

# Frequency & Time Standards

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## GPS Time and Frequency Reference Receiver

HP 58503B

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



HP 58503B Option 001

### HP 58503B GPS Time and Frequency Reference Receiver

#### GPS Makes Precise Time and Frequency Affordable

The HP 58503B 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 58503B GPS Time and Frequency Reference Receiver provides a highly-reliable, low cost source of precision time and frequency.

The HP 58503B 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-failures (MTBF). This delivers superior performance and reliability while eliminating the need for periodic oscillator replacement as required in GPS rubidium sources.

By locking its quartz oscillator to the GPS signal, the HP 58503B provides frequency accuracy of better than 1 part in  $10^{12}$ . 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 58503B automatically enters an intelligent holdover mode using HP SmartClock technologies. This minimizes frequency drift and compensates for environmental changes, maintaining accuracy to better than  $1 \times 10^{-9}$  per day.

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

#### Year 2000 Compliant

The HP 58503B has been thoroughly tested to be sure it reliably will move from the year 1999 to the year 2000. This transition was tested while locked to satellites (via simulator), in holdover mode, and when the new year requires a leap second. Further testing proved that the unit recognized that 2000 is a leap year, and that it operates through the GPS system clock rollover in August of 1999. This thorough testing is testimony to HP's uncompromising dedication to quality products - products you can count on.

#### Using Technology to Solve Problems

Development labs and manufacturing now have a convenient source for frequency and time—both 10 MHz and 1 pps outputs are standard. The HP 58503B is a cost-effective in-house standard. By using the HP 58503B 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 58503B essential. For smaller labs where cost is a key concern, the HP 58503B provides a low-cost alternative for precise time and frequency. For more advanced labs, the HP 58503B offers an excellent time reference.

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

#### Abbreviated Characteristics and Specifications

##### GPS Receiver

- 8-channel, parallel-tracking
- HP SmartClock/HP Enhanced GPS
- DC power options available

##### 10 MHz Output Characterizations

**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:**  $> 1V$  p-p 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):**  $< 8.6$   $\mu$ 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  $\mu$ s

##### Power Requirements

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

**Option AWQ\* +19 Vdc to +59Vdc (> +23 Vdc required to start)**

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

\*Only one power supply may be selected. The standard unit operates only from the ac line voltages described above. If either the 24V or 48V power input options are selected, the unit will operate only from that voltage. For backup power, we recommend an appropriate UPS (uninterruptible power supply). These units are inexpensive and can be selected to provide backup power for various amounts of time.

#### Ordering Information

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

**Opt 001 Front-Panel Display**

**Opt AWQ 24/48 Vdc Power**

##### Special Output Frequencies

Including 5MHz, telecom T1 and E1 reference signals and even second output options; contact HP for availability and price.

##### GPS Antenna System and Accessories

See page 497 for the complete line of GPS Accessories.