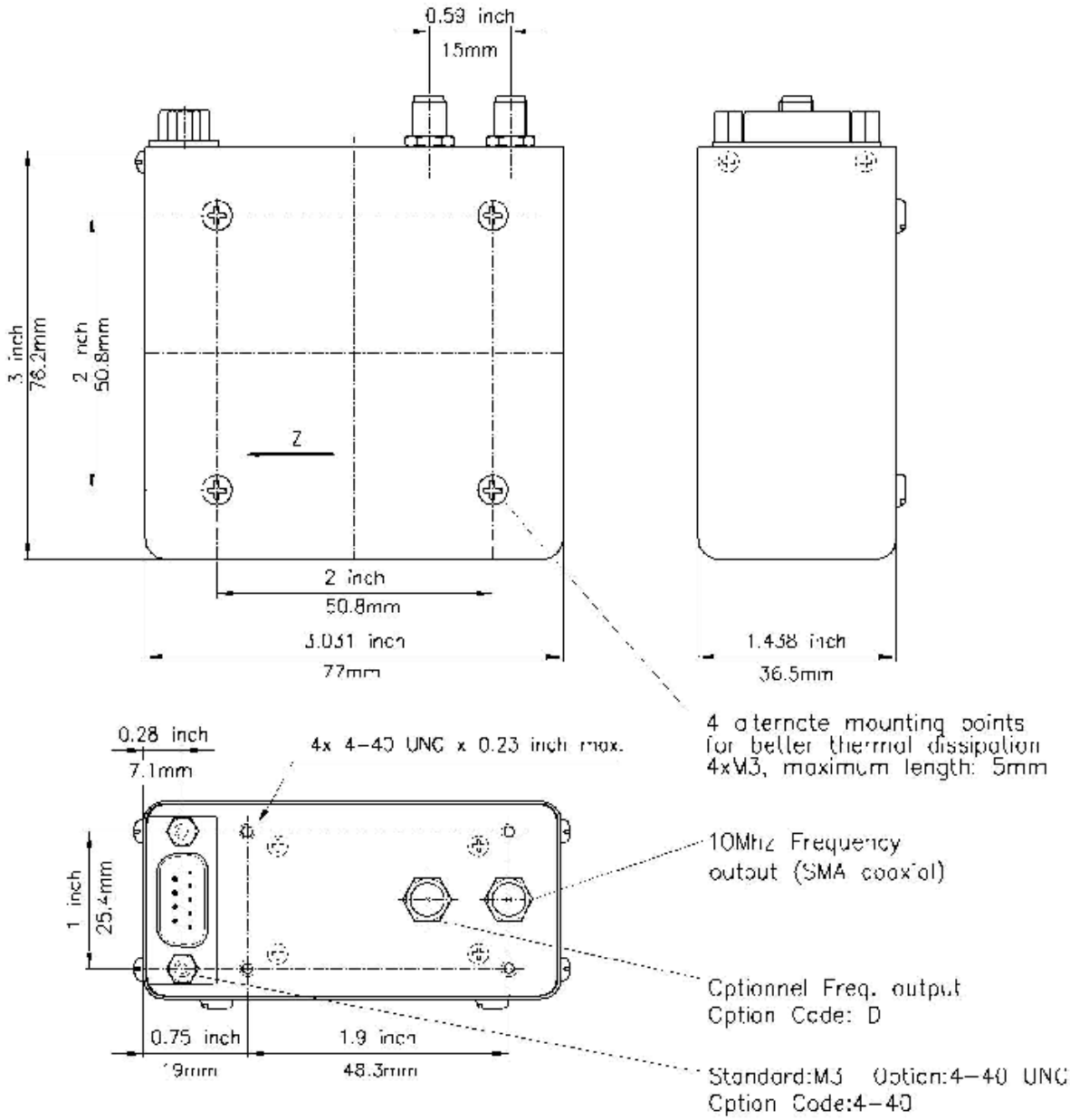
Where each returned byte is an ASCII coded hexadecimal value, separated by a <Space> character. All parameters are coded at full scale.

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.

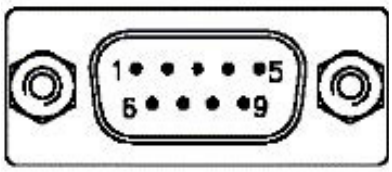
Fxx: output frequency correction through C- field, by steps of 1×10^{-11} , where xx is a signed 8 bits word.

PACKAGE: (all dimensions in inch)



Connector front view:

D-Sub 9 pins male



PIN	FUNCTION
1	+24V (+12V)
2	0V (GND)
3	Lock indicator (open coll.)
4	Vref (5V hi-stability ref.) or no connected (option code NOREF)
5	GND
6	TxD (RS232 transmit,TTL)
7	GND
8	Frequency adjust (0 to 5V)
9	RxD (RS232 receive,TTL)

