

# FREQUENCY/TIME STANDARDS & SYNCHRONIZATION

## GPS Time and Frequency Reference Receiver

HP 58503A

- Reduce the cost for precise time and frequency
- Eliminate calibration through GPS technology
- Improve reliability through HP quartz oscillators



HP 58503A Option 001

### GPS Makes Precise Time and Frequency Affordable

The HP 58503A is well-suited for a broad range of applications. Regardless of industry, it meets the needs of manufacturing, development, calibration labs and services. Through a unique combination of technology, the HP 58503A Time and Frequency Reference Receiver provides a highly-reliable, low-cost source of precision time and frequency.

The HP 58503A is based on Hewlett-Packard's proven quartz technology. This provides unsurpassed reliability and confidence, as well as excellent short-term stability. The core of the design is an oscillator with > 500,000 hours of field-proven mean-time-between-failure (MTBF). This delivers superior performance and reliability while eliminating the need for periodic oscillator replacement as required in rubidium sources.

By locking the oscillator to the GPS signal, the HP 58503A provides frequency accuracy of better than  $1 \times 10^{-12}$ . This gives you the long-term performance of GPS with the superior short-term stability of a state-of-the-art quartz oscillator. Time accuracy compared to UTC (USNO MC) is better than 110 ns—even in the presence of Selective Availability (SA).

When the GPS signal is interrupted, the HP 58503A automatically enters an intelligent holdover mode using HP SmartClock. This minimizes frequency drift and compensates for environmental changes, maintaining accuracy to better than  $1 \times 10^{-10}$  per day.

This unique combination of technology provides you superior value—lower cost, smaller size, higher performance and superior reliability. For a more detailed description of the technologies, see "Key Technologies", page 489.

### Using Technology to Solve Problems

By providing an affordable high-performance reference for frequency and time, many problems have been solved. This convenient reference is easy to integrate into any environment requiring precise time or frequency.

Development labs and manufacturing now have a convenient source for frequency and time—both 10 MHz and 1 pps outputs are standard. Often the HP 58503A proves to be a cost-effective alternative to distributing an in-house standard. By using the HP 58503A as an external frequency reference for test equipment, time-base aging is eliminated—improving the quality of test results while eliminating the need for periodic time-base calibration.

Metrology and calibration labs find the HP 58503A essential. For smaller labs where cost is a key concern, the HP 58503A provides a low-cost alternative for precise time and frequency. For more advanced labs, the HP 58503A offers an excellent time reference. Additionally, it gives you a view into the international time scale through UTC—allowing you to steer or monitor the performance of other oscillators in the lab.

The communications industry also benefits from the convenience of the HP 58503A. When telecom reference signals are unavailable or unreliable, a high-quality reference signal is required. Output options for the HP 58503A provide highly-accurate reference signals with signal formats consistent with all ITU-T specifications. This simplifies the evaluation of communications equipment during development and deployment.

Regardless of industry, the HP 58503A provides a cost-effective, highly-reliable source of precise time and frequency anywhere in the world.

### HP 58503A GPS Time and Frequency Reference Receiver Abbreviated Characteristics and Specifications

#### GPS Receiver

- 6-channel, parallel-tracking
- C/A code, L1 code
- HP SmartClock/HP Enhanced GPS
- DC power supplies available

#### 10 MHz Output Characteristics

**Frequency Accuracy** (locked):  $< 1 \times 10^{-12}$  for a one-day average  
**Holdover Aging** (unlocked):  $< 1 \times 10^{-10}$  per-day average frequency change in 24 hours of unlocked operation  
**Output Level:**  $> 1V_{pp}$  sine wave into  $50 \Omega$  load  
**Phase Noise** (locked):

Offset from signal (Hz)	SSB phase noise (dBc)
1	-85
10	-125
100	-135
1,000	-140
10,000	-145

#### Time-domain Stability (locked):

Averaging time (seconds)	Root Allan variance
0.01	$1.5 \times 10^{-10}$
0.1	$1.5 \times 10^{-11}$
1	$5 \times 10^{-12}$
10	$5 \times 10^{-12}$
100	$5 \times 10^{-11}$
1,000	$5 \times 10^{-11}$

#### 1 pps Output Characteristics

**Jitter on Leading Edge** (locked):  $< 750$  ps rms  
**Time Accuracy** (locked):  $< 110$  ns with respect to UTC (USNO MC)—95% probability when unit is properly installed and calibrated  
**Accumulated Time Error** (unlocked):  $< 8.6 \mu\text{s}$  accumulated in 24 hours after three days of locked operation with a fixed antenna location  
**Output Level:**  $> 2.4$  V pulse into  $50 \Omega$  load  
**Pulse Width:**  $26 \mu\text{s}$

**Front Panel Indicators (LED):** Power, GPS lock, holdover, alarm

**Remote Interface:** RS-232-C DTE configuration

**RS-232 Connector:** 25-pin female rectangular D subminiature on rear panel

#### Power Requirements

**Standard (ac power):** 90 to 132 Vac or 198 to 264 Vac, automatically selected; 50 to 60 Hz

**Option AWM (48 Vdc Power):** -37 to -60 Vdc operating range. Less than -46 Vdc required at start.

**Option AWR (24 Vdc Power):** +19 to +30 Vdc operating range. Greater than +23 Vdc required at start.

**Input Power (all power options):**  $< 35$  watts nominal

### Ordering Information

**HP 58503A** GPS Time and Frequency Reference Receiver

**Opt 001** Front Panel Display

**Opt AWM** 48 Vdc Power

**Opt AWR** 24 Vdc Power

#### Telecom Output Options

**Opt 104** 1.544 Mb/s,  $100 \Omega$  Balanced Superframe

**Opt 105** 1.544 Mb/s,  $100 \Omega$  Balanced ESF

**Opt 220** 2.048 Mb/s,  $120 \Omega$  Balanced CCS

**Opt 221** 2.048 Mb/s,  $120 \Omega$  Balanced CAS

**Opt 222** 2.048 Mb/s,  $120 \Omega$  Balanced CAS/CRC4

**Opt 270** 2.048 Mb/s,  $75 \Omega$  Unbalanced CCS

**Opt 271** 2.048 Mb/s,  $75 \Omega$  Unbalanced CAS

**Opt 272** 2.048 Mb/s,  $75 \Omega$  Unbalanced CAS/CRC4

#### GPS Antenna System and Accessories

See page 495 for the complete line of GPS Accessories.