The Global Leader in Resilient **PNT**

iSource+® Space- LNMO Short Spec

Space Low Noise & Performance Source

The LNMO is a cost-effective, high-performance master crystal oscillator. It's designed with long-lifetime, high-reliability technology for advanced space applications.

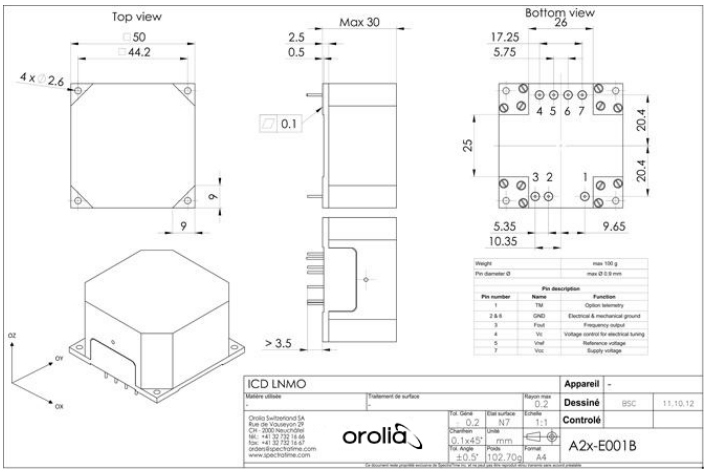
Key Features

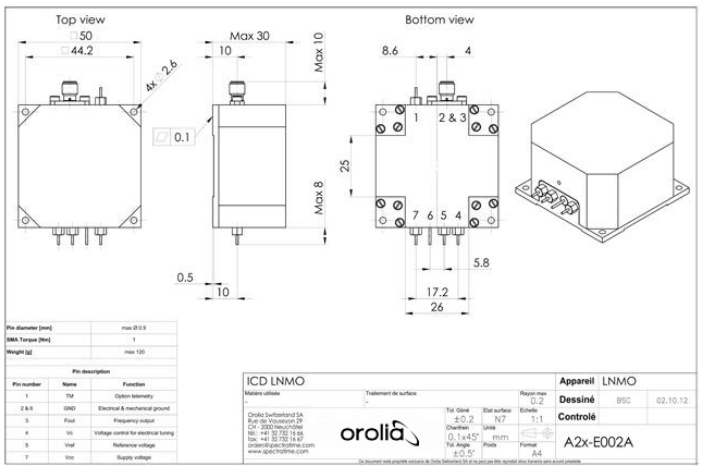
- Very small mass and volume
- Low noise
- Low power consumption
- Low temperature sensitivity
- Excellent short and long term stability
- Fast warm-up
- Wide operating temperature
- Pre-adjusted frequency and/or voltage controlled
- Frequency Range: 5MHz to 40MHz
- Supply voltage: 12V or 15V
- Rad tolerant up to 100krad

Applications

Navigation | GPS receivers | Down and Up Converters | Transponders | FGU | Board Calculator | Synthesizer | SAR

LNMO external dimensions (2 versions available)





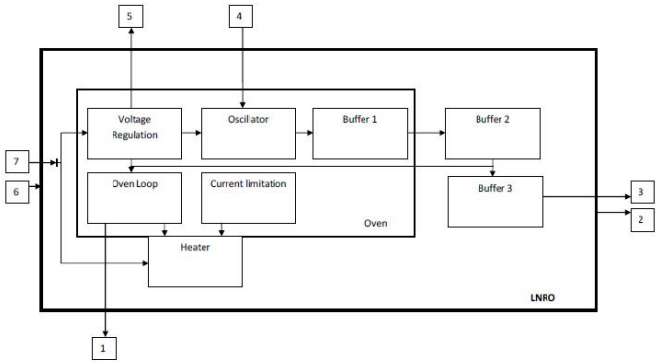
SPECIFICATIONS

Type	A2x-S001 at 10MHz		
Parameter	Value		
Dimensions	50x50x30 mm		
Output signal frequency	10 MHz*		
Frequency long term stability, 1st year Average ageing per day after 1 month	< ±3x10^{-8} / year < ±1x10^{-10} / day		
Frequency long term stability, years after	< ±1x10^{-8} / year		
Frequency short term stability	< 1x10^{-12} (0.1-10 s)		
Frequency stability over full temp. range	< ± 1x10^{-9}		
Frequency adjustment	> ± 2.5 Hz		
SSB phase noise assuming 10MHz carrier 1 Hz 10 Hz 100 Hz 1000 Hz 10000 Hz	ULN (dBc/Hz) < -110 < -140* < -150* < -160 < -168	LN (dBc/Hz) < -105 < -135* <-145 < -155 < -165	Standard (dBc/Hz) < -100 < -130* < -140 < -150 < -160
	* Subject to export control (end user statement required)		
Output signal level	7 dBm ± 1 Up to 10 dBm on request		
Output impedance	50 Ω ± 10%		
Harmonics	-40 dBc		
Spurious signals	-120 dBc		
Power consumption during warm-up	Standard 4W	Fast 6W	
Nominal power consumption	1.5 W		
Maximum power consumption in operation	2.5 W		
Volume	< 75 cm^3		
Power supply	12 V	15V	
Warm-up time (accuracy < ±2x10^{-8} at 25°C)	Standard 10 minutes	Fast 5 minutes	
Mass	100 gr		