ELECTRICAL

Technical Specifications

Type	LPFRS-01		
	Standard version	Options	
Frequency Accuracy @ Shipment	< 5E-11 (+25°C), typical		
Frequency	10 MHz	Optional 20 MHz, 15 MHz, 5 MHz	
Frequency change within operating temperature range (Thermal chamber with air flow)	<= ± 1 x 10^{-10} over -5°C to +55°C < 2 x 10^{-10} over 0-65°C	-0 to 65°C (option code E65) -30 to 70°C (option code E70) -30 to 60°C (option code E)	
Long term stability (Measured after 3 months of continuous operation)	< 5x10^{-11} / month (typical: 3x10^{-11} / month)	< 3x10^{-11} / month < 2x10^{-10} /year (option code A) < 1x10^{-9} /10 years (typical: ±1x10^{-11} / month)	
Short term stability	2 x 10^{-11} / 1 s 7 x 10^{-12} / 10 s 2 x 10^{-12} / 100 s	Improved short term stability (option code S) 1 x 10^{-11} / 1 s 3 x 10^{-12} / 10 s 1 x 10^{-12} / 100 s	
Phase noise (10 MHz)	-70 dBc/Hz at 1 Hz -80 dBc/Hz at 10 Hz -115 dBc/Hz at 100 Hz -135 dBc/Hz at 1kHz -140 dBc/Hz at 10 kHz	@10 MHz -80 dBc/Hz at 1 Hz -100 dBc/Hz at 10Hz -130 dBc/Hz at 100 Hz -145 dBc/Hz at 1kHz -153 dBc/Hz at 10 kHz (option code Q3)	@10 MHz -80 dBc/Hz at 1 Hz -100 dBc/Hz at 10Hz -130 dBc/Hz at 100 Hz -145 dBc/Hz at 1kHz -153 dBc/Hz at 10 kHz -153 dBc/Hz at 100 kHz (option code Q3/X)
Frequency retrace (in stable temperature, gravity, pressure and magnetic field conditions)	< 5 x 10^{-11} within 1 h after 24 h off		
Warm-up time [minutes]	standard version 5 x 10^{-10} after 15' at +25°C	fast warm-up (option code F) 5 x 10^{-10} after 7' at +25°C fast warm-up (option code FE) 5 x 10^{-10} after 6' at +25°C	
Analog frequency adjustment For stable operation, an external voltage adjust. value shall be applied (DC voltage of 0 to 5V) on pin 8. Typically: the cursor pin of a 10kΩ variable resistor connected between pins 2 and 4 (GND & Vref) can provide this adjustment voltage.(refer to op. manual).	2.5 x 10^{-9} ±20%	5 x 10^{-9} ± 20% (option code O) 3 x 10^{-8} ± 20% (option code O2) 6 x 10^{-9} ± 20% (option code O1) Precise analog frequency tuning (option code GI1) 2.5 to 3 x 10^{-9}	
Digital frequency adjustment through serial RS-232 port.	±1.2 x 10^{-7} (resolution: 1 x 10^{-9}) 2.5 x 10^{-9} (resolution: 1 x 10^{-11}) ±20%		
Output level	Sine wave 0.5 Vrms ±10%, 50 Ω	7-11dbm/50Ω (option code 9DB) 12-15dbm/50Ω (option code 13DB)	
>Number of output (s)	Single output	Dual output (option code D)	
Return loss	-20 dB		
		@10 MHz	@5 MHz
Harmonics	< -25dBc	< -40 dBc (option code X)	< -40 dBc
Spurious f_0 ± 100kHz	< -80dBc	< -110 dBc (option code X)	< -120 dBc
Sub-harmonics	< -60dBc	< -100 dBc (option code X)	< -100 dBc
Supply voltage Max Power Supply Ripple	24V option : 18 to 32 V < 50 mV peak to peak (from 1Hz to 1 MHz frequency band)	12V option : 11.2 to 17 V	28V option : 22.5V to 32 V
Supply voltage sensitivity	< 2 x 10^{-11} for 10% voltage change	< 1 x 10^{-11} for ±10% for 28V option only	
Input power	warm up: typical <20 W at 12 V typical <25 W at 24 V -5°C: <13 W +25°C: <10 W +50°C: <7 W	warm up: <32 W (with option code F or E) warm up: <36 W (with option code FE) warm up: <40 W (with option code 28V/F or 28/E)	

Type	LPFRS/AV1			
	Standard version		Options	
Electrical Protection				
power +24V (12V)	An internal diode protects against reverse polarity connection			
RF output	ESD and short-cut protected			
TxD output	ESD and short-cut protected			
5V (Vref) output	ESD and short-cut protected			
RxD input	ESD protected			
Frequency adjust input	ESD protected			
Lock indicator	Over current protected			
Lock Indicator (pin 3)	Standard	Option LR	Option B	Option BR
L = open collector locked	Open	Closed	< 0.4V	5V
B = TTL unlocked	Closed	Open	5V	< 0.4V

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^{-11} / all axis
Storage Temperature	- 55°C to + 85°C	
Operating Temperature	-25°C to +55°C (55°C is the maximal temperature of the thermal chamber with air flow around the unit)	
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^{-11} / g / all axis
Vibration Sensitivity	-	< 1 x 10^{-9} / g / (Option code Q3) (option Q3/X excluded)
Conformal Coating	-	Option code CC

PHYSICAL

Size	76 × 77× 36.5mm. (3.0 × 3.03 × 1.44 inches)	
Weight	290 g max. (0.64 Lbs. max)	
Volume	1/5 liter (13 cubic inches)	
Connector	9 male contacts Mate with ITT Cannon Series DB9+ SMA coaxial - M3 mating	UNC mating (Option code 4-40)
Mounting Drill	Standard M3 mating	
Warranty	Electronics : 1 year; Lamp & cell : 20 years	

Ordering Information:

LPFRS / AV1 / 10 M / 12V

Type Option Frequency Supply voltage

POWERED BY TRUST

safran-navigation-timing.com

SAFRAN

February 20, 2023