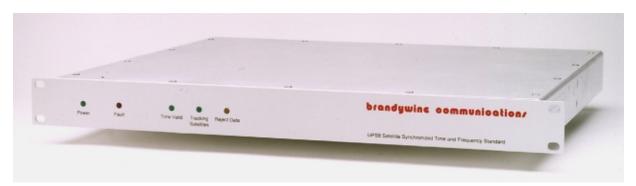# brandywine communications

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**

- **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**
- **Two 1.544 MHz or 2.048 MHz outputs**

The GPS is an economical and reliable Time and Frequency instrument offering a wide range of standard features in a compact, IU rack-mount chassis. Precision time and frequency outputs, accurate to 40 nano- seconds rms 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.

A variety of internal oscillators, including the standard TCXO, offer 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.

Two serial data ports, RS-422 and RS-232 are provided. Time, date, position, and 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 MHz or 2.048 MHz, and an 8 kPPS frame rate allows the GPS 8 to be used as a telecommunications primary reference clock (PRC).

Sine waves of 1, 5, 10 MHz and 1.544 or 2.048 MHz are also provided. 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)

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GPS 8 Specifications

1 PPS Output

Connector	BNC
Type	TTL
On Time	Rising Edge

Serial Interface

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

Sine Wave Outputs

Number of outputs	2 pairs of 2
Connector	BNC
Frequency (MHz)	1, 5, 10, 1.544, 2.048
Level	1 Vrms into 50 ohms
Isolation	Transformer

Time Code Output

Number of Outputs	1
Code Format	IRIG B modulated
Level	2.2 Vpp into 600 ohms

Time Code Options

Codes	NASA 36, 2137, XR3 (250Hz)
Levels	DC level shift (HCMOS Logic Level)

Telecom Outputs

Frequency	2.048 MHz or 1.544 MHz (2 ea)
Output	G703 Section 6 2.37V pulse into 75 ohms or 3V pulse into 120 ohms
Frame Rate	8 kPPS

Summary Alarm

Voltage free relay changeover contacts & TTL level (positive or negative)

Environmental-Physical-Power

Temperature

Instrument	0 to + 50°C
Antenna	-40 to +85°C
Humidity	To 95% non-condensing
Power	110/230 Vac
Optional Power	24 Vdc, -48 Vdc, 125 Vdc
Dimensions	19 inch Rack Mount, 1.73" (1U) height, 15.80" 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

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 Requirement	Automatic. No input of time or position required

Timing Accuracy

Tracking satellites	±150 ns. absolute 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 PER °C	AVERAGING TIME					
		1 SEC	10 SEC	100 SEC	1K SEC	10K SEC	1 DAY
TCXO	$1X10^{-8}$	$1X10^{-9}$	$2X10^{-9}$	$2X10^{-8}$	$5X10^{-10}$	$6X10^{-11}$	$1X10^{-12}$
OCXO	$3X10^{-8}$	$5X10^{-10}$	$3X10^{-10}$	$4X10^{-10}$	$4X10^{-10}$	$5X10^{-11}$	$1X10^{-12}$
HSOCXO	$5X10^{-11}$	$2X10^{-12}$	$3X10^{-12}$	$1X10^{-11}$	$1X10^{-11}$	$5X10^{-12}$	$1X10^{-12}$
Rb	$3X10^{-12}$	$2X10^{-11}$	$3X10^{-12}$	$1X10^{-12}$	$1X10^{-12}$	$1X10^{-12}$	$8X10^{-13}$

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 (A)	SINEWAVE (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 TELCO	2 ea TELCO	XR3			125Vdc
04		Rb			2137			

Other brandywine communications products

- Timing plug ins for CPCI, PCI, PC104, VME, PMC and ISA platforms
- Time and Frequency distribution
- Time/message displays
- Video Time/message inserters

* 100ns without selective availability implemented

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