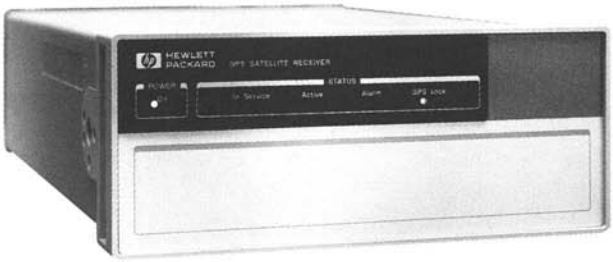
FREQUENCY & TIME STANDARDS

Time and Frequency Reference Distribution

HP 58000A, 58503A, 10811D/E

- Reduce wireless network costs
- Improve reliability and performance
- Custom designs meet exact needs



HP 58503A GPS Time and Frequency Reference Receiver

HP 58000A Series Time and Frequency Reference Distribution Systems

HP 58000A Series Time and Frequency Reference Distribution Systems provide the frequency and timing distribution needed for synchronization of wireless communications networks using either digital (TDMA, CDMA) or analog technologies. HP 58000A series systems are applicable to cellular, PCS, satellite, paging, special mobile radio and military wireless communication networks.

Use the HP 58000A series to meet the demanding needs of new technologies or to upgrade existing installations to realize better synchronization, reliability, and reduced cost of maintenance.

The available building blocks, or functions, of the HP 58000A Series Time and Frequency Reference Distribution System include:

- GPS timing receiver
- Intelligent disciplined oscillators
  - HP SmartClock
- Enhanced GPS filtering
- Frequency references/frequency translators
- Distribution amplifiers
- Wide range of ac and dc power sources

Drawing on these proven designs, Hewlett-Packard delivers products custom configured to meet your precise needs. Products that meet requirements for form, fit, function, performance, and price.

You get the product you would design for yourself. You also get a product which incorporates several HP contributions that improve reliability and performance while reducing cost.

Why Choose the HP 58000A Series?

Reliability: The HP 10811D quartz oscillator is used in all HP 58000A series designs. MTBF of the HP 10811D quartz oscillator is >1,000,000 hours—no routine maintenance required, minimal replacement cost. (Compare to rubidium at 60,000 hours replacement.)

HP SmartClock: Rubidium performance and intelligent holdover with quartz reliability and price. Unique to HP, HP SmartClock technology "learns" the behavior of a quartz oscillator and intelligently uses this information to provide rubidium performance in holdover.

Enhanced GPS: Optimum filtering based on careful study of the GPS Selective Availability spectrum. Reduces the effects of SA by an order of magnitude for systems referenced to GPS. Optimum filters also available for T1/E1 references.

Worldwide Support: HP's Sales and Support Organization covers more than 110 countries. We stand ready to support our products anywhere you need us.

Optimum Designs: HP delivers a custom design to meet your requirements for space, power, configuration, features, performance, and price. Pick from a variety of timing, distribution, power, and GPS functions to realize the precise solution for your needs.

HP SmartClock

HP SmartClock technology delivers rubidium performance and intelligent holdover at quartz prices and with quartz reliability. The HP 10811D quartz oscillator, when used with HP SmartClock algorithms and hardware, provides holdover performance equal to rubidium for periods of several days.

HP SmartClock works as shown in Figure 1. A reference is provided by a GPS receiver, a T-1 or E-1 timing feed or a Stratum 1 clock such as the HP 5071A primary frequency standard. The HP 10811D quartz oscillator is compared to the reference signal. An error signal sent to the microprocessor adjusts the frequency of the HP 10811D. In normal operation, the long-term stability of the HP 10811D is set by the reference signal.

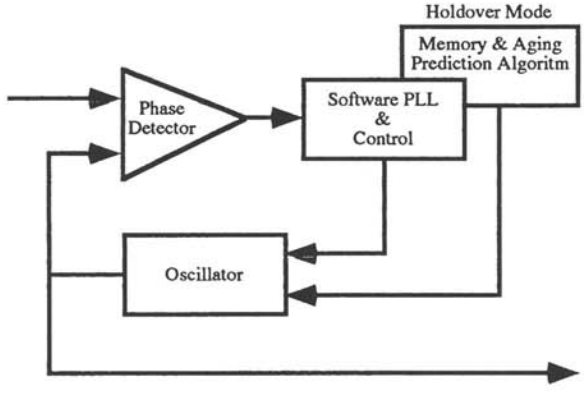


Figure 1. HP SmartClock Concept

During normal operation, the oscillator's characteristics with respect to the reference are "learned" over a period of time. Learned behavior includes both aging and temperature effects.

If the reference signal fails, HP SmartClock enters into holdover operation and the HP SmartClock algorithm applies the learned characteristics of the oscillator intelligently over time. The result is an excellent holdover oscillator with superior reliability at reduced cost. Figure 2 is an illustration of performance during holdover based on a suitable learning period of normal operation.