Connection: Power, RF Output, Control voltage, Ref Voltage, TM	7 solderable pins or 5 solderable pins +SMA		
Mechanical interface Mechanical fixation	flat base plate 4 x M2 screw		
Max. base plate operating temperature	70 °C	60°C	50°C
Min. base plate operating temperature	-30°C	-20°C	0°C
Storage temperature	-40 to 85 °C		
First natural resonance	> 800 Hz		
Random Vibration tested, with axis perpendicular to the mounting plane. 20 - 100 Hz 100- 500 Hz 500- 2000 Hz Duration	+9dB/oct 1 (1.5) g^2/Hz** -6 dB/oct 60 (180) sec/axis**		
Random Vibration tested, with axis parallel to the mounting plane. 20 - 1000 Hz 1000 - 2000 Hz Duration	0.14(0.22) g^2/Hz** -6 dB/oct 60 (120) sec/axis**		
Sinusoidal vibration 5 - 20 Hz 20 - 100 Hz Sweep rate	11 mm 0-peak 25 g 2(1) oct/min.**		
Life time / MTBF	15 years/9 Mio hrs		
Pressure sensitivity vacuum to atmosphere (thermal effect)	< ±5 x 10^{-8} @25°C		

* Other frequencies (5 MHz to 40 MHz) and related specifications available upon request.
** Values in brackets only applicable for qualification testing

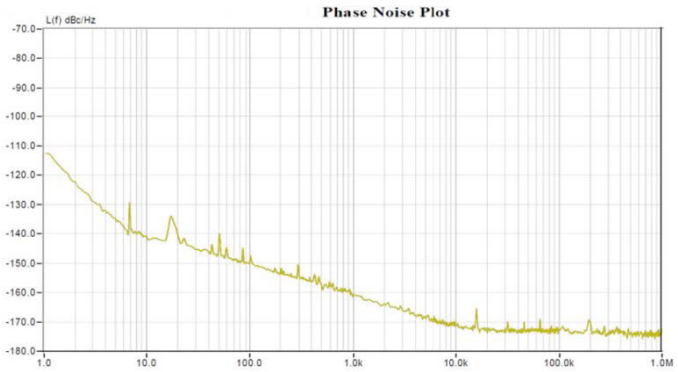
FUNCTIONAL BLOCK DIAGRAM OF THE LNMO



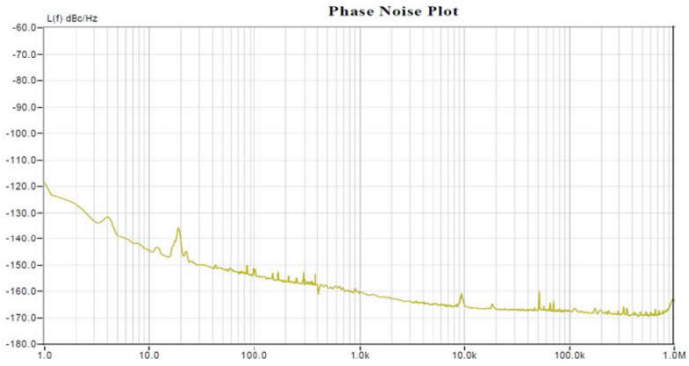
1. Optional telemetry output
2. RF GND output
3. RF output
4. Control voltage input
5. Voltage reference output
6. Supply GND input
7. Supply Voltage input

