iSource+™ Low Cost LPFRS Spec

High Precision & Performance Source

Applications

Telecom | Navigation | Broadcast | Defense | Instrument

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

Product Characteristics

- Small volume   :13 in^3
- Freq. offset over temp. range   :±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)
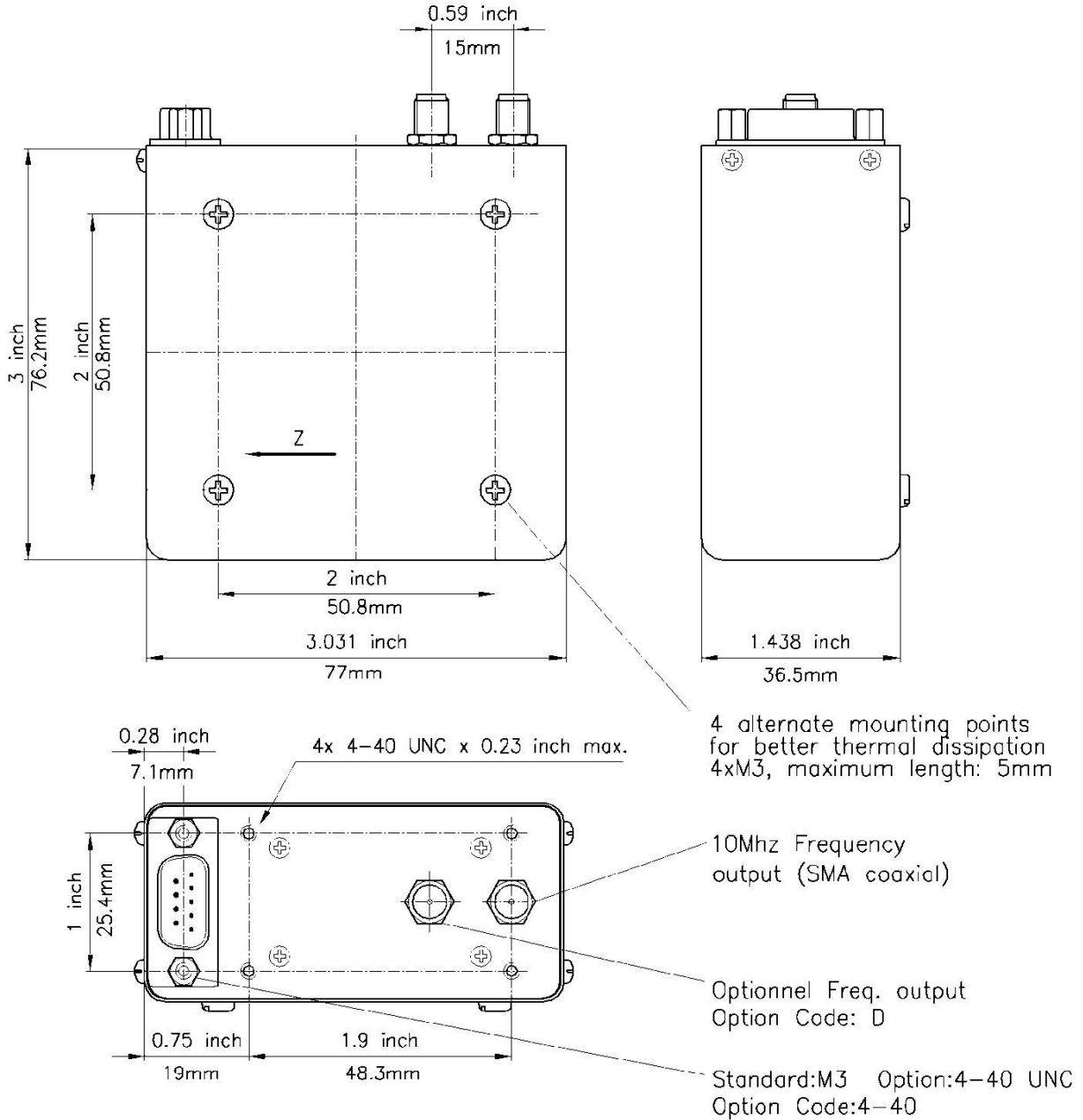
`CC:` Rb-lamp heating current (500mA to 0mA)

`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 x 10^{-9} , where `xx` is a signed 8 bits word. This value is automatically stored in a EEPROM.
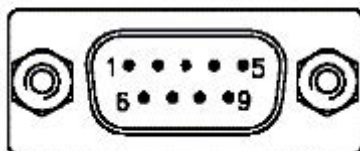
`Fxx:` output frequency correction through C- field, by steps of 1 x 10^{-11} , where `xx` is a signed 8 bits word.

The Global Leader in
Resilient **PNT**

PACKAGE: (all dimensions in inch)

0.59 inch
15mm

3 inch
76.2mm

2 inch
50.8mm

Z

2 inch
50.8mm

3.031 inch
77mm

1.438 inch
36.5mm

4 alternate mounting points
for better thermal dissipation
4xM3, maximum length: 5mm

0.28 inch
7.1mm

4x 4-40 UNC x 0.23 inch max.

1 inch
25.4mm

10Mhz Frequency
output (SMA coaxial)

Optionnel Freq. output
Option Code: D

0.75 inch
19mm

1.9 inch
48.3mm

Standard:M3   Option:4-40 UNC
Option Code:4-40

Connector front view:

D-Sub 9 pins male

PIN	FUNCTION
1	+24V (+12V)
2	OV (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 (O to 5V)
9	RxD (RS232 receive,TTL)

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SPECIFICATIONS

ELECTRICAL

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)*	$\leq \pm 1 \times 10^{-10}$ over -5°C to +55°C < 2×10^{-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)*	$< 5 \times 10^{-11}$ / 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	2×10^{-11} / 1 s 7×10^{-12} / 10 s 2×10^{-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)	-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)*	$< 5 \times 10^{-11}$ 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) 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).	2.5×10^{-9} ±20%	$5 \times 10^{-9} \pm 20\%$ (option code O) $3 \times 10^{-8} \pm 20\%$ (option code O2) $6 \times 10^{-9} \pm 20\%$ (option code O1) Precise analog frequency tuning **(option code GI1)** 2.5 to 3×10^{-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		
		@10 MHz	@5 MHz
Harmonics	< -25dBc	< -40 dBc **(option code X)**	< -40 dBc
Spurious f_o ± 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	**12V option** : 11.2 to 17 V	**28V option** : 22.5V to 32 V
	< 50 mV peak to peak (from 1Hz to 1 MHz frequency band)		
Supply voltage sensitivity	$< 2 \times 10^{-11}$ for 10% voltage change	$< 1 \times 10^{-11}$ 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) L = open collector B = TTL	Standard	Option LR	Option B	Option BR
locked	Open	Closed	< 0.4V	5V
unlocked	Closed	Open	5V	< 0.4V

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) $< 2 \times 10^{-11}$ / 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	$< 1 \times 10^{-10}$ 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
Vibration Sensitivity	-	$< 1 \times 10^{-9}$ / 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