

LPFRS/AV1 AIRBORNE 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

Defense
MIL
Avionics

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.

Product Characteristics

- Small volume :13 in³
- Freq. offset over temp. range :31x10⁻¹⁰
- Stability :1x10⁻¹²/100 sec.
- Long term stability :< 5x10⁻¹⁰/year
- Low warm-up current :< 0.9A

Main Applications

- Military radio systems
- Navigation instruments
- Cockpit Instrumentation
- Tracking and guidance control
- Timing instrument

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)

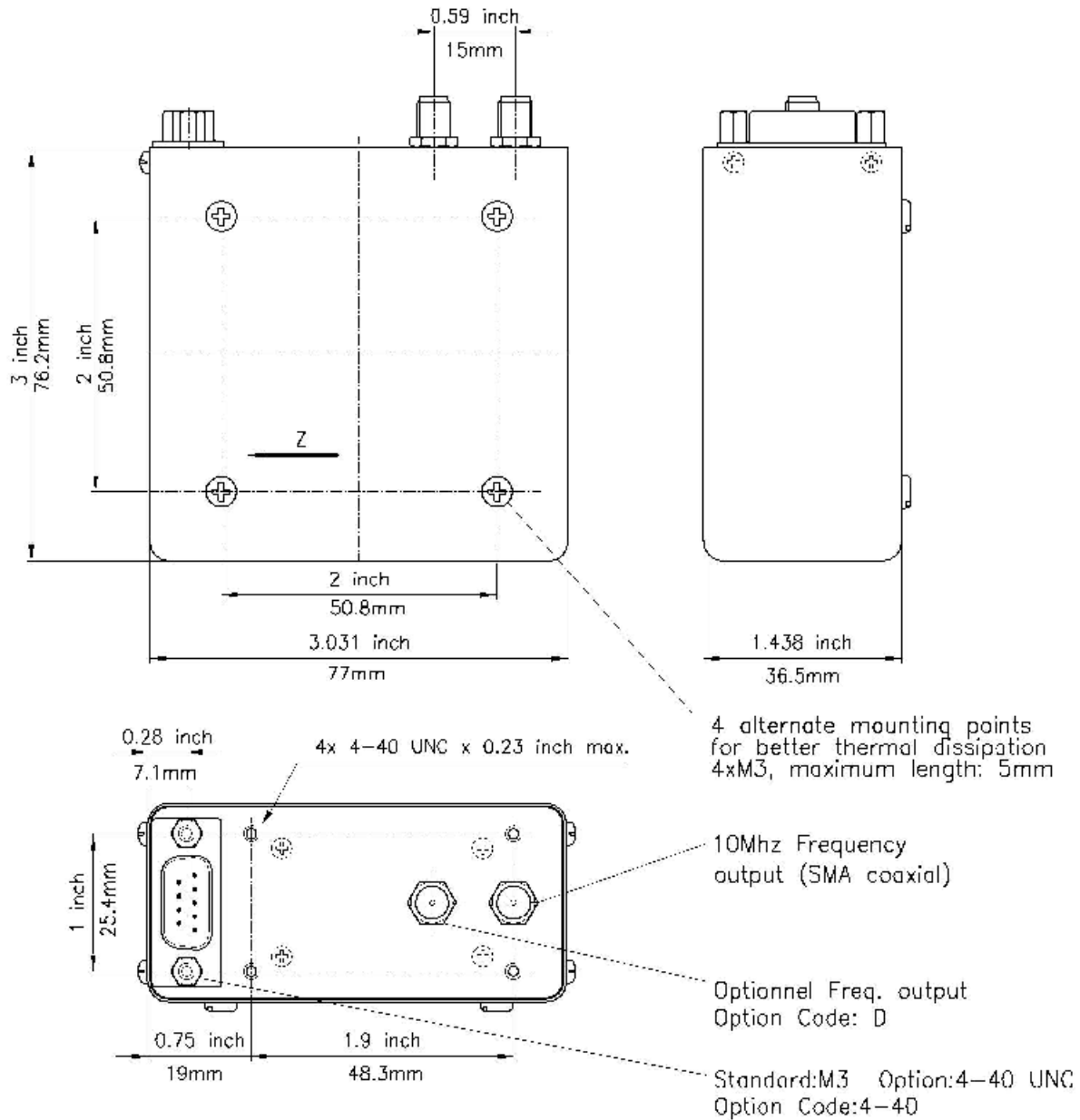
BB: Rb-cell heating current (500mA to 0mA)

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.

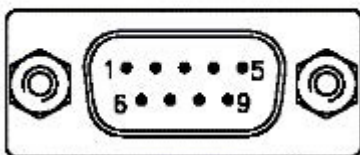
Fxx: output frequency correction through C- field, by steps of 1×10^{-11} , where xx is a signed 8 bits word.