Typical LNMO Phase Noise

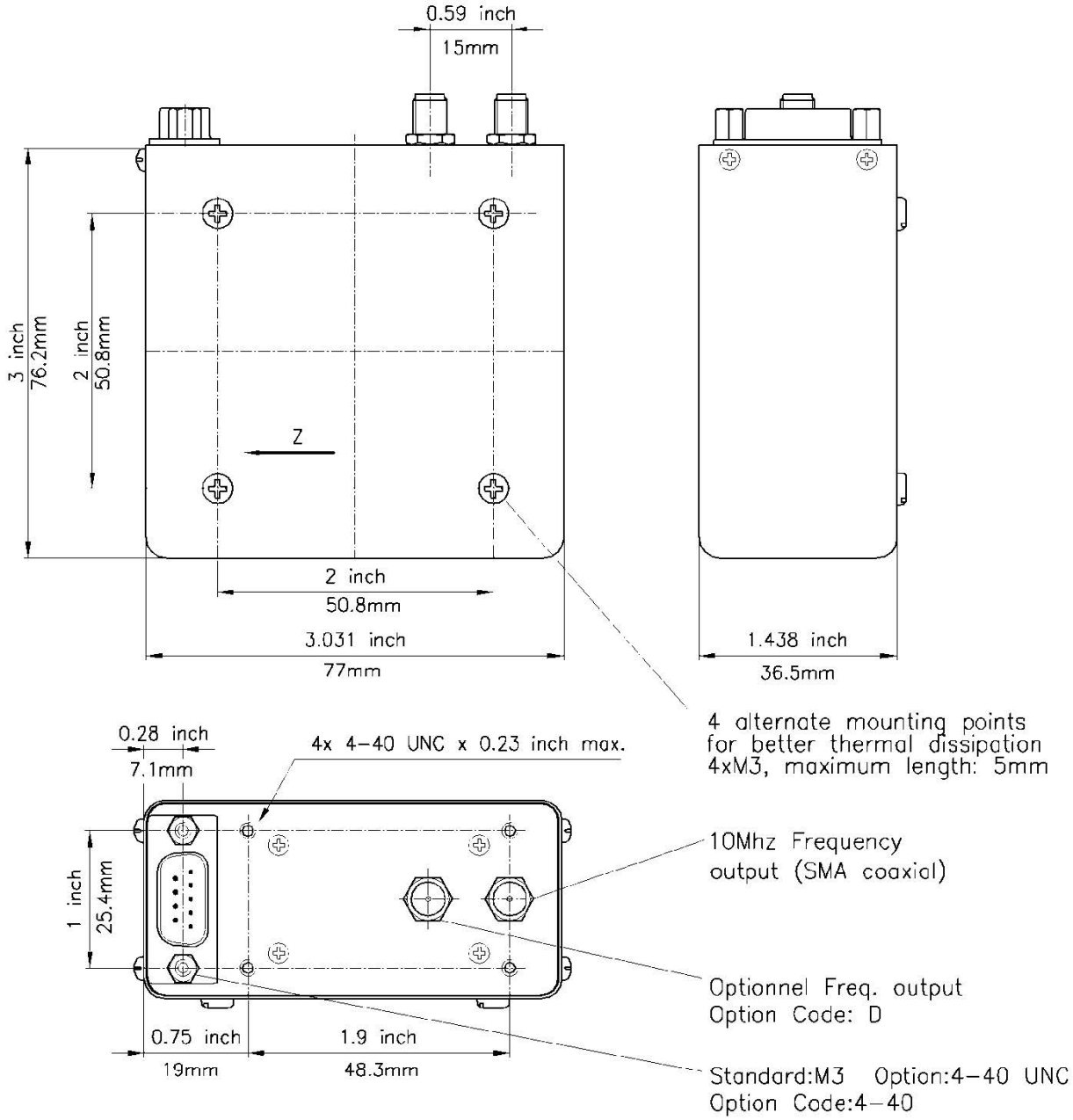
LNMO Phase noise at 10MHz



LNMO Phase noise at 5 MHz

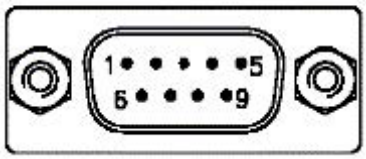


PACKAGE: (all dimensions in inch)



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)

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)*	<= ± 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		
Harmonics	< -25dBc	< -40 dBc **(option code X)**	
Spurious f_0 ± 100kHz	< -80dBc	< -110 dBc **(option code X)**	
Sub-harmonics	< -60dBc	< -100 dBc **(option code X)**	
Conformal coating	Yes		
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) 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			
Lock Indicator (pin 3) L = open collector B = TTL	Standard locked Open unlocked Closed	Option LR Closed Open	Option B < 0.4V 5V	Option BR 5V < 0.4V

ENVIRONMENTAL OPERATING

Magnetic field sensitivity	< 2 x 10^{-11} / Gauss in X and Y axis < 1 x 10^{-10} / Gauss in Z 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)**
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

18 January, 2021. iSource+™ Low Cost LPFRS Spec