

GPS 8

GPS SYNCHRONIZED TIME AND FREQUENCY STANDARD



- Frequency Accuracy of 1×10^{-12}
- Choice of Disciplined Oscillator
- Very Stable Time & Frequency outputs
- Optional P(Y) code GPS receiver
- 1U 19" rack mount

The GPS is an economical and reliable Time and Frequency instrument offering a wide range of standard features in a compact, 1U rack-mount chassis. Precision time and frequency outputs, accurate to 40 nano-seconds to UTC/USNO and 1×10^{-12} respectively, are provided in a variety of signal formats.

Applications for the popular GPS8 include central time and frequency systems, timing for power utility systems, and frequency standards for a wide variety of communications installations. The IRIG B output is perfect for use in range timing installations, as inputs to SER and SCADA systems and for driving remote time displays. 1PPM and 1PPD or IRIG B DC shift may be selected for output.

A variety of internal oscillators, including the standard TCXO, provide price/performance trade-off possibilities for the user. The GPS 8 can be specified to include an oscillator that is appropriate for almost any application. An advanced oscillator control algorithm precisely disciplines the internal oscillator to the GPS input ensuring superior holdover performance. In addition to the standard TCXO, a variety of oven controlled (OCXO) and Rubidium oscillators are optionally available.

- Timing Accuracy 40ns, rms to UTC
- 1PPS and IRIG B Time Code outputs
- Two Serial Ports
- 1 MHz, 5 MHz or 10 MHz sine waves
- 1.544, 2.048 or 19.6608 MHz outputs

Two serial data ports, RS-422 and RS-232 are provided. Time, date, position, GPS satellite health and signal strength are reported.

A precision 1PPS time mark output may be used for synchronizing or calibrating other equipment.

The serial time code output (IRIG B is standard) allows time synchronization to be distributed to computers, displays, and other equipment requiring precise time.

Two square waves, 1.544, 2.048 or 19.6608 MHz, and an 8 kPPS frame rate enable the GPS 8 to be used as a telecommunications primary reference clock (PRC).

Sine waves of 1, 5 or 10 MHz are also available. The sine wave outputs are configured as two pairs of two of the above frequencies. Signal level integrity monitoring is provided for the sine wave outputs.

Status information is provided over the serial interface, by a summary alarm, and by four front panel LED indicators. The status reported by the summary alarm and the serial interface includes loss of GPS signal, PLL unlock, loss of output, and Rubidium oscillator unlock. (The rubidium oscillator is an optional feature)

GPS 8 Specifications

1 PPS Output

| | |
|-----------------------|-----------------------|
| Connector | BNC |
| Amplitude & Impedance | 0, +5Vdc from 50 Ohms |
| On Time | Rising edge |
| Duty Cycle | 50% |

Serial Interface

| | |
|-----------------|-----------------------------------|
| Number of Ports | 2 |
| Connector | DB9 |
| Type | RS-232 and/or RS-422 ₁ |
| Baud Rate | 50-19, 200 ₁ |

Sine Wave Outputs₁

| | |
|-------------------|--|
| Number of outputs | Two pairs of 2 |
| Connector | BNC |
| Frequency (MHz) | 1, 5, 10 ₂ (select when ordering) |
| Level | 1 Vrms into 50 Ohms |
| Isolation | Transformer |

Time Code Output, Modulated Carrier₁

| | |
|-------------------|------------------------------------|
| Number of Outputs | 1 |
| Code Format | IRIG B, 2137, NASA 36 ₁ |
| Level | 3Vpp into 600 Ohms |

Digital Time Code & Pulse Rates₁

| | |
|----------------------|---------------------------------------|
| Outputs ₁ | IRIG B, 1PPM, 1PPD, Programmable Rate |
| Levels | DC level shift (HCMOS Logic Level) |

Telecom Outputs₁

| | |
|------------|--|
| Frequency | 2.048, 1.544 or 19.6608 MHz, 2 ea ₂ |
| Output | G703 Section 6 2.37V pulse into 75 Ohms or 3V pulse into 120 Ohms |
| Frame Rate | 8 kPPS, 0v and +5v from 75 Ohms |

Summary Alarm Voltage free relay changeover contacts & TTL level, positive or negative₁

