The Global Leader in Resilient **PNT**

iSource+® StarLPRO-1500 Spec

High Precision & Performance Rubidium Source

Applications

Telecom | Navigation | Broadcast | Defense | Instrument

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

Smart StarLPRO-1500

- Ultra low aging : < $2E^{-12}$/ day
- Freq. offset over temp. range : < 2 E^{-10} over 0°C to 60°C
- Short-term stability : $1E^{-12}$ @ 100s
- Small volume : 28 in^3 (5x3.74x1.5" / 128x95x38.1mm)
- Single power supply voltage : 12V or 24V
- RS232 standard interface : Control & monitoring commands, 9600 b/s

SPECIFICATIONS

ELECTRICAL

Spec	StarLPRO-1500			
Type	**Standard**	**Options**		
RFOUT Frequency	10 MHz	Not applicable		
Frequency Change Operating temperature range *(Thermal chamber with air flow)*	< $2E^{-10}$ -0°C to +60°C	+- $1E^{-10}$ **(order code: 60)**		
Frequency Accuracy @ Shipment	< $5E^{-11}$ (+25°C), typical			
Aging *(After 3 months of continuous operation)*	< $5E^{-11}$ / month (typical: $3E^{-11}$ / month)	< $3E^{-11}$ / month < $2E^{-10}$ / year < $1E^{-9}$ / 10 years (order code: A) (typical: ±$1E^{-11}$ / month)		
Short Term Stability 1s 10s 100s	 2E-11 $8E^{-12}$ $3E^{-12}$	Improved Short term stability (order code: S) $1E^{-11}$ $3E^{-12}$ $1E^{-12}$		
Phase Noise (dBc/Hz) *(RFOUT 10 MHz)* 1 Hz 10 Hz 100 Hz 1k Hz 10K Hz	 -75 -95 -125 -145 -150			
Frequency Retrace Off/On *(In stable temperature, gravity, pressure & magnetic field conditions)*	< $5E^{-11}$ 24 hr / 1 hr			
Warm-up Time @ +25°C Frequency stability	12 min $5E^{-10}$	Lock < 7min **(order code: F)**	Lock < 5min **(order code: FE)**	25 min 5E-10 **(order code: LP)**
Analog Frequency Adjustment Range Tolerance *[An external voltage (0-5 VDC) can be applied to pin 7 (V adjust). And internal mechanical adjustment by screwdriver*	5 x 10^{-9} ±20%			
Digital Frequency Adjustment Range Resolution *(Through RS-232 commands)*	±$1.67E^{-8}$ $5.12E^{-13}$			
RFOUT Output level Output impedance Harmonics Spurious f_o ± 100kHz	 Sine wave 0.5 Vrms (± 10% / 50Ω) 50 Ω ±20% < -40dBc < -80dBc			
Communication Interface Protocol speed	RS-232 control & monitoring (see commands below) 9600, n, 8, 1			

Spec	StarLPRO-1500			
Type	**Standard**	**Options**		
Supply Voltage (DC)	24V (20 to 32 V)	12V (11.2 to 16 V) **(order code: 12V)**		
Max Power Supply Ripple	< 50 mV peak to peak (from 1Hz to 1 MHz frequency band)			
Supply Voltage Sensitivity	< $2E^{-11}$ for 10% voltage change			
Input Power		with the following options:		
Warm up @+25°C (typical) 0°C +25°C +60°C	<30W @12V or <38W @ 24V <14 W < 11 W < 7 W	(F/E) <40 W (24V only)	(FE) <50 W (24V only)	(LP) <24W
		Option GPS : +2W		
Lock Monitor : 5V CMOS LOAD (output impedance ~ 1KΩ)	Lock: < 0.5V	Unlock: > 4.2V		
Conformal coating	None	Included (order code: CC)		
Reverse Voltage Protection	< -40V (up to -40V on power input / no damage)			
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			

ENVIRONMENTAL

Spec	StarLPRO-1500
Type	**Standard**
Magnetic Field Sensitivity	< $2E^{-11}$ / Gauss (< $1E^{-10}$ / Gauss in longitudinal axis)
Storage Temperature	- 55°C to + 85°C
Humidity	GR-CORE-63, Section 5.1.2
Operating Vibration	GR-CORE-63, Section 5.4.2 Random and Sinusoidal MIL-PRF-28800F, Class 3, 4
Shock	Survival: 40g / 11ms
Helium concentration sensitivity	< $1E^{-10}$ per ppm of Helium concentration change
G-Tip-Over Test	< $2E^{-10}$ / g in worst axis

PHYSICAL

Spec	StarLPRO-1500	
Type	**Standard**	**Options**
Size (L x W x H)	5x3.74x1.5" / 128x95x38.1mm	
Weight	234g (8.25oz)	
Mounting & Mechanical Layout Screw fixture type (6 pieces)	see drawings below UNC-4-40	Not applicable M3 (order code: M3)
Connector	10 pins male TE-Connectivity 87456-6 Contacts AWG20 TE-Connectivity 86016-5	

MODEL ORDERING INSTRUCTIONS

StarLPRO-1500 / 10M / 12V / xx

Type Frequency Supply voltage Options (A/S/etc)

STANDARD RS-232 CONTROL & MONITORING COMMANDS

The operating and monitoring parameters of the StarLPRO-1500 are accessible for read and write operations through the serial RS-232 port (9600 bits/sec., no parity, 1 start bit, 8 data bits, 1 stop bit).