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.)
5	or no connected (option code NOREF) GND
6	TxD (RS232 transmit, TTL)
7	GND
8	Frequency adjust (0 to 5V)
9	RxD (RS232 receive, TTL)

Technical Specifications

ELECTRICAL

Type	LPFRS/AV1		
	Standard version		Options
Frequency	10 MHz		Optional 20 MHz, 15 MHz, 5 MHz
Frequency change within operating temperature range (Thermal chamber with air flow)	<= $\pm 1 \times 10^{-10}$ over -5°C to +55°C		-30 to 70°C (option code E70) -30 to 60°C (option code E)
Frequency Accuracy @ Shipment	< $5E^{-11}$ (+25°C), typical		
Long term stability (Measured after 3 months of continuous operation)	< 5×10^{-11} / month (typical: 3×10^{-11} / month)		< 3×10^{-11} / month < 2×10^{-10} /year (option code A) (typical: $\pm 1 \times 10^{-11}$ / 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 (option code Q3/X)
Frequency retrace (in stable temperature, gravity, pressure and magnetic field conditions)	< 5×10^{-11} within 1 h after 24 h off		
Warm-up time [minutes]	standard version 5×10^{-10} after 15' at +25°C	fast warm-up (option code F) 5×10^{-10} after 7' at +25°C fast warm-up (option code FE) 5×10^{-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) to pin 8. Typically: the cursor pin of a 10kΩ variable resistor connected between pins 4 and 5 can provide this adjustment voltage.	2.5 x 10^{-9} ±20%		Large analog frequency tuning (option code O) 5×10^{-9} ±20% Precise analog frequency tuning (option code G11) 2.5 to 3 x 10^{-9}
Digital frequency adjustment through serial RS-232 port.	$\pm 1.2 \times 10^{-7}$ (resolution: 1×10^{-9}) 2.5×10^{-9} (resolution: 1×10^{-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		
Harmonics	< -25dBc		< -40 dBc (option code X)
Spurious f0 ± 100kHz	< -80dBc		< -110 dBc (option code X)
Sub-harmonics	< -60dBc		< -100 dBc (option code X)
Conformal coating	Yes		
Supply voltage	28V option : 18 to 32 V		12V option : 11.2 to 17 V
Max Power Supply Ripple	< 50 mV peak to peak (from 1Hz to 1 MHz frequency band)		
Supply voltage sensitivity	< 2×10^{-11} for 10% voltage change		
Input power	warm up: typical <20 W at 12 V typical <25 W at 28 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)

Type		LPFRS/AV1			
		Standard version		Options	
Electrical Protection	power +24V (12V) RF output TxD output 5V (Vref) 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 and short-cut protected ESD protected ESD protected Over current protected			
<u>Lock Indicator (pin 3)</u>		<u>Standard</u>	<u>Option LR</u>	<u>Option B</u>	<u>Option BR 5V</u>
L = open collector	locked	Open Closed	Closed Open	< 0.4V 5V	< 0.4V
B = TTL	unlocked				

ENVIRONMENTAL OPERATING

Magnetic field sensitivity	$< 2 \times 10^{-11}$ / Gauss in X and Y axis $< 1 \times 10^{-10}$ / Gauss in Z axis		
Low pressure (altitude)	MIL-STD-810F method 500.4 Limited to 30'000m altitude	Other test method on request	
Operating Temperature	-25°C to +60°C (60°C is the maximal temperature of the thermal chamber with air flow around the unit)	Possible extended operating temp. Up to 70°C (option E70)	
Vibration random	MIL STD 810F method 514.5C-8	Other vibration profile on request	
Humidity	RTCA/DO-160C hot humidity, 35°C, 95% relative humidity	Other test method on request	
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) $< 5 \times 10^{-11}$ / g / all axis	

ENVIRONMENTAL NON OPERATING

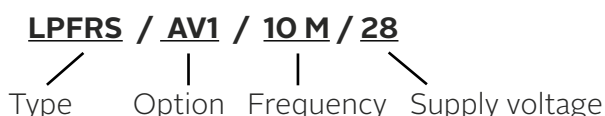
Storage Temperature	Any temperature from -55°C to +85°C		
Shocks	MIL STD 810 + 516.2 /160g, 4ms, half sinus	Other tests method on request	
Humidity	RTCA/DO-160C hot humidity, 35°C, 95% relative humidity	Other tests method on request	
Acceleration	MIL STD 810 method 513.5 procedure I *		

* pending for approval

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	

Ordering Information:



**POWERED
BY TRUST**



Safran Electronics & Defense
safran-electronics-defense.com