Environmental-Physical-Power

| | |
|----------------|--|
| Temperature | |
| Instrument | 0 to + 50°C |
| Antenna | -40 to +85°C |
| Humidity | To 95% non-condensing |
| Power | 95-260 Vac, 19 W warm, 30 W cold ³ |
| Optional Power | 18-36 Vdc, 36-72 Vdc, -48Vdc |
| Dimensions | 19 inch Rack Mount, 1.73 inches high (1U) 15.80 inches depth |
| Weight | 11lb typical |
| EMC Emission | To EN50081-1 as EN55022 |
| EMC Immunity | To EN50082-1 as EN1000-4-2 ESD, IEC 801-3 HF Field, IEC 801-4 Burst |
| MTBF | 159,769 Hours per Mil 217F, Notice 2, 25 degrees C, ground benign |

Note 1 User Selectable, Telecom outputs may be used to provide 1, 5 or 10 MHz TTL outputs. Consult sales office

Note 2 Factory Set

Note 3 With HSOCXO option

GPS Specification

| | |
|-----------------------|--|
| Satellite Signal | GPS L ₁ 1575.42 MHz |
| Satellite Code | C/A 1.023 MHz |
| Receiver Type | Parallel 8 Channel, 8 Satellites tracked continuously and simultaneously |
| Position Accuracy | 2.4 m horizontal, 5 m altitude with respect to WGS-84 after 24 hours of position averaging |
| Warm start | <20 seconds |
| Autonomous Start | <120 seconds |
| Cold Start, Automatic | No input of time or position is required |
| Antenna & 100' cable | Included at no extra cost. |
| Dynamic Operation | Specify Dynamic Mode at time of order ₂ |
| Tracking satellites | ±150 nS. absolute to UTC* Std Deviation 34 nS (Osc.-03) Hourly mean 25 nS (Osc.-03) |
| Holdover Mode | <8 µsec/day (Osc.-03), 1 µsec/day (Osc.-04) |

Frequency Stability

While Tracking satellites See table below

| OSC TYPE | STABILITY 0-50°C | AVERAGING TIME | | | | | |
|----------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | | 1 SEC | 10 SEC | 100 SEC | 1K SEC | 10K SEC | 1 DAY |
| TCXO | 1X10 ⁻⁶ | 1X10 ⁻⁹ | 2X10 ⁻⁹ | 2X10 ⁻⁸ | 5X10 ⁻¹⁰ | 6X10 ⁻¹¹ | 1X10 ⁻¹² |
| OCXO | 5X10 ⁻⁸ | 5X10 ⁻¹⁰ | 3X10 ⁻¹⁰ | 4X10 ⁻¹⁰ | 4X10 ⁻¹⁰ | 5X10 ⁻¹¹ | 1X10 ⁻¹² |
| HSOCXO | 5X10 ⁻⁹ | 2X10 ⁻¹² | 3X10 ⁻¹² | 1X10 ⁻¹¹ | 1X10 ⁻¹¹ | 5X10 ⁻¹² | 1X10 ⁻¹² |
| Rb | 2X10 ⁻¹⁰ | 2X10 ⁻¹¹ | 3X10 ⁻¹² | 1X10 ⁻¹² | 1X10 ⁻¹² | 1X10 ⁻¹² | 8X10 ⁻¹³ |

SSB Phase Noise

(Data taken with HSOCXO option installed)

| | |
|---------|----------|
| 1Hz | -110 dBc |
| 10Hz | -130 dBc |
| 100 Hz | -140 dBc |
| 1000 Hz | -155 dBc |

| ORDERING INFORMATION | | | | | | | | |
|----------------------|----------|--------------|----------------|----------------|----------|------------------|----------------------------|-------------|
| GPS 8 | -AA | -BB | -CC | -DD | -EE | -FF | -GG | -HH |
| OPTION | MODEL | OSC | SINEWAVE E (A) | SINEWAVE E (B) | TIMECODE | TELCO | SERIAL | POWER |
| 00 | STD C/A | | 2 ea 10MHz | 2 ea 10MHz | IRIG B | 2 ea 1.544 PULSE | 2 ea RS-232 | 115/230 Vac |
| 01 | | TCXO (STD) | 2 ea 5MHz | 2 ea 5MHz | | 2 ea 2.048 PULSE | 2 ea RS-422 | 24Vdc |
| 02 | STD P(Y) | OCXO | 2ea 1MHz | 2 ea 1MHz | NASA 36 | | 1 ea RS-232 1 ea RS-422 | -48Vdc |
| 03 | | HI STAB OCXO | 2 ea 1MHz | 2 ea 1MHz | XR3 | | | 125Vdc |
| 04 | | Rb | | | 2137 | | | |

GPS8 Plus model

Adds keypad and digital display

* 100ns without selective availability implemented