



RELIABLE

# RUBIDIUM

AFFORDABLE

HIGH PERFORMANCE

**A new standard**  
of synchronization performance

 **datum inc**

# Introducing the X72 Rubidium atomic oscillator

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The new Datum X72 offers nothing less than a revolutionary advance in physics miniaturization and integration. It delivers an unequalled blending of ultra-compact design, a wide temperature range and low power consumption. Now superior Rubidium performance is available for a whole new world of frequency reference and synchronization applications, along with stability for the life of your network without recalibration. All at a cost that's comparable to quartz.

## **Get an edge on the market in price and performance.**

We understand the pressures you face in providing low-cost, reliable and competitive designs. Our X72 delivers the superior performance and lifetime-cost benefits of rubidium oscillators, combined with flexibility, extreme operating ranges, reliability and low cost — everything it takes to ensure project success. You also can say goodbye to the frequency hops, rapid aging, bad retrace and frequent recalibration that comes with traditional solutions.

## **Full temperature spectrum performance sets a new standard for precision atomic references.**

We've merged the benefits of breakthrough physics integration with the stability characteristics of Rubidium atomic resonance. As a result, the X72 is capable of excellent frequency



control, even at temperatures well above those troublesome to ovenized quartz crystal oscillators. You can count on it for accuracy with full spectrum performance from +85°C to -40°C, within any environment.

## A multitude of frequencies and characteristics for any network environment.

The X72 can be disciplined by a precision 1 PPS reference like GPS and can operate on its own as a precision stand-alone reference. Outputs include a 1 PPS, and Datum offers a variety of application-specific tracking algorithms, all of which are the culmination of thirty years of timing and synchronization experience and expertise. We even can incorporate your customized tracking algorithm within the X72 unit.

## Communication is a key to our success.

Utilizing its serial port, the X72 provides dynamic frequency control and selection and can enable or disable outputs as well. It also can provide information such as serial number, operating hours, operating temperature, event history, self-test and other vital performance indicators.

## Want independent, stand-alone, maintenance-free synchronization? Get it from Datum.

We give you Stratum 2 performance with network-wide synchronization. And unlike service providers who rely on major telecom operators for their references, the holdover characteristics of the X72 eliminate the need to trust your network to anyone else's synchronization device. All things considered, you won't find an easier or more cost-effective way to build reliability and redundancy throughout an entire CDMA or WCDMA network.

**The Datum X72 offers an array of technological advances and user benefits, including Rubidium atomic stability at a cost that's close to quartz.**

- Eliminates the need for expensive, time-consuming recalibration.
- Built to withstand the rigors of even the most demanding CDMA and WCDMA networks.



- Datum Serial Interface Protocol makes command, control and monitoring simpler than ever.
- Ultra-compact dimensions (0.70 in x 3.00 in x 3.50 in) (17.7 mm x 76 mm x 89 mm).
- Full temperature spectrum performance (+85°C to -40°C).
- Low power operation at: +5V or +10V to +32V.

**The X72 delivers superior performance in a wide range of applications.**

<b>Broadcasting</b>	CATV HDTV DBS DAR	<b>Wireless</b>	3G/PCS Cellular WLL Geo-Location Mobile Radio Paging
	<b>PSTN</b>		ATM XDSL PBX SDH SONET ISDN



# TECHNICAL SPECIFICATIONS

## ELECTRICAL SPECIFICATIONS

Technical specifications subject to change without notice. Contact Datum for latest information.

### • Frequency Outputs:

XO*	Sine	Square Wave*	1 PPS*
60 Mhz	5, 10, 15 MHz	5, 10, 15 MHz	yes
52 MHz	13 MHz	13 Mhz	yes
61.44 MHz	10.24 MHz	2.048 MHz	yes

\* digital

Typical factory settings. Other standard telecom frequencies available. All frequency outputs are programmable to off or enabled.

### • Sine Output (1):

- **Power:** 7.8 dBm  $\pm$  10% into 50 $\Omega$
- **Phase Noise:**

10 Hz	<-90 dBc/Hz
100 Hz	<-128 dBc/Hz
1 kHz	<-140 dBc/Hz
10 kHz	<-147 dBc/Hz
- **Spurious:**

Harmonic:	<-60 dBc
Non-harmonic:	<-60 dBc

### • Digital Outputs (2):

- **Jitter:** <10 ps RMS
- **Stability:**

t=1 seconds	<3E-11
t=10 seconds	<1E-11
t=100 seconds	<3E-12
- **Accuracy At Shipment:**  $\pm$ 5E-11 (25°C), typical
- **Retrace:**  $\pm$ 2E-11 (on-off-on: 24h-48h-12h@25°C)
- **Control Range:**  $\pm$ 2E-6 with granularity of 2E-12  
Analog Input: 0-5 V into 5kOhms, range settable  
Serial: DSIP

### • Warm-up Time:

- Time to lock: 4 minutes
- Time to <1E-9: 7.5 minutes
- **Supply Voltages:** +5 Vdc  $\pm$ 10% or 10 to 32 V
  - Warmup: 17 W max
  - Operating: 7 W

### • Emissions/Susceptibility:

- Meets applicable CE and FCC requirements
- **Test/Status:** Built-In Self-Test (BIST)  
ACMOS: Service / Fault-Unlock  
Serial: DSIP

### • Reliability

Benign, ground: MTBF: 600,000 hrs

### • Performance Levels:

	Aging	Temp. Coefficient
Application profile 1	<5E-11/month	<1E-10 [-40°C, 85°C]
Application profile 2	<3E-11/day or <2E-10/month	<2E-10 [0°C, 70°C]
Application profile 3	<5E-8 over 20 years	[-40°C, 85°C]

## ENVIRONMENTAL SPECIFICATIONS

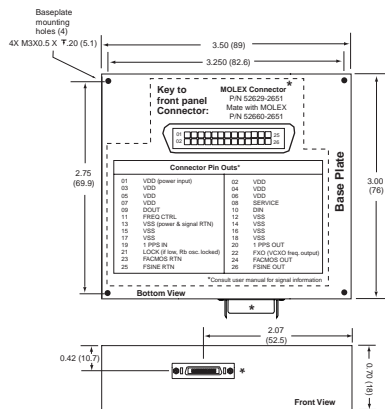
- **Operating Temperature:** -40°C to +85°C baseplate
- **Magnetic Field Sensitivity:** dc ( $\pm$ 2 GAUSS)  $\pm$ 4E-11/GAUSS
- **Humidity:** GR-CORE-63, <5 to 90%, RH Non-condensing
- **Vibration:**
  - Operating: GR-CORE-63, 4.5.2/4, locked to 1.0 g
- **Storage and Transport:**
  - Temperature: -55°C to +85°C
  - Shock/Vibration: GR-CORE-63 4.4.1 to 1.5 g

## PHYSICAL SPECIFICATIONS

- **Weight:** 7 oz (200 g)
- **Size:** 3.5" L X 3.0" W X 0.70" H  
(89 mm x 76 mm x 17.7 mm)
- **Volume:** 7.6 cu. in. (124 ml)
- **Warranty:** Electronics: 1 year; Rb lamp & cell: 20 years

**NOTES:** Consult factory for application support, test reports or special requirements. DSIP is the Datum Serial Interface Protocol.

Unless otherwise noted, values are typical, at 25°C and nominal voltage.



### CONNECTOR PIN OUTS

01 VDD (+power input)	02 VDD
03 VDD	04 VDD
05 VDD	06 VDD
07 VDD	08 SERVICE
09 DOUT	10 DIN
11 FREQ CTRL	12 VSS
13 VSS (-power & signal RTN)	14 VSS
15 VSS	16 VSS
17 VSS	18 VSS
19 1 PPS IN	20 1 PPS OUT
21 LOCK (if low, Rb osc. locked)	22 FXO (VCXO freq. output)
23 FACMOS RTN	24 FACMOS OUT
25 FSINE RTN	26 FSINE OUT



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