

# SyncSystem 4380A

## High Performance GNSS Time and Frequency Reference



### Summary

The SyncSystem 4380A provides superior time and frequency performance in a highly configurable 1U rack-mountable package with redundant and hot-swappable power supplies. The combination of a high-performance internal rubidium atomic oscillator and multi-constellation and multi-band GNSS receiver ensures accurate long-term synchronization with UTC while providing excellent phase noise and short-term stability demanded by metrology, aerospace, communications and defense applications. The 4380A is well suited to satisfy your current timing needs and provide the flexibility to meet future requirements. Each 4380A has six expansion ports for hot-swappable I/O modules that provide a wide array of timing signal outputs and high resolution measurement input ports.

### Key Features

- Timing accuracy: <math><10\text{ ns RMS}</math>
- Frequency accuracy: <math><1\text{E-}13</math> at 1 day
- Multi-band GNSS receiver mitigates effect of ionospheric delay changes and supports advanced GNSS processing
- Phase noise: <math>-110\text{ dBc/Hz}</math> (1 Hz offset)
- Hot-swappable I/O modules
- Redundant and hot-swappable power supplies
- Network management interface
- Remote software upgradeable
- External frequency reference input enables higher timing performance using external frequency standard such as 5071A Cesium clock or MHM 2020 Active Hydrogen Maser
- High resolution phase and time interval measurement inputs (refer to Multi-Channel Measurement Data Sheet for details)

### The Ultimate System Clock Design

The SyncSystem 4380A is a state-of-the-art GNSS disciplined time and frequency reference. The system utilizes an internal rubidium (Rb) atomic clock and low noise synthesizer (LNS) in conjunction with GNSS measurements to provide outputs that are characterized by the short-term stability of the atomic clock and the long-term stability of GNSS. This architecture provides low phase noise performance for all

timing inputs and outputs and in addition delivers frequency coherency across all signal output types (e.g., 1 PPS, IRIG-B, 5 MHz, 10 MHz).

The one Pulse Per Second (PPS) accuracy and frequency stability of the SyncSystem 4380A is further enhanced by using a multi-band (L1/L2/L5) GNSS receiver. Using the L1 and L2 bands, the receiver applies corrections to the GNSS timing signals that remove a significant portion of the errors due to ionospheric delay.

### Internal XPRO Oscillator

Included in the SyncSystem 4380A is Microchip's XPRO, which leverages over 35 years of proven rubidium atomic physics with advanced digital electronics architecture to provide an exceptionally stable oscillator that meets the most demanding performance requirements. Great care has been taken in the design of the XPRO for long operating periods and can maintain 5E-11 per month aging.

The XPRO serves as the reference and holdover when no GNSS frequency reference is being used. The SyncSystem 4380A measures the frequency of the XPRO and a low noise OCXO is steered for frequency alignment.

### Enhanced Timing Performance

Although the SyncSystem 4380A already employs an internal rubidium oscillator, the unit also has the ability to use an external frequency reference (for example, 5071A Cesium clock or MHM 2020 Hydrogen Maser) when available. This further enhances the performance of the system without requiring additional upgrades and provides a scalable architecture that allows users to fulfill a wide range of current and future requirements with a single unit.

### Positioning Data

Recognizing that timing is often just one component of an overall solution, positioning data from the internal multi-band GNSS receiver is also provided to users. GNSS measurement data can either be logged to internal memory for subsequent downloading and post-processing or output in real-time through the Ethernet port.

The SyncSystem 4380A has the ability to produce a Receiver Independent Exchange (RINEX) file that allows users to post-process the GNSS observations and determine the antenna position to typically under one centimeter.

## Redundant and Hot-swappable Power Supplies

In applications where reliability is a must, the SyncSystem 4380A is capable of operating from an AC (100 – 240 VAC, 50-60 Hz) or DC power 48 VDC (22 VDC to 60 VDC) source and comes with two fully redundant hot swappable power supplies. The system can be configured with two AC power supplies, two DC power supplies or a combination of one AC and one DC power supply. The unit is capable of operating from a single supply in the event one of the two power supplies fails.

## Remote Monitoring and Control

The Ethernet interface allows users to remotely monitor and control the unit as well as upgrade the system software and firmware. Local management is also available through the use of a RS-232 adapter via the local USB ports.

## Specifications

- Time accuracy: <10 ns RMS
- Frequency accuracy: 1E-13 at 1 day
- Aging: 5E-11/month
- Allan deviation (GPS locked)
  - 1s 6E-13
  - 10s 8E-13
  - 100s 8E-13
  - 1,000s 6E-13
  - 10,000s 6E-13
  - 100,000s 1E-13
- Phase noise (4395B-10)
  - 1 Hz -110 dBc/Hz
  - 10 Hz -132 dBc/Hz
  - 100 Hz -145 dBc/Hz
  - 1 kHz -150 dBc/Hz
  - 10 kHz -155 dBc/Hz
  - 100 kHz -155 dBc/Hz
  - 1 MHz -155 dBc/Hz
- Mechanical/environmental
  - Size: 1.75" (h) × 19.00" (w) × 19.00" (d)
  - Weight: 20 lbs (9.1 kg)
  - Operating temperature: 0 °C to 50 °C
  - Humidity: 0% to 95% non-condensing
  - Power: 55 Watts

## Standard Input/Output Signals

- GNSS input
  - Connector: TNC(F)
  - Antenna voltage: 0, 5 Vdc or 12 Vdc (selectable)

- 10 MHz input
  - Connector: BNC(F)
  - Level: 10 dBm ±3 dB
  - Impedance: 50Ω
  - Format: sine wave
- Serial console
  - Connector: DB9(M) (USB to serial adapter provided)
  - Format: RS-232
  - Baud: 115,200 (others available upon request)
- Network interface
  - Connector: RJ-45
  - Interface: 10/100/1000 BASE-T
- Power Supplies - Hot Swappable
  - 4385A—AC power supply module
    - Connector: IEC 60320 C-14 Inlet
    - Voltage: 100 VAC–240 VAC, 45 Hz–65 Hz
  - 4386A—DC power supply module (requires DC option in chassis)
    - Connector: 3-pin (mating connector: AMP #1-350346-0)
    - Voltage: 22 Vdc–60 Vdc

## Hot-swappable Modules (refer to Modules data sheet for more details)

- Pulse outputs
  - 4394A: PPS/DC IRIG output module
  - 4334A: Epoch pulse output module
  - 4391A: Code output module
  - 4331A: RS-422 Differential code output module
  - 4376A: 4-port RS422 PPS output (DB-15)
  - 4335A: Pulse (DC-IRIG) output module
  - 4344A: Pulse (10V PPS) output module
- Frequency
  - 4395B-1: 1 MHz output module
  - 4395B-5: 5 MHz output module
  - 4395B-10: 10 MHz output module
- AM IRIG
  - 4387A: AM IRIG module
  - 4337A: AM IRIG epoch module
  - 4338A: 4-epoch AM IRIG module
- Telecom
  - 4374A: 4-port T1/E1 module (RJ-45)
  - 4332A: 4-port TOD module (RJ-45)
- Input and Measurement
  - 4393A: 4-channel PPS measurement module
  - 4382A: 4-channel Phase measurement module
  - 4383A: 4-port IRIG input module
- Optional Accessories
  - 90000-L1L2: Inline 12dB GNSS signal amplifier, L1/L2
  - 90001-L1L2: Inline 21dB GNSS signal amplifier, L1/L2
  - 92003: GNSS antenna
  - 94000-115200: RS-232 console interface (115,200 bps) included
  - 94001-5071A: 5071A serial converter (9600 bps)