There are 2 basics commands, which are `M, Cxxxx`

`M<CR><LF>:` monitors the basic internal signals of the atomic clock.

The returned answer looks like

`HH GG FF EE DD CC BB AA <CR> <LF>`

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

`HH:` Read-back of the user provided frequency adjustment voltage on pin 2 (0 to 5V)

`GG:` reserved

`FF:` peak voltage of Rb-signal (0 to 5V)

`EE:` DC-Voltage of the photocell (5V to 0V)

`DD:` varactor control voltage (0 to 5V)

`CC:` Rb-lamp heating current (Imax to 0)

`BB:` Rb-cell heating current (Imax to 0)

`AA:` reserved

`Cxxxx<CR><LF>:` output frequency adjustment through the synthesizer, by steps of 5.12 x 10^{-13}, where xxxx is a signed 16 bits word in hexa coded ASCII. This value is automatically stored in a EEPROM as last frequency which is applied after RESET or power-ON operation.

In Track mode this correction is not in use. The function **FC**sddddd do the same.

Set frequency adjustment	**FC**sddddd<CR><LF>	s=+/- signe ddddd = limited within range : +32767/-32768 FC+99999 : interrogation	sddddd<CR><LF>	s: +/- signe ddddd : frequ. Adj. in 5.12 x 10^{-13} step

PIN-OUT COMPARISON DESCRIPTION

PIN FUNCTION LAYOUT

	LPFRS-01/LPRO TEMEX			LPRO DATUM		
	Parameter	Requirements		Parameter	requirements	
Interface Circuits connector : (10 pin contact two rows)	Pin 1(output)	10 Mhz RF	Interface Circuits connector : (10 pin contact two rows)	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	>1.5x10^{-9} to 5V <-1.5x10^{-9} to 0V		Pin 7(input)	>1.5x10^{-9} to 5V <-1.5x10^{-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	

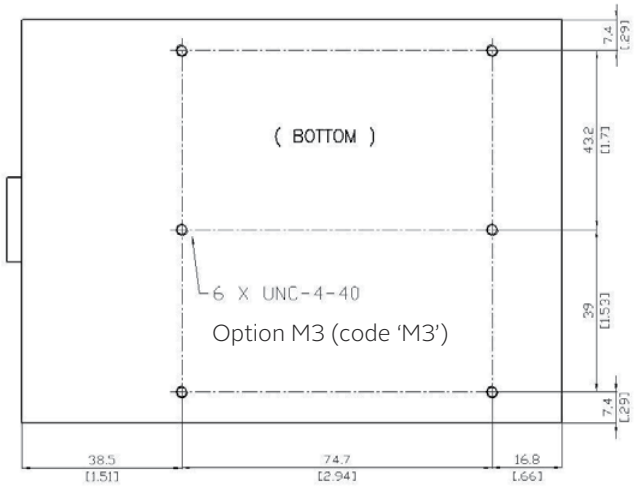
HEAT SINK MOUNTING

Below are some heat sink options depending on your environmental system configuration:

1. Mount the StarLPRO-1500 on a copper ground PCB. This mounting configuration is not recommended for >50°C ambient operational temperature.
2. Mount the StarLPRO-1500 against a system chassis using the UNC 4-40, Option M3 (code 'M3') screws with the provided thermal pad or thermal paste in between and wire bridge the connector. This mounting configuration is recommended.
3. Mount a radiator on top of the StarLPRO-1500 with the provided thermal pad or thermal paste in between, if no base plate or system chassis is available. This mounting configuration is recommended.

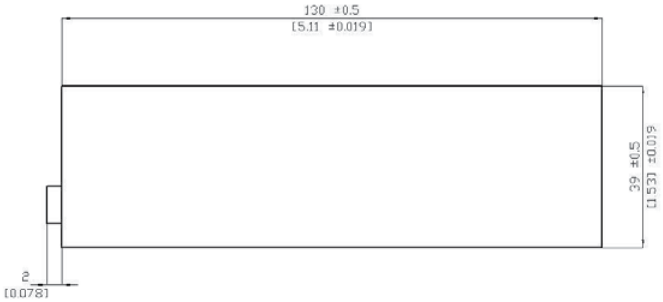
For any heat sink mounting questions, best practices or recommendations, please feel free to contact us at sales@spectratime.com

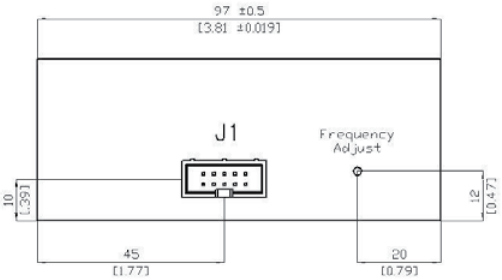
MECHANICAL DRAWINGS



Maximum lenght of the fastening screws :
For UNC-4-40 : 0.1968"
For M3 : 5 mm

00 [0.00] Dimension are in mm
Dimension are in inche





Connector front view: