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 in³
- 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 $1 \times 10^{-9}$, 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 $1 \times 10^{-11}$, where xx is a signed 8 bits word.
**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)

**PACKAGE:** (all dimensions in inch)

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

10Mhz Frequency output (SMA coaxial)

Optionnel Freq. output Option Code: D

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

Connector front view:

D-Sub 9 pins male
## SPECIFICATIONS
### ELECTRICAL

<table>
<thead>
<tr>
<th>Type</th>
<th>LPFRS-O1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Accuracy @ Shipment</td>
<td>&lt; 5E-11 (+25°C), typical</td>
</tr>
<tr>
<td>Frequency</td>
<td>10 MHz</td>
</tr>
<tr>
<td>Frequency change within operating</td>
<td>&lt;= ± 1 x 10^-10 over -5°C to +55°C</td>
</tr>
<tr>
<td>temperature range (Thermal chamber with air flow)</td>
<td>-30 to 70°C (option code E70)</td>
</tr>
<tr>
<td>Frequency change within operating</td>
<td>&lt;= ± 1 x 10^-10 over 0-65°C</td>
</tr>
<tr>
<td>temperature range (Thermal chamber with air flow)</td>
<td>-30 to 60°C (option code E)</td>
</tr>
<tr>
<td>Long term stability (Measured after 3 months of continuous operation)</td>
<td>&lt; 3x10^-11 / month (typical: 3x10^-11 / month)</td>
</tr>
<tr>
<td>Frequency retrace</td>
<td>&lt; 5 x 10^-11 within 1 h after 24 h off</td>
</tr>
<tr>
<td>Warm-up time [minutes]</td>
<td>standard version: 5 x 10^-10 after 15' at +25°C</td>
</tr>
<tr>
<td>Analog frequency adjustment</td>
<td>2.5 x 10^-9 ±20%</td>
</tr>
<tr>
<td>Precision analog frequency tuning</td>
<td>2.5 to 3 x 10^-9</td>
</tr>
<tr>
<td>Digital frequency adjustment through</td>
<td>±1.2 x 10^-7 (resolution: 1 x 10^-9)</td>
</tr>
<tr>
<td>serial RS-232 port.</td>
<td>2.5 x 10^-4 (resolution: 1 x 10^-11) ±20%</td>
</tr>
<tr>
<td>Output level</td>
<td>Sine wave 0.5 Vrms +10%, 50 Ω</td>
</tr>
<tr>
<td>&gt;Number of output(s)</td>
<td>Single output</td>
</tr>
<tr>
<td>Return loss</td>
<td>-20 dB</td>
</tr>
<tr>
<td>Harmonics</td>
<td>&lt; -25dBc</td>
</tr>
<tr>
<td>Spurious f_o +100kHz</td>
<td>&lt; -80dBc</td>
</tr>
<tr>
<td>Sub-harmonics</td>
<td>&lt; -60dBc</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>24V option: 18 to 32 V</td>
</tr>
<tr>
<td>Max Power Supply Ripple</td>
<td>12V option: 11.2 to 17 V</td>
</tr>
<tr>
<td>Supply voltage sensitivity</td>
<td>&lt; 1 x 10^-11 for 10% voltage change</td>
</tr>
<tr>
<td>Input power</td>
<td>&lt; 2 x 10^-11 for 10% voltage change</td>
</tr>
</tbody>
</table>
## 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 protected
- ESD protected
- Over current protected

## Lock Indicator (pin 3)
- Standard: Open
- Option LR: Closed
- Option B: < 0.4V
- Option BR: 5V
- Option B: < 0.4V

### Lock Indicator
- L = open collector
- B = TTL

### Standard
- Locked
- Unlocked

### Options
- LR
- B
- BR

## 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\(^{-10}\) / 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 Environmental 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
- 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 x 77 x 36.5mm. (3.0 x 3.03 x 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

www.orolia.com
sales@orolia.com