

OSA 3705 Passive Hydrogen Maser

Passive Hydrogen Maser Frequency and Time Standard

Introduction

Telecommunication networks require highly accurate clocks for the effective transmission of digital signals.

One of the primary objectives of telecommunication networks is to guarantee, at the connection between different networks, a slip rate of less than one slip in 72 days.

Meeting these stringent specifications requires the implementation of a Primary Reference Clock (PRC) that generates signals with an accuracy better than $1E-11$, at all times.

Generally, this is achieved using Cesium or Hydrogen Maser clock technology, often combined with GPS receivers as backup sources.

Unlike off-air receivers, Maser clocks are autonomous, self-contained primary references immune from external influences.

A well maintained synchronisation backbone minimises network errors, thus increases network efficiency, resulting in a higher quality of service and a greater use of capacity.

Passive Frequency and Time Standard OSA 3705 PH

is the number one alternative to a high performance reference when better stability and competitive accuracy are needed.



Highlights

- Extremely stable frequency reference based on Hydrogen atom transition.
- Ultimate G.811/Stratum 1 compliant PRS for SDH/SONET synchronisation.
- Alternative technology to cesium reference sources.
- Lifetime is not constraint to 10-12 years like with cesium oscillators but 20 years.
- Low cost hydrogen refurbishment.
- 2.048/5/10/100 MHz and 1 PPS standard outputs.
- Digital control and monitoring of all operations on LCD display and keypad.
- 3 years warranty on Physics package.
- Expected lifetime: 20 years.

Typical Applications

- Telecommunication systems
- Reference for test equipment



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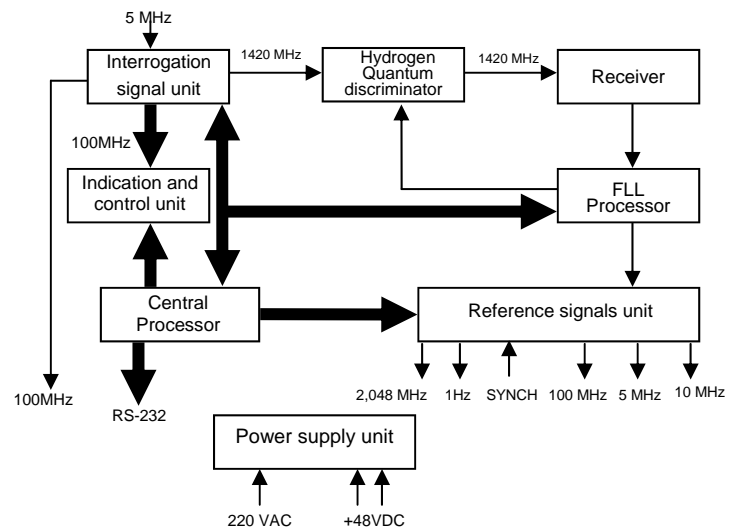
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Principle of operation

Hydrogen Maser principle of operation is based on quartz oscillator frequency locked to the frequency line of hydrogen atom emission of the discriminator (see below). The influence of the discriminator RF-cavity frequency fluctuation on emission line is eliminated by RF-cavity frequency adjustment to quartz oscillator frequency. As discriminator energy level emitted by hydrogen atoms is less than the sum of loss energy, FM excitation signal is introduced into the discriminator cavity to provide spectral line indication and frequency adjustment, controlled by the FLL processor.

The interrogation signal with the frequency of 1420.405 MHz is separated directly in the discriminator cavity. Due to the interaction of the FM interrogation signal with atom line and resonator cavity, signal is converted into AM signal.

The FLL processor produces signals to control the frequency of oscillator, which is tuned locked to the frequency of the hydrogen atoms spectrum line.



Typical Characteristics

Internal reference :

- Type: Passive Hydrogen Frequency and Time Standard
- Initial Frequency: $\pm 2 \times 10^{-12}$ (changed $\pm 2^\circ\text{C}$ within range 5°C to 40°C)
- Accuracy $\text{\textcircled{O}}$: $\pm 1 \times 10^{-12}$ ($22^\circ\text{C} \pm 2^\circ\text{C}$)
- Frequency corrector: Resolution: 1×10^{-15}
Range: 1×10^{-10}
- Frequency stability:
 - 1 sec.: 2×10^{-12}
 - 10 sec.: 6×10^{-13}
 - 100 sec.: 1×10^{-13}
 - 3600 sec.: 6×10^{-14}
 - 1 day: 2×10^{-14}
- Long term stability: $\pm 6 \times 10^{-14}$ /month for first 18 months of continuous operation
- Magnetic sensitiveness: $< 2 \times 10^{-14}$ (1/Oersted)
- Temperature coefficient: $< 5 \times 10^{-14}$ ($1/^\circ\text{C}$)
- Frequency reproducibility: 1×10^{-12}

Environment :

- Operational Temp.: $+5^\circ\text{C}$ to $+40^\circ\text{C}$
- Storage Temp.: 0°C to $+50^\circ\text{C}$
- Humidity: $< 80\%$ (max 35°C)
- EMC: Meets EN50081-1, EN50082-1
- Safety : Meets EN61010-1 (1993) / A2 (1995)
- Expected lifetime: 20 years

Output signals :

- 5 MHz / 10 MHz / 100 MHz, 1Vrms $\pm 0.2\text{V}$, 50 Ω
- 2.048 MHz pulse, 2.5Vpp, 75 ohms (range 1.5-2.8Vpp)
- 1PPS, positive polarity TTL level, 50 ohms

Phase noise (at 5 MHz output) dB/Hz:

- 10 Hz : -115
- 100 Hz : -135
- 1000 Hz : -145
- 10000 Hz : -150

Control Monitoring and Warm up :

- Digital control and monitoring of all operating parameters on LCD display and keypad.
- Warm up time: 8 hours

Electrical / Mechanical :

- Voltage: 220 VAC (100-240V) / 50-60 Hz and 2x48VDC (36-72V)
- Power consumption: max 80W
- Dimension: 203x440x513mm (HxWxD) (19" rack mounting)
- Weight : 30 kg

Oscilloquartz SA reserves the right to change all specifications contained herein at any time without prior notice.

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