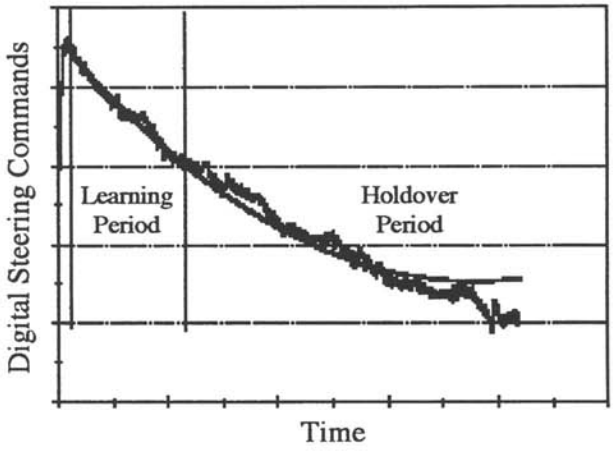


Figure 2. Typical HP SmartClock Holdover Aging Performance

Enhanced GPS

Enhanced GPS is another HP innovation which contributes to a high quality timing distribution and synchronization solution. Enhanced GPS uses an optimum digital filter designed to reduce the jitter intentionally imposed in GPS signals by Selective Access (SA). Enhanced GPS reduces jitter from about 300 ns to approximately 50 ns RMS (see Figure 3).

Enhanced GPS also evaluates the received GPS data. Bad data, due to a malfunctioning satellite or other interruption, is not used. An HP 58000A series product remains reliable even when GPS signals are occasionally degraded.

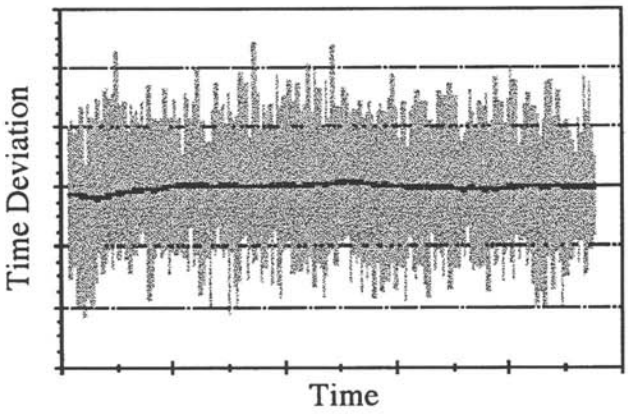


Figure 3. Enhanced GPS filtering reduces SA jitter from about 300 ns to 50 ns RMS

The HP 58503A GPS Time and Frequency Reference Receiver

The HP 58503A GPS time and frequency reference receiver is a high-performance GPS time and frequency reference receiver which meets the needs of many wireless applications. The HP 58503A is an example of the solutions Hewlett-Packard can provide using the HP Series 58000A as a platform.

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

GPS Receiver

- 6-channel, parallel-tracking
- C/A code, L1 carrier
- HP SmartClock technology
- Enhanced GPS technology
- AC or dc supply voltages

10 MHz Output Characteristics

Frequency Accuracy: $<1 \times 10E^{-12}$ locked, one day average
Holdover Aging: $<1 \times 10E^{-9}$/day (Opt 005), $<5 \times 10E^{-10}$/day (Opt 006), $<1 \times 10E^{-10}$/day (Opt 007)

1 pps Output Characteristics

Accuracy of "on" edge (locked): <100 ns traceable to and synchronous with UTC (USNO) with a satellite in view
Accumulate Time Error: $<7\ \mu$s/day unlocked for 48 hours after one day of operation at a fixed location
Jitter: TDEV <0.1 ns @ 1s
Waveform: Pulse width 20 μs

Front Panel Indicators (LED): In service, active, alarm, GPS lock status, power
Front Panel Display (Opt 004): 16 characters, time position, satellite data, status

Ordering Information

Contact Hewlett-Packard for more information and design consultation on the HP 58000A series time and frequency reference distribution systems.

HP 10811D/E

HP 10811D/E Oscillators

The HP 10811D/E crystal oscillators are oven-controlled, high-performance component oscillators. Both offer unmatched quality, high performance, and low cost. The low aging rate and fast warmup time reduce maintenance costs and downtime. Low power consumption gives the HP 10811D/E oscillators longer battery-backup time. Low phase noise translates to lower system phase noise when using HP oscillators.

The HP 10811D has a PCB connector for all external connections; the HP 10811E uses filter feedthrough terminals for power connections and oven monitor. The HP 10811E also has SMB snap-on RF connectors for the 10 MHz output and EFC input, and provisions for shock mounting.

The HP 105B quartz frequency standard uses the HP 10811D and is available as a complete standalone instrument.

Ordering Information	Price
HP 105B Quartz Frequency Standard	$10,400
Opt 908 Rack Flange Kit	+$184
Opt 910 Extra Manual	+$128
HP 10811D 10 MHz Oscillator, PCB/Edge Connector	$1,070
HP 10811E 10 MHz Oscillator, SMB Connectors	$1,225
Options for HP 10811D or HP 10811E	
Opt 001 Low Aging Rate	+$510
Opt 002 Low Phase Noise	+$765
Opt 003 Integrated Opt 001 and Opt 002	+$2,550
Opt 100 Reduced Specifications	−$200
Note: Options are mutually exclusive; no mixing.	
HP 5089A Standby Power Supply (includes ac and dc input power cables, dc output cable, and extender board)	$9,380
Opt 001 Spare Board (HP 05089-60001)	+$1,530
Opt 908 Rack Mounting Adapter Kit	+$77
Opt 910 Extra Operating and Service Manual	+$53
HP 58000 Series Time and Frequency Distribution Products	from $12,000