

Features

Compact, Robust & Lightweight
Easy Handling
Multiple Frequency Outputs
GPS/Caesium reference inputs with auto-calibration feature
1 PPS Output
1 PPS Synchronization Input



RUBIDIUM PRODUCTS

Modules, Instruments and Militarized Components

RubiSource® T&M



Overview

The RubiSource® T&M is a portable timing reference based on Datum's well known rubidium oscillator technology for universal use in test and measurement applications. A variety of coherent standard frequencies are provided:

- Sine wave 10 MHz, 5 MHz & 1 MHz
- Square wave 10 MHz & 5 MHz

The RubiSource® T&M's 1PPS output signal provides exact timing information. This output can be synchronized to an external 1PPS input signal.

The reliable output signals are based on the highly accurate and stable rubidium oscillator inside. The rubidium's fast warmup eliminates the need for bulky backup batteries.

The RubiSource® T&M can be locked to an external primary source such as a GPS receiver or caesium Standard for automatic frequency calibration of the rubidium oscillator and/or enhancing the intrinsic rubidium accuracy to near-caesium quality.



Timing, Test & Measurement

Portable Rubidium Test & Measurement Source



Specifications

ELECTRICAL SPECIFICATIONS

Output

- 1 x sine wave 1 MHz, 1Vrms into, 50 Ω , BNC
- 1 x sine wave 5 MHz, 1Vrms into, 50 Ω , BNC
- 1 x sine wave 10 MHz, 1Vrms into, 50 Ω , BNC
- 1 x square wave, minimum 2.4 V into 50 Ω , BNC (factory setting: 10 MHz TTL)*
- 1 x square wave, minimum 2.4 V into 50 Ω , BNC (factory setting: 5 MHz TTL)*
- 1 x square wave 1 PPS (pulse length typical 10 us), minimum 2.4 V into 50 Ω , BNC

*User Configurable to

- 10 MHz TTL
- 5 MHz TTL
- 1 MHz TTL
- 8 kHz TTL
- 100 Hz TTL
- 1 PPS (pulse length typical 10 us)

Accuracy

Frequency accuracy (factory shipment): $\pm 5E-11$ @ 25°C

Internal Time Base

Datum's Rubidium Oscillator

Aging

- < 5E-11/month
- < 1E-9 over 10 years

Input

- 1 x external reference signal, BNC/50 Ω
 - sine wave or square wave 5 MHz or 10 MHz
 - signal levels: 1 Vrms $\pm 10\%$ or TTL min. 2.4 V/max. 5V, MTIE (200S) < 1 ns
- 1 x GPS disciplined frequency signal from Datum's GPS FC product, TNC/50 Ω
- 1 x 1 PPS signal, BNC/50 Ω
 - square wave 1 Hz $\pm 1E-8$, 1—10 Vpp, pulse length minimum 150 ns, slope < 15 ns

ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

MTBF Values

65,000 hours (Based on Field-Experience)

Standards

- EN 61326-1:1997
- EN 61010-1:1993

Calibration Input

- 1x auto-calibration input: 10/5 MHz (LED status of external calibration)
- 1x input reference: Datum's GPS-FC product

Power Supply

- | | |
|---------------------|---------------------------------------|
| Voltage | 100-240 Vac, 50-60 Hz |
| Current Consumption | Maximum 1.0A |
| Power Consumption | Typ. 30 W at 230 VAC, 22 W at 110 VAC |

Size (WxHxD)

10.24 x 4.72 x 14.37 inch (260 x 120 x 365 mm)

Weight

9.5 lbs. (4.3 kg) Nominal

Options

- | | |
|---------------------|----------------------------|
| Power Supply | |
| Voltage | Nominal 24 VDC, +20-30 VDC |
| Current Consumption | Maximum 2.5 A |

Accessories

- Datum GPS-FC 10MHz product (P/N 84000000) including mounting parts (see inset below on page 91)
- Transport Case (P/N 81700001)
- Interface Cable (RubiSource T&M / GPS-FC)
 - Cable Length 25m (P/N 45400710)
 - Cable Length 50m (P/N 45400720)(note: with cable type RG58 up to 250m available)
- Balun Transformer (see inset on page 91)

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Specifications subject to change without notice.

Portable Rubidium Test & Measurement Source

Functional Features

Applications

The sine wave and square wave outputs of the RubiSource® T&M are typically provided for metrology and calibration laboratory equipment such as:

- Universal Counter
- Spectrum Analyzer
- Synthesized Signal Generator

Operation With Other Datum Products

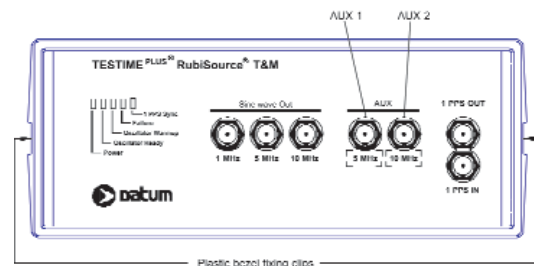
The RubiSource® T&M has one reference input specifically designed for easy connection to Datum's GPS-FC to provide exact GPS timing information (see inset below).

Automatic Frequency Adjustment

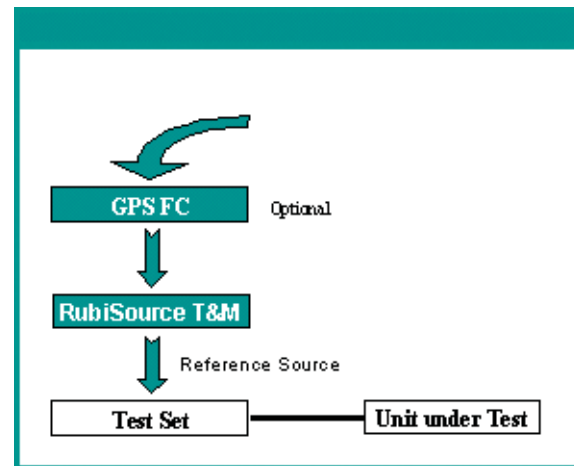
Calibration of the RubiSource® T&M has been made extremely simple. There is no need for external frequency difference meters or phase comparators. Just connect a 5 MHz or 10 MHz reference signal from a primary standard (Cesium, GPS disciplined rubidium) to the rear panel input. The RubiSource® T&M will automatically sense the signal, evaluate its stability and slowly (typically within 10 minutes) tune the output signals to a frequency accuracy of $<2E-11$. The unit will continue to operate with the excellent performance of the internal rubidium oscillator until a new calibration cycle is started. The calibration parameters will be retained in a non-volatile memory.

By connecting Datum's smart GPS antenna (GPS-FC) the RubiSource® T&M can serve as a GPS disciplined frequency standard exceeding even the long-term frequency accuracy of caesium.

Automatic frequency adjustment can be disabled with a recessed slide switch. Switch tampering can be prevented by placing a calibration sticker across its access opening.



Front View



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The Datum GPS-FC GPS Frequency Controller is a very compact GPS-disciplined low cost frequency system. This smart system makes use of the accurate GPS timing signals and generates high performance frequencies.



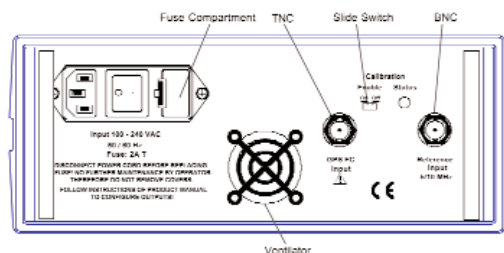
The Balun Transformer is a bi-directional adapter for frequency and traffic interfaces converting signals from 120 Ω balanced (Sub-D9 interface) to 75 Ω unbalanced (BNC interface) and vice versa.

Portable Rubidium Test & Measurement Source

Functional Features



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Rear View

1 PPS Input/Output Synchronization

The 1 PPS output can be synchronized to an external reference 1 PPS. The RubiSource integrity checks the signal at the 1 PPS input and synchronizes its output to better than 100ns. A front panel LED indicates successful synchronization. The LED turned off indicates loss of synchronization.

Functional Monitoring/Built-in Test Equipment

Extensive continuous self tests monitor critical functions of the RubiSource® T&M to ensure its high accuracy. Failures of the equipment hardware compromising the frequency accuracy of the output signals will be detected.

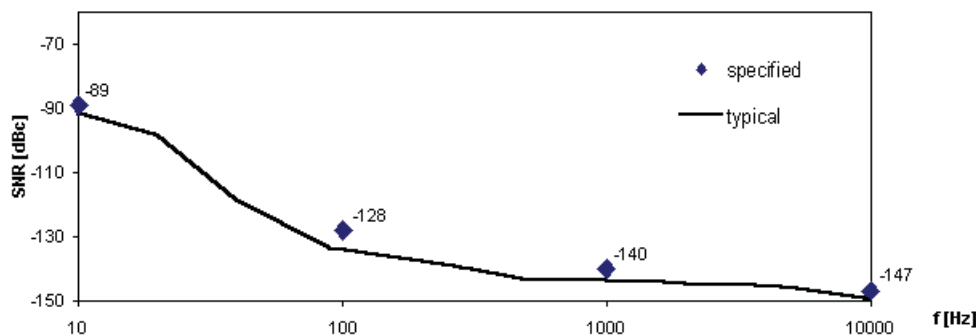
When power is applied the unit enters into a warm-up phase for a few minutes until it reaches full accuracy.

Front panel LED indicators inform the user of the status of the unit.

Alan Deviation (10 MHz sine wave)

$\tau = 1$ second	$< 2.5E-11$ typically $< 1.0E-11$
$\tau = 10$ seconds	$< 0.8E-11$
$\tau = 100$ seconds	$< 0.25E-11$

Phase Noise (10 MHz sine wave)